SOLUBILITIES
OF
ORGANIC COMPOUNDS

A COMPILATION OF QUANTITATIVE SOLUBILITY DATA FROM THE PERIODICAL LITERATURE

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THIRD EDITION

VOLUME II

1941

NEW YORK
D. VAN NOSTRAND COMPANY, INC.
250 FOURTH AVENUE

Printed in U. S. A.

PREFACE

In the preface to the preceding volume of this compilation it was mentioned that the plan of arrangement was being changed from alphabetical in accordance with the English names of the compounds, to alphabetical in accordance with the symbols of the elements. The chemical composition was thus made the basis of the arrangement instead of the names by which the compounds are known.

In this second volume a purely chemical classification has likewise been adopted. It consists in arranging the compounds in accordance with their increasing content of carbon, hydrogen and oxygen. In this way the position of each one is exactly fixed by its empirical formula and the uncertainty is avoided of choosing the best classifying name from the several by which many organic compounds can be correctly designated. The disadvantage of this plan is that empirical formulae are difficult to remember and hence are not easy to use for identifying compounds of carbon. To compensate for this deficiency and provide an additional means of locating desired results, a cross reference name index has been placed at the end of the volume.

In spite of the considerable progress which has been made in recent years in perfecting the rules for naming and representing the structural formulae of organic compounds, an entirely satisfactory system of their classification has still not been perfected. One of the best of those based upon nomenclature is that used by Dr. Austin M. Patterson in his table of Physical Constants of Organic Compounds, published on pages 484-747 of the 20th Edition of the Handbook of Chemistry and Physics, 1935, (Chemical Rubber Publishing Co., Cleveland, Ohio.) It is a pleasure to acknowledge the aid this table has been as a guide in selecting the preferred names and formulae of the compounds included in the present compilation. It has also been especially helpful in tracing the identity of compounds which have been referred to only by name in many of the original papers in which solubility results are given.

Although in most cases the name may be a sufficient identification, language differences and nomenclature revisions often add greatly to the difficulty of tracing the formula corresponding to a given name. The failure to record the structural formula as well as to specify the exact terms in which the results are expressed, may render the most careful work of little value.

Furthermore, results are often reported only in terms selected to demonstrate some theoretical relationship and insufficient details are they were determined. This limits the use which might be made of them in the solution of other problems. It would indeed be a great advantage if the structural formula was given at least one time in every paper and the original numerical values in which the determinations were made, recorded in every case.

As in all previous editions of this compilation the question of where to draw the line in regard to results which are of sufficient interest to be included has been a difficult problem. The published results vary from the most accurate quantitative studies to simple observations of approximate solubilities under loosely controlled conditions. These latter are usually given in connection with descriptions of the preparation and properties of organic compounds and are thus very widely scattered in the literature. They have for the most part been incorporated in the descriptions of organic compounds given in Beilstein and other compendia. To have included them in this volume would have amounted to republication of information usually sought and easily found elsewhere. In general, therefore, it may be said that the present compilation is confined to results taken from original papers and having an interest from the quantitative solubility standpoint.

Solutions are in all cases mixtures from which the constituents cannot be separated mechanically. Solubilities express the amounts beyond which a given compound will not mix with one or more other compounds under fixed conditions. Due to the several states in which matter exists, solubilities may be of quite varied character. In general, however, the ordinary conception of solubility is limited to only a few of the numerous variations which are possible. It will probably be a surprise to some that so much space has been given in the present volume to freezing-points. They are, however, one of the most universal examples of quantitative solubility data. They differ from what is usually looked upon as solubility, in that the end point is reached in a different manner. Thus a mixture of two compounds rendered liquid by elevation of temperature, on gradually being cooled will reach a point, called the freezing-point, at which one or the other of the constituents will separate as a solid. This point represents the solubility of one compound in the other. The method involved differs principally from that ordinarily employed for solubility determinations in that the composition of the mixture remains constant while the saturation temperature is being approached, instead of the reverse procedure.

A very large number of solubility determinations made by the freezing point method are available, but for the most part they are not of as general interest as the results of the determinations made by the more familiar methods. Therefore, references only to such data are given.

freezing-point may be the solute, references to each constituent are needed. In previous editions each system was recorded only under the name of that constituent the initial of which came first in the alphabet, and the name of the other constituent was given in the index. In the present volume an attempt has been made to record every system under the name of each of the constituents of which it is composed. Thus, in the case of all but a few of the more complex ones, there are assembled under every compound for which data are available, the names of all other compounds with which its freezing-point has been determined.

As in the case of the preceding volume the text of the present one has been prepared for planographic reproduction by combining the new data, typewritten on a "Varityper" and photographically reduced, with those tables of the previous editions which have not been superseded by more accurate determinations. The result leaves much to be desired from the point of view of typography, but, as in the case of the previous volume, this method was the only one of which the cost was not prohibitive. The main purpose has been to secure clearness, even at the expense of monotonous repetitions and uniformity of appearance. In view of the large numbers of results which have been collected and systematically arranged it can hardly be expected that complete freedom from typographical and other errors has been attained. The best that can be hoped is that very few of the errors which will inevitably be found will be of a misleading character.

A.S.

Washington, D. C., September 1, 1941.

ABBREVIATIONS

Most of the following abbreviations will be found written both with capitals and without.

$[\alpha]_D$. — Specific Rotation.
abs. — Absolute.
abs. coef. — Absorption Coefficient.
alcohol. — Ethyl Alcohol.
amt(s). — Amount(s).
anhy. — Anhydrous.
aq. — Aqueous.
atm(s). — Atmosphere(s).
at. wt. — Atomic Weight.
b.-pt. — Boiling-point.
C. — Centigrade.
calc. — Calculate(ed).
cc. — Cubic Centimeter(s).
cm. — Centimeter(s).
coef. — Coefficient.
com. — Commercial.
compd. — Compound.
conc. — Concentration, Concentrated.
cond. — Conductivity.
const. — Constant.
cor. — Corrected.
crit. — Critical,
cryo. — Cryohydric.
cryst. — Crystalline.
d. — Dextro (in connection with the name of an optically active compound).
d. — Density (d_{18} — Specific Gravity at 18°, referred to water at 4°; d_{20}^{20} at 20° referred to water at 20°).
decomp. — Decomposition.
dif. — Different.
dil. — Dilute.
dist. coef. — Distribution Coefficient.
ed. — Edition.
elec. — Electric(al).
equil. — Equilibrium.
equiv. — Equivalent(s).
eutec. — Eutectic.
F. — Fahrenheit.
f.-pt. — Freezing-point.
g., gm., gms. — Gram(s).
gm. mol. — Gram Molecule(s).
G. M. — Gram Molecule(s).
hr(s). — Hour(s).
i. — $(d + l)$ Inactive (in connection with the name of an optically active compound.)
inorg. — Inorganic.
insol. — Insoluble.
l. — Lævo (in connection with the name of an optically active compound).
kg. kgm. — Kilogram(s).
l. — Liter(s).
mm. — Millimeter(s)
m. — Meta.
max. — Maximum.
mg., mgm. — Milligram(s).
mol(s). — Molecule(s), Molecular.
mol. wt. — Molecular Weight.
millimol. — Milligram Molecule.
m.-pt. — Melting-point.
n. — Normal (gm. equiv. per l.).
N. — Normal (used rarely).
o. — Ortho.
ord. — Ordinary.
org. — Organic.
p. — Page.
p. — Para.
pet. — Petroleum.
ppt. — Precipitate.
pt. — Point.
quad. pt. — Quadruple Point.
qual. — Qualitative.
sapon. — Saponification.
sat. — Saturated.
sol(s). — Solution(s).
sp. gr. — Specific Gravity (Density).
sq. cm. — Square Centimeter.
s. — Symmetrical.
sym. — Symmetrical.
t°. — Temperature, Centigrade Scale.
temp(s). — Temperature(s).
tr. pt. — Transition Point.
vol(s). — Volume(s).
undissoc. — Undissociated.
U. S. P. — U. S. Pharmacopœia.
wt. — Weight.
∞ — Infinity.
$.10^{-2}$, $.10^{-5}$, etc., following a result means that the decimal point is to be moved as many places to the left as indicated by the minus exponent.

CARBON Tetra BROMIDE CBr_4.

SOLUBILITY OF CARBON TETRABROMIDE IN WATER.

(Gross and Saylor, 1931.)

The saturated solution was prepared by shaking in a thermostat and analyzed by means of an interferometer.

100 gms. H_2O dissolve 0.024 gm. CBr_4 at 30°.

Results for the fusion and transformation points of mixtures of CBr_4 + CCl_4 are given in the form of a diagram by Sohier, 1931. The determinations were made by recording with a thermocouple the temperature changes at regular intervals during the cooling and the heating of known mixtures of the two compounds. The curves for both fusion and transformation decend continuously from the fusion and transformation points of CBr_4 to those of CCl_4. At concentrations of CBr_4 greater than 75% decomposition prevented direct determinations of the fusion points.

Results are also given for the distribution of CCl_4 between aqueous 70% CH_3OH solution and mixed crystals of CBr_4 + CCl_4. In connection with these determinations an analytical method for determining the halogens in presence of each other is described.

Later studies of this system directed particularly toward determining the molecular size of the α polymorphic form of these compounds are given by Verstraete, 1934. Results for the distribution between the saturated vapor phase and mixed crystals of CBr_4 + CCl_4, containing 20% of CCl_4 are given.

FUSION-POINTS OF MIXTURES OF CARBON TETRABROMIDE AND CHLOROFORM.

(Verstraete, 1934.)

t°	Gms. CBr_4 per 100 gms. mixture	t°	Gms. CBr_4 per 100 gms. mixture	t°	Gms. CBr_4 per 100 gms. mixture
92.3	100.	6.7	60.73	-40.55	30.05
39.7	85.35	0.4	57.07	-49.4	25.59
28.4	77.25	-14.4	46.28	-63.7 (Eutec)	19.3
18.0	69.50	-32.0	35.03	-63.3	0.0

FUSION-POINTS OF MIXTURES OF CARBON TETRABROMIDE AND PENTACHLORETHANE.

(Verstraete, 1934.)

t°	Gms. CBr_4 per 100 gms. mixture	t°	Gms. CBr_4 per 100 gms. mixture	t°	Gms. CBr_4 per 100 gms. mixture
92.3	100	13.0	57.51	-36.5 (Eutec)	25.48
58.6	87.29	0.2	48.23	-32.0	12.10
42.9	80.77	-13.6	40.55	-29.5	0.0
26.6	69.06	-23.7	34.26		

CARBON Tetra CHLORIDE CCl_4 (See also Vol. I, p. 214 and p. 584)

SOLUBILITY OF CARBON TETRACHLORIDE IN WATER.

(Gross, 1929; Gross and Saylor, 1931.)

t°	Gms. CCl_4 per 1000 gms. H_2O	Gm. Mol. CCl_4 per 1000 gms. H_2O
15	0.77	0.0050
25	0.77	0.0050
30	0.81	0.0053
28.5	0.13 (Clifford, 1921.)	

The saturated solution was prepared by shaking in a thermostat and analyzed by means of an interferometer.

SOLUBILITY OF WATER IN CARBON TETRACHLORIDE. (See also Vol. I, p. 584)

(Rosenbaum and Walton, 1930.)

t°	Gms. H_2O per, 100 gms. CCl_4	t°	Gms. H_2O per 100 gms. CCl_4
10	0.00711	30	0.0109
20	0.00844	40	0.0152
24	0.010 (Clifford, 1921.)	50	0.0237

SOLUBILITY OF CARBON TETRACHLORIDE IN AQUEOUS SALT SOLUTIONS.

(Gross, 1929.)

Solvent	t°	Gms. CCl_4 per 1000 gms. H_2O
Aq. 0.5 normal KCl	25	0.65
Aq. 0.5 normal $MgSO_4$	25	0.48

RECIPROCAL SOLUBILITY OF CARBON TETRACHLORIDE, WATER AND ALKYL ACIDS AT 25°.

(Smith and Berman, 1937.)

The determinations were made by titrating mixtures of two of the components with the third until homogenity resulted or a permanent cloud separated.

Results for mixtures containing:

Formic Acid

Gm. Mol. Percent		
CCl_4	HCOOH	H_2O
0.01	0.0	99.9
0.15	40.0	60.0
0.30	49.0	51.0
0.40	55.0	44.0
0.60	63.0	36.0
0.90	74.0	24.0
2.2	94.0	3.9

Acetic Acid

Gm. Mol. Percent			Gm. Mol. Percent		
CCl_4	CH_3COOH	H_2O	CCl_4	$C H_3COOH$	H_2O
0.01	0	99.9	11.4	58	33
0.3	5.2	94.5	15.0	58	27
0.3	9.5	90	23	57	20
0.4	14.4	85	27	55	18.
0.4	20.0	79	32	53	15
0.5	28.0	72	48	44	8.0
2.4	46.0	52	55	39	6.2

CARBON Tetra CHLORIDE

RECIPROCAL SOLUBILITY OF CARBON TETRACHLORIDE, WATER AND ALKYL ACIDS AT 25°. (Con.)

Results for Mixtures containing:

Propionic Acid

Gm. Mol. Percent		
CCl_4	C_2H_5COOH	H_2O
0.01	0.0	99.0
0.2	5.7	94
0.5	19	80
1.5	26	72
5.0	33	62
13	40	47
17	44	39
31	47	22
42	46	12
49	43	8.3
55	40	5.5
63	35	2.4
75	25	0.1
99.9	0	0.1

n Butyric Acid

Gm. Mol. Percent		
CCl_4	C_3H_7COOH	H_2O
0.01	0.	99.9
0.1	4.7	95
1.4	22	76
4.8	35	60
7.7	40	52
15	50	35
28	51	21
45	47	7.7
56	39	5.0
59	37	4.1
64	33	3.0
68	30	2.1
79	21	0.3
99.9	0	0.1

n Valeric Acid

Gm. Mol. Percent		
CCl_4	C_4H_9COOH	H_2O
0.01	0.	99.9
0.	0.695	99.3
0.	50.5	49.5
7.1	58	35
17	62	21
24	61	15
40	57	3.1
73	26	0.6
99.9	0	0.1

n Caproic Acid

Gm. Mol. Percent		
CCl_4	$C_5H_{11}COOH$	H_2O
0.01	0.	99.9
0.	0.16	99.84
0.	69.5	30.5
5.7	73.	21
14.	72.	14
22.	68.	9.5
44	53	2.6
72	28	0.4
99.9	0	0.1

n Heptylic (Enanthic) Acid

Gm. Mol. Percent		
CCl_4	$C_6H_{13}COOH$	H_2O
0.01	0.	99.99
0.	0.053	99.95
0.	78.3	21.7
5.9	80	14.0
11.	78	11.
22.	73	5.2
29	67	4.2
38	60	2.1
69	31	0.3
99.9	0	0.1

RECIPROCAL SOLUBILITY OF CARBON TETRACHLORIDE, WATER AND METHYL ALCOHOL.

(Sata and Niwase, 1937.)

The temperatures were determined at which known mixtures of the three components were homogenous, opalescent and cloudy.

Percentage composition of Mixture			t° of:		
CCl_4	CH_3OH	H_2O	Homogeneity	Opalence	Cloudiness
65.2	32.7	2.1	28.0	27.5 - 22.5	20.5
65.1	32.7	2.2	28.0	27.5 - 20.5	18.5
65.0	32.6	2.4	34.0	33.0 - 31.0	28.0
64.9	32.6	2.5	—	—	30.0
82.78	16.56	0.66	—	—	30.0
47.6	47.7	4.7	—	—	30.0
30.5	61.1	8.4	—	—	30.0
13.6	68.6	17.8	—	—	30.0
0.99	49.51	49.5	—	—	30.0
0.66	33.14	66.86	—	—	30.0

CARBON TetraCHLORIDE

MISCIBILITY OF CARBON TETRACHLORIDE, WATER AND ETHYL ALCOHOL AT 0°.

(Bonner, 1910.)

Note.—The determinations were made by gradually adding ethyl alcohol to mixtures of the given amounts of water and the other constituent until a homogeneous solution was obtained. The results give the binodal curve for the system. The author also determined "tie lines" showing the compositions of various pairs of liquids which may exist in equilibrium. As the two layers approach each other in composition, the tie line is gradually shortened and finally reduced to a point, designated as the "plait point" of the binodal curve. This point is indicated by a * in the tables. The mixtures above and below the * correspond, according to their Sp. Gr., to the upper and lower layers of the system.

Composition of Homogeneous Mixtures				Composition of Homogeneous Mixtures			
Gms. CCl_4	Gms. H_2O	Gms. C_2H_5OH	Sp. Gr. sat. sol.	Gms. CCl_4	Gms. H_2O	Gms. C_2H_5OH	Sp. Gr. sat. sol.
0.961	0.039	0.224	1.36	0.60	0.40	0.94	1.03
0.928	0.072	0.347	1.23	0.499	0.501	1.04	1.0
*0.92	0.08	0.39	—	0.40	0.60	1.0	0.97
0.90	0.10	0.45	1.20	0.25	0.75	1.105	0.95
0.80	0.20	0.64	1.15	0.10	0.90	1.0	0.92
0.70	0.30	0.82	1.07	0.032	0.968	0.745	0.93

100 gms. Aq. 0.4 normal Sodium Oleate Solution (= 10.8 gm. Na Oleate per 100 gms. solution) dissolve 6.65 gms. CCl_4 at 20°. (Smith, 1932.)

RECIPROCAL SOLUBILITY OF CARBON TETRACHLORIDE AND SULFUR DIOXIDE.

(Bond and Beach, 1926.)

t° of complete miscibility	Gms. CCl_4 per 100 gms. sat. sol.	t° of complete miscibility	Gms. CCl_4 per 100 gms. sat. sol.
−37.2	28.36	−29.8	66.26
−35.2	31.66	−33.57	80.83
−29.68	49.93	−34.9	82.56
−29.27	58.19	−39.8	88.44
−29.37	58.98		

FUSION-POINTS OF MIXTURES OF CARBON TETRACHLORIDE AND CHLOROFORM.

(Verstraete, 1934.)

t°	Gms. CCl_4 per 100 gms. mixture	t°	Gms. CCl_4 per 100 gms. mixture	t°	Gms. CCl_4 per 100 gms. mixture
−68.0	20.00	−73.1	56.40	−54.6	82.76
−69.0	24.94	−67.8	68.58	−49.65	87.59
−73.4	37.96	−63.05	73.85	−36.35	94.38
−77.7 (Eutec.)	46.52	−58.3	79.18	−22.9	100.00

FUSION-POINTS OF MIXTURES OF CARBON TETRACHLORIDE AND PENTACHLOR ETHANE.

(Verstraete, 1934.)

t°	Gms. CCl_4 per 100 gms. mixture	t°	Gms. CCl_4 per 100 gms. mixture	t°	Gms. CCl_4 per 100 gms. mixture
−37.2	10.66	[illegible]			

DISTRIBUTION OF CARBON TETRACHLORIDE BETWEEN METHYL ALCOHOL AND OIL OF VASELINE AT 25°.

(Kozakewitch, 1935.)

Gm. Mol. CCl_4 per 1000 gms: $CH_3OH(a)$	Gm. Mol. CCl_4 per 1000 gms: Vaseline(v)	$\frac{a}{v}$	Gm. Mol. CCl_4 per 1000 gms.: $CH_3OH(a)$	Gm. Mol. CCl_4 per 1000 gms.: Vaseline(v)	$\frac{a}{v}$
0.189	0.180	1.05	0.352	0.340	1.04
0.324	0.303	1.07	0.453	0.440	1.02

The author also gives results showing the effect of various salts upon the above distribution.

FREEZING-POINTS OF MIXTURES OF CARBON TETRACHLORIDE AND ETHYL ALCOHOL.

(Wyatt, 1928.)

t°	Gm. Mol. Percent of CCl_4 in mixture	Solid Phase
-117.3	0.0	C_2H_5OH
-118. (Eutec.)	11.0	" + $CCl_4\cdot(?)C_2H_5OH$
-47.6(tr.pt.)	44.6	$CCl_4\cdot(?)C_2H_5OH + CCl_4$
-22.8	100.0	CCl_4

Other determinations are given only as points on the diagram. The author also gives the internal molal latent heat curve of the system.

FREEZING-POINTS OF MIXTURES OF CARBON TETRACHLORIDE AND ETHYL ETHER.

(Wyatt, 1929.)

t°	Gm. Mol. Percent of CCl_4 in Mixture	Solid Phase
-116.2	0.0	$(C_2H_5)_2O$
-118.5 (Eutec.)	5.4	" + $2(C_2H_5)_2O.CCl_4$
-122.5 (Eutec.*)	12.5	$(C_2H_5)_2O + (C_2H_5)_2O.CCl_4$
-107. (tr. pt.)	18.0	$2(C_2H_5)_2O.CCl_4 \rightarrow (C_2H_5)_2O.CCl_4$
- 86.5 (m. pt.)	—	$(C_2H_5)_2O.CCl_4$
- 48.2 (tr. pt.)	89.0	" $\rightarrow CCl_4$
- 22.8	100.0	CCl_4

* = Metastable Eutec.

Other determinations are given only as points on the diagram. Results for the internal molal latent heats of evaporation are also given.

FREEZING-POINTS OF MIXTURES OF CARBON TETRACHLORIDE AND ETHYL ACETATE.

(Wyatt, 1929.)

t°	Gm. Mol. Percent of CCl_4 in Mixture	Solid Phase
-83.6	0.0	$CH_3COOC_2H_5$
-90 (Eutec. tr.)	16.5	" + $2(CH_3COOC_2H_5).CCl_4$(?)
-86(?)(m. pt.(?))	33.3	$2(CH_3COOC_2H_5).CCl_4$
-87 (Eutec. tr.?)	42.0	$CH_3COOC_2H_5.CCl_4$ or $2(CH_3COOC_2H_5)CCl_4$
-47.8 (tr. pt.)	86.1	" " + CCl_4

MUTUAL SOLUBILITY OF BENZENE AND CARBON TETRACHLORIDE.

(Determined by the synthetic method.)

(Baud, 1913.)

t°.	Gms. C_6H_6 per 100 Gms. Mixture.	t°.	Gms. C_6H_6 per 100 Gms. Mixture.	t°.	Gms. C_6H_6 per 100 Gms. Mixture.
−24.2	0	−40	19.3	−20	48
−30	2.8	−34	24.2	−10	64.1
−40	8.5	−35 tr. pt.	31	0	85.3
−46.3 Eutec.	12.9	−30	36	+ 5.5	100

Freezing-point data are given for the following systems:

CCl_4 + $CHCl_3$ (Timmermans, 1928; Sameshima and Hiramatsu, 1934.)
+ $CH_2:CHBr$ (Ethylene bromide) (Linhard, 1925.)
+ 1.2,$C_2H_4Br_2$ (Di brom Ethane) (Timmermans, 1928.)
+ $(CH_3)_2CO$ (Acetone) (Timmermans, 1928; Wyatt, 1929.)
+ CS_2 (Timmermans, 1928.)
+ C_6H_6 (Linard, 1925; Lauer and Stodola, 1934.)
+ $C_6H_5NH_2$ (Timmermans, 1930.)
+ $C_6H_5NO_2$ (Linard, 1925; Hrynakowski and Szmyt, 1928.)
+ C_6H_{12} (Cyclohexane) (Timmermans, 1928.)

TRI CHLORO MONO FLURO METHANE CCl_3F.

SOLUBILITY OF TRICHLORO MONOFLUORO METHANE IN ORGANIC SOLVENTS AT 32°.

(Zellhoeffer, 1937; Zellhoeffer, Copley and Marvel, 1938))

Solvent	Formula	Gms. CCl_3F per 100 cc solvent at 364 mm. pressure(1)
Carbitol Acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	28.6
Di ethyl ether of tetra ethylene glycol	$C_2H_5O(CH_2CH_2O)_4C_2H_5$	21.6
Ethyl ether of diethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	33.8(2)
Di methyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	30.2(2)
Di ethyl ether of di ethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	49.5(2)

(1) Vapor pressure of CCl_3F at 4.5°; (2) Gms. per 100 gms. solvent at 364 mm pressure and 32.2°.

DI CHLORO DI FLUORO METHANE CCl_2F_2.

SOLUBILITY OF DICHLORO DIFLUORO METHANE IN ORGANIC SOLVENTS AT 32°.

(Zellhoeffer, 1937; Zellhoeffer, Copley and Marvel, 1938.)

Solvent	Formula	Gms. CCl_2F_2 per 100 cc solvent at 2693 mm pressure(1)
Carbitol Acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	25.8
Carbitol ethyl ether	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	38.0
Di ethyl ether of tetra ethylene glycol	$C_2H_5O(CH_2CH_2O)_4C_2H_5$	25.8
Carbitol methoxy acetate	$C_2H_5O(CH_2CH_2O)_2COCH_2OCH_3$	16.2
4-Methyl -2 pentanol acetate	$(CH_3)_2CHCH_2CH(OCOCH_2)CH_3$	52.0
2,3 Di β' ethoxy-β-ethoxy dioxane	$C_{12}H_{24}O_6$	19.6
y,y' Di chloro-n - propyl ether	$(ClCH_2CH_2CH_2)_2O$	22.0
Di chloro iso propyl ether	$(C_3H_6Cl)_2O$	25.8
α Fluoro naphthalene	$C_{10}H_7F$	23.6
Tri chloro benzene	$C_6H_3Cl_3$	20.4
Ethyl ether or di ethylene glycolacetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	26.7(2)
Di methyl ether or tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	21.5(2)
Di ethyl ether or di ethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	45.8(2)

(1) Vapor pressure of CCl_2F_2 at 4.5°; (2) Gms. per 100 gms. solvent at 2693 mm. pressure and 32.2°.

TETRACHLORO ETHYLENE $CCl_2:CCl_2$.

Freezing-point data for mixtures of tetrachloro ethylene and tetra chloro ethane ($C_2H_2Cl_4$) are given by Timmermans and Mme. Vesselovsky, 1931.

DICHLORO TETRAFLUORO ETHANE $C_2Cl_2F_4$.

SOLUBILITY OF DICHLORO TETRAFLUORO ETHANE IN ORGANIC SOLVENTS AT 32°.

(Zellhoeffer, 1937; Zellhoeffer, Copley and Marvel, 1938.)

Solvent	Formula	Gms. $C_2Cl_2F_4$ per 100 cc solvent at 786 mm pressure (1)
Carbitol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	16.2
Di methyl ether of tetraethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	13.8
Ethyl ether of di ethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	15.5(2)
Dimethyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	12.0(2)
Diethyl ether of di ethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	30.0(2)

(1) Vapor pressure of C_2Cl_4 F_4 at 4.5°.
(2) Gms. per 100 gms. solvent at 786 mm pressure and 32.2°.

TRICHLORO TRIFLUORO ETHANE $C_2Cl_3F_3$.

SOLUBILITY OF TRICHLORO TRIFLUORO ETHANE IN ORGANIC SOLVENTS AT 32.2°.

(Zellhoeffer, Copley and Marvel, 1938.)

Solvent	Formula	Gms. $C_2Cl_3F_3$ per 100 gms. solvent(1)
Ethyl ether of di ethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	33.0
Di methyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	27.5
Di ethyl ether of di ethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	46.5

(1) At a pressure of $C_2Cl_3F_3$ corresponding to its vapor pressure at 4.5°.

CHLOROPICRIN (Trichloronitromethane) CCl_3NO_2.

RECIPROCAL SOLUBILITY OF CHLOROPICRIN AND WATER. (Thompson and Black, 1920.)

Chloropicrin was shaken with a large amount of water to form an emulsion. The mixture was allowed to stand 3 days at room temperature and then maintained at 25° for 6 hours. The chlorine in 100 cc. of the solution was determined. A similar experiment was made at 0°. For the 75° result the solution sat. at 0° waw kept 2 days in a thermostat at 75°.

t°..........................	0°.	25°.	75°.
Gms. CCl_3NO_2 per 100 cc. H_2O..........	0.2272	0.1621	0.1141

For the determination of the solubility of water in chloropicrin, a small amount of water was dissolved in a large amount of chloropicrin and the mixture slowly cooled untill a white cloud appeared. The temperature was then slowly raised untill clearing occurred. The average of the temperature of clouding and of clearing was taken as the temperature of solubility.

t°................	32°.	36°.	41°.	48°.	50°.8.	55°.
Gms. H_2O per 100 gms. CCl_3NO_2.	0.1003	0.1185	0.1243	0.1647	0.1853	0.2265

Freezing-point data for mixtures of chloropicrin and nitrogen peroxide are given by Pascal, 1923.

Results for mixtures of chloropicrin and tetra nitro methyl aniline are given by Jefremow and Tichomirowa, 1928.

PHOSGENE (Carbonyl Chloride) $COCl_2$. (See also Vol. I, p. 237.)

VAPOR PRESSURES OF MIXTURES OF PHOSGENE AND VARIOUS SOLVENTS.

(Kireiew, Kaplan and Wasnewa, 1936.)

Instead of the direct method used by Atkinson, Heycock and Pope, 1920 and Baskerville and Cohen, 1921, for the solubility of Phosgene in various solvents (See Volume I, p. 237.) the authors made determinations of the differences in pressure of mixtures of phosgene and various solvents at several temperatures.

Results at -15° for mixtures of Phosgene and:

DiChloro Ethane, $C_2H_4Cl_2$				Xylol, $C_6H_4(CH_3)_2$			
Wt. % $COCl_2$ in solution	Total Vapor Pressure mm.	Wt. % $COCl_2$ in Solution	Total Vapor Pressure mm.	Wt. % $COCl_2$ in Solution	Total Vapor Pressure mm.	Wt. % $COCl_2$ in Solution	Total Vapor Pressure mm.
0.0	8.	18.02	90.4	0.0	0.0	33.32	124.
1.13	25.4	23.0	102.4	3.36	31	42.0	145
3.45	37.4	28.8	121.4	6.21	48	48.8	162
5.75	45.4	36.02	143.3	13.1	67	54.1	176.
8.02	56.4	42.1	162	21.83	92	100.0	282.5
12.24	70.4	46.9	179.4	27.55	108		

VAPOR PRESSURES OF MIXTURES OF PHOSGENE AND VARIOUS SOLVENTS. (Con.)

Results at 0° for mixtures of Phosgene and:

Dichlor Ethane, $C_2H_4Cl_2$		Xylene, $C_6H_4(CH_3)_2$		Chloro Benzene, C_6H_5Cl	
Wt. % $COCl_2$ in Solution	Total Vapor Pressure, mm.	Wt. % $COCl_2$ in Solution	Total Vapor Pressure, mm.	Wt. % $COCl_2$ in Solution	Total Vapor Pressure, mm.
0.	20.6	0.0	6.	0.0	2.56
2.32	74	3.57	38.6	2.8	35.0
4.71	98	6.81	65.6	5.5	60.0
7.0	119	15.57	134.6	12.8	121.
11.26	154	22.93	180.6	19.0	168.
16.98	209	29.11	242.6	24.5	206.
22.06	238	38.11	280.6	33.5	262.
30.48	292	46.72	324.6	40.6	301.
37.36	335	52.48	355.6	46.4	338.
42.97	367	57.22	380.6	51.1	360.
48.36	390	61.1	395.6	55.1	381.
51.78	405	100.0	556.5	100.	556.5
54.56	423				

Results at 20° for mixtures of Phosgene and:

Benzene C_6H_6		Xylene $C_6H_4(CH_3)_2$		Toluene $C_6H_5CH_3$		Dichloro Ethane $C_2H_4Cl_2$	
Wt. % $COCl_2$ in Solution	Total Vapor Pressure	Wt. % $COCl_2$ in Solution	Total Vapor Pressure	Wt. % $COCl_2$ in Solution	Total Vapor Pressure	Wt. % $COCl_2$ in Solution	Total Vapor Pressure
0.	74.6	0.0	10	0.0	21	0.0	60.5
2.30	136.6	9.0	212.5	9.5	184.8	6.8	187.3
8.97	234.6	16.8	342.	24.3	421	12.9	284.3
16.83	336.6	23.2	441.	36.94	567	18.7	364.3
23.83	422.5	29.4	521.5	43.62	651	23.17	432.3
29.43	488.6	34.5	582.5	47.07	702	28.75	504.3
34.	541.1	38.9	633.7	50.1	747	34.71	582.3
38.75	603.9	42.8	688.7	52.81	780	42.61	667.3
42.68	645.6	46.6	726.6	100.0	1204	46.7	707.3
49.18	711.3	49.5	754.6			49.51	746.3
52.0	731.8	100.0	1204.			51.35	763.3

Results at 20° for mixtures of Phosgene and:

Dichloro Ethylene $C_2H_2Cl_2$		Tetrachloro Ethane $C_2H_2Cl_4$		Carbon Tetrachloride CCl_4		Gasoline (Petrol)	
Wt. % $COCl_2$ in Solution	Total Vapor Pressure	Wt. % $COCl_2$ in Solution	Total Vapor Pressure	Wt. % $COCl_2$ in Solution	Total Vapor Pressure	Wt. % $COCl_2$ in Solution	Total Vapor Pressure
0.0	52	0.0	7.25	0.0	89	0.	5
2.0	98	5.7	137.3	5.4	226.8	9.34	260
7.8	210	15.44	328.3	14.95	410.8	17.57	432
12.7	300	30.3	554.3	19.77	478.8	24.73	557
17.8	375	35.9	627.3	29.67	621.8	30.7	654
22.05	438	38.5	659.3	35.45	685.8	35.91	723
27.1	506	42.3	696	40.21	733.8	40.56	760
33.6	597	45.02	747.3	100.	1204.	100.	1204
36.4	648	100.0	1204.				
39.	678						
42.93	721						

The authors also give the partial vapor pressures and interpolated vapor pressure values for regular intervals of COCl concentration i

CARBON DISULFIDE CS_2. (See also Vol. I pages 238 and 584.)

100 gms. sat. solution of CS_2 in Water contain 0.127 gm. CS_2 at 10° and 0.1185 gms. at 25°.

100 gms. sat. solution of H_2O in CS_2 contain 0.0086 gm. H_2O at 10° and 0.0142 gm. at 25°. (Uspenski, 1929.)

The complete temperature-concentration diagram of the system CS_2 + H_2O between -70 and +135° is given by Terres and Rühl (1934)

RECIPROCAL SOLUBILITY OF CARBON DISULFIDE AND METHYL ALCOHOL.

(Drucker, 1923.)

t°	Gms. CS_2 per 100 gms. sat. sol.	t°	Gms. CS_2 per 100 gms. sat. sol.	t°	Gms. CS_2 per 100 gms. sat. sol.
13.02	46.58	40.50	76.88	39.19	89.03
24.77	52.55	40.6 *	80.5	37.75	91.14
33.12	61.42	40.69	80.75	33.44	94.73
39.57	71.36	40.27	83.30	23.23	97.18

* = critical solution temperature. This temperature is given by Cornish, Archibald, Murphy and Evans, 1934, as 36.2°.

RECIPROCAL SOLUBILITY OF CARBON DISULFIDE AND:

(Joukovsky, 1934.)

Acetonitrile (CH_3CN)

t°	Gms. CS_2 per 100 gms. mixture	t°	Gms. CS_2 per 100 gms. mixture
3.2	26.9	51.5*	62.5
20.0	29.0	51.5	71.5
22.0	30.3	51.5	75.2
38.0	35.6	49.0	83.7
48.5	42.5	30.0	94.3
51.5	57.8	12.5	97.5

Nitromethane (CH_3NO_2)

t°	Gms. CS_2 per 100 gms. mixture	t°	Gms. CS_2 per 100. gms. mixture
18.5	14.5	63.5*	55.0
19.5	15.0	63.5	62.7
26.5	16.0	61.5	78.4
33.6	17.0	57.7	84.1
58.5	27.5	43.0	92.2
63.4	42.4	22.5	95.5

* = Critical solution temperature.((This is given as 63.3° by Timmermans and Mme. Hennaut-Roland, 1932.)

The author also gives results for the total and partial vapor pressures at 20.5° of the above systems and for CS_2 + allyl iso sulfocyanide and CS_2 + tri ethyl amine.

RECIPROCAL SOLUBILITY OF CARBON DISULFIDE AND ACETONE.

(Wieth, 1929.)

t°	Gms. per 100 gms. sat. sol. $(CH_3)_2CO$	Gms. per 100 gms. sat. sol. CS_2	t°	Gms. per 100 gms. sat. sol. $(CH_3)_2CO$	Gms. per 100 gms. sat. sol. CS_2
-72	78.4	21.6	-42.5	41.2	58.8
-52	61.8	38.2	-45	28.7	71.3
-43.5	51.4	48.6	-55	14.8	85.2
-42.5	46.0	54.0			

EQUILIBRIUM IN THE LIQUID AND VAPOR PHASES OF SYSTEMS COMPOSED OF CARBON DISULPIDE AND ANOTHER SOLVENT.

(Lewin, 1930.)

The determinations were made with the aid of a separatory funnel having a small bulb below the stop-cock and a similar one connected by a short tube with the stopper. The mixture was placed in the lower bulb and the funnel evacuated. The stop-cock was then opened and the mixture allowed to come to equilibrium with its vapor at a given temperature. The stop-cock was then closed, the funnel inverted and the vapor condensed in the bulb of the stopper by means of a freezing mixture. The composition of the two liquid mixtures thus obtained was determined by means of a Pulfrisch refractometer.

Results for mixtures of CS_2 and:

Acetone at 35°.10

Mol. Percent CS_2 in	
Liquid	Vapor
3.55	16.77
7.96	24.46
12.90	36.34
27.15	51.44
35.85	55.90
49.13	60.76
50.80	62.13
65.01	65.77
83.65	74.64
92.68	83.93
97.17	91.73

Ether at 20°.10

Mol. Percent CS_2 in	
Liquid	Vapor
10.35	10.50
23.20	21.70
31.26	28.60
31.95	29.30
46.65	40.01
59.38	48.68
70.60	57.00
77.60	63.60
83.25	69.41
87.90	76.28
95.60	89.70

Cyclohexane at 30.05°

Mol. Percent CS_2 in	
Liquid	Vapor
6.60	16.86
14.00	32.78
24.42	47.64
36.48	60.25
48.33	69.84
56.35	76.45
62.15	79.00
69.65	83.82
86.55	93.90

Iso butyl Chloride at 20°

Mol. Percent CS_2 in	
Liquid	Vapor
7.15	18.98
13.73	32.71
24.03	46.23
27.97	52.50
30.30	55.25
42.74	65.87
56.15	73.23
67.72	79.25
83.25	88.45
87.87	91.47
93.45	94.95

Iso pentane at 20°.

Mol. Percent CS_2 in	
Liquid	Vapor
9.85	9.05
18.30	16.52
32.02	26.00
46.96	34.69
53.85	38.80
65.61	46.46
80.90	59.43
82.50	61.27
92.95	75.23
97.90	89.83

Freezing-point data are given for the following systems:

CS_2 + $(CH_3COO)_2O$ (Acetic anhydride) (Jones and Betts, 1928.)
" + CH_3COOH (Pickering, 1893.)
" + $HCONH_2$ Formamide (Jankovsky, 1934.)
" + $N(C_2H_5)_3$ Triethyl amine " "
" + $(C_2H_5)_2O$ Ethyl Ether (Saphir, 1929.)
" + $CH_3COOC_2H_5$ " Acetate " "
" + $CH_2(OCH_3)_2$ Methylal " "
" + C_5H_{12} Iso pentane " "
" + $CHCl_3$ Chloroform (Timmermans, 1928.)
" + CCl_4 Carbon tetra chloride " "
" + C_6H_6 Benzene (Pickering, 1893; Hirshberg, 1932.)
" + C_6H_{12} Cyclohexane (Hirshberg, 1932.)
" + $C_6H_5NO_2$ Nitrobenzene (Timmermans, 1928.)
" + $C_6H_{11}CH_3$ Methyl cyclo hexane (Timmermans, 1934.)
" + C H Br Ethyl bromide " "

BROMOFORM $CHBr_3$.

1000 gms. H_2O dissolve 3.01 gms. $CHBr_3$ at 15° and 3.19 gms. at 30°. (Gross and Saylor, 1931.)

100 gms. anhydrous formic acid dissolve 25.3 gms. $CHBr_3$ at 25°. (Gordon and Reid, 1922.)

Freezing-points of Mixtures of:

Bromoform and Liquid Carbon Dioxide.
(Büchner, 1905–06.)

t°.	Gms. $CHBr_3$ per 100 Gms. CH_3Br+CO_2.
−31	0
−32	3.7
−30	4.9
−16	13.5
− 8	24
− 5	35.2–67.7 quad. pt.
− 3.5	92.1

Bromoform and Toluene.
(Baud, 1912.)

t° of Freezing.	Gms. $CHBr_3$ per 100 Gms. $CHBr_3+C_6H_5.CH_3$.	Solid Phase.
+ 7.7	100	$CHBr_3$
−11.4	86.6	"
−22.2	75.6	"
−30.9	69.8	"
−48.5	60.3	"

Freezing-point lowering data are also given for:

$CHBr_3$ + NO_2 (Pascal, 1923.)
" + C_6H_6 (Schmidlin and Lang, 1912.)

CHLOROFORM $CHCl_3$.

SOLUBILITY IN WATER.
(Chancel and Parmentier, 1885; Rex, 1906.)

t°.	Gms. $CHCl_3$ per Liter of Solution.	Density of Solutions.
0	9.87	1.00378
3.2	8.90	...
17.4	7.12	1.00284
29.4	7.05	1.00280
41.6	7.12	1.00284
54.9	7.75	1.00309

t°.	Gms. $CHCl_3$ per 100 Gms. H_2O (Rex).
0	1.062
10	0.895
20	0.822
30	0.776

100 cc. H_2O dissolve 0.42 cc. $CHCl_3$ at 22°; Vol. of sol. = 100.39 cc., Sp. Gr. = 1.0002.

100 cc. $CHCl_3$ dissolve 0.152 cc. H_2O at 22°; Vol. of sol. = 99.62 cc., Sp. Gr. = 1.4831. (Herz, 1898.)

1000 gms. H_2O dissolve 8.52 gms. $CHCl_3$ at 15° and 7.71 gms. at 30°. (Gross and Saylor, 1931.)

SOLUBILITY OF WATER IN CHLOROFORM. (See also Vol. I, p.584.)

(Gibby and Hall, 1931.)

Mixtures of accurately weighed amounts of water and chloroform were warmed until the water dissolved and, while cooling, the temperature determined at which the first appearance of turbidity could be detected by observing from the side in a beam of light. The results when plotted give two lines which intersect at 0°, the point corresponding to the change from the solubility of ice to that of water. The authors failed to obtain the hydrate of chloroform reported by Chancel and Parmentier, 1885.

t°	Gms. H_2O per 100 gms. $H_2O + CHCl_3$	t°	Gms. H_2O per 100 gms. $H_2O + CHCl_3$	t°	Gms. H_2O per 100 gms. $H_2O + CHCl_3$
-25	0.006(1)	11	0.043	31	0.109
-15	0.009(1)	17	0.061	45	0.118
-1	0.014(1)	22	0.065	43	0.144
+3	0.019	23	0.072	54	0.165

(1) = Solid Phase, Ice.

100 cc 2.0 normal aq. sodium acetate solution dissolve 0.4 gm. $CHCl_3$ at about 18°. (Traube, Schöning and Weber, 1927.)

100 gms. aqueous 0.4 normal sodium oleate solution (=10.8 gms. Na oleate per 100 gms. solution) dissolve 20.6 gms. $CHCl_3$ at 20°. (Smith, 1932.)

SOLUBILITY OF CHLOROFORM IN WATER AND IN BLOOD.

(Winterstein and Hirschberg, 1927.)

The solutions were saturated both by shaking with an excess of $CHCl_3$ and by passing a current of air saturated with $CHCl_3$ vapor through or above the solution until saturated.

Solvent	t°	Gms. $CHCl_3$ per 100 gms. sat. sol.
Water	16-18	0.55
Physiol. salt sol. (0.85% NaCl)	"	0.50
Unchanged blood serum	"	0.56-0.77
Whole blood	"	0.75-0.86

The distribution of chloroform between blood corpuscles and blood liquid depends upon the concentration of $CHCl_3$. At concentrations near the saturation point the corpuscles absorb about twice as much as the plasma while at very low concentrations the corpuscles can absorb four to six times as much $CHCl_3$ as the plasma.

SOLUBILITY OF CHLOROFORM IN AQUEOUS ETHYL ALCOHOL, METHYL ALCOHOL, AND ACETONE MIXTURES AT 20°.

(Bancroft, 1895.)

In Ethyl Alcohol. Per 5 cc. C_2H_5OH.		In Methyl Alcohol. Per 5 cc. CH_3OH.		In Acetone. Per 5 cc. $(CH_3)_2CO$	
cc. H_2O.	cc. $CHCl_3$.	cc. H_2O.	cc. $CHCl_3$.	cc. H_2O.	cc. $CHCl_3$.
10	0.20	10	0.10	5	0.16
8	0.3	5	0.48	4	0.22
6	0.515	4	0.8	3	0.33
4	1.13	2	4	2	0.58
2	2.51	1.49	7	1	0.955
1	4.60	1.35	8	0.79	1.12
0.91	5	1.12	10	0.505	1.60
0.76	6			0.30	2.50
0.55	8			0.21	3.50
0.425	10			0.19	4
0.20	20			0.16	5
0.125	30.24			0.12	10

Data for the system chloroform, ethyl ether and water are given by Jüttner, 1901.

Experiments by Schachner (1910) show that various fats (olive oil, sheep suet, goose fat) in an atmosphere containing 0.55% $CHCl_3$ vapor, dissolve 0.96–0.98 per cent $CHCl_3$ at 38.5°.

Data for the properties of solutions of $CHCl_3$ in water, saline solution, serum, hemoglobin, etc., in their relation to anesthesia are given by Moore and Roaf, (1904) and Waller (1904–05).

EQUILIBRIUM IN THE SYSTEM CHLOROFORM, ETHYL ALCOHOL AND WATER.

(Schoorl and Regenbogen, 1922.)

Mixtures of accurately measured volumes of the very carefully purified constituents were cooled to the appearance of milkiness and the temperature measured by a thermometer immersed in the mixture. The determinations were plotted and the following results for regular intervals of temperature obtained from the curves.

Ratio in cc. of		Cc. $CHCl_3$ required to yield clouding at					
H_2O	to C_2H_5OH.	0°.	10°.	15°.	20°.	25°.	66°.
80	20	–	0.7	–	–	–	–
66.7	33.3	0.7	1.0	1.3	1.6	1.9	–
60	40	1.5	2.2	2.5	2.9	3.2	–
50	50	6.35	7.6	8.2	8.9	9.6	14.0
33.3	66.7	20.8	22.9	23.9	24.9	25.9	–

Ratio in cc. of		Cc. H_2O required to yield clouding at					
$CHCl_3$	to C_2H_5OH.	0°.	10°.	15°.	20°.	25°.	66°.
33.3	66.7	20.1	22.3	23.4	24.4	25.5	–
50.0	50.0	8.8	9.7	10.2	10.6	11.1	14.5
69.0	31.0	3.4	3.65	3.8	3.95	4.15	–
81.0	19.0	1.4	1.5	1.6	1.65	1.7	–

For a mixture of 50 cc. of H_2O + 50 cc. $CHCl_3$, 45 cc. C_2H_5OH are required to yield clouding at 66°.

It is pointed out that the difference between the present results and those of Bancroft are easily explained if Bancroft used alcohol containing 6 % H_2O, instead of absolute.

CHLOROFORM $CHCl_3$.

SOLUBILITY OF CHLOROFORM IN ORGANIC SOLVENTS AT 32.2°.

(Zellhoeffer, Copley and Marvel, 1938.)

Solvent	Formula	Gms. $CHCl_3$ per 100 gms. solvent(1)
Ethyl ether of di ethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	80.0
Di methyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	89.5
Di ethyl ether of diethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	87.5

(1) At a pressure of $CHCl_3$ corresponding to its vapor pressure at 4.5°.

FREEZING-POINTS OF MIXTURES OF CHLOROFORM AND ETHYL ETHER:

(Smits and Berckmans, 1918.)

t° of freezing.	Mols $CHCl_3$ per 100 mols. mixture.	Solid Phase.	t° of freezing.	Mols $CHCl_3$ per 100 mols. mixture.	Solid Phase.
66.5	100.0	$CHCl_3$	95.8	45.13	$CHCl_3.(C_2H_5)_2O$
72.6	90.04	»	99.7	40.00	»
78.7	81.77	»	104.8	35.00	»
93.5	70.00	»	108.1	33.33	»
95.2 (Eutec.)	..	» $+ 2CHCl_3.(C_2H_5)_2O$	111.4	30.05	$CHCl_3.2(C_2H_5)_2O$
93.6	68.00	$2CHCl_3.(C_2H_5)_2O$	114.3	27.0	»
93.5	66.66	»	117.6	20.0	»
93.6	65.00	»	118.4	18.65	»
96.0	61.00	»	121.5	14.99	»
97.4 (Eutec.)	..	» $+ CHCl_3.(C_2H_5)_2O$	121.7 (Eutec.)	..	» $+ (C_2H_5)_2O$
96.4	60.0	$CHCl_3.(C_2H_5)_2O$	119.9	10.01	$(C_2H_5)_2O$
95.1	55.0	»	118.3	5.13	»
94.4	50.0	»	116.4	0.00	»

Freezing-point data for mixtures of chloroform and nitrogen peroxide are given by Pascal, 1923.

MUTUAL SOLUBILITY OF BENZENE AND CHLOROFORM. FREEZING-POINT METHOD.

(Wroczynski and Guye, 1910.)

t°.	Gms. C_6H_6 per 100 Gms. Solution.	Solid Phase.	t°.	Gms. C_6H_6 per 100 Gms. Solution.	Solid Phase.	t°.	Gms. C_6H_6 per 100 Gms. Solution.	Solid Phase.
−63.5	0	$CHCl_3$	−60	26.8	C_6H_6	−20	58.3	C_6H_6
−70	11.8	"	−50	32	"	−10	70.8	"
−75	14.7	"	−40	39	"	0	88	"
−81.7	18.4	$CHCl_3 + C_6H_6$	−30	47.8	"	5	100	"
−70	22.6	C_6H_6						

The eutectic point was found by extending the curves to their intersection. The temperature of the eutectic could not be reached by use of liquid CO_2.

DISTRIBUTION OF CHLOROFORM BETWEEN METHYL ALCOHOL AND OIL OF VASELINE AT 25°.

(Kosakewitch, 1934.)

Gm. Mol. $CHCl_3$ per 1000 gms:			Gm. Mol. $CHCl_3$ per 1000 gms:		
CH_3OH(a)	Vaseline(v)	$\frac{a}{v}$	CH_3OH(a)	Vaseline(v)	$\frac{a}{v}$
0.337	0.068	5.1	0.589	0.126	4.7
0.389	0.0861	4.4	0.630	0.117	5.3
0.482	0.0935	4.4			

The author also gives results showing the effect of various salts upon the above distribution.

Freezing-point data are given for:

$CHCl_3+CCl_4$ (Carbon tetrachloride)(1)(6)
" $+CS_2$ (Carbon di sulfide)(1)
" $+CH_3OH$(Methyl alcohol)(2)(4)(10)
" $+(CH_3)_2CO$ (Acetone)(3)(5)
" $+(CH_3)_2O$ (Methyl Ether)(9)
" $+(C_2H_5)_2O$ (Ethyl Ether)(4)
" $+C_6H_6$ (Benzene)(1)(3)(7)
$CHCl_3+C_6H_5NH_2$ (Aniline)(5)
" $+C_6H_5CH_3$ (Toluene)(1)
" $+C_6H_5NO_2$ (Nitrobenzene)(8)
" $+C_6H_{12}$ (Cyclohexane)(1)
" $+C_6H_{14}$ n (Hexane)(1)
" $+HBr$(11)
" $+HCl$(10)

(1) Timmermans, 1928; (2) Saphir, 1929; (3) Wyatt, 1928; (4) Wyatt, 1929; (5) Tsakalatos and Guye, 1910; (6) Sameshima and Hiramatsu, 1934; (7) Wroczynskii and Guye, 1910; (8) Hyrnakowski and Szmyt, 1928; (9) Baume, 1909, 1914; (10) Baume and Borowski, 1914; (11) Maass and McIntosh, 1912.

DICHLORO MONO BROMO METHANE $CHCl_2Br$.

A saturate solution of dichloro brom methane in formic acid contains 76 percent $CHCl_2Br$ at 61.3°. (Lecat, 1930.)

DICHLORO MONOFLURO METHANE $CHCl_2F$.

SOLUBILITY OF DICHLORO MONOFLUORO METHANE IN ORGANIC SOLVENTS AT 32.2°.
(Copley, Zellhoeffer and Marvel, 1938.)

Solvent	Formula	Gms. $CHCl_2F$ per 100 gms. solvent(1)	Mol. fraction
Phenol	C_6H_5OH	26.9	0.197
Ethylene Glycol	$HOCH_2CH_2OH$	10.0	0.055
Tri methylene Glycol	$HOCH_2CH_2CH_2OH$	10.6	0.073
Anisole	$C_6H_5OCH_3$	67.3	0.415
Phenetole	$C_6H_5OC_2H_5$	62.5	0.425
Phenyl vinyl ether	$C_6H_5OCH=CH_2$	55.9	0.394
Dimethyl ether of ethylene glycol	$CH_3OCH_2CH_2OCH_3$	155.0	0.576
Cyclohexyl methyl ether	$(CH_2)_5CHOCH_3$	90.0	0.500
1.4-Dimethoxy cyclo hexane	$CH_3OHC(CH_2)_4CHOCH_3$	94.1	0.571
Acetic acid	CH_3COOH	68.8	0.286
Propionic acid	C_2H_5COOH	66.5	0.330
n Butyl butyrate	$CH_3(CH_2)_2COO(CH_2)_3CH_3$	87.0	0.546
Diethyl oxalate	$C_2H_5OCOCOOC_2H_5$	56.1	0.556
Dimethyl sulfate	$(CH_3O)_2SO_2$	46.3	0.361
Tri ethyl phosphate	$(C_2H_5O)_3PO_4$	113.2	0.666
Tri butyl phosphate	$(C_4H_9O)_3PO_4$	84.2	0.685
Tri (β-methoxyethyl) phosphate	$(CH_3OCH_2CH_2O)_3PO_4$	83.6	0.687
Cyclo hexyl amine	$CH_2(CH_2)_4CHNH_2$	107.0	0.506
Aniline	$C_6H_5NH_2$	38.5	0.258
Ouinoline	C_9H_7N	63.3	0.443
Dimethyl cyclo hexyl amine	$CH_2(CH_2)_4CHN(CH_3)_2$	80.7	0.500
Dimethyl aniline	$C_6H_5N(CH_3)_2$	69.5	0.425
Methyl diphenyl amine	$(C_6H_5)_2NCH_3$	35.7	0.388
Formamide	$HCONH_2$	7.5	0.032
Acetamide	CH_3CONH_2	trace	—
Methyl formamide	$HCONHCH_3$	76.8	0.303

N, N-Dimethyl formamide	$HCON(CH_3)_2$	93.1	0.398
N,-Methyl acetamide	$CH_3CONH(CH_3)$	95.5	0.403
N, N-Dimethyl acetamide	$CH_3CON(CH_3)_2$	187.0	0.614
N,- Tetra ethyloxamide	$[CON(C_2H_5)_2]_2$	96.5	0.651
N, N-Tetra methyl succinamide	$[CH_2CON(CH_3)_2]_2$	118.0	0.663
N, Methyl-N-cyclohexyl acetamide	$CH_3CON(CH_3)C_6H_{10}$	114.0	0.632
Benzaldehyde	C_6H_5CHO	75.0	0.436
Heptaldehyde	$C_6H_{13}CHO$	97.9	0.510
Paraldehyde	$C_6H_{12}O_3$	88.8	0.532
Cyclohexanone	$CH_2(CH_2)_4C-O$	127.8	0.548
Δ^2-Cyclohexanone	 $CH_2\left<\begin{matrix}CH_2-CH_2\\CH=CH\end{matrix}\right>C=O$	90.3	0.457
Acetyl acetone	$CH_2C=O.CH_2C=O.CH_3$	102.3	0.499
Acetonyl acetone	$CH_3.C=O.CH_2CH_2.C=O.CH_3$	116.3	0.563
Ethyl aceto acetate	$CH_3C=O.CH_2C=O.OC_2H_5$	91.3	0.536
Ethyl diethyl aceto acetate	$CH_3C=O.C(C_2H_5)_2C=O.OC_2H_5$	88.0	0.614
Salicyl aldehyde	C_6H_4OHCHO	50.1	0.372
Ethyl'methyl ketoxime	$CH_3C=NOH.C_2H_5$	65.0	0.338

(1) At a partial pressure of di chloro mono fluoro methane corresponding to its vapor pressure (0.847 atm.) at 4.5°. The vapor pressure of this compound is 2.221 atmospheres at 32.2°. The theoretical "Ideal" Mol. fraction is 0.381 in the saturated solution. This was calculated by using Raoult's law, and is the ratio of the vapor pressure of di chloro mono fluoro methane at 4.5° to its value at 32.2°.

SOLUBILITY OF DICHLORO MONOFLUORO METHANE IN ORGANIC SOLVENTS AT 32°.

(Zellhoeffer, 1937.)

Solvent	Formula	Gms. $CHCl_2F$ per 100 cc solvent at 638 mm pressure(1)
Cellosolve acetate	$C_2H_5O(CH_2)_2OCOCH_3$	100.0
Carbitol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	97.0
Carbitol ethyl ether	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	105.0
Dimethyl ether of tetraethyleneglycol	$CH_3O(CH_2CH_2O)_4CH_3$	104.0
Diethyl ether of tetraethylene glycol	$C_2H_5O(CH_2CH_2O)_4C_2H_5$	93.0
Dimethyl ether of triethylene glycol	$[CH_3O(CH_2)_2OCH_2]_2$	98.0
Carbitol methoxyacetate	$C_2H_5O(CH_2CH_2O)_2COCH_2OCH_3$	89.0
Butyl carbitol acetate	$\underline{n}\ C_4H_9O(CH_2CH_2O)_2COCH_3$	70.0
Diethylene glycol diacetate	$[CH_3COOCH_2CH_2]_2O$	88.0
4- Methyl-2-pentanol acetate	$(CH_3)_2CHCH_2CH(OCOCH_3)CH_3$	72.0
2,3-Di-β'-ethoxy-β-ethoxydioxane	$C_{12}H_{24}O_6$	85.0
y,y'-Dichloro-n-propyl ether	$(ClCH_2CH_2CH_2)_2O$	49.0
Dichloro isopropyl ether	$(C_3H_6Cl)_2O$	49.0
α Fluoro naphthalene	$C_{10}H_7F$	37.0
Butyl cellosolve n butyrate	$\underline{n}\ C_4H_9O(CH_2)_2OCO-\underline{n}-C_3H_7$	65.0
Butyl cellosolve acetate	$\underline{n}\ C_4H_9O(CH_2)_2OCOCH_3$	75.0

DICHLORO MONOFLUORO METHANE $CHCl_2F$. (Con.)

SOLUBILITY OF DICHLORO MONOFLUORO METHANE IN ORGANIC SOLVENTS AT 32 . (Con.)

Solvent	Formula	Gms. $CHCl_2F$ per 100 cc solvent at 638 mm pressure(1)
Butyl cellosolve laurate	$\underline{n}\ C_4H_9O(CH_2)_2OCO(CH_2)_{10}CH_3$	44.0
Butyl cellosolve tetra hydro furfuryl ether	$(C_4H_9O)CH_2O(CH_2)_2O\ \underline{n}C_4H_9$	75.0
Tetra hydro furfuryl cellosolve acetate	$(C_4H_9O)CH_2O(CH_2)_2OCOCH_3$	86.0
Methyl carbitol acetate	$CH_3O(CH_2CH_2O)COCH_3$	100.0
Butyl carbitol chloride	$\underline{n}-C_4H_9(CH_2CH_2O)_2Cl$	63.0
Methyl ether of triethylene glycol acetate	$CH_3O(CH_2CH_2O)_3COCH_3$	91.0
Tetra hydro furfuryl laurate	$(C_4H_7O)CH_2OCO(CH_2)_{10}CH_3$	50.0
Tetra hydro furfuryl acetate	$(C_4H_7O)CH_2OCOCH_3$	87.0
αγ,Glycerol dichlor hydrine acetate	$(ClCH_2)_2CHOCOCH_3$	55.0
Ethyl laurate	$CH_3(CH_2)_{10}COOC_2H_5$	48.0
2-Ethyl-1-hexanol acetate	$CH_3(CH_2)_3CH(C_2H_5)CH_2OCOCH_3$	63.0
Furfuryl acetate	$(C_4H_3O)CH_2OCOCH_3$	65.0
Ethyl furonate	$(C_4H_3O)COOC_2H_5$	76.0
Furfural	$(C_4H_3O)CHO$	72.0
Tetralin	$C_{10}H_{12}$	46.0
Decalin	$C_{10}H_{18}$	24.0
Benzo trifluoride	$C_6H_5CF_3$	40.0
p Fluoro anisole	$\underline{p}\ FC_6H_4OCH_3$	56.0
Cellosolve glycollate	$C_2H_5O(CH_2)_2OCOCH_2OH$	57.0
Cellosolve succinate	$[C_2H_5O(CH_2)_2OCOCH_2]_2$	70.0
Cellosolve adipate	$[C_2H_5O(CH_2)_2OCO(CH_2)_2]_2$	75.0
Benzyl cellosolve	$C_6H_5CH_2O(CH_2)_2OH$	42.0
Benzyl cellosolve acetate	$C_6H_5CH_2O(CH_2)_2OCOCH_3$	65.0
Methyl cellosolve phthalate	$\underline{o}\ C_6H_4(COOCH_2CH_2OCH_3)_2$	59.0
Butyl cellosolve phthalate	$\underline{o}\ C_6H_4(COOCH_2CH_2O-n-C_4H_9)_2$	51.0
Ethylene glycol diacetate	$(CH_3COOCH_2)_2$	91.0
Methyl cellosolve carbonate	$(CH_3OCH_2CH_2O)_2CO$	77.0
Carbitol levulinate	$C_2H_5O(CH_2CH_2O)_2CO(CH_2)_2COCH_3$	75.0
Ethylene glycol diethoxy acetate	$(C_2H_5OCH_2COOCH_2)_2$	75.0
Diethylene glycol diethoxy acetate	$[C_2H_5OCH_2COOCH_2CH_2]_2O$	71.0
Carbitol ethoxy acetate	$C_2H_5O(CH_2CH_2O)_2COCH_2OC_2H_5$	84.0
Diethylene glycol dimethoxy acetate	$[CH_3OCH_2COOCH_2CH_2]_2O$	71.0
Methylene carbitol methoxy acetate	$CH_3O(CH_2CH_2O)_2COCH_2OCH_3$	93.0
Methyl carbitol chloride	$CH_3(CH_2CH_2O)_2Cl$	80.0
Ditetra hydro furfuryl ether of diethylene glycol	$[C_4H_7O)CH_2OCH_2CH_2]_2O$	86.0
Tetra hydro furfuryl cellosolve acetate	$(C_4H_7O)CH_2OCH_2CH_2OCOCH_3$	86.0
Triethylene glycol dimethoxy acetate	$(CH_2OCH_2COOCH_2CH_2OCH_2)_2$	72.0
Di-β-chloroethyl ether of ethylene glycol	$[ClCH_2CH_2OCH_2]_2$	54.0
Methoxy acetate of triethylene glycol acetate	$CH_2OCH_2COO(CH_2CH_2O)_2COCH_3$	89.0
Triethylene glyco diacetate	$[CH_3COOCH_2CH_2OCH_2]_2$	85.0
Dimethyl ether of hexa ethylene glycol	$CH_3O(CH_2CH_2O)_6CH_3$	88.0
2,3-Di-β"methoxy-β-'-ethoxy-β- ethoxy dioxane	$C_{14}H_{28}O_8$	74.0
Methyl ether of triethylene glycol		

SOLUBILITY OF DICHLORO MONOFLUORO METHANE IN ORGANIC SOLVENTS AT 32.2°. (Con.)

(Zellhoefer, Copley and Marvel, 1938.)

Solvent	Formula	Gms. $CHCl_2F$ per 100 gms. solvent at 638 mm pressure(1)
Trimethylene glycol diacetate	$(CH_3COOCH_2)_2CH_2$	90.0
Trimethylene glycol dimethoxy acetate	$(CH_3OCH_2COOCH_2)_2CH_2$	77.0
Tetra hydro furfuryl methoxy acetate	$(C_4H_7O)CH_2OCOCH_2OCH_3$	94.0
Tetra hydro furfuryl benzoate	$(C_4H_7O)CH_2OCOC_6H_5$	62.0
Triacetin	$(CH_3COOCH_2)_2CHOCOCH_3$	73.0
Tripropionin	$(CH_3CH_2COOCH_2)_2CHOCOCH_2CH_3$	67.0
Tributyrin	$[CH_3(CH_2)_2COOCH_2]_2CHOCO(CH_2)_3CH_3$	49.0
Tricaproin	$[CH_3(CH_2)_4COOCH_2]_2CHOCO(CH_2)_4CH_3$	51.0
Ethylene glycol	$HOCH_2CH_2OH$	11.0
Diethylene glycol	$(HOCH_2CH_2)_2O$	32.0
Triethylene glycol	$HO(CH_2CH_2O)_3H$	40.0
Trimethylene glycol	$HO(CH_2)_3OH$	12.0
Tetra hydro furfuryl alcohol	$(C_4H_7O)CH_2OH$	62.0
n Butyl-n butyrate	n $C_3H_7COO-n-C_4H_9$	76.0
Diethyl phthalate	o $C_6H_4(COOC_2H_5)_2$	65.0
Diethyl acetone dicarboxylate	$(C_2H_5OCOCH_2)_2CO$	66.0
Ethyl levulinate	$CH_3CO(CH_2)_2COOC_2H_5$	91.0
Resorcinol diethyl ether	n $C_6H_4(OC_2H_5)_2$	52.0
l Menthone	$C_{10}H_{18}O$	71.0
Diphenyl sulfide	$C_6H_5SC_6H_5$	32.0
Ethyl ether of diethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	102.0
Dimethyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	111.0
Diethyl ether of diethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	113.0
Cyclohexyl methyl ether	$C_6H_{11}OCH_3$	90.0
Dimethyl ether of ethylene glycol	$CH_3OCH_2CH_2OCH_3$	155.0
Di-β-Chloroethyl ether	$ClCH_2CH_2OCH_2CH_2Cl$	42.5
Dimethyl ether of diethylene glycol	$CH_3O(CH_2CH_2O)_2CH_3$	120.0
Diethyl ether of diethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	113.0
Methyl ether of diethylene glycol chloride	$CH_3(CH_2CH_2O)_3Cl$	69.0
Dimethyl ether of triethylene glycol	$CH_3O(CH_2CH_2O)_3CH_3$	101.0
Methyl ether of triethylene glycol chloride	$CH_3(CH_2CH_2O)_3Cl$	77.5
Dimethyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	111.0
Dimethyl ether of hexa ethylene glycol	$CH_3O(CH_2CH_2O)_6CH_3$	83.6
γ,γ'-Dichloro-n-propyl ether	$(ClCH_2CH_2CH_2)_2O$	43.8
Dichloro-iso propyl ether	$[ClCH_2(CH_3)CH]_2O$	44.5
p Fluoro anisole	p $FC_6H_4OCH_3$	50.8
Resorcinol diethyl ether	m $C_6H_4(OC_2H_5)_2$	52.0
Dioxane	$C_4H_8O_2$	107.7
Tetra hydro furfuryl ether of n butyl cellosolve	$(C_4H_7O)CH_2O(CH_2)_2OC_4H_7$	79.1

DICHLORO MONO FLUORO METHANE $CHCl_2F$. (Con.)

SOLUBILITY OF DICHLORO MONOFLUORO METHANE IN ORGANIC SOLVENTS AT 32.2°. (Con.)

(Zellhoefer, Copley and Marvel, 1938.)

Solvent	Formula	Gms. $CHCl_2F$ per 100 gms. solvent at 638 mm. pressure(1)
Ditetra hydro furfuryl ether of diethylene glycol	$[(C_4H_7O)CH_2OCH_2CH_2]_2O$	80.0
Diphenyl sulfide	$C_6H_5SC_6H_5$	28.8
Bis(β-methylthiol ethyl) sulfide	$CH_3SCH_2CH_2SCH_2CH_2SCH_3$	46.0
n Butyl butyrate	$CH_3(CH_2)_2COO(CH_2)_3CH_3$	87.0
Ethyl laurate	$CH_3(CH_2)_{10}COOC_2H_5$	56.1
Diethyl phthalate	$\underline{o}\ C_6H_4(COOC_2H_5)_2$	56.1
Diethyl oxalate	$C_2H_5OCOCOOC_2H_5$	83.0
Diethyl malonate	$C_2H_5OCOCH_2COOC_2H_5$	82.0
Triacetin	$(CH_3COOCH_2)_2CHOCOCH_3$	62.9
Tripropionin	$(CH_3CH_2COOCH_2)_2CHOCOCH_2CH_3$	61.7
Tributyrin	$[CH_3(CH_2)_2COOCH_2]_2CHOCO(CH_2)_2CH_3$	45.8
Tricaproin	$[CH_3(CH_2)_4COOCH_2]_2CHOCO(CH_2)_4CH_2$	52.1
Trimethylene glycol diacetate	$(CH_3COOCH_2)_2CH_2$	84.1
α, y-Glycerol dichlorhydrin acetate	$(ClCH_2)_2CHOCOCH_3$	44.0
4 - Methyl -2- pentanol acetate	$(CH_3)_2CHCH_2CH(OCOCH_3)CH_3$	84.8
Cellosolve acetate	$C_2H_5O(CH_2)_2OCOCH_3$	104.0
Cellosolve succinate	$[C_2H_5O(CH_2)_2OCOCH_2]_2$	65.0
Cellosolve adipate	$[C_2H_5O(CH_2)_2OCO(CH_2)_2]_2$	71.7
Benzyl cellosolve acetate	$C_6H_5CH_2O(CH_2)_2OCOCH_3$	60.4
Methyl cellosolve phthalate	$\underline{o}\ C_6H_4(COOCH_2CH_2OCH_3)_2$	50.5
n Butyl cellosolve phthalate	$\underline{o}\ C_6H_4(COOCH_2CH_2OC_4H_9)_2$	48.4
Ethylene glycol diethoxy acetate	$(C_2H_5OCH_2COOCH_2)_2$	67.0
Diethylene glycol diethoxy acetate	$(C_2H_5OCH_2COOCH_2CH_2)_2O$	63.0
Dimethylene glycol dimethoxy acetate	$(CH_3OCH_2COOCH_2CH_2)_2O$	60.2
Tetra hydro furfuryl cellosolve acetate	$(C_4H_7O)CH_2OCH_2CH_2OCOCH_3$	80.9
Triethylene glycol dimethoxy acetate	$(CH_3OCH_2COOCH_2CH_2OCH_2)_2$	61.4
Methoxy acetate of triethylene glycol acetate	$(CH_3OCH_2COO(CH_2CH_2O)_3COCH_3$	84.3
Triethylene glycol diacetate	$[CH_3COOCH_2CH_2OCH_2]_2$	75.9
Carbitol methoxy acetate	$C_2H_5O(CH_2CH_2O)_2COCH_2OCH_3$	81.2
n Butyl carbitol acetate	$C_4H_9O(CH_2CH_2O)_2COCH_3$	71.8
Diethylene glycol diacetate	$(CH_3COOCH_2CH_2)_2O$	79.2
n Butyl cellosolve n butyrate	$C_4H_9O(CH_2)_2OCOC_3H_7$	71.3
n Butyl cellosolve acetate	$C_4H_9O(CH_2)_2OCOCH_3$	80.4
n Butyl cellosolve laurate	$C_4H_9O(CH_2)_2OCO(CH_2)_{10}CH_3$	49.9
Methyl carbitol acetate	$CH_3O(CH_2CH_2O)_2COCH_3$	94.0
Methyl ether of triethylene acetate	$CH_3O(CH_2CH_2O)_3COCH_3$	86.2
Tetra hydro furfuryl laurate	$(C_4H_7O)CH_2OCO(CH_2)_{10}CH_3$	93.5
Furfuryl acetate	$(C_4H_3O)CH_2OCOCH_3$	57.5
Ethyl furoate	$(C_4H_3O)COOC_2H_5$	68.4
Trimethylene glycol dimethoxy acetate	$[CH_3OCH_2COOCH_2]_2CH_2$	66.6
Tetra hydro furfuryl methoxy acetate	$(C_4H_7O)CH_2OCOCH_2OCH_3$	83.9
Tetra hydro furfuryl benzoate	$(C_4H_7O)CH_2OCOC_6H_5$	55.0
Methyl cellosolve carbonate	$[CH_3OCH_2CH_2O]_2CO$	67.8
l Menthone	$C_{10}H_{18}O$	79.5

Furfural	$(C_4H_3O)CHO$	62.1
Ethyl levulinate	$CH_3COCH_2CH_2COOC_2H_5$	89.9
Ethylene glycol	$HOCH_2CH_2OH$	10.0
Trimethylene glycol	$HOCH_2CH_2CH_2OH$	10.6
Diethylene glycol	$HOCH_2CH_2OCH_2CH_2OH$	28.5
Triethylene glycol	$HOCH_2CH_2OCH_2CH_2OCH_2CH_2OH$	35.8
Tetra hydro furfuryl alcohol	$(C_4H_7O)CH_2OH$	58.8
Benzyl cellosolve	$C_6H_5CH_2O(CH_2)_2OH$	39.2
Cellosolve glycolate	$C_2H_5OCH_2CH_2OCOCH_2OH$	50.9
Aniline	$C_6H_5NH_2$	38.5
Dimethyl aniline	$C_6H_5N(CH_3)_2$	69.5
p Amino dimethyl aniline	p $(CH_3)_2NC_6H_4NH_2$	47.3
Quinoline	C_9H_7N	63.3
Tetraethyl oxamide	$(C_2H_5)_2NCOCON(C_2H_5)_2$	96.5
N - Diethylamide of mono ethyl malonate	$(C_2H_5)_2NCOCH_2COOC_2H_5$	95.0
Acetylpiperidine	$C_5H_{10}NCOCH_3$	1.315
Nitrobenzene	$C_6H_5NO_2$	47.1
Tetralin	$C_{10}H_{12}$	47.5
Decalin	$C_{10}H_{18}$	27.2
Benzo trifluoride	$C_6H_5CF_3$	33.6
α Mono fluoro naphthalene	$C_{10}H_7F$	32.7

(1) At a pressure of $CHCl_2F$ corresponding to its vapor pressure at 4.5°.

MONOCHLORO DIFLURO METHANE $CHClF_2$

SOLUBILITY OF MONOCHLORO DIFLUORO METHANE IN ORGANIC SOLVENTS AT 32.2°.

(Zellhoefer, Copley and Marvel, 1938.)

Solvent	Formula	Gms. $CHClF_2$ per 100 gms. solvent (1)
Ethyl ether of diethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	114.3
Dimethyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	109.0
Diethyl ether of diethylene glycol	$C_2H_5(CH_2CH_2O)_2C_2H_5$	112.7

(1) At a pressure of $CHClF_2$ corresponding to its vapor pressure at 4.5°.

IODOFORM CHI_3.

SOLUBILITY OF IODOFORM IN SEVERAL SOLVENTS.

Solvent	t°	Gms. CHI_3 per 100 gms. solvent	Authority
Water	25	0.0106	U.S.P. VIII
Ethyl Alcohol	25	2.14	" "
" "	25	1.43	Vulpius, 1893
" "	b. pt.	19.2	U.S.P. VIII
" "	"	10.0	Vulpius, 1893
Ethyl Ether	25	19.2	U.S.P. VIII
" "	25	16.6	Vulpius, 1893
Pyridine	20-25	173.1	Dehn, 1917
Aq. 50% Pyridine	"	22.4	" "
Lanolin	46	5.2	Klose, 1907

Solubility of Iodoform in Glycerol.

Chiaria, 1917, 1919.)

Definite weights of 95 % glycerol (d_{15} = 1.255) and $CH\ I_3$ were heated 2 hours under a reflux condenser and the solution rapidly filtered and cooled to 15°. A definite weight of it was analyzed by adding standard silver nitrate and titrating the excess with sulfocyanate. The solubility was found to be 0.123 gms. $CH\ I_3$ per 100 gms. sat. sol. at 15°.

Increase in temperature or use of more concentrated glycerol did not greatly increase this result. (Chiaria, 1917, 1919.)

Freezing-point data for mixtures of iodoform and naphthalene gave a single eutectic at 70°.8 and 43.53 wt. per cent $CH\ I_3$. (Vasilév, 1916.)

HYDROCYANIC ACID CHN. (See also Vol. I, p. 569.)

Freezing-point data are given for:

HCN + $HCOOH$ (formic Acid) (Peiker and Coffin, 1933.)
" + C_6H_5CHO (benzaldehyde) " " " "

METHYLENE BROMIDE Di bromo Methane) CH_2Br_2.

1000 gms. H_2O dissolve 11.70 gms. CH_2Br_2 at 15° and 11.93 gms. at 30°. (Gross and Saylor, 1931.)

Freezing-point data are given for:

CH_2Br_2 + CH_2Cl_2 (Timmermans, 1934.)
" + CH_2I_2 " "
" + $C_6H_5NH_2$ (Timmermans, 1930.)

Solubility of Methylene Bromide, Methylene Chloride and Methyl Iodide, Each Separately in Water.

(Rex, 1906.)

t°.	Gms. per 100 Gms. H_2O.		
	CH_3I.	CH_2Cl_2.	CH_2Br_2.
0	1.565	2.363	1.173
10	1.446	2.122	1.146
20	1.419	2	1.148
30	1.429	1.969	1.176

METHYLENE CHLORIDE (Dichloro Methane) CH_2Cl_2.

SOLUBILITY OF METHYLENE CHLORIDE IN ORGANIC SOLVENTS AT 32.2°.

(Copley, Zellhoefer and Marvel, 1938.)

Solvent	Formula	Gms. CH_2Cl_2 per 100 gms. solvent(1)	Mol. Fraction
Phenol	C_6H_5OH	21.0	0.130
Anisole	$C_6H_5OCH_3$	38.5	0.328
1,4-Dimethoxy cyclo hexane	$C_6H_{10}(OCH_3)_2$	46.0	0.442
Diethyl ether of diethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	56.8	0.520
Dimethyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	58.0	0.602
Acetic acid	CH_3COOH	28.0	0.174
Propionic acid	C_2H_5COOH	32.0	0.218
Triethyl phosphate	$(C_2H_5)_3PO_4$	55.0	0.541
Tri-n-propyl phosphate	$(C_3H_7)_3PO_4$	50.0	0.567
Tri-n-butyl phosphate	$(C_4H_9)_3PO_4$	43.5	0.574
Triphenyl phosphate	$(C_6H_5)_3PO_4$	19.2	0.412
Tri-o-cresyl phosphate	$(C_6H_4(CH_3))_3PO_4$	21.3	0.470
Ethyl ether of diethylene glycol acetate	$C_2H_5OCH_2CH_2OOCCH_3$	50.0	0.509
Ethyl aceto acetate	$CH_3COCH_2COOC_2H_5$	45.4	0.410
Ethyl diethyl aceto acetate	$CH_3COC(C_2H_5)_2COOC_2H_5$	40.3	0.468
Cyclo hexylamine	$C_6H_{11}NH_2$	52.0	0.377
Diphenyl amine	$(C_6H_5)_2NH$	trace	
Formamide	$HCONH_2$	6.2	0.038
Methyl formamide	$HCONHCH_3$	36.5	0.202
Dimethyl formamide	$HCON(CH_3)_2$	41.0	0.261
N-Methyl acetamide	$CH_3CONHCH_3$	42.7	0.269
N,N-Dimethyl acetamide	$CH_3CON(CH_3)_2$	80.8	0.452
N, Methyl-N-cyclohexyl-n-butane sulfonamide	$C_4H_9SO_2N(CH_3)C_6H_{11}$	35.1	0.490
N, Methyl-N-cyclohexyl acetamide	$C_6H_{11}N(COCH_3)CH_3$	60.0	0.521
N, Ethyl-N-cyclohexyl acetamide	$C_6H_{11}N(COCH_3)C_2H_5$	56.5	0.530
Ethyl Methyl ketoxime	$C_2H_5(CH_3)C=NOH$	31.5	0.244
Benzaldehyde	C_6H_5CHO	41.0	0.349
Salicylaldehyde	o-$C_6H_4(OH)CHO$	32.0	0.315
Heptaldehyde	$CH_3(CH_2)_5CHO$	47.3	0.388
Paraldehyde	$C_6H_{12}O_3$	38.5	0.374
Cyclohexanone	$C_6H_{10}O$	63.0	0.421
Δ^2-Cyclohexenone	C_6H_8O	47.3	0.349
Acetyl acetone	$CH_3COCH_2COCH_3$	45.5	0.394
Acetonyl acetone	$CH_3COCH_2CH_2COCH_3$	57.2	0.434

(1) At a partial pressure of methylene chloride corresponding to its vapor pressure (0.230 atm.) at 4.5°.

The vapor pressure of this compound is 0.739 atmosphere at 32.2°.

The theoretical "ideal" mol. fraction is 0.311 in the saturated solution. This was calculated by using Raoult's law and is the ratio of the vapor pressure of methylene chloride at 4.5° to its value at 32.2°.

SOLUBILITY OF METHYLENE CHLORIDE IN ORGANIC SOLVENTS AT 30°.

(Zellhoeffer, 1937; Zellhoeffer, Copley and Marvel, 1938.)

Solvent	Formula	Gms. CH_2Cl_2 per 100cc solvent at 181 mm pressure(1)
Cellosolve acetate	$C_2H_5O(CH_2)_2OCOCH_3$	49.3
Carbitol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	45.0
Diethyl ether of tetra ethylene glycol	$C_2H_5O(CH_2CH_2O)_4C_2H_5$	36.0
Ethyl ether of diethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	50.0 (2)
Dimethyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	57.5 (2)
Diethyl ether of diethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	56.7 (2)

(1) Vapor pressure of CH_2Cl_2 at 4.5°.
(2) Gms. per 100 gms. solvent at 181 mm pressure and 32.2°.

Freezing-point data are given for:

CH_2Cl_2 + C_2H_5Br (Ethyl bromide) (Timmermans, 1934.)
" + $(CH_3)_2CHCH_2Br$ (Iso butyl bromide) (" "
" + CH_3CHCl_2 (1.1. dichloro ethane) " "
" + CH_2Cl_2 (methylene bromide) " "
" + CH_2I_2 (methylene iodide) " "
" + $C_6H_5NO_2$ (nitro benzene) (Hyrnakowski and Szmyt, 1938.)

MONOCHLORO MONOFLUORO METHANE CH_2ClF.

SOLUBILITY OF MONOCHLORO, MONOFLUORO METHANE IN ORGANIC SOLVENTS AT 32.2°.

(Zellhoeffer, Copley and Marvel, 1938.)

Solvent	Formula	Gms. CH_2ClF per 100 gms. solvent(1)
Ethyl ether of diethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	53.8
Dimethyl ether of tetra ethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	57.0
Diethyl ether of diethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	58.0

At a pressure of CH_2ClF corresponding to its vapor pressure at 4.5°.

METHYLENE IODIDE (Diiodo methane) CH_2I_2.

1000 gms. H_2O dissolve 1.24 gm. CH_2I_2 at 30°. (Gross and Saylor, 1931.) Freezing-point data are given by Timmermans, 1934, for CH_2I_2 + $CHCl_2$ over CH_2I_2 + CH_2Br_2.

CYANAMIDE CH_2N_2. (See also Vol. I, p. 216.)

Freezing-point data are given by Pratolongo, 1913, for CH_2N_2 + dicyanamid and CH_2N_2 + Urea.

FORMALDEHYDE, Solid Polymers $(CH_2O)_n$.

SOLUBILITY OF THE SIX WELL DEFINED SOLID POLYMERS OF FORMALDEHYDE IN WATER. (Auerbach and Barschall, 1908.)

	Name	Formula	m. pt.	Gms. per 100 cc. Sat. Solution in Water.
	Paraformaldehyde	$(CH_2O)_n + xH_2O$	150-160	20-30 gms. at 18°
α	Polyoxymethylene	$(CH_2O)_n$	163-8	11 gms. at 18-25°
β	Polyoxymethylene	$(CH_2O)_n$	163-8	3.3 gms. at 18°, about 4 at 25°
γ	Polyoxymethylene	$(CH_2O)_n$	163-5	less than 0.1 at 18°, 0.1 gm. at 25°
δ	Polyoxymethylene	$(CH_2O)_n$	169-70	practically insoluble
α	Trioxymethylene	$C_3H_6O_3$	63-4	17.2 at 18°, 21.1 at 25°

All are insoluble in alcohol and ether except trioxymethylene.

SOLUBILITY OF TRIOXYMETHYLENE IN AQ. SODIUM SULFITE SOLUTIONS AT 15°. (Lumière and Seyewetz, 1902.)

Gms. Na_2SO_3 per 100 cc. H_2O	5	10	20	25	28 (sat.)
Gms. $C_3H_6O_3$ per 100 cc. sat. sol.	22	24	26	27	27

Data are also given for the solubility of various mixtures of trioxymethylene and sodium sulfite in water at 15°.

The distribution coefficient of formaldehyde between water and ether is 8.5 at 0° and 9.23 at 20°. (Hantzsch and Vagt, 1901.)

FORMIC ACID HCOOH.

SOLUBILITY IN WATER, DETERMINED BY FREEZING-POINT METHOD. (Faucon, 1910.)

t° of Solidif.	Gms. HCOOH per 100 Gms. Mixture.	t° of Solidif.	Gms. HCOOH per 100 Gms. Mixture.	t° of Solidif.	Gms. HCOOH per 100 Gms. Mixture.
0	0	−30	53	−40	74.2
−5	12.5	−35	57.6	−30	79
−10	23	−40	62.5	−20	84.2
−15	32	−45	66.5	−10	89.4
−20	40.2	−49 Eutec.	70	0	95
−25	46.5	−45	71.7	+8.51	100

Similar data for mixtures of 97.4% formic acid and water are given by Kremann, 1907.

SOLUBILITY OF FORMIC ACID IN VARIOUS SOLVENTS AT 25° AND VICE VERSA. (Gordon and Reid, 1922.)

The mixtures were constantly shaken at 25° for 4 hours. After separation of the two layers, the formic acid in a weighed amount of each was determined by titration. The weight of the other constituent was calculated by difference.

Solubility of Formic Acid in Various Solvents.

Solvent.	Gms. HCOOH per 100 gms. solvent.
Benzene	14.40
Bromoform	2.45
Carbon disulfide	1.18
Carbon tetra chloride	3.41
Cotton seed oil	8.68
Kerosene	0.897
Toluene	11.04
Xylene	8.74

Solubility of Various Compounds in Anhydrous Formic Acid.

Compound.	Gms. compound per 100 gms. HCOOH
Benzene	15.14
Bromoform	25.3
Carbon disulfide	4.66
Carbon tetra chloride	6.95
Cotton seed oil	0.77
Kerosene	1.56
Toluene	9.08
Xylene	7.29

FORMIC ACID HCOOH.

EQUILIBRIUM IN THE SYSTEM FORMIC ACID, ANILINE AND WATER AT 15°.

(Pound and Wilson, 1935.)

The system is characterized by a region in which the components separate into two liquid layers and one in which crystals of aniline formate, $C_6H_7NCH_2O_2$, are formed. These liquid mixtures and solid crystals change continuously, producing formanilide and water. The crystals redissolve and the homogeneous liquid mixtures separate in time, into two layers.

The authors determined the binodal curve by titrating aqueous formic acid mixtures with aniline. The end point, shown by opalescence, could be determined to within one drop of aniline. Three tie lines showing the percentage of formic acid in adjoining layers were determined. Using these and the values for the binodal curve the following results for the composition of a series of liquid layers in contact with each other have been estimated.

Gms. per 100 gms. aqueous layer			Gms. per 100 gms. aniline layer			
HCOOH	$C_6H_5NH_2$	H_2O	HCOOH	$C_6H_5NH_2$	H_2O	
0.0	3.6	96.4	0.0	95.0	5.0	
4.0	12.0	84.0	0.65	93.5	5.85	
5.5	15.5	79.0	1.7	91.0	7.3	
7.1	21.0	71.9	3.8	83.5	12.7	
8.3	28.5	63.2	6.0	72.0	22.0	
8.5	41.0	50.5	7.4	62.0	30.6	
8.2	50.0	41.8	8.2	50.0	41.8	P.P.

In addition to the binodal curve the authors determined the region in which aniline formate is formed. The saturated solutions were prepared by agitating known mixtures of aniline and formic acid at 15° for ¾ hour or longer and analyzing the solution and the solid phase which separated. Points on the curve were also determined by titrating formic acid solutions with aniline at 15° until crystals remained in the solution and also by titrating aniline with formic acid solutions until crystals persisted. Although the appearance of the crystals varied with the different conditions under which they were formed, analysis showed them to be the formate in all cases. The following points on the curve were determined.

Gms. per 100 gms. sat. solution			Solid Phase
HCOOH	$C_6H_5NH_2$	H_2O	
7.2	79.6	13.2	$C_6H_7N.CH_2O_2$
11.3	64.8	23.9	"
12.5	51.9	35.6	"
18.4	38.5	43.1	"
24.0	36.8	39.2	"
33.1	35.1	31.8	"
41.1	38.1	20.8	"

The authors also describe the changes which occur on keeping the liquid mixtures and the crystals of aniline formate.

MUTUAL SOLUBILITY OF BENZENE AND FORMIC ACID. SYNTHETIC METHOD.

(Ewins, 1914.)

t° of Miscibility.	Gms. HCOOH per 100 Gms. Sol.	t° of Miscibility.	Gms. HCOOH per 100 Gms. Sol.	t° of Miscibility.	Gms. HCOOH per 100 Gms. Sol.
21	9.2	70	31.5	60	74
30	10.3	72	35	40	82
40	12.2	73.2	43.51	20	87
50	16.5	72	60	5	89.6
62	22	70	65		

Results for this system are also given by Wrewsky, Held and Scukarev, 1928, 1929. The critical solution temperature is reported by Timmermans and Mme. Hennaut-Roland, 1930, to be 74.15°.

SOLUBILITY OF BENZENE IN AQUEOUS SOLUTIONS OF FORMIC ACID. SYNTHETIC METHOD.

(Ewins, 1914.)

In 95 Wt. % HCOOH.		In 85 Wt. % HCOOH.		In 75 Wt. % HCOOH.		In 60 Wt. % HCOOH.	
t° of Miscibility.	Gms. C_6H_6 per 100 Gms. Sol.	t° of Miscibility.	Gms. C_6H_6 per 100 Gms. Sol.	t° of Miscibility.	Gms. C_6H_6 per 100 Gms. Sol.	t° of Miscibility.	Gms. C_6H_6 per 100 Gms. Sol.
57.5	96.3	71	97.5	122	12	105	6
77	94.4	87	96.0	97.5	8.5	82	3.8
98	89.8	101	96	74	6	76	3
112	85.2	100.5	14.3				
94.5	24.7	81	10				
80.5	20	46	7				
51	12.5						

DISTRIBUTION OF FORMIC ACID AT 25° BETWEEN:

(Gordon and Reid, 1922.)

Water and Carbon Disulfide.		Water and Carbon Tetrachloride.		Water and Cotton Seed Oil.			
Gms. HCOOH per 100 gms.		Gms. HCOOH per 100 gms.		Gms. HCOOH per 100 gms.		Gms. HCOOH per 100 gms.	
H_2O layer.	CS_2 layer.	H_2O layer.	CCl_4 layer.	H_2O layer.	C.S.O. layer.	H_2O layer.	C.S.O. layer.
5.8	0.00148	5.8	0.00378	1.1	0.0172	20.9	0.331
8.1	[illegible]	8.6	0.0081	2.3	0.036	30.3	0.489
14.6	[illegible]	[illegible]	[illegible]	3.7	0.057	51.1	1.10
[illegible]	[illegible]	26.9	[illegible]	5.5	0.0878	62.5	1.67
41.6	[illegible]	41.[illegible]	[illegible]	8.1	0.1305	71.3	2.43
54.8	[illegible]	58.9	0.1700	12.7	0.193	80.7	3.50
				14.4	0.220	87.2	4.86

The average value for the distribution of formic acid between water and chloroform at 25° was found by Smith, 1921-1922, to be 32.2 millimols HCOOH per liter of the H_2O layer and 1.0 millimol per liter of the $CHCl_3$ layer.

Results showing the distribution of formic acid between water and olive oil are given by Bodansky, 1928.

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND ETHER

at 15°.			at 20°.3.		
(Pinnow, 1919, 1922.)					
Conc. of HCOOH in			Conc. of HCOOH in		
H_2O layer (c1).	$C_4H_{10}O$ layer (c2).	$\frac{c_1}{c_2}$	H_2O layer (c1).	$C_4H_{10}O$ layer (c2).	$\frac{c_1}{c_2}$
1.134	0.526	2.19	1.343	0.588	2.51
0.619	[illegible]	[illegible]	0.663	0.245	2.71
0.342	0.134	[illegible]	0.393	0.142	2.77
0.136	0.0583	[illegible]	0.158	0.0561	2.8[illegible]
0.0276	0.0186	[illegible]			
0.0234	0.0010	2.49			

at 25°.

(Smith, 1921, 1922.)

Millimols HCOOH per liter H_2O layer (C_1).	Millimols HCOOH per liter $(C_2H_5)_2O$ layer (C_2).	$\frac{C_1}{C_2}$
30.00	13.25	2.26
13.45	4.75	2.77
8.85	3.25	2.72
6.55	2.30	2.85
4.775	1.625	2.94

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND ETHER AT 18°.

(Auerbach and Zeglin, 1922.)

Gm. mols. HCOOH per liter of			Gm. mols. HCOOH per liter of		
H_2O layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$	H_2O layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.
0.0476	0.0176	2.53	0.3695	0.1477	2.44
0.0499	0.0185	2.52	0.5090	0.2074	2.41
0.0960	0.0364	2.52	0.6782	0.2799	2.38
0.1036	0.0394	2.52	0.8358	0.3494	2.33
0.1954	0.0756	2.50	1.058	0.4531	2.30
0.2868	0.1131	2.47	1.349	0.6068	2.20

DISTRIBUTION OF FORMIC ACID BETWEEN AQUEOUS 0.5 *n* SULFURIC ACID SOLUTIONS AND ETHER AT 18°.

(Auerbach and Zeglin, 1922.)

Gm. mols. HCOOH per liter of			Gm. mols. HCOOH per liter of		
0.5 *n* H_2SO_4 layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.	0.5 *n* H_2SO_4 layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$
0.0501	0.0200	2.50	0.4786	0.2003	2.39
0.0928	0.0373	2.49	0.4930	0.2070	2.38
0.1710	0.0694	2.47	0.6724	0.2888	2.33
0.1964	0.0803	2.45	0.8517	0.3732	2.28
0.3164	0.1302	2.43	0.8890	0.3913	2.27
0.3455	0.1426	2.42	1.268	0.5834	2.17
0.4061	0.1687	2.41	1.320	0.6116	2.16

Data for the distribution of formic acid between ether and aq. 0.5 *n* H_2SO_4 containing 200 gms. of glucose per liter, are given by Auerbach and Beck, **1926**. The experiments were made for the purpose of perfecting a method for the determination of formic acid in sugar containing foodstuffs such as honey, fruit juices and marmalades.

Data for the extraction of formic acid from water by ether are given by Dakin, Janney and Wakemann, 1913.

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND BENZENE AT 13–15°.

(v. Georgievics, 1913.)

A small separatory funnel was used and the acid in each layer titrated with 0.1 *n* NaOH, using phenolphthaleine as indicator.

Gms. HCOOH Found per:		Gms. HCOOH Found per:	
25 cc. H_2O Layer.	150 cc. C_6H_6 Layer.	25 cc. H_2O Layer.	150 cc. C_6H_6 Layer.
1.016	0.016	2.365	0.035
1.539	0.031	3.826	0.062
1.800	0.024	5.874	0.114
2.112	0.031	7.836	0.138

The distribution ratio of formic acid between water and benzene was found by King and Narracott (1909) to be 1 to 0.0242 at room temp.

DISTRIBUTION OF FORMIC ACID AT 25° BETWEEN :

Water and Benzene.

(Brown and Bury, 1923.)

Normality of HCOOH in	
H_2O layer.	C_6H_6 layer.
3.400	0.0117
3.757	0.0138
3.933	0.0147
4 689	0.0188
5.483	0.0233
6.806	0.0348

(Gordon and Reid, 1922.)

Gms. HCOOH per 100 gms.	
H_2O layer.	C_6H_6 layer.
5.3	0.0170
6.4	0.0197
9.9	0.0400
13.6	0.0584
18.5	0.0840
29.2	0.156
41.2	0.322
58.2	0.800

Water and Bromoform.

(Gordon and Reid, 1922.)

Gms. HCOOH per 100 gms.	
H_2O layer.	$CHBr_3$ layer.
3.1	0.114
6.9	0.180
10.8	0.176
23.1	0.394
39.0	0.675
53.6	1.195

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND CHLOROFORM AT:

0° (Bektourov, 1939.)		10° (Schilow and Lepin, 1922.)		50° (Bektourov, 1939.)	
Gm. Equiv. HCOOH per liter		Normality HCOOH in:		Gm. Equiv. HCOOH per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	$CHCl_3$ layer	H_2O layer	$CHCl_3$ layer
1.7495	0.00709	2.25	0.0174	1.6431	0.01418
3.2153	0.01537	4.22	0.0348	2.2223	0.02010
4.2556	0.02246	7.67	0.0783	3.1207	0.0295
7.7540	0.0543	13.08	0.244	5.1185	0.0556
9.5041	0.0827	17.82	1.131	8.2038	0.1182
11.7973	0.1418			11.1117	0.2009

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND CARBON TETRACHLORIDE.

(Bektourov, 1939.)

0°		25°		60°	
Gm. Equiv. HCOOH per liter		Gm. Equiv. HCOOH per liter		Gm. Equiv. HCOOH per liter	
H_2O layer	CCl_4 layer	H_2O layer	CCl_4 layer	H_2O layer	CCl_4 layer
4.4920	0.003546	4.1492	0.004728	3.5936	0.00662
5.4377	0.005910	6.4306	0.00946	7.6364	0.0236
8.3029	0.01300	10.0005	0.0212	9.5986	0.0354
10.0005	0.01888	12.9794	0.0361	11.9865	0.0591
12.2465	0.0283	14.3270	0.04728	14.5871	0.0886
17.6133	0.0827				

DISTRIBUTION OF FORMIC ACID AT 25° BETWEEN:

(Archibald, 1932.)

Water and:	Gm. Mols. HCOOH per liter		$\frac{C_2}{C_1}$
	H_2O layer (C_1)	Organic layer (C_2)	
Amyl alcohol	0.14386	0.08318	0.5782
	0.48989	0.25472	0.5200
Tertiary amyl alcohol	0.11443	0.13015	1.1373
	0.36056	0.39705	1.1012
Normal butyl alcohol	0.25622	0.22507	0.8486
	0.78493	0.63554	0.8097
Secondary Butyl alcohol	0.11830	0.12781	1.0804
	0.34625	0.36953	1.0672
Methyl ethyl ketone	0.12269	0.16511	1.3457
	0.34252	0.44332	1.2942

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND BENZENE.

(Bektourow, 1939.)

0° Gm. Equiv. HCOOH per liter H_2O layer	0° C_6H_6 layer	25° Gm. Equiv. HCOOH per liter H_2O layer	25° C_6H_6 layer	60° Gm. Equiv. HCOOH per liter H_2O layer	60° C_6H_6 layer
1.4573	0.00226	2.5739	0.00568	3.3877	0.0208
2.7443	0.00454	4.6747	0.0123	4.5233	0.0303
3.3310	0.00645	6.2645	0.0208	6.1699	0.0473
7.9868	0.0240	7.4000	0.0265	7.7691	0.0693
10.0308	0.0378	8.2423	0.0325	9.2737	0.0947
12.6615	0.0599	9.0466	0.0378	10.9771	0.1419
				12.1126	0.1514

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND NITROBENZENE AT 25°.

(de Kolossowsky, Kulikow and Bekturow, 1935.)

Gm. Mol. HCOOH per liter H_2O layer(C_1)	$C_6H_5NO_2$ layer(C_2)	$\frac{C_1}{C_2}$
0.185	0.0038	48.7
0.489	0.01025	47.7
0.9215	0.0193	47.7
1.230	0.026	47.3
1.878	0.041	45.8
3.1248	0.0693	45.1
4.6384	0.1108	41.9
5.991	0.1539	38.9
9.6828	0.3164	30.6
12.2466	0.4942	24.8
14.2632	0.7749	18.4
16.5942	2.1798	7.6
16.5060	3.1827	5.2
16.3296	3.4776	4.7
14.918	4.985	2.99
13.608	6.3512	2.14

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND TOLUENE AT 25°.

(de Kolossowsky and Megenine, 1932.)

Gm. Equiv. HCOOH per liter H_2O layer(C_1)	$C_6H_5CH_3$ layer(C_2)	$\frac{C_1}{C_2}$
0.9978	0.002203	452.9
2.9922	0.007760	385.6
4.9846	0.015394	323.8
6.9739	0.02606	267.6
8.9587	0.04128	217.0
10.936	0.06366	171.8
12.903	0.0937	132.6
14.85	0.1503	115.0
16.76	0.2374	70.6
18.61	0.3878	48.0
20.34	0.6563	31.0
21.88	1.1165	19.6
23.31	1.689	13.8
24.16	1.844	13.1

DISTRIBUTION OF FORMIC ACID AT 25° BETWEEN :

(Gorden and Reid 1922.)

Water and Kerosene.

Gms. HCOOH per 100 gms. H_2O layer	Kerosene layer.
17.9	0.0099
30.9	0.0218
38.9	0.0329
43.2	0.0415
59.8	0.126
66.3	0.173

Water and Toluene.

Gms. HCOOH per 100 gms. H_2O layer	Toluene layer.
5.3	0.0149
7.9	0.0246
16.5	0.0566
31.0	0.1375
41.7	0.270
59.7	0.726

Water and Xylene

Gms. HCOOH per 100 gms. H_2O layer.	Xylene layer.
5.0	0.0208
5.1	0.0238
8.6	0.0421
9.6	0.0420
15.0	0.0572
15.6	0.0556
25.6	0.1155
26.4	0.1120
40.4	0.223
41.2	0.254
55.2	0.500
55.7	0.493

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND ORTHO NITRO TOLUENE AT 25°.

(de Kolossowsky, 1934; de Kolossowsky, Kulikow and Bekturow, 1935.)

Gm. Mols. HCOOH per liter		$\frac{C_1}{C_2}$	Gm. Mols. HCOOH per liter		$\frac{C_1}{C_2}$
H_2O layer(c_1)	o $C_6H_4CH_3 \cdot NO_2(C_2)$		H_2O layer(c_1)	o $C_6H_4CH_3 \cdot NO_2(C_2)$	
0.3073	0.0047	65.4	4.708	0.0846	55.65
0.6005	0.0095	63.2	6.619	0.131	50.2
0.8747	0.0143	61.2	13.818	0.520	26.6
1.4538	0.0234	62.1	15.602	0.786	19.85
2.1962	0.0369	59.5	18.498	2.092	8.84
3.3592	0.0563	59.7	17.765	3.966	4.48

DISTRIBUTION OF FORMIC ACID BETWEEN:

WATER AND PETROLEUM ETHER

(Grossfeld and Mermeister, 1932.)

cc. 0.1n NaOH required per 25 cc.		$\frac{C_1}{C_2}$
H_2O layer(C_1)	Pet. Ether layer(C_2)	
21.6	0.024	900
48.9	0.028	1750
138.0	0.044	3140
169.0	0.055	3070
224.9	0.078	2880

METHYL ALCOHOL AND i-OCTANE(1) AT 0°.

(Smith and Norton, 1932.)

Gm. Mol. HCOOH per liter		$\frac{C_2}{C_1}$
CH_3OH layer(C_1)	i.oct. layer(C_2)	
0.1633	0.00505	0.0309
0.5084	0.01271	0.0250

(1) = 2.2.4 - Tri methyl Pentane

DISTRIBUTION OF FORMIC ACID AT 25° BETWEEN ACETONE AND GLYCEROL.

(Smith, 1921-1922.)

Millimols. HCOOH per liter of		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer (G).	
2.075	1.525	1.36
2.8875	2.0625	1.40
5.65	3.70	1.39
7.8	5.65	1.38
20.8	16.0	1.30

DISTRIBUTION OF FORMIC ACID BETWEEN 2.2.4 TRIMETHYL PENTANE AND β METHOXY ETHANOL.

(Henriques, 1933.)

Results at -19.5 °

Millimols HCOOH per liter		$\frac{C_1}{C_2}$
Pentane layer(C_1)	Ethanol layer(C_2)	
1.3	252.9	0.0051
3.3	203.6	0.0046

Results at 0°

Millimols HCOOH per liter		$\frac{C_1}{C_2}$
Pentane layer(C_1)	Ethanol layer(C_2)	
1.1	248.3	0.0046
3.4	667.9	0.0051
4.6	720.7	0.0064
4.9	961.7	0.0051

RECIPROCAL SOLUBILITY OF FORMIC ACID AND ALLYL ISO SULFOCYANIDE ($CH_2{:}CHCH_2NCS$)

(Jankovsky, 1934.)

t°	Gms. HCOOH per 100 gms. mixture	t°	Gms. HCOOH per 100 gms. mixture	t°	Gms. HCOOH per 100 gms. mixture
6.5	6.6	39.7	38.8	35.8	67.7
25	11.5	39.8*	45.0	33.5	70.1
36	25.8	39.1	51.2	26	77.5
39	33.8	38.2	55.4	10	84.0

* Critical Solution Temperature.

The author also studied the reciprocal solubility of Formic Acid and Tri Ethyl Amine but found that the addition compound which is formed separates into two liquid layers at the moment of fusion. The limits of reciprocal solubility in this system at the ordinary temperature are 1.4 and 39.2 gms. HCOOH per 100 gms. of the mixture.

The limit of reciprocal solubility of Formic Acid and Ethylene Bromide is at 51.5 percent HCOOH and 71.8°. (Lecat, 1930.)

The limit of reciprocal solubility of Formic Acid and n Pentane is at 10.0 percent HCOOH and 28°. (Lecat, 1930.)

Freezing-point data are given for:

$HCOOH + HCN$	(Peiker and Coffin, 1933.)
" $+ HCOOK$	(Kendall and Adler, 1921.)
" $+ HCOOLi$	" " "
" $+ HCOONH_4$	" " "
" $+ HCOONa$	" " "
" $+ (HCOO)_2Pb$	" " "
" $+ (HCOO)_2Ca$	" " "
" $+ CH_3COOH$	(Baud, 1913c)
" $+ HCOONH_2$ (formamide)	(Joukovsky, 1934.)
" $+ CH_3CN$ (acetonitrile)	" "
" $+ CH_3NO_2$ (nitro methane)	" "
" $+ N(C_2H_5)_3$ (tri ethyl amine)	" "
" $+ C_4H_5NS$ (allyl iso sulfocyanide)	" "
" + o $C_6H_4ClNO_2$ (o chloro nitro benzene)	(Bruni and Berti, 1900.)
" $+ C_7H_8O_2$ (di methyl pyrone)	(Kendall, 1914.)

METHYL CHLORIDE CH_3Cl.

SOLUBILITY OF METHYL CHLORIDE IN SEVERAL ORGANIC SOLVENTS. (Kling, 1915.)

The results are expressed in terms of $l_t = (V - V_0) \cdot \frac{T_t}{F_t} - (V_n - V_c) \div V_c$ in which V = volume of gas after absorption, V_0 = original volume of gas, T_t = temp. on absolute scale, F_t = temp. of thermostat, V_n = volume of the flask, V_c = volume of solvent.

t°.	l_t in each solvent determined separately.			
	$CHCl_3$.	$\begin{array}{c}CHCl\\ \vert\\ CHCl\end{array}$	$\begin{array}{c}CCl_3\\ \vert\\ CHCl_2\end{array}$	CCl_4.
— 5	276.8	239.4	168.1	115.4
0.	202.5	174.8	125.2	87.6
+ 5	158.3	130.7	98.7	68.7
10	119.5	101.2	79.0	56.2
15	93.5	76.9	65.1	45.9
20	72.9	58.6	54.1	38.0

Solubility of Methyl Chloride in Carbon Tetrachloride and in Dichlor Ethane at Several Temperatures and Partial Pressures.

(Kaplan and Romantchouk, 1936.)

Partial Pressure of CH_3Cl in mm Hg.	cc CH_3Cl (at 0° and 760mm) dissolved per 1cc CCl_4 at:			cc CH_3Cl (at 0° and 760mm) dissolved per 1cc $C_2H_2Cl_2$ at:		
	-10°	0°	$+20^{\circ}$	-10°	0°	$+20^{\circ}$
760	145	83	38	336	152	76
700	124	71	36	294	134	67
600	95	56	30	228	106	54
500	71	42	24	170	82	42
400	52	30	19	130	60	33
300	36	19	14	92	42	24
200	22	12	10	58	25	16
100	10	6	5	28	10	8

Solubility of Methyl Chloride in Several Solvents at Varying Pressures.

(Horiuti, 1931.)

Results for:

Acetone $(CH_3)_2CO$		Methyl Acetate, CH_3COOCH_3		Chloroform, $CHCl_3$	
P(mm)	Gm. Mol. CH_3Cl per 1.0 gm. mol. sat. sol.	P(mm)	Gm. Mol. CH_3Cl per 1.0 gm. mol. sat. sol.	P(mm)	Gm. Mol. CH_3Cl per 1.0 gm. mol. sat. sol.
229.2	0.0000	213.4	0.0000	197.1	0.0000
292.1	0.0182	294.9	0.0227	270.7	0.0230
412.7	0.0522	410.8	0.0560	404.9	0.0627
540.6	0.0891	526.9	0.0886	558.2	0.1074
674.2	0.1255	631.0	0.1176	702.3	0.1483
808.8	0.1637	773.9	0.1575	855.2	0.1912
1014.3	0.2195	979.0	0.2119	973.0	0.2232

Carbon Tetrachloride CCl_4		Benzene, C_6H_6		Chloro benzene, C_6H_5Cl	
P(mm)	Gm. Mol. CH_3Cl per 1.0 gm. mol. sat. sol.	P(mm)	Gm. Mol. CH_3Cl per 1.0 gm. mol. sat. sol.	P(mm)	Gm. Mol. CH_3Cl per 1.0 gm. mol. sat. sol.
112.4	0.0000	93.7	0.0000	11.6	0.0000
256.9	0.0280	190.2	0.0248	151.7	0.0337
431.4	0.0639	329.0	0.0608	311.7	0.0719
603.7	0.0996	463.8	0.0955	503.5	0.1180
758.1	0.1328	626.6	0.1373	669.9	0.1572
890.5	0.1623	776.6	0.1758	908.6	0.2121
1023.9	0.1926	1012.7	0.02349	1060.9	0.2479

The solubilities of CH_3Cl in the above solvents at one atmosphere pressure, in terms of the Ostwald Solubility Expression l (see p. 37 as calculated by Horiuti are as follows

Solvent	l	Solvent	l
Acetone	69.3	Carbon Tetrachloride	40.9
Methyl Acetate	64.3	Benzene	55.9
Chloroform	67.6	Chloro benzene	47.2

The solubility of Methyl Chloride in Cyclohexanol ($C_6H_{11}OH$), in terms of the Ostwald Solubility Expression (the ratio of the volume (v) of gas absorbed to the vol. (V) of the absorbing liquid), is 17.7 at 26°. (Cauquil, 1927.)

Results for the solubility of Methyl Chloride in Fenchon ($C_{10}H_{16}O$) are given by Pasteur, 1931.

C_1H_3

METHYL CHLORIDE CH_3Cl.

SOLUBILITY OF METHYL CHLORIDE IN ORGANIC SOLVENTS AT 32°.

(Zellhoeffer, 1937; Zellhoeffer, Copley and Marvel, 1938.)

Solvent	Formula	Gm. CH_3Cl per 100cc solvent at 2203 mm pressure (1)
Cellosolve acetate	$C_2H_5O(CH_2)_2OCOCH_3$	36.4
Carbitol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	32.2
" ethyl ether	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	32.4
Dimethyl ether of tetraethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	32.5(2)
Diethyl ether of tetraethylene glycol	$C_2H_5O(CH_2CH_2O)_4C_2H_5$	30.2
Dimethyl ether of triethylene glycol	$[CH_3O(CH_2)_2OCH_2]_2$	34.4
Carbitol methoxy acetate	$(C_2H_5O(CH_2CH_2O)_2COCH_2OCH_3$	——
Butyl carbitol acetate	$\underline{n}$-$C_4H_9O(CH_2CH_2O)_2COCH_3$	29.4
Diethylene glycol diacetate	$[CH_3COOCH_2CH_2]_2O$	24.8
4-Methyl-2-pentanol acetate	$(CH_3)_2CHCH_2CH(OCOCH_3)CH_3$	30.4
y,y'-Dichloro-n-propyl ether	$(ClCH_2CH_2CH_2)_2O$	28.2
Dichloro iso propyl ether	$(C_3H_6Cl)_2O$	29.4
α Fluoro naphthalene	$C_{10}H_7F$	26.2
Tri chloro benzene	$C_6H_3Cl_3$	19.4
1.1.2.2-Tetra chloro ethane	$Cl_2CHCHCl_2$	35.0
Butyl cellosolve $\underline{n}$ butyrate	$\underline{n}$ $C_4H_9O(CH_2)_2OCO$-$\underline{n}C_3H_7$	29.0
" " acetate	$\underline{n}$ $C_4H_9O(CH_2)_2OCOCH_3$	32.0
" " laurate	$\underline{n}$ $C_4H_9O(CH_2)_2OCO(CH_2)_{10}CH_3$	20.6
Tetra hydro furfuryl ether of butyl cellosolve	$(C_4H_7O)CH_2O(CH_2)_2O$-$\underline{n}$ C_4H_9	28.2
Tetra hydro furfuryl cellosolve acetate	$(C_4H_7O)CH_2O(CH_2)_2OCOCH_3$	30.4
Methyl carbitol acetate	$CH_3O(CH_2CH_2O)_2COCH_3$	30.8
Butyl carbitol chloride	$\underline{n}$ $C_4H_9(OCH_2CH_2)_2Cl$	28.0
Methyl ether of tri ethylene glycol acetate	$CH_3O(CH_2CH_2O)_3COCH_3$	30.0
Tetra hydro furfural laurate	$(C_4H_7O)CH_2OCO(CH_2)_{10}CH_3$	20.4
" " " acetate	$(C_4H_7O)CH_2OCOCH_3$	34.2
α,y-Glycerol dichlor hydrine acetate	$(ClCH_2)_2CHOCOCH_3$	26.6
Ethyl laurate	$CH_3(CH_2)_{10}COOC_2H_5$	21.2
2 Ethyl-1-hexanol acetate	$CH_3(CH_2)_3CH(C_2H_5)CH_2OCOCH_3$	27.2
Furfuryl acetate	$(C_4H_3O)CH_2OCOCH_3$	26.3
Ethyl furoate	$(C_4H_3O)COOC_2H_5$	30.2
Furfural	$(C_4H_3O)CHO$	27.6
Tetralin	$C_{10}H_{12}$	22.8
Decalin	$C_{10}H_{18}$	14.2
Benzo tri fluoride	$C_6H_5CF_3$	30.0
p Fluoroanisole	$\underline{p}$ $FC_6H_4OCH_3$	30.4
Ethyl ether of diethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	33.3
Diethyl ether of diethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	38.2

(1) Vapor pressure of CH_3Cl at 4.5°.

(2) Gms. per 100 gms. solvent at 2203 mm. pressures and 32.2°.

METHYL CHLORIDE

Freezing-point data are given for:

CH_3Cl + (CH_3OH) Methyl Alcohol (Baume et. al., 1914.)
" + $((CH_3)_2O)$ Dimethyl Ether " " " "

BROMO METHIONIC ACID $CHBr(SO_3H)_2$.

100 gms. H_2O dissolve [illegible] gms. $CHBr(SO_3H)_2$ at 25°. (Backer, 1929.)

CHLORO METHIONIC ACID $CHCl(SO_3H)_2 \cdot 2H_2O$.

100 gms. H_2O dissolve [illegible] gms. $CHCl(SO_3H)_2$ at 25°. (Backer, 1929.)

METHYL IODIDE CH_3I.

A sat. solution of methyl iodide in water at 20° has a *d* = 2.18 and contains [illegible] CH_3I.
(Fühner, 1924.)

100 gms. H_2O dissolve 0.0101 gm. mol. = 1.434 gm. CH_3I at 30°.
(Van Arkel and Vles, 1936.)

Freezing-point data are given for:

CH_3I + CH_3OH (Methyl alcohol) (Baume and Tykociner, 1914.)
CH_3I + NO_2 (Nitrogen peroxide) (Pascal, 1923.)
" + C_5H_5N (Pyridine) (Aten, 1905-06.)

FORMAMIDE $HCONH_2$

SOLUBILITY IN WATER, DETERMINED BY THE FREEZING-POINT METHOD.
(English and Turner, 1915.)

t° of Solidif.	Gms. $HCONH_2$ per 100 Gms. H_2O.	Solid Phase.	t° of Solidif.	Gms. $HCONH_2$ per 100 Gms. H_2O.	Solid Phase.	t° of Solidif.	Gms. $HCONH_2$ per 100 Gms. H_2O.	Solid Phase.
0	0	Ice	-38.1	116.4	Ice	-37.6	207	$HCONH_2$
-2.7	9.91	"	-42.5	169	"	-30.4	360.8	"
-5.7	17.85	"	-45.4	187.8	$HCONH_2.H_2O$	-21.0	540.3	"
-11	35.45	"	-40.4	218.4	"	-14.5	836.8	"
-21.6	81.91	"	-40	243.4	"	-6.4	1780	"

Similar data are also given for formamide + formic acid and formamide + propionic acid.

SOLUBILITY OF FORMAMIDE IN METHYL ALCOHOL
DETERMINED BY THE FREEZING-POINT METHOD.
([illegible], 1934.)

t°	Gms. $HCONH_2$ per 100 gms. Mixture	Solid Phase	t°	Gms. $HCONH_2$ per 100 gms. Mixture	Solid Phase
-98.0	0.0	CH_3OH	-44.2	49.1	$HCONH_2$
-101.1 (Eutec.)	12.2	" + $HCONH_2$	-34.6	59.9	"
-75.1	25.6	$HCONH_2$	-14.7	83.8	"
-65.6	33.7	"	+ 2.5	100.0	"
-61.5	38.7	"			

RECIPROCAL SOLUBILITY OF FORMAMIDE AND NITROBENZENE.

(Joukovsky, 1934.)

t°	Gms. $HCONH_2$ per 100 gms. mixture	t°	Gms. $HCONH_2$ per 100 gms. mixture	t°	Gms. $HCONH_2$ per 100 gms. mixture
60	5.2	108.2*	36.8	81	70.40
84	8.1	107.6	43.1	19.2	76.0
102.8	16.8	107.6	44.7	—	90.0
104.2	18.7	107.0	45.6		

* Critical solution temperature

Results for this system in terms of volume percent of the liquids are given by Jänecke, 1939. This author also gives complete results for the ternary system Formamide + Nitrobenzene + Hexane.

Freezing-point data are given for:

$HCONH_2$ + CH_3COOH (Acetic acid) (English and Turner, 1915.)
" + n C_3H_7COOH (n Butyric acid) " " "
" + CS_2 (Carbon Disulfide) (Joukovsky, 1934.)
" + $(C_2H_5)_2O$. (Ethyl Ether) " "
" + C_6H_6 (Benzene) " "
" + $C_6H_5NO_2$ (Nitro benzene) " "

NITRO METHANE CH_3NO_2.

Reciprocally saturated layers of nitromethane and water were each analyzed by means of viscosity measurements.

100 gms. sat. solution of nitro methane in water (upper layer) contain 10 gms. $C_6H_5NO_2$ at 25°.

100 gms. sat. solution of water in nitro methane (lower layer) contain 2 gms. H_2O at 25°. (Wright, Murray-Rust and Hartley, 1931.)

Determinations of the total and partial vapor pressures of mixtures of nitro methane and methyl alcohol and of nitro methane and ethyl ether at 20.5° are given by Joukovsky, 1934.)

Freezing-point data are given by Joukovsky, 1934, for:

CH_3NO_2 + $HCOOH$ (Formic Acid)
" + C_6H_6 (Benzene)
" + $C_6H_5NO_2$ (Nitro benzene)

The critical solution temperature of mixtures of Nitro methane and Tetra chlor ethylene is 41°. (Cornish, Archibald, Murphy and Evans, 1934.)

The limit of the reciprocal solubility of Nitro methane and:

Prim. i- Butanol is at 56.5 percent nitro methane and 17.0°.
i - Butyl carbinol is at 87.5 percent nitro methane and 13.5°.
Dimethyl ethyl carbinol is at 49.5 percent nitro methane and about 3°.
(Lecat, 1930.)

METHANE CH_4.

SOLUBILITY IN WATER.

(Winkler, 1901.)

t°.	β.	β'.	q.	t°.	β.	β'.	q.
0	0.05563	0.05530	0.00396	40	0.02369	0.02198	0.00159
5	0.04805	0.04764	0.00341	50	0.02134	0.01876	0.00136
10	0.04177	0.04127	0.00296	60	0.01954	0.01571	0.00115
15	0.03690	0.03628	0.00260	70	0.01825	0.01265	0.00093
20	0.03308	0.03233	0.00232	80	0.01770	0.00944	0.00070
25	0.03006	0.02913	0.00209	90	0.01735	0.00535	0.00040
30	0.02762	0.02648	0.00191	100	0.01700	0	0

β = Bunsen Absorption Coefficient, which is the volume of gas (reduced to 0° and 760 mm) dissolved by 1 volume of the liquid when the partial pressure of the gas is 760 mm.

β' = is the same as β, except the measurements are at the total pressure of the gas plus liquid instead of at the partial pressure of the gas alone.

q = the weight of gas in grams dissolved by 100 gms. of pure solvent at the indicated temperature and total pressure of 760 mm.

SOLUBILITY OF METHANE IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 20°.

(Christoff, 1906.)

Gms. H_2SO_4 per 100 gms. aq. solvent	Gm. Mol. H_2SO_4 per liter solvent	β	l
35.82	4.64	0.01691	0.01815
61.62	9.55	0.01311	0.01407
95.6	18.0	0.03072	0.03303

β = Bunsen Absorption Coefficient

l = Ostwald Solubility Expression, which is the ratio of the volume (v) of gas absorbed at any pressure and temperature to the volume (V) of the absorbing liquid, i.e. $l = \frac{v}{V}$. This expression differs from the Bunsen Absorption Coefficient β, in that the volume V of the dissolve gas is not reduced to 0° and 760 mm. The solubility l is therefore the volume of gas dissolved by unit volume of solvent at the temperature of the experiment. The two expressions are related thus:

$$l = \beta\,(1 + 0.00367t), \qquad \beta = \frac{l}{(1 + 0.00367\cdot t)}$$

Using a special apparatus which permitted the agitation of a sample of air containing a known percentage of Pittsburgh natural gas (composed of 90 % CH_4 + 10 % C_2H_6) with water, and the removal of the sample for analysis after the period of contact with the water, the solubility coefficient α_{25} (= the volume of gas reduced to 0° dissolved by 1 vol. of H_2O at 25°, when the pressure of the gas over the water is 760 mm.) was found to be 0.032. (Milligan, 1924.)

C_1H_4.

SOLUBILITY OF MINE GAS (79.4 % CH_4 + 17.1 % N_2 + 2.8 % O_2 + 0.7 % CO_2) IN WATER AND ORGANIC SOLVENTS UNDER PRESSURE.

(Fischer and Zerbe, 1923.)

An autoclave of 330 cc. capacity was used. Into this was placed 100 cc. of solvent and mine gas from a steel cylinder untill a pressure of about 20 atmospheres was reached. The autoclave was then shaken at about 20° for $^1/_2$ hour. The pressure was then lowered to 1 atmosphere and a weighed amount of the solution analyzed for its contained gas. The results showed that although much nitrogen was present the absorbed gas contained the several constituents in approximately the same ratio as the used mine gas.

The author was interested principally in comparative values for various solvents.

Used solvent.	Cc. Gas dissolved by 1 vol. of solvent.	Used solvent,	Cc. Gas dissolved by 1 vol. of solvent.
Water	0.09	Acetone	0.61
Petroleum ether (b. pt. 65°).	1.34	Ethyl acetate	0.45
» (» 65–100).	0.84	Chloroform	0.32
» (» 100–150).	0.66	Carbon disulfide	0.36
Petroleum	0.56	Benzene	0.51
Paraffine oil	0.44	Xylene	0.53
Methyl alcohol	0.46	Aniline	0.16
Ethyl alcohol	0.60	Nitrobenzene	0.16
Amyl alcohol	0.44	Tri cresol	0.26
Ethyl ether	0.91	Coal tar hydrocarbon (250-300).	0.40

100 cc. H_2O dissolve 3.2 cc. Methane (0° and 760 mm) at 21°.
» Rubber » 26.8 cc. » » »

The gas dissolved by a given amount of air free rubber was pumped out with a Töpler pump and measured over mercury. Data are also given for the effect of temperature and pressure and for the relation between solubility and penetrability.

(Venable and Fuwa, 1922.)

SOLUBILITY OF METHANE IN METHYL ALCOHOL AND IN ACETONE.

(Levi, 1901, 1902.)

In methyl alcohol l (Ostwald expression, see page 37) = $0.5644 - 0.0046\,t - 0.00004\,t^2$.

In acetone l (Ostwald expression) = $0.5906 - 0.00613\,t - 0.000046\,t^2$.

From which are calculated the following values:

In Methyl Alcohol.				In Acetone.			
t°.	l.	t°.	l.	t°.	l.	t°.	l.
0	0.5644	40	0.3164	0	0.5906	40	0.2718
10	0.5144	50	0.2344	10	0.5247	50	0.1691
20	0.4564	60	0.1444	20	0.4496	60	0.0572
30	0.3904	70	0.0464	30	0.3653		

SOLUBILITY OF METHANE IN ETHYL ALCOHOL.

(Bunsen, 1877, 1892.)

t°.	2°.	6.4°.	11°.	15°.	19°.	23.5°.
Abs. coef. β (found)	0.51721	0.50382	0.49264	0.48255	0.4729	0.4629

from which the following formula was calculated.

Bunsen abs. coef. β for methane = $0.522745 - 0.00295882\,t - 0.0000177\,t^2$.

THE SOLUBILITY OF METHANE IN WATER AND IN ORGANIC SOLVENTS AT 25° AND AT PRESSURES UP TO 140 ATMOSPHERES.

(Frolich, Tauch, Hogan and Peer, 1931.)

The determinations were made by shaking methane and each of the several olvents at various pressures in a steel cylinder maintained at 25° and, fter attainment of equilibrium, withdrawing a sample of the mixture over ercury in one of three burets so designed that the volume could be easured with the same degree of accuracy at any ratio of gas to liquid. he results are given only in the form of a diagram from which the following approximate values were estimated.

Solvent	cc CH_4 (reduced to 25° and 760 mm) dissolved by 1.0 cc solvent at:					
	20	40	60	80	100	140 Atmospheres
ater	0.9	1.2	1.8	2.0	2.6	3.3
ethanol (1)	9.0	19.0	29.5	41.0	55.0	—
thanol	7.5	14.5	21.5	29.5	38.0	48.0 (120 Atm.)
ropane	41	83	125	174	200 (90 Atm.)	—
utane	37	71	107	144	—	—
entane	33	63	97	129	164	—
exane	30	59	89	120	—	—
ctane	24	51	80	110	140	—
yclohexane	15	33	56	83	—	—
enzene	11	24	41	59	80	—
eavy Naphtha	10	20	31	43	—	—
as Oil	8	16	23	32	41	62

(1) The solubility of methane in n propanol, iso propanol, n butanol nd iso butanol is, within experimental error, the same as in methanol.

SOLUBILITY OF METHANE IN SEVERAL ALCOHOLS AND OTHER SOLVENTS.

(McDaniel, 1911.)

Solvent.	t°.	Abs. Coef. A.	Bunsen Coef. β.	Solvent.	t°.	Abs. Coef. A.	Bunsen Coef. β.
Alcohol:							
Methyl (99%)	22.1	0.4436	0.4102	Toluene	40.1	0.4675	0.4080
"	30.2	0.4278	0.3883	"	50.2	0.4545	0.4013
"	40	0.3938	0.3436	"	60	0.4502	0.3690
"	49.8	0.2695	0.2278	*m* Xylene	21.1	0.5146	0.4778
Ethyl (99.8%)	22.2	0.4628	0.4282	"	30.5	0.5028	0.4529
"	30.1	0.4503	0.4051	"	50	0.4972	0.4203
"	40	0.4323	0.3771	"	60	0.4870	0.3992
Isopropyl	21.5	0.4620	0.4275	Hexane	22.2	0.6035	0.5585
"	29.9	0.4532	0.4081	"	40.2	0.5320	0.4639
"	40	0.4400	0.3837	"	49.7	0.5180	0.4380
"	60.3	0.4244	0.3478	"	60	0.4964	0.4068
Amyl	22	0.4532	0.4196	Heptane	22.2	0.7242	0.6720
"	30.1	0.4444	0.4002	"	30.1	0.6906	0.6221
Benzene	22.1	0.4954	0.4600	"	40	0.6675	0.5820
"	35	0.4484	0.3976	Pinene*	20	0.4888	0.4565
"	40.1	0.4198	0.3661	"	30.1	0.4620	0.4163
"	49.9	0.3645	0.3081	"	39.1	0.4472	0.3914
Toluene	25	0.4852	0.4450	"	45	0.4440	0.3811
"	30	0.4778	0.4300	"	55.2	0.3694	0.3076

* b. pt. 155-160°.

Abs. coef. *A* = vol. of methane absorbed by unit vol. of solvent **at temp** stated.

SOLUBILITY OF METHANE IN SEVERAL ORGANIC SOLVENTS AT VARIOUS TEMPERATURES.

(Horiuti, 1931.)

t^0	Solubility of CH_4 in terms of the Ostwald Solubility Expression l, in:					
	CCl_4	$(CH_3)_2CO$	$(C_2H_5)_2O$	CH_3COOCH_3	C_6H_6	C_6H_5Cl
-80.4	—	—	2.220	—	—	—
-76.7	—	0.8726	2.119	0.7571	—	—
-60.6	—	0.7699	1.754 (4)	0.6926	—	—
-41.6	—	0.6943	1.476	0.6454	—	0.5703 (-40.8)
-20.4	0.8109 (1)	0.6513 (2)	1.275	0.6203	—	0.5259
0	0.7621	0.6232	1.157	0.6068	0.5687 (3)	0.4976
+20	0.7271	0.6165	1.078	0.6032	0.5680	0.4808
40	0.7031	0.6101	—	0.5987	0.5697	0.4728
60	0.6876	—	—	—	0.5787	0.4748 (5)

(1) = -19.8°; (2) = -21.8°; (3) = 13.1°; (4) = -61.6°; (5) = 99.6°.

Results for the solubility of CH_4 in $(C_2H_5)_2O$, reported by Christoff, 1912, in terms of the Ostwald Solubility Expression, are $l = 1.066$ at 0° and 1.028 at 10°.

SOLUBILITY OF METHANE IN SEVERAL SOLVENTS AT PRESSURES LESS THAN ONE ATMOSPHERE.

(Kirjeew and Romantchouk, 1936.)

Solvent	Gas Pressure in mm Hg	cc CH_4 (at 0° and 760 mm) dissolved by 1 cc solvent at:				
		-20°	-10°	0°	+20°	+40°
Petrol (Gasoline?)	50	0.040	0.035	0.035	0.030	0.015
" "	100	0.085	0.080	0.070	0.060	0.040
" "	200	0.170	0.155	0.145	0.120	0.085
" "	300	0.255	0.240	0.220	0.180	0.130
" "	400	0.340	0.320	0.300	0.240	0.175
" "	500	0.420	0.400	0.375	0.300	0.220
" "	600	0.515	0.498	0.455	0.365	0.265
" "	700	0.595	0.562	0.530	0.425	0.310
" "	760	0.650	0.610	0.575	0.460	0.340
Xylene	50	0.050	0.045	0.040	0.035	0.030
"	100	0.100	0.090	0.085	0.070	0.055
"	200	0.195	0.185	0.172	0.150	0.110
"	300	0.290	0.275	0.260	0.220	0.160
"	400	0.390	0.370	0.350	0.295	0.220
"	500	0.485	0.460	0.435	0.370	0.270
"	600	0.580	0.555	0.520	0.445	0.320
"	700	0.680	0.645	0.610	0.520	0.375
"	760	0.740	0.700	0.660	0.565	0.410
Cracking Benzene(?)	50	0.065	0.060	0.050	0.040	0.020
" "	100	0.130	0.130	0.100	0.080	0.060
" "	200	0.225	0.260	0.205	0.170	0.125
" "	300	0.385	0.340	0.305	0.250	0.180
" "	400	0.515	0.450	0.405	0.340	0.250
" "	500	0.640	0.565	0.510	0.425	0.310
" "	600	0.770	0.675	0.610	0.505	0.370
" "	700	0.895	0.790	0.710	0.590	0.435
" "	760	0.975	0.855	0.770	0.640	0.470

SOLUBILITY OF METHANE IN DICHLORO ETHANE AND IN HEAVY SOLVENT AT 0° AND VARIOUS PRESSURES.

(Kirjeew and Romantchouk, 1936.)

Solvent	cc CH_4 (at 0° and 760 mm) dissolved by 1 cc solvent at 0° and at a pressure of:					
	50	100	200	400	600	760 mm Hg.
Dichloro Ethane	0.020	0.045	0.080	0.105	0.245	0.310
Heavy Solvent	0.025	0.050	0.095	0.190	0.280	0.355

1000 cc cyclohexanol ($C_6H_{11}OH$) dissolve 133.3 cc CH_4 at 26° and 765 mm Hg pressure. (Cauquil, 1927.)

The coef. of absorption β (Bunsen) of methane in petroleum (Russian) is 0.144 at 10° and 0.131 at 20°. (Gniewosz and Walfisz, 1887.)

Determinations of the pressure—composition—temperature equilibrium in the systems

Methane + Ethane
" + Ethylene
" + Ethane + Ethylene

are given by Ruhemann, 1939, and Guter, Newitt and Ruhemann, 1940.

Determinations of the equilibrium in the systems: Methane + Pentane, Methane + Hexane and Methane + Heptane, at various temperatures and under pressures between 35 and 250 atmospheres, are given by Boomer, Johnson and Piercey, 1938.

THIOUREA $CS(NH_2)_2$.

SOLUBILITY OF THIOUREA IN WATER.

The fairly closely agreeing results of Oliveri-Mandala and Irrera, 1930; Jänecke and Hoffmann, 1932 and Shnidman, 1933, were plotted and the following average values taken from the curve.

t°	Gms. $CS(NH_2)_2$ per 100 gms. sat. sol.	t°	Gms. $CS(NH_2)_2$ per 100 gms. sat. sol.	t°	Gms. $CS(NH_2)_2$ per 100 gms. sat. sol.
-5	Eutec. 3.0	40	23.5	100	70.5
0	4.7	50	32.5	120	80.7
10	8.0	60	41.5	140	89.2
20	12.0	70	50.5	160	95.5
25	14.2	80	58.0	180	100.0
30	16.7	90	64.5		

Results for the vapor pressures at various temperatures and the boiling-points of aqueous thiourea solutions at atmospheric pressure are given by Jänecke and Hoffmann, 1932.

Freezing-point data for mixtures of thiourea and water are given by Kettner, 1919.

SOLUBILITY OF THIOUREA IN AQUEOUS SOLUTIONS OF AMMONIA.

(Jänecke and Hoffmann, 1932.)

The determinations were for the most part made by observing the temperature of complete solubility on slowly warming mixtures of known amounts of the constituents contained in ampules or shaking flasks.

t°	Gms. per 100 gms. mixture		t°	Gms. per 100 gms. mixture		t°	Gms. per 100 gms. mixture	
	H_2O	NH_3		H_2O	NH_3		H_2O	NH_3
-33	14.3	55.6	26.5	10.1	30.0	65.0	15.8	21.4
-31	42.6	43.4	28.7	51.4	19.2	66.0	48.4	4.1
-26.1	29.3	42.5	29.2	70.0	9.7	66.8	46.1	4.8
-20.9	10.4	50.2	30	70.5	7.8	68.2	40.3	7.7
-10.9	32.6	44.4	30	59.3	13.1	69.8	8.3	22.2
- 8.9	43.5	35.5	35.9	78.5	0.8	71.7	35.0	9.5
0	83.4	9.3	38.6	29.4	23.2	75.0	43.1	3.2
0	73.2	16.1	41.5	61.1	9.4	80.4	29.5	8.5
+ 1.4	75.5	14.9	42	16.5	24.6	83.0	11.5	17.2
7.5	11.5	42.0	45	16.2	23.7	87.1	3.2	19.1
10	80.1	8.9	45	51.2	11.2	89.6	27.0	6.2
10	70.0	15.4	45	63.6	7.1	94.2	16.8	11.1
12.5	22.8	29.7	48.0	40.6	16.4	103.0	18.6	8.3
17.5	36.0	26.4	55.6	5.3	26.1	105.9	25.6	2.4
18.0	64.9	18.3	56.1	18.9	21.9	108.5	5.1	14.2
20	76.0	8.5	56.4	52.8	5.1	114.2	12.3	7.7
20	65.5	14.4	64.8	34.6	12.6	139.0	2.7	8.4
						147.8	1.3	6.8

10 cc sat. solution of thiourea in cold aqueous saturated magnesium perchlorate, $Mg(ClO_4)_2$, contain 0.7 gm. $CS(NH_2)_2$. (Duclaux and Durand-Gasselin, 1938.

SOLUBILITY OF THIOUREA IN AQUEOUS SOLUTIONS OF ANTIPYRINE.

(Oliveri-Mandala and Irrera, 1930.)

Results at 15°

Gms. per 100 gms. sat. sol.	
Antipyrine	$CS(NH_2)_2$
0.0	10.538
0.193	0.389
3.638	13.742
5.682	17.338

Results at 25°

Gms. per 100 gms. sat. sol.	
Antipyrine	$CS(NH_2)_2$
0.0	13.394
0.193	0.445
3.638	16.570
5.682	20.904

SOLUBILITY OF THIOUREA IN LIQUID AMMONIA.

(Jänecke and Hoffmann, 1932.)

t°	Gms. $CS(NH_2)_2$ per 100 gms. sat. sol.	Solid Phase	t°	Gms. $CS(NH_2)_2$ per 100 gms. sat. sol.	Solid Phase
-78	0	NH_3	+2.0	54.3	$CS(NH_2)_2.NH_3$
-71.8	11.3	$CS(NH_2)_2.3NH_3$	6.2	58.2	"
-68.0	12.7	"	11.8	61.2	$CS(NH_2)_2$
-55.5	18.0	"	30.0	64.9	"
-37.1	27.2	"	40.3	69.6	"
-32.8	32.2	"	98.7	81.6	"
-19.9	40.7	"	111.0	83.9	"
-15.0	44.5	"	127.0	87.4	"
-12.0	50.7	"	152.0	93.9	"
-10	50.0	$CS(NH_2)_2.NH_3$	181.0	100.0	"

100 gms. sat. sol. of thiourea in liquid ammonia contain 37 gms. $CS(NH_2)_2$ at room temp. (?)(DeCarli, 1927.)

100 gms. Pyridine dissolve 12.5 gms. thiourea at 20-25°.

100 gms. aq. 50% Pyridine dissolve 41.2 gms. thiourea at 20-25°.

(Dehn, 1917.)

SOLUBILITY OF THIOUREA IN METHYL AND IN ETHYL ALCOHOL.

(Shnidman, 1933.)

The determinations were made by the synthetic, sealed tube, method. The end point was that at which the solid phase had nearly disappeared.

Results for Methyl Alcohol			Results for Ethyl Alcohol		
t°	Gms. $CS(NH_2)_2$ per 100 gms. sat. sol.	Mol. Fraction $CS(NH_2)_2$	t°	Gms. $CS(NH_2)_2$ per 100 gms. sat. sol.	Mol. Fraction $CS(NH_2)_2$
25.11	11.95	0.0540	20.25	3.61	0.0221
40.80	16.37	0.0760	31.99	4.69	0.0289
53.76	22.01	0.0999	37.69	5.40	0.0334
62.00	24.56	0.1205	45.14	6.33	0.0393
			51.22	7.21	0.0449
			58.05	8.48	0.0531
			64.77	9.81	0.0618

METHYL ALCOHOL CH_3OH.

FREEZING-POINTS OF MIXTURES OF METHYL ALCOHOL AND WATER.

The previous results of Pickering, 1893, Baumé and Borowski, 1914, and Benjamin, 1932, are in good agreement with the later determinations of Ewart, 1937. The results of Pushin and Glagoleva, 1922, are apparently erroneous. The following values are from the curve given by Ewart.

t°	Gm. Mol. CH_3OH per 100 gm. mol. mixture	Solid Phase	t°	Gm. Mol. CH_3OH per 100 gm. mol. mixture	Solid Phase
- 5	5.0	Ice	-105.5	60.0	$CH_3OH.H_2O$
- 20	15.0	"	-110	66	"
- 35	25.0	"	-117.5	70	"
- 52.5	35.0	"	-125 (Eutec.)	72	" + CH_3OH
- 72	45.0	"	-117	80	CH_3OH
- 85	50.0	"	[illegible]	86	"

FREEZING-POINTS OF MIXTURES OF METHYL ALCOHOL, ETHYL ALCOHOL, AND WATER.

(Aldrich, and Querfeld, 1931.)

The mixtures were made by diluting accurately measured volumes of the alcohols at 15.6° with water to a total volume of 100 cc at 15.6°. The The concentrations are thus the volume percent of total alcohol present. The freezing-points are the averages of the temperature at which the first crystal appeared and that at which it just disappeared.

Vol. Percent CH_3OH in Alcohol mixture	Freezing-point of aqueous Mixture Containing:					
	10 Vol.%	20 Vol. %	30 Vol. %	40 Vol. %	50 Vol. %	60 Vol. % CH_3OH + C_2H_5OH
0	-3.6	- 8.6	-15.1	-22.7	-30.7	-38.8
12.5	-3.7	- 8.8	-15.6	-23.7	-32.3	-41.1
25.0	-3.8	- 9.1	-16.1	-24.6	-33.8	-43.4
33.3	-3.9	- 9.3	-16.5	-25.2	-34.8	-44.9
50.0	-4.1	- 9.6	-17.2	-26.4	-36.8	-48.0
66.7	-4.3	-10.0	-17.0	-27.7	-38.9	-51.1
75.0	-4.4	-10.2	-18.2	-28.4	-39.9	-52.7
87.5	-4.5	-10.3	-18.8	-29.3	-41.4	-55.6
100.0	-4.6	-10.7	-19.3	-30.2	-43.0	-57.3

The authors also give results for the boiling points of the above mixtures.

FREEZING-POINTS OF MIXTURES OF METHYL ALCOHOL, GLYCEROL AND WATER.

(Feldman and Dahlstrom, 1936.)

A series of mixtures of CH_3OH + $C_3H_5(OH)_3$ were prepared by weighing and for each determination weighed amounts of these were added to weighed amounts of water. The freezing-point was taken as the temperature at which the last crystal disappeared on slow warming. The results were plotted and the following values for regular intervals of composition of the mixtures were taken from the curve.

Gms. CH_3OH per 100 gms. CH_3OH+$C_3H_5(OH)_3$ Mixture(A)	Freezing-points of Mixtures Composed of:				
	90 Wt. % H_2O + 10 Wt. % (A)	80 Wt. % H_2O + 20 Wt. % (A)	70 Wt. % H_2O + 30 Wt. % (A)	60 Wt. % H_2O + 40 Wt. % (A)	50 Wt. % H_2O + 50 Wt. % (A)
0	-1.9	- 5.4	- 9.7	-15.6	-23.6
12.2	-2.5	- 6.5	-11.5	-18.8	-28.8
20.4	-3.2	- 7.7	-13.5	-21.5	-32.7
30.3	-3.2	- 8.5	-15.5	-23.9	-35.5
39.1	-4.2	-10.0	-17.5	-26.5	-39.2
49.6	-4.2	-10.2	-18.2	-29.2	-42.8
60.5	-5.2	-12.1	-20.5	-32.5	-46.7
69.8	-5.5	-12.5	-21.0	-33.7	-47.5
81.2	-6.0	-13.8	-23.5	-36.2	-50.0
89.3	-6.2	-14.2	-24.5	-37.8	-51.5
100.0	-6.3	-15.2	-26.5	-39.8	-53.2

The previous results of Olsen, Brunjes and Olsen, 1930, for H_2O + CH_3OH and for H_2O + $C_3H_5(OH)_2$, and of Aldrich and Overfeld, 1931 for H_2O + CH_3OH differ slightly from the present values.

Miscibility of Methyl Alcohol at 0° with Mixtures of:

Carbon Tetrachloride and Water. (Bonner, 1910.) Composition of Homogeneous Mixtures.				Chloroform and Water. (Bonner, 1910.) Composition of Homogeneous Mixtures.			
Gms. CCl_4.	Gms. H_2O.	Gms. CH_3OH.	Sp. Gr. of Mixture.	Gms. $CHCl_3$.	Gms. H_2O.	Gms. CH_3OH.	Sp. Gr. of Mixture.
*0.985	0.015	0.215	...	0.979	0.021	0.161	...
0.974	0.026	0.328	1.30	0.90	0.10	0.35	1.17
0.90	0.10	0.74	1.13	0.80	0.20	0.49	1.12
0.80	0.20	1.10	1.04	*0.73	0.27	0.57	...
0.70	0.30	1.40	1	0.70	0.30	0.60	1.08
0.60	0.40	1.68	0.97	0.60	0.40	0.70	1.05
0.50	0.50	1.71	0.95	0.50	0.50	0.77	1.02
0.40	0.60	1.77	0.93	0.40	0.60	0.83	1
0.20	0.80	1.88	0.92	0.20	0.80	0.84	0.97
0.10	0.90	1.90	0.92	0.10	0.90	0.74	0.96
0.026	0.974	1.045	0.93	0.013	0.987	0.267	0.98

NOTE.—The above determinations were made by gradually adding methyl alcohol to mixtures of given amounts of water and the other constituent until a homogeneous solution was obtained. The results give the binodal curve of the system. The author also determined "tie lines" showing the composition of each of two layers in contact with each other. These tie lines become shorter as the compositions of the pairs of liquids approach each other and finally are reduced to a point known as the "plait point" of the binodal curve. This point is marked by an * in the above table. The mixtures above and below the * correspond, according to their Sp.Gr., to the upper and lower immicible layers of the system.

Reciprocal Solubility of Methyl Alcohol, Ethyl Acetate and Water

(Beech and Glastone, 1938.)

The binodal curve was determined by the titration method. The composition of conjugate layers was found by preparing mixtures of known amounts of the three components and analyzing the upper layer for acetate. These results and the solubility curve fixed the tie lines. The points at the extremities of these lines gave the compositions of conjugate layers.

Gms. per 100 gms. lower layer			Gms. per 100 gms. upper layer		
H_2O	$CH_3COOC_2H_5$	CH_3OH	H_2O	$CH_3COOC_2H_5$	CH_3OH
Results at 0°					
90.4	9.6	0.0	2.3	97.7	0.0
85.4	9.5	5.1	2.6	97.1	0.3
80.8	9.5	9.7	3.2	95.5	1.3
75.5	10.2	14.3	3.7	94.1	2.2
72.0	11.2	16.8	4.8	91.1	3.9
60.4	16.3	23.3	7.9	84.4	7.7

Results at 20°

92.2	7.8	0.0	2.8	97.2	0.0
87.8	8.0	4.2	3.4	95.6	1.0
83.0	8.4	8.6	4.3	92.6	3.1
79.0	9.3	11.7	5.8	88.9	5.3
74.6	10.5	15.0	6.3	87.4	6.3
65.2	14.5	20.3	10.2	79.8	10.0
55.1	21.4	23.5	15.0	71.3	13.7

The following results for points on the binodal curve of this system at 20° are given by Bancroft, 1895.

Per 1.0 cc CH_3OH		Per 1 cc CH_3OH	
cc H_2O	cc $CH_3COOC_2H_5$	cc H_2O	cc $CH_3COOC_2H_5$
10	1.08	1.0	4.9
3	0.68	0.98	7.0
1.5	1.69	1.0	8.0
1.29	2.50	1.03	10.0

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL, ETHYL ETHER AND WATER AT 20°.

(Bancroft, 1895.)

Per 1 cc CH_3OH		Per 1 cc CH_3OH		Per 1 cc CH_3OH	
cc H_2O	cc $(C_2H_5)_2O$	cc H_2O	cc $(C_2H_5)_2O$	cc H_2O	cc $(C_2H_5)_2O$
10	1.13	1.8	0.63	0.52	5.0
7	0.85	1.0	1.23	0.44	10.0
4	0.60	0.83	1.8	0.45	15.0
2.5	0.56	0.64	3.0		

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL BENZENE AND WATER AT 20°.

(Perrakis, 1925.)

The amount of water required to produce clouding in various mixtures of methyl alcohol and benzene was determined by a titration method.

Gms. CH_3OH per 100 gms. $CH_3OH + C_6H_6$ mixture	Gms. H_2O to produce clouding per 100 gms. mixture	Gms. CH_3OH per 100 gms. $CH_3OH + C_6H_6$ mixture	Gms. H_2O to produce clouding per 100 gms. mixture
22.90	0.9456	48.59	3.8000
32.06	1.6624	51.22	4.1888
37.80	2.2900	54.01	4.5111
40.70	2.9080	57.16	5.2640
45.02	3.3721	64.23	7.1093

EQUILIBRIUM IN THE SYSTEM BENZENE, METHYL ALCOHOL AND WATER AT 25°.

(Barbaudy, 1926 *a.*)

A diagram of the isotherm of clouding is given and the following results for three pairs of conjugated layers.

Aqueous Layer.				Benzene Layer.			
Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat sol.			
CH_3OH.	C_6H_6.	H_2O.	$d_{\frac{25}{4}}$.	CH_3OH.	C_6H_6.	H_2O.	$d_{\frac{25}{4}}$.
60.8	9.8	29.4	0.8718	4.05	95.67	0.28	0.87003
61.5	11.4	27.1	0.8675	4.22	95.48	0.30	0.86978
61.0	10.2	28.8	0.8700	4.09	95.63	0.28	0.8700

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL BENZENE AND WATER AT 20°.

(Bancroft, 1895.)

H_2O was added to mixtures of known amounts of CH_3OH + C_6H_6 until clouding occurred.

Per 5 cc CH_3OH		Per 5 cc CH_3OH	
cc H_2O	cc C_6H_6	cc H_2O	cc C_6H_6
5.0	0.15	1.0	1.9
3.0	0.215	0.8	3.0
2.0	0.59	0.69	4.0
1.4	1.00	0.49	8.0

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL, BENZENE AND WATER.

(Sata and Niwase, 1937.)

The temperatures were determined at which the mixtures of weighed amounts of the three constituents were homogeneous, opalescent or cloudy.

Gms. per 100 gms. mixture			Temperature of:		
CH_3OH	C_6H_6	H_2O	Homogeneity	Opalescence	Cloudiness
72.4	25.3	2.3	27.0	26.0-23.5	23.0
72.3	25.2	2.5	29.0	28.1-27.0	26.0
72.0	25.1	2.9	—	—	30.0
64.45	32.25	3.30	24.0	23.0-21.1	19.0
64.44	32.21	3.35	28.0	27.5-24.5	23.5
64.36	32.17	3.47	33.0	32.0-26.5	24.0
64.28	32.13	3.59	36.0	35.0-29.0	28.0
64.19	32.09	3.72	37.0	36.5-32.0	31.0
64.10	32.00	3.90	—	— —	30.0
57.40	38.20	4.40	31.0	30.0-26.5	25.5
57.30	38.10	4.60	26.0	24.8-22.8	22.0
57.20	38.10	4.70	—	— —	30.0
47.00	46.90	6.10	28.0	27.0-26.0	25.0
46.90	46.80	6.30	32.0	31.0-30.0	29.0
46.80	46.70	6.50	—	—	30.0

The above results at 30° fall close to the curve for the system C_2H_5OH + C_6H_6 + H_2O at 30°.

MISCIBILITY OF METHYL ALCOHOL (see Note, p.45) AT 0° WITH MIXTURES OF:

Brombenzene and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. C_6H_5Br.	Gms. H_2O.	Gms. CH_3OH.	Sp. Gr. of Mixture.
0.991	0.009	0.230	...
0.985	0.015	0.314	1.24
*0.98	0.02	0.40	...
0.90	0.10	1.01	1.04
0.80	0.20	1.50	0.98
0.70	0.30	1.84	0.95
0.60	0.40	2.065	0.94
0.50	0.50	2.24	0.91
0.40	0.60	2.30	0.90
0.30	0.70	2.28	0.89
0.20	0.80	2.20	0.89
0.095	0.905	1.927	0.90
0.016	0.984	1.332	0.91

Ethyl Bromide and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. C_2H_5Br.	Gms. H_2O.	Gms. CH_3OH.	Sp. Gr. of Mixture.
0.973	0.027	0.202	1.27
0.950	0.05	0.33	...
0.936	0.064	0.393	1.18
0.90	0.10	0.54	1.14
0.80	0.20	0.86	1.05
0.70	0.30	1.04	1.01
0.60	0.40	1.18	0.99
0.50	0.50	1.26	0.97
0.40	0.60	1.31	0.96
0.20	0.80	1.21	0.94
0.10	0.90	0.94	0.94
0.022	0.978	1.94	0.98

MISCIBILITY OF METHYL ALCOHOL (see Note, p.45) AT 0° WITH MIXTURES OF:

Hexane and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. Hexane(1).	Gms. H_2O.	Gms. CH_3OH.	Sp. Gr. of Mixture.
0.973	0.067	4.280	...
0.90	0.10	4.69	0.80
0.80	0.20	5.26	0.80
0.691	0.309	5.710	0.82
0.60	0.40	6.17	0.81
0.491	0.509	6.365	0.83
0.40	0.60	6.33	0.83
0.30	0.70	6.13	0.84
0.20	0.80	5.49	0.85
0.10	0.90	4.01	0.86
0.016	0.984	1.759	0.91

Heptane and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. Heptane(1).	Gms. H_2O.	Gms. CH_3OH.	Sp. Gr. of Mixture.
0.966	0.034	4.78	...
0.90	0.10	5.55	0.80
0.793	0.207	6.36	0.82
0.70	0.30	7.30	0.82
0.60	0.40	8.22	0.82
0.50	0.50	8.76	0.82
0.40	0.60	8.65	0.83
0.30	0.70	7.78	0.83
0.198	0.802	6.71	0.84
0.10	0.90	4.40	0.87
0.038	0.962	2.96	0.91

(1) The hexane and heptane used were Kahlbaum's "aus Petroleum."

100 cc. cotton seed oil ($d_{25} = 0.922$) dissolve 4.84 gms. CH_3OH at 25°. (Wroth and Reid, 1916.)

100 cc. methyl alcohol dissolve 6.74 gms. cotton seed oil at 25°. " "

DISTRIBUTION OF METHYL ALCOHOL BETWEEN WATER AND COTTON SEED OIL AT 25° (Wroth and Reid, 1916.)

Gms. CH_3OH per 100 cc. Oil Layer.	Gms. CH_3OH per 100 cc. H_2O Layer.	Ratio.	Gms. CH_3OH per 100 cc. Oil Layer.	Gms. CH_3OH per 100 cc. H_2O Layer.	Ratio.
0.199	17.28	86.6	0.275	23.48	85.2
0.253	23.34	92.2	0.258	24.44	94
0.298	25.73	86.2	0.284	23.06	81.4
0.264	24.15	91.3			

Determinations of the Reciprocal Solubility in the systems:

Methyl Alcohol + o Nitrophenol + Water
and " " + p " + " at 25° and at 40°.

are given by Duff, 1929. The systems yield immiscible layers over the lower concentrations of CH_3OH and $C_6H_5NO_3$.

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL, NORMAL BUTYL ALCOHOL AND WATER.

(Mueller, Pugsley and Ferguson, 1931.)

The binodal curves, tie lines and plait points were determined at temperatures between 0° and 105°. Both the titration method and observation of the temperature of changes in mixtures contained in sealed tubes were used. The compositions are given on the weight basis. The plait points were found by plotting and were also controlled experimentally. The sources of error and methods of overcoming them are described

Gms. per 100 gms. upper layer			Gms. per 100 gms. lower layer			
CH_3OH	H_2O	$CH_3(CH_2)_2CH_2OH$	CH_3OH	H_2O	$CH_3(CH_2)_2CH_2OH$	
			Results at 0°			
4.20	23.30	76.70	7.0	90.0	10.0	
8.75	30.10	79.90	12.50	87.50	12.5	
12.25	36.90	63.10	15.50	84.80	15.20	
14.50	44.25	57.20	18.90	79.50	20.50	
16.50	51.50	48.50	19.40	74.50	26.50	
18.50	63.10	36.90	18.50	63.10	36.90	PP
			Results at 15°			
2.3	21.7	78.3	4.8	91.6	8.4	
4.3	24.0	76.0	8.4	90.7	9.3	
6.7	27.5	72.5	10.7	89.7	10.3	
9.3	32.4	67.6	13.2	88.0	12.0	
12.7	40.5	59.5	15.6	83.9	16.1	
14.4	47.8	52.2	16.3	80.0	20.0	
16.0	64.5	35.5	16.0	64.5	35.5	PP
			Results at 30°			
2.4	23.8	76.2	4.7	92.4	7.6	
5.3	28.4	71.6	9.1	90.7	9.3	
7.5	33.0	67.0	11.2	88.8	11.2	
8.5	35.9	64.1	12.5	86.7	13.3	
10.0	41.5	58.5	13.5	83.8	16.2	
12.3	52.2	47.8	14.2	77.2	22.8	
13.9	65.5	34.5	13.9	65.5	34.5	PP
			Results at 45°			
11.5	66.0	34.0	11.5	66.0	34.0	PP
			Results at 60°			
9.71	66.4	33.2	9.71	66.4	33.2	PP
			Results at 75°			
2.1	30.0	70.0	3.1	92.0	8.0	
4.5	36.8	63.2	5.5	88.7	11.3	
6.0	44.8	55.2	6.8	85.0	15.0	
7.8	67.0	33.0	7.8	67.0	33.0	PP
			Results at 90°			
5.0	67.3	32.7	5.6	67.3	32.7	PP
			Results at 105°			
3.5	67.4	32.6	3.5	67.4	32.6	PP

Additional results for the binodal curves and upper and lower layers

EQUILIBRIUM IN THE SYSTEM METHYL ALCOHOL, ISO BUTYL ALCOHOL AND WATER.

(Jänecke, 1933.)

Weighed amounts of the three constituents were sealed in tubes and the temperatures determined at which clouding and clearing occurred.

Wt. % CH_3OH in $CH_3OH + H_2O$ Mixture (A)	Gms. $C_4H_{10}O$ per 100 gms. mixture of $C_4H_{10}O$ + (A)	Temp. of:	
		Clouding	Clearing
0=H_2O	81.7	38.4	38.9
"	57.8	126.5	126.4
"	49.1	132.4	132.8
"	26.7	133.0	133.0
"	20.7	130.3	130.6
"	17.5	127.6	127.7
"	16.3	126.7	126.7
"	10.6	107.7	108.0
"	8.0	90.4	90.4
5.2	52.07	112.6	113.0
"	72.42	80.8	80.9
"	24.33	107.2	107.3
"	12.93	88.1	88.2
"	10.63	75.6	75.8
9.7	81.06	6.8	7.5
"	74.58	52.8	53.2
"	65.13	83.7	83.9
"	61.89	86.4	88.9
"	50.54	93.6	94.0
"	36.04	88.1	88.4
9.7	20.0	73.6	74.3
"	18.95	72.6	73.2
"	12.76	55.2	55.5
16.1	74.99	25.3	27.2
"	56.83	68.3	68.5
"	52.73	69.9	70.0
"	22.66	37.2	37.3
"	17.66	17.6	—
20.2	76.18	2.4	—
"	69.42	33.5	33.6
"	52.96	49.2	49.4
"	38.79	32.9	32.4
"	29.85	23.7	23.9
"	23.91	10.5	—
25.0	88.6	18.3	19.7
"	62.74	20.5	—
"	50.21	21.9	—
"	49.78	17.7	—
"	41.32	48.32	—
"	28.44	22.2	—

The author also gives b. pt. determinations, vapor pressures and refractive indices of various binary mixtures of the above compounds.

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL, TOLUENE AND WATER AT 25°.

(Mason and Washburn, 1937.)

The binodal curve of this system was determined by adding H_2O to its saturation point to a series of solutions of $CH_3OH + C_6H_5CH_3$ at 25°.

Gms. per 100 gms. sat. sol.		
CH_3OH	$C_6H_5CH_3$	H_2O
8.32	91.28	0.40
13.02	86.24	0.74
26.22	72.40	1.37
36.84	60.37	2.79
50.56	43.94	5.51
62.15	26.99	10.86
67.35	14.72	17.91
65.73	7.20	27.06
59.40	2.83	37.77
53.12	1.37	45.50
41.06	0.50	58.43
24.00	0.14	75.87
6.72	0.06	93.23

The authors also give the refractive indices of the above mixtures and of conjugate solutions as well as results for the distribution of CH_3OH between the liquid layers.

METHYL ALCOHOL

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL, ORTHO CRESOL AND WATER.

(v. Szelenyi, 1929.)

Weighed amounts of the three compounds were sealed in tubes and the temperatures determined at which the mixtures cleared or clouded. These results were plotted and from the curves, the following points on the binodal curves of the system were obtained.

Gms. per 100 gms. sat. solution		
CH_3OH	o $C_6H_5CH_3OH$	H_2O
Results at 45°		
14.46	5.5	80.04
17.35	6.75	76.90
20.0	25.0	55.0
20.07	40.0	39.93
8.86	73.5	17.64
5.89	78.5	15.61
Results at 55°		
14.3	6.5	79.2
16.8	9.75	73.45
18.84	31.3	49.86
17.96	46.7	35.34
10.54	68.5	20.96
6.17	77.5	16.23
Results at 70°		
10.92	5.8	84.0
13.8	9.8	76.4
15.64	15.8	68.56
16.23	40.8	42.97
7.13	74.0	18.87
3.49	81.2	15.31
2.72	82.2	15.08
0.66	85.0	14.34
Results at 95°		
4.62	5.0	90.38
10.20	11.5	78.30
12.23	20.0	67.77
13.26	34.2	52.54

Gms. per 100 gms. sat. solution		
CH_3OH	o $C_6H_5CH_3OH$	H_2O
Results at 95° (Con.)		
4.96	73.3	21.74
2.13	82.5	16.37
0.46	81.06	17.94
Results at 120°		
0.0	5.5	94.5
3.95	8.9	87.15
8.27	28.2	63.53
7.96	48.0	44.04
5.35	65.0	29.65
3.34	71.0	25.66
1.02	76.8	22.18
Results at 140°		
0.0	7.3	92.7
1.09	13.0	85.91
3.63	17.0	79.37
1.04	68.0	30.96
0.39	69.0	30.61
0.0	72.0	28.0
Results at 160°		
0.0	19.5	80.5
0.94	24.5	74.56
0.53	54.0	45.47
0.0	58.5	41.5
Crit. Solution Temp. = 169.7°		
0.0	39.5	60.5

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL, METHYL BENZOATE AND WATER.

(Gilbert and Lauer, 1927.)

The determinations were made by the titration method. To a measured volume of one component in a large test tube, maintained at constant temperature, the other components were alternately added from burets, until, upon rapid stirring, the mixture became clear. Calculating from the densities of the liquids the measured volumes were converted to weights.

t = 15°		t = 25°		t = 35°	
Gms. per 100 gms. mixture		Gms. per 100 gms. mixture		Gms. per 100 gms. mixture	
CH_3OH	$C_6H_5COOCH_3$	CH_3OH	$C_6H_5COOCH_3$	CH_3OH	$C_6H_5COOCH_3$
0.0	99.8	0.0	99.4	0.0	98.8
16.1	79.4	12.4	83.8	20.9	68.3
19.4	75.0	19.2	74.1	26.9	59.9
29.3	60.0	31.7	54.4	32.3	51.7
39.3	44.0	39.4	41.3	39.1	39.8
45.1	34.5	45.4	30.0	42.7	32.7
47.4	29.9	49.8	17.8	44.9	28.0
50.6	23.1	50.6	11.7	47.8	21.7
52.6	17.3	50.3	9.5	49.2	15.2
52.4	14.5	46.5	4.4	48.3	11.3
52.0	10.7	39.9	1.1	47.0	8.9
0.0	0.1	0.0	0.4	0.0	0.5

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL, CYCLOHEXANE AND WATER AT 24.8°.

(Washburn and Spencer, 1934.)

The authors give the following weights of the three components corresponding to points on the binodal curve but do not give the calculated percentage compositions from which their triangular diagram of the system was drawn.

Composition of the saturated solutions		
Gms. CH_3OH	Gms. C_6H_{12}	Gms. H_2O
0.0125	2.8555	9.8755
0.0294	5.4948	9.9300
0.0555	7.7729	9.9073
0.1103	7.7508	4.9642
0.3263	13.2856	4.9529
0.2760	7.0175	1.8852
0.4788	8.6026	1.8672
0.8520	11.1167	1.8965
0.9519	8.6042	0.9519
1.4762	8.1968	0.5204
1.8943	7.8472	0.3786
2.9639	7.7553	0.1342
8.7854	0.1404	0.0397
7.6861	0.0704	0.0142

The refractive indices of each of the above mixtures were also determined. The authors also give several determinations of the lowering of the freezing-point of methyl alcohol - cyclohexane solutions and the following values for the distribution of methyl alcohol between water and cyclohexane.

Wt. percent CH_3OH in:		
H_2O layer (C_1)	C_6H_{12} layer C_2	$\frac{C_1}{C_2}$
3.2	0.05	64
15.1	0.25	60
26.8	0.40	67
34.9	0.50	70
38.8	0.65	61
41.8	0.70	60

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL AND BENZENE.

(Wieth, 1929.)

t°	Gms. C_6H_6 per 100 gms. mixture	t°	Gms. C_6H_6 per 100 gms. mixture
-6.8	23.1	-0.6	42.8
-3.8	30.1	+2.0	59.7
-1.6	37.9	2.3	62.9

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL AND n HEXANE.

(Rothmund, 1898.)

The determinations were made by the synthetic method which consists in observing the temperatures at which weighed mixtures of the two liquids become homogenous on slow warming, and become cloudy on slow cooling.

t°	Gms. C_6H_{14} per 100 gms.		t°	Gms. C_6H_{14} per 100 gms.	
	CH_3OH rich layer	H_2O rich layer		CH_3OH rich layer	H_2O rich layer
10	26.5	96.8	43	43.6	91.2
20	31.6	95.9	40	52.7	85.5
30	38.3	93.7	42.6 (c.s.t.)	68.9	

Additional results are given by Perschke, 1926, and Howard and Patterson, 1926.

Results for composition of the co-existent liquid and vapor phases in the system methyl alcohol + n hexane at 45° are given by Ferguson, 1932.

CRITICAL SOLUTION TEMPERATURES OF MIXTURES OF METHYL ALCOHOL AND OTHER SOLVENTS.

(Cornish, Archibald, Murphy and Evans, 1934.)

Mixture		c.s.t.
$CH_3OH + C_2Cl_4$	(Tetra chlor ethylene)	10.0
" $+ CH_3(CH_2)_3CH_3$	(n Pentane)	14.75
" $+ CH_3(CH_2)_4CH_3$	(n Hexane)	32.0
" + "	"	34.0 (Freed, 1933.)
" $+ CH_3(CH_2)_5CH_3$	(n Heptane)	51.5
" $+ C_8H_{18}$	(i-Octane = 2.2.4-Tri methyl Pentane)	42.5

A diagram of the results showing the depression of the critical solution temperature (33.6°) of mixtures of Methyl Alcohol and Hexane, produced by increasing amounts of $C_5H_{11}COOH$, $C_6H_{13}COOH$, $C_7H_{15}COOH$ and C_4H_9COOH, is given by Ssementschenko, W. and Davidoffokaja, E., 1934.

Determinations of the Reciprocal Solubility of Methyl Alcohol and Tetra Ethyl Silan , $Si(C_2H_5)_4$, are given by Bjerrum and Jozefowitz, 1932.)

RECIPROCAL SOLUBILITY OF METHYL ALCOHOL AND CYCLOHEXANE.

(Jones and Amstell, 1930.)

The synthetic method was used and special care observed in purifying the CH_3OH and C_6H_{12} and in preventing entrance of H_2O while weighing the liquids in the glass tubes which were afterwards sealed for observing the solubility limits.

t°	Gms. C_6H_{12} per 100 gms. mixture	t°	Gms. C_6H_{12} per 100 gms. mixture	t°	Gms. C_6H_{12} per 100 gms. mixture
17.1	33.23	45.56	69.86	45.10	81.25
30.4	39.40	45.58	70.80	42.80	86.93
40.05	48.96	45.60*	72.00	37.5	91.47
42.68	53.60	45.58	72.81	32.3	93.40
44.62	59.49	45.53	77.60	30.6	95.50
45.45	66.18	45.45	79.26	6.1	97.30
45.52	69.15	45.32	80.64		

* Critical solution temperature

The authors also determined the reciprocal solubility curves in mixtures made with CH_3OH containing small amounts of H_2O. The results show that the maximum critical point is increased more than the ternary critical solution point by given amounts of H_2O. In order to use this procedure for determining traces of H_2O in CH_3OH, the weight concentration of 75 percent C_6H_{12} was selected and the following changes in maximum critical point with increasing amounts of H_2O were found.

Wt. % H_2O in CH_3OH	0.0	0.331	0.800	1.114	2.031	3.900
Max. crit. temp. of 75 wt. % C_6H_{12} mixtures	45.55°	50.52°	55.74°	58.75°	66.50°	81.56°

The authors give similar results showing the effect of benzene and acetone admixtures upon the maximum critical temperatures of the system.

FREEZING-POINTS OF MIXTURES OF METHYL ALCOHOL AND:

(Saphir, 1929.)

Ethyl Alcohol, C_2H_5OH		Acetone, $(CH_3)_2CO$		Ethyl Ether, $(C_2H_5)_2O$	
t°	Wt. % CH_3OH in Mixture	t°	Wt. % CH_3OH in Mixture	t°	Wt. % CH_3OH in Mixture
-97.8	100	-103.0	84.1	-106.3	82.0
-103.1	91.7	-108.7	71.2	-113.4	62.8
-111.8	80.0	-111.7	59.2	-117.4	50.1
-120.9	71.4	-115.7 (Eutec)	50.3(?)	-121.2	31.1
-150	(Eutec)(Esti.)	-113.7	36.1	-119.5 (Eutec)	
-129.6	16.9	-111.0	27.7	-126.0	(Eutec)(unstable)
-122.5	10.2	-108.3	27.5	-119.0	15.4
-114.0	0.0	-104.1	13.3	-118.9	10.1
		-95.6	0.0	-118.0	6.2
				-116.4	0.0

The methyl alcohol branch of the $CH_3OH + (CH_3)_2CO$ system shows an angle at -112.2° corresponding probably to the polymorphic transformation of CH_3OH reported by Parks, 1925.

FREEZING-POINTS OF MIXTURES OF BENZENE AND METHYL ALCOHOL. (Porrakis, 1925.)

t° of cryst.	Mols. C_6H_6 per 100 mols. of Mixture.	t° of cryst.	Mols. C_6H_6 per 100 mols. of Mixture.	t° of cryst.	Mols. C_6H_6 per 100 mols. of Mixture.
5.40	100.00	—0.10	42.57	—11.50	16.45
3.25	92.16	—1.35	36.67	—17.00	13.67
3.00	84.22	—3.20	31.00	—23.00	9.86
2.40	75.00	—4.90	27.18	—46.00	7.07
2.10	63.08	—7.60	22.98	—67.0	4.93
1.85	57.32	—9.70	19.39	—94.0	0.00
1.40	49.39				

The author also gives tables and curves for benzene and normal butyl alcohol and for benzene and iso-propyl alcohol.

Freezing-point data are given for:

$CH_3OH + CHCl_3$	(Baume and Borowski, 1914, Saphir, 1929; Wyatt, 1929.)
" $+ CH_3Cl$	(Baume, 1914.)
" $+ CH_3I$	(Baume and Tykociner, 1914.)
" $+ CH_3COOH$	(Pickering, 1893.)
" $+ HCONH_2$	(Joukovsky, 1934.)
" $+ C_2H_5COOH$	(Baume and Pamfil, 1914.)
" $+ C_2H_5COOH \cdot HCl$	" " "
" $+ C_6H_6$	(Pickering, 1893.)
" $+ NH_3$	(Baume and Borowski, 1914.)
" $+ SO_2$	(Baume and Pamfil, 1914.)
$CH_3OH.HCl + C_2H_5COOH$	(Baume, 1914.)

UREA (Carbamide) $CO(NH_2)_2$.

SOLUBILITY OF UREA IN WATER.

The closely agreeing results of Pinck and Kelly, 1925; Jänecke and Rahlf, 1930; Schnidman and Sunier, 1932; Miller and Dittmar, 1934; and Wetrow, 1937, were plotted, and the following values taken from the smooth curve. In most cases the determinations were made by the synthetic method and in others by direct analysis of the saturated solutions using the urease method for urea. The earlier results of Speyers, 1902, are somewhat too low.

Very careful determinations of the freezing-point lowering in aqueous solutions of urea are given by Chadwell and Politi, 1938.

t°	Gms. $CO(NH_2)_2$ per 100 gms. sat. sol.	Solid Phase	t°	Gms. $CO(NH_2)_2$ per 100 gms. sat. sol.	Solid Phase
- 5	15.0	Ice	40	62.5	$CO(NH_2)_2$
- 7.5	21.2	"	50	67.0	"
-10	27.0	"	60	71.5	"
-11.5 (Eutec)	32.5	" + $CO(NH_2)_2$	70	75.6	"
0	40.0	$CO(NH_2)_2$	80	80.0	"
+10	46.0	"	90	84.0	"
20	52.0	"	100	88.0	"
25	54.8	"	120	95.5	"
30	57.5	"	132.6	100.0	"

10 cc cold sat. aqueous solution of Magnesium PerChlorate ($Mg(ClO_4)_2$) dissolve more than 11 gms. of $CO(NH_2)_2$. (Duclaux and Durand-Gasselin, 1938.)

SOLUBILITY OF UREA IN AQUEOUS SOLUTIONS OF NITRIC ACID.

(Dalman, 1934.)

The saturated solutions were prepared by agitation at constant temperatures and weighed portions analyzed for acid by titration and for urea by the urease method as described by Fox and Gelhard, 1923.

Results at 10°		Results at 25°		Results at 40°		Solid Phase at each Temp.
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		
HNO_3	$CO(NH_2)_2$	HNO_3	$CO(NH_2)_2$	HNO_3	$CO(NH_2)_2$	
0.0	46.0	0.0	54.5	0.0	62.3	$CO(NH_2)_2$
2.2	48.1	3.2	56.8	5.8	64.9	"
6.5	52.5	9.7	61.6	11.0	67.0	"
9.0	54.7	12.1	63.1	14.7	68.3	"+$CO(NH_2)_2.HNO_3$
8.1	44.7	11.2	50.0	14.3	55.6	$CO(NH_2)_2.HNO_3$
6.8	28.4	9.4	27.1	13.9	38.9	"
5.8	11.7	9.1	11.1	12.5	19.5	"
8.5	3.2	13.5	2.4	14.3	8.9	"
17.0	1.1	31.2	1.3	25.5	3.1	"
33.0	0.5	49.9	1.4	40.8	1.8	"
50.0	0.4	66.1	1.7	55.1	2.1	"
67.2	0.4			65.3	2.4	"

SOLUBILITY OF UREA IN AQUEOUS SOLUTIONS OF SULFURIC ACID.

(Dalman, 1934.)

Results at 10°

Gms. per 100 gms. sat. sol.		Solid Phase
H_2SO_4	$CO(NH_2)_2$	
0.0	46.0	$CO(NH_2)_2$
3.2	48.6	"
11.9	54.2	"
18.0	57.2	"
28.2	62.2	"+$[CO(NH_2)_2]_2.H_2SO_4$
30.1	56.0	$[CO(NH_2)_2]_2.H_2SO_4$
37.2	40.4	"
44.9	36.8	"
51.6	38.0	"+$CO(NH_2)_2.H_2SO_4$
52.4	34.2	$CO(NH_2)_2.H_2SO_4$
56.0	22.0	"
68.4	12.6	"
74.0	19.7	"
74.6	24.7	"

Results at 25°

Gms. per 100 gms. sat. sol.		Solid Phase
H_2SO_4	$CO(NH_2)_2$	
0.0	54.5	$CO(NH_2)_2$
9.6	59.2	"
19.3	62.4	"
29.3	65.8	"+$[CO(NH_2)_2]_2H_2SO_4$
31.0	60.6	$[CO(NH_2)_2]_2.H_2SO_4$
35.7	49.2	"
39.0	44.1	"
46.4	40.3	"
52.7	42.2	"+$CO(NH_2)_2.H_2SO_4$
53.2	39.4	$CO(NH_2)_2.H_2SO_4$
57.9	25.0	"
68.9	19.3	"
72.1	24.3	"
72.9	26.5	"

SOLUBILITY OF UREA IN AQUEOUS SOLUTIONS OF OXALIC ACID.

(Dalman, 1934.)

Results at 10°		Results at 25°		Results at 40°		Solid Phase at each Temp.
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		
$H_2C_2O_4$	$CO(NH_2)_2$	$H_2C_2O_4$	$CO(NH_2)_2$	$H_2C_2O_4$	$CO(NH_2)_2$	
0.0	46.0	0.0	54.5	0.0	62.3	$CO(NH_2)_2$
0.2	46.2	0.3	54.6	0.5	62.4	"+$[CO(NH_2)_2]_2.H_2C_2O_4$
0.2	43.3	0.3	47.9	0.5	55.0	$[CO(NH_2)_2]_2.H_2C_2O_4$
0.2	32.2	0.3	35.0	0.6	32.4	"
0.2	15.6	0.6	26.9	0.9	16.1	"
0.4	4.6	0.9	9.4	2.2	6.6	"
2.3	1.2	5.0	1.9	5.8	3.9	"
—	—	10.3	1.5	14.7	2.8	"+$CO(NH_2)_2.H_2C_2O_4$
—	—	—	—	16.9	2.5	$CO(NH_2)_2.H_2C_2O_4$
5.7	0.9	11.0	1.4	19.3	2.2	"+$H_2C_2O_4.2\ H_2O$
—	—	—	—	18.7	1.2	$H_2C_2O_4.2H_2O$
5.4	0.0	10.2	0.0	17.8	0.0	"

SOLUBILITY OF UREA IN AQUEOUS SOLUTIONS OF ACETIC ACID.

(Dalman, 1937.)

In the case of this system the urease method for urea gave incorrect results in presence of acetic acid and the determinations were made by removing this acid by evaporation to dryness at 50-60° and weighing the residue of dried urea.

Results at 10°		Results at 25°		Results at 40°		Solid Phase at each Temp.
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		
CH_3COOH	$CO(NH_2)_2$	CH_3COOH	$CO(NH_2)_2$	CH_3COOH	$CO(NH_2)_2$	
0.0	46.0	0.0	54.5	0.0	62.3	$CO(NH_2)_2$
7.3	45.9	10.4	52.7	10.2	59.6	"
14.4	45.5	19.8	50.8	20.1	56.6	"
21.8	44.8	30.7	48.0	40.9	49.0	"
29.3	43.6	41.5	45.3	51.8	44.8	"
40.7	41.7	50.2	42.6	—	—	"+$CO(NH_2)_2.2CH_3COOH$
44.0	36.4	54.4	37.0	60.6	39.3	$CO(NH_2)_2.2CH_3COOH$
52.9	25.8	59.9	30.5	62.7	37.0	"
64.7	17.2	69.3	22.8	64.2	35.5	"
75.6	12.3	74.4	17.1	66.3	33.2	"
86.0	8.5	88.5	11.2	69.9	29.7	"
90.5	7.0	—	—	72.8	27.0	"
91.8	6.5	—	—	—	—	"+CH_3COOH
94.1	2.5	—	—	—	—	CH_3COOH
95.6	4.4	—	—	—	—	"

SOLUBILITY OF UREA IN AQUEOUS SOLUTIONS OF TARTARIC ACID.

(Dalman, 1937.)

Results at 10°

Gms. per 100 gms. sat. sol. $H_2C_4H_4O_6$	Gms. per 100 gms. sat. sol. $CO(NH_2)_2$	Solid Phase
8.4	46.0	$CO(NH_2)_2$
15.8	46.0	"
24.3	46.0	"
32.8	46.0	" + 2.1
36.1	40.6	2.1
40.0	35.8	"
43.4	32.3	"
46.2	30.0	" + 1.2
45.9	25.5	1.2
45.9	20.3	"
46.3	14.6	"
48.2	9.3	"
51.7	5.1	"
51.3	4.6	"
55.9	4.7	" + $H_2C_4H_4O_6$
55.5	3.1	$H_2C_4H_4O_6$
54.5	0.0	"

Results at 25°

Gms. per 100 gms. sat. sol. $H_2C_4H_4O_6$	Gms. per 100 gms. sat. sol. $CO(NH_2)_2$	Solid Phase
8.7	53.2	$CO(NH_2)_2$
17.5	51.8	"
27.7	50.3	"
35.9	49.0	" + 2.1
39.6	43.9	2.1
44.4	38.0	"
48.8	33.5	" + 1.2
49.7	25.6	1.2
50.5	20.3	"
51.6	14.7	"
54.6	8.4	"
56.6	6.0	"
59.1	5.0	" + $H_2C_4H_4O_6$
58.8	3.2	$H_2C_4H_4O_6$
58.5	0.0	"

2.1 = $[CO(NH_2)_2]_2 \cdot H_2C_4H_4O_6$; 1.2 = $CO(NH_2)_2 \cdot 2(H_2H_4H_4O_6)$.

SOLUBILITY OF UREA IN ETHYL ACETATE CONTAINING SMALL AMOUNTS OF WATER AT 25°.

(Lewis and Burrows, 1912.)

Gms. H_2O per 100 Gms. Solvent. (Ethyl Acetate + H_2O).	Gms. Urea per 100 Gms. Sat. Sol.	Gms. H_2O per 100 Gms. Solvent. (Ethyl Acetate + H_2O).	Gms. Urea per 100 Gms. Sat. Sol.
0	0.080	1.677	0.308
0.652	0.148	2.006	0.328*
1.112	0.198	2.138	0.342
1.638	0.296	3.234	0.343†

* A second liquid phase was suspected here.

† A second liquid phase could be distinguished.

SOLUBILITY OF UREA IN ACETIC ACID DETERMINED BY THE FREEZING-POINT METHOD.

(Wetrow, 1937.)

t°		Gm. Mols. $CO(NH_2)_2$ per 100 gm. mols. mixture	Solid Phase
16.8		0.0	CH_3COOH
15.3		3.0	"
13.0		5.0	"
12.4	Eutec.	—	" + $CO(NH_2)_2 \cdot 2CH_3COOH$
19.7		8.0	$CO(NH_2)_2 \cdot 2CH_3COOH$
30.8		15.0	"
39.9		25.0	"
41.5		33.3	"
40.7		36.0	"

t°		Gm. Mols. $CO(NH_2)_2$ per 100 gm. mols. mixture	Solid Phase
39	Eutec.	42.0	$CO(NH_2)_2 \cdot 2CH_3COOH + CO(NH_2)_2$
53		46.0	$CO(NH_2)_2$
59		48	"
65.5		50.0	"
71.0		52.0	"
76.0		54.0	"
81.5		56.0	"
90.5		60.0	"
92.5		65.0	"

SOLUBILITY OF UREA IN AQUEOUS SOLUTIONS OF CITRIC ACID.

(Dalman, 1937.)

Results at 10°		Results at 25°		Results at 40°		Solid Phase at each Temp.
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		
$H_3C_6H_5O_7$	$CO(NH_2)_2$	$H_3C_6H_5O_7$	$CO(NH_2)_2$	$H_3C_6H_5O_7$	$CO(NH_2)_2$	
2.9	45.9	5.4	53.6	6.5	60.2	$CO(NH_2)_2$
5.2	45.9	10.5	52.5	17.7	56.6	" + 4.1
6.3	42.2	12.5	49.4	20.4	52.8	4.1
7.8	39.0	15.0	46.2	23.7	49.7	"
9.6	35.0	17.8	43.0	27.0	46.7	4.1 + 2.1
10.4	29.5	19.3	38.0	28.7	43.2	2.1
12.1	24.6	21.7	32.5	30.3	40.1	"
14.3	18.8	23.8	28.2	32.1	37.0	" + 1.1
17.2	12.0	24.0	22.6	32.4	30.0	1.1
22.4	7.2	24.4	17.6	34.1	21.7	"
31.0	3.0	27.0	12.1	39.4	12.1	"
42.9	1.5	34.6	6.1	48.1	5.7	"
48.7	1.2	41.6	4.0	56.0	3.0	"
—	—	51.7	2.4	64.0	2.3	"
54.0	1.0	62,2	1.4	69.0	1.8	" + $H_3C_6H_5O_7$
54.0	0.0	62.1	0.0	68.6	0.0	$H_3C_6H_5O_7$

4.1 = $[CO(NH_2)_2]_4 \cdot H_3C_6H_5O_7$; 2.1 = $[CO(NH_2)_2]_2 \cdot H_3C_6H_5O_7$; 1.1 = $CO(NH_2)_2 \cdot H_3C_6H_5O_7$.

Results for the equilibrium in the system Urea, Ammonia and Water, determined by the synthetic and freezing-point methods together with vapor pressures, fixing the range of existence of the solid phases, Urea, ammonium carbonate, bicarbonate, sesquicarbonate and carbamate are given by Jänecke, 1930, and Jänecke and Rahlfs, 1930, 1932.

SOLUBILITY OF UREA IN METHYL ALCOHOL. (Walton and Wilson, 1925.)

The saturated solutions were prepared by vigorous stirring at constant temperature. The solutions were analyzed by evaporating and weighing the residue. At the lower temperatures a stable molecular compound, $CO(NH_2)_2.CH_3OH$, is formed.

t°.	Gms. $CO(NH_2)_2$ per 100 gms. CH_3OH.	Solid Phase.	t°.	Gms. $CO(NH_2)_2$ per 100 gms. CH_3OH.	Solid Phase.
-15.20.	10.92	$CO(NH_2)_2$ (Unstable form)	17.45.	3.76	$CO(NH_2)_2.CH_3OH$ (Stable form)
- 9.85.	11.64	»	17.0..	3.63	»
+ 0 25.	14.24	»	15.2..	3.93	»
7.33.	16.70	»	9.85.	4.88	»
15.23.	19.73	»	+ 0.25.	7.71	»
18.14.	21.16	»	7.33.	10.98	»
-78.0..	0.32	$CO(NH_2)_2.CH_3OH$ (Stable form)	8.03.	11.30	»
-24.9 .	2.89	»	15.23.	16.47	»
-21.3..	3.17	»	16.63.	17.72	»
-20.2..	3.25	»	18.14.	19.56	»
-18.1..	3.48	»	18.79.	20.27	»

The transition point between $CO(NH_2)$ and $CO(NH_2)_2CH_3OH$ is at + 19°.25

SOLUBILITY OF UREA IN ALCOHOLS.

(Speyers, 1902)

t°.	In Methyl Alcohol. Wt. of 1 cc. sat. sol.	In Methyl Alcohol. Gms. $CO(NH_2)_2$ per 100 gms. CH_3OH.	In Ethyl alcohol. Wt. of 1 cc. sat. sol.	In Ethyl alcohol. Gms. $CO(NH_2)_2$ per 100 gms. C_2H_5OH.
0	0.861	15.0	0.8213	2.6
10	0.863	17.7	0.814	4.0
20	0.869	22.0	0.804	5.4
25	0.872	24.5	0.805	6.2
30	0.876	27.7	0.806	7.2
40	0.890	35.3	0.804	9.3
50	0.908	46.0	0.803	11.7
60	0.928	62.8	—	15.1
70	—	—	—	20.2

100 gms. abs. methyl alcohol dissolve 21.8 gms. $CO(NH_2)_2$ at 19.5°.
100 gms. abs. ethyl alcohol dissolve 5.06 gms. $CO(NH_2)_2$ at 19.5°. (de Bruyn, 1903.)

SOLUBILITY OF UREA IN ALCOHOLS.

(Timofeiew, 1894.)

Alcohol.	t°.	Gms. $CO(NH_2)_2$ per 100 Gms. Solvent.	Alcohol.	t°.	Gms. $CO(NH_2)_2$ per 100 Gms. Solvent.
Methyl Alcohol	−12	11	Isopropyl Alcohol	19.4	5.76
"	0	14.2	"	20	6.17
"	19	20.9	"	81	23.46
"	40	36.4	Isobutyl Alcohol	0	1.01
"	62	66.6	"	19	1.65
"	71	107.4	"	41	3.12
Ethyl Alcohol	− 9	2.69	"	60	4.40
"	0	3.26	"	80	6.34
"	18	5	"	98	10
"	41	9.45	Isoamyl Alcohol	20	1.18
"	60	16.3	"	60	3.41
"	81	30.8	"	80	4.88
Propyl Alcohol	0	1.65	"	83	5.24
"	20	2.56	"	98	6.15
"	40	5.12	Capryl Alcohol	19.4	0.56
"	60	7.72	"	98	2
"	80	12.28	Ally Alcohol	19.4	9.37
"	98	18.06			

SOLUBILITY OF BENZOIC ACID IN ETHYL ALCOHOL SOLUTIONS OF UREA AT 25° AND VICE VERSA. (Osaka and Ando, 1921.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
C_6H_5COOH.	$CO(NH_2)_2$.	Solid Phase.	C_6H_5COOH.	$CO(NH_2)_2$.	Solid Phase.
36.92	0.00	C_6H_5COOH	45.65	12.12	C_6H_5COOH
37.64	0.72	"	46.23	12.51	$C_6H_5COOH + CO(NH_2)_2$
38.55	1.81	"	43.78	12.15	$CO(NH_2)_2$
39.38	2.64	"	35.06	12.76	"
40.75	4.22	"	25.38	9.41	"
41.56	5.10	"	11.22	7.39	"
42.31	6.11	"	5.06	6.59	"
42.90	7.09	"	0.00	5.82	"
44.68	9.67	"			

SOLUBILITY OF UREA IN MIXTURES OF ETHYL ALCOHOL AND QUINOLINE AT 20-25°.

(Pucher and Dehn, 1921.)

Per cent C_7H_9N in solvent.	Gms. $CO(NH_2)_2$ per 100 cc. sat. sol.	Per cent C_7H_9N in solvent.	Gms. $CO(NH_2)_2$ per 100 cc. sat. sol.	Per cent C_7H_9N in solvent.	Gms. $CO(NH_2)_2$ per 100 cc. sat. sol.
0.0	5.0	47.5	1.50	65	0.32
10.0	4.0	50.0	1.05	70	0.50
23.2	2.5	55.0	0.64	80	0.19
37.5	1.8	60.0	0.26	90	0.10
				100	0.11

SOLUBILITY OF UREA IN ETHYL ETHER.

(Gortner, 1914.)

When 0.3255 gm. urea was extracted in a Soxhlet apparatus with anhydrous ether for 48 hours, the extract was found to contain 0.072 gm. urea. An approximate estimate, based on the volume of liquid and the number of siphonings per hour indicates a solubility of 0.0004 gm. urea per 100 cc. of ether.

100 gms. glycerol dissolve about 50 gms. urea at 15°.

100 gms. pyridine dissolve 0.96 gm. urea at 20–25°. (Dehn, 1917.)

100 gms. aq. 50% pyridine dissolve 21.53 gms. urea at 20–25°.

Results for equilibrium in the system Urea + Di phenyl amine are given by Nijveld, 1934, and for the system Urea + Di phenyl amine + Resorcinol are given by Hyrnakowski, Staszewski and Szmyt, 1937.

SOLUBILITY OF UREA IN LIQUID AMMONIA.

(Scholl and Davis, 1934.)

From the volume and pressure of the vapor above the saturated solutions at given temperatures, determined in an isotensiscope, the amount of NH_3 was calculated and this subtracted from the weight of liquid ammonia present in the original mixtures, to find the composition of the saturated solutions. Previous determinations of this system by Jänecke, 1930, agree well with the present results.

t°	Gm. Mols. $CO(NH_2)_2$ per 100 gm. mols. mixture	Gms. $CO(NH_2)_2$ per 100 gms. NH_3	Gms. $CO(NH_2)_2$ per 100 gms. sat. sol.	Vapor Pressure in Atmos.	Solid Phase
-26.6	6.64	25.10	20.8	1.3	$CO(NH_2)_2.NH_3$
5.8	15.26	63.52	38.8	4.7	"
23.9	23.39	107.6	51.8	7.6	"
35.9	32.29	168.2	62.8	9.2	"
40.9	37.60	212.5	68.0	9.4	"
44.7	43.59	272.5	73.2	9.0	"
45.6 tr.pt.	—	—	74.6	—	" + $CO(NH_2)_2$
50.0	47.20	315.2	75.9	9.4	$CO(NH_2)_2$
61.8	52.05	382.9	79.3	11.1	"
81.0	61.39	560.6	84.8	13.4	"
82.0	61.53	563.9	85.0	13.5	"
101.0	74.38	1024.	91.	12.5	"

UREA

Freezing-point data are given for:

Urea $(CO(NH_2)_2)$ +

CCl_3COOH (tri chlor acetic acid) (1)(2)
$CHCl_2COOH$ (di chlor acetic acid)(2)
$CH_2ClCOOH$ (mono chlor acetic acid(2)
CH_3COOH (acetic acid)(2)(7)(22)
$CN.NH_2$ (cyanamide)(26)(28)(29)
$(CONH_2)_2NH$ (biuret)(27)
$COOC_2H_5.NH_2$(urethan)(5)(8)
$(CH_2OHCHOH)_2$ (erythritol)(3)
C_6H_5OH (phenol)(1)(21)(23)(25)
$C_6H_4(OH)_2$ o (pyrocatechol)(2)(30)
$C_6H_4(OH)_2$ m (resorcinol)(1)(10)(30)
$C_6H_4(OH)_2$ p (hydroquinol)(1)
$C_6H_5OHCOOH$ o (salicylic acid(22)
$C_6H_4OHCH_3$ o (cresol)(4)
$C_6H_4OHOCH_3$ (guaicol)(1)(6)
$C_6H_5NO_2$ (nitro benzene)(31)
$C_6H_4(NO_2)_2$ o (di nitrobenzene)(20)
" m " (20)(31)
" p " (20)
$C_6H_3(NO_2)_3$ s (tri nitrobenzene (31)
$C_6H_4OH(NO_2)$ o (nitrophenol)(21)
" m " (21)
" p " (21)
$C_6H_3OH(NO_2)_2$ 1.2.4 (di nitro phenol (2)
$C_6H_4CH_3NO_2$ o (nitro toluene)(19)
" m " " (19)
" p " " (19)
$C_6H_3CH_3(NO_2)_2$ 1.2.4(di nitro toluenc (5)(20)(24)
$C_6H_5CH:CHCOOH$ (Cinnamic acid)(22)
$CH_3CONHC_6H_5$ (acetanilide)(9)
$CH_3CONHC_6H_4OC_2H_5$ (phenacetine)(5)(8)
$(CH_3)_2CHC_6H_3CH_3OH$ (thymol)(12)
$(CH_3)_2.C.(SO_2C_2H_5)_2$(sulfonal)(9)
$C_6H_5.C_6H_5$ (di phenyl(1)(6)
$C_6H_5OHCOOC_6H_5$ (salol)(5)(8)
$C_{10}H_8$ (naphthalene(1)
$C_{10}H_7OH$ (α naphthol)(1)
$C_{10}H_{19}OH$ (menthol)(8)
$C_{11}H_{12}ON_2$ (antipyrine)(5)(8)
$C_{20}H_{24}N_2O_2$ (quinine) (5)(8)
Urethan + Phenol (13)
" + Salicylic acid (13)
" + Phenacetine (17)(18)
" + Antipyrine (11)(18)
Resorcinol + Antipyrine (17)(18)
Benzoic acid + Resorcinol (14)
Salicylic acid + Antipyrine (17)(18)
" " + Acetanilide (15)
Acetanilide + Phenacetine (17)(18)
" + β Naphthol (15)
Sulfonal + Phenacetine (17)(18)
" + Antipyrine (16)
" + Salipyrine (16)
Antipyrine + " (17)(18)
" + Phenacetine (17)(18)

(1) Puschin and König, 1928
(2) " " Rikovsky, 1932
(3) " " Dezelic, 1932
(4) " " Sladovic, 1928
(5) Adamanis, 1933
(6) Giua, 1916
(7) Brady and Truszkowski, 1924
(8) Hrynakowski and Adamanis, 1933
(9) " " " 1933(a)
(10) " " " 1933(b)
(11) " " " 1935
(12) " " Szmyt, 1935
(13) " " " 1935(a)
(14) " " " 1935(b)
(15) " " " 1935(c)
(16) " " " 1938(a)
(17) Hrynakowski, 1934
(18) " 1934(a)
(19) Kremann, 1907
(20) " and Petritschek, 1917
(21) " " Rodenis, 1906
(22) " Weber and Zechner, 1925
(23) Philip, 1903
(24) Rheinboldt and Kirscheisen, 1926
(25) " Henning and " , 1925
(26) Jänecke and Rahlfs, 1930
(27) " " 1932
(28) Pratolonga, 1914.
(29) " Jänecke and Rahlfs, 1930
(30) van der Hammen, 1931
(31) Van Dorf, Limburg and Nobel, 1937

UREA PHOSPHATE $CO(NH_2)_2.H_3PO_4$.

SOLUBILITY OF UREA PHOSPHATE IN WATER AND IN METHYL AND ETHYL ALCOHOLS.

(Matignon and Dode, 1932, 1934.)

Results for:

Water			Methyl Alcohol			Ethyl Alcohol		
t°	d. of sat. sol.	Gms. $CO(NH_2).H_3PO_4$ per 100 gms. sat. sol.	t°	d. of sat. sol.	Gms. $CO(NH_2)_2.H_3PO_4$ per 100 gms. sat. sol.	t°	d. of sat. sol.	Gms. $CO(NH_2)_2.H_3PO_4$ per 100 gms. sat. sol.
10	1.18	41.4	10	0.925	25.5	10	0.83	8.3
13	1.20	44.0	13	0.93	27.4	13	0.835	9.1
18	1.24	47.9	18	0.94	30.2	18	0.85	10.4
24.5	1.26	52.4	24.5	0.98	34.6	24.5	0.85	13.0
32	1.29	57.5	32	1.00	40.9	32	0.86	16.6
46	1.32	66.9	46	1.07	52.9	46	0.91	28.1

Results are also given for the fusion points of the system $CO(NH_2)_2$ + $CO(NH_2)_2.H_3PO_4$. The eutectic is at 72° and 37 percent $CO(NH_2)_2$.

NITROGUANIDINE $NH_2.C(NH).NH.NO_2$.

One liter of saturated solution of Nitroguanidine in Water contains 4.4 gms. $CH_4O_2N_4$ at 25° and 82.5 gms. at 100°.

One liter of saturated solution in aqueous 1.0 normal KOH contains 12.2 gms. $CH_4O_2N_4$ at 25°. Some decomposition occurs as indicated by the evolution of ammonia. There are two forms of nitroguanidine which differ slightly in solubility. (Davis, Ashdown and Couch, 1925.)

SOLUBILITY IN AQUEOUS SOLUTIONS OF SULFURIC ACID.

Results at 0° and at 25°.

(Davis, 1922.)

Per cent conc. of aq. H_2SO_4.	Gms. $NH_2.C(NH)NH.NO_2$ per 100 cc. sat. sol. at 0°.	Gms. $NH_2.C(NH)NH.NO_2$ per 100 cc. sat. sol. at 25°.
0 (= H_2O)	0.12	0.42
15	0.30	0.55
20	0.45	1.05
25	0.75	1.8
30	1.3	2.9
35	2.0	5.2
40	3.4	8.0
45	5.8	10.9

Results at 13°.

(Ewan and Young, 1921.)

Per cent conc. of aq. H_2SO_4.	Gms. $NH_2.C(NH)NHNO_2$ per 100 gms. aq. H_2SO_4.
5.8	0.37
17.2	0.65
20.0	0.72
22.7	0.87
25.2	0.95
28.2	1.37
33.2	2.55

In the case of the determinations by Davis an excess of solid was shaken with the aqueous acid and the saturated solution analyzed. The determinations by Ewan and Young were made by adding 82 % H_2SO_4 to definite mixtures of nitro guanidine and water untill the solid just dissolved. These authors also give a few determinations made with aqueous nitric acid mixtures.

METHIONIC ACID $CH_2(SO_3H)_2$

100 gms. H_2O dissolve 245.8 gms. $CH_2(SO_3H)_2$ at 25°. (Backer, 1929, 1930.)

METHANE SULFONIC ACID CH_3SO_3H.

RECIPROCAL SOLUBILITY OF METHANE SULFONIC ACID AND WATER DETERMINED BY THE FREEZING-POINT METHOD.

(Berthoud, 1929.)

t°	Gm. Mol. Percent CH_3SO_3H	Solid Phase
- 1.8	0.29	Ice
-17.0	5.75	"
-27.5	8.15	"
-42.0	11.1	"
-75.0 Eutec	16.4	" + $CH_3SO_3H.3H_2O$
-67.6	18.2	$CH_3SO_3H.3H_2O$
-64.0	19.1	"
-53.5	24.4	"
-51.7 m.pt.	23.8	"
-52	27.6	"
-54.0	31.0	"
-54.5 Eutec	31.5	" + $CH_3SO_3H.H_2O$.
-51.0	32.1	$CH_3SO_3H.H_2O$

t°	Gm. Mol. Percent CH_3SO_3H	Solid Phase
-30.9	36.9	$CH_3SO_3H.H_2O$
-15.3	40.3	"
+ 1.5	45.5	"
9.8	47.8	"
11.0 m.pt.	51.1	"
10.7	52.9	"
3.2	61.8	"
-12.0	76.3	"
-14.5	77.5	"
-15.0 Eutec	78.0	" + $CH_3SO_3.H$
-13.6	78.0	CH_3SO_3H
- 8.5	83.3	"
+ 6.0	89.2	"
20.0	100.0	"

METHYL AMINE CH_3NH_2.

The solubility of methyl amine in water at 60°, determined by an aspiration method and calculated from the vapor pressure of 40.6 mm Hg, is 419 in terms of the Bunsen Abs. Coef (see p. 37) and 511 in terms of the Ostwald Solubility Expression (see p. 37) (Doyer, 1890)

Freezing-point data for mixtures of CH_3NH_2 + H_2O are given by Pickering, 1893.

DISTRIBUTION OF METHYL AMINE AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. CH_3NH_2 per liter. H_2O layer (C_1).	Millimols. CH_3NH_2 per liter. $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
2.625	0.475	0.181
6.15	1.225	0.199
13.5	1.9	0.141
27.4	4.5	0.164

Water and Ether.

Millimols. CH_3NH_2 per liter. H_2O layer (C_1).	Millimols. CH_3NH_2 per liter. $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
4.90	0.575	0.117
7.60	0.90	0.118
11.25	1.225	0.109
19.1	2.05	0.107
34.5	3.9	0.113

Water and Xylene.

Millimols. CH_3NH_2 per liter H_2O layer (C_1).	Millimols. CH_3NH_2 per liter $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_2}$.
1.730	0.130	0.0750
3.745	0.255	0.0680
4.990	0.501	0.0528
19.018	0.982	0.0517

DISTRIBUTION OF METHYL AMINE BETWEEN WATER AND CHLOROFORM.

Results at Several Temperatures

(Moore and Winmill, 1912.)

t^o	Gm. Equiv. CH_3NH_2 per liter aq. layer	Partitio Coef.	Gms. CH_3NH_2 per liter		$\frac{C_1}{C_2}$
			H_2O layer(C_1)	$CHCl_3$ layer(C_2)	
18	0.0817	8.496	0.02113	0.001521	13.80
"	0.0909	8.477	0.06876	0.005611	12.25
25	0.1203	7.965	0.10151	0.008380	12.11
"	0.1312	8.0	0.2003	0.01682	11.90
32.35	0.1399	5.99	0.3793	0.03242	11.70
"	0.0959	6.0	0.6850	0.05940	11.53

Results at 25^o

(Felsing and Buckley, 1933.)

Gms. CH_3NH_2 per liter:		$\frac{C_1}{C_2}$
H_2O layer(C_1)	$CHCl_3$ layer(C_2)	
0.9741	0.08473	11.50
1.2773	0.1126	11.34
1.5563	0.1379	11.28
1.7485	0.1551	11.27
2.0384	0.1834	11.11
2.6180	0.2402	10.90

Results for the distribution of methyl amine between aqueous 0.05 molar copper sulfate and chloroform at 25^o are given by Felsing and Buckley, 1933.

DISTRIBUTION OF METHYL AMINE AT 25^o BETWEEN:

Water and Benzene

(Herz and Stanner, 1927.)

Gm. Mols. CH_3NH_2 per liter		$\frac{C_2}{C_1}$
H_2O layer(C_1)	C_6H_6 layer(C_2)	
0.5515	0.0242	0.044
1.0545	0.0424	0.040
1.5636	0.0485	0.031
2.0758	0.0576	0.028

Water and Toluene

(Herz and Stanner, 1927.)

Gm. Mols. CH_3NH_2 per liter		$\frac{C_2}{C_1}$
H_2O layer(C_1)	$C_6H_5CH_3$ layer(C_2)	
0.5382	0.0242	0.045
1.0091	0.0364	0.036
1.5061	0.0424	0.028
2.0169	0.0667	0.033

DISTRIBUTION OF METHYL AMINE AT 25^o BETWEEN WATER AND AMYL ALCOHOL.

(Herz and Fischer, 1904.)

Gms. CH_3NH_2 per liter	
H_2O layer	$C_5H_{12}O$ layer
3.70	1.20
9.40	3.30
15.7	5.4
20.0	7.2
25.3	9.2
33.0	12.4

Gm. Mols. CH_3NH_2 per liter	
H_2O layer	$C_5H_{12}O$ layer
0.1155	0.03804
0.3036	0.1070
0.5054	0.1759
0.6429	0.2315
0.8126	0.2981
1.0613	0.3974

TETRA CHLORO ETHYLENE $CCl_2:CCl_2$.

CRITICAL SOLUTION TEMPERATURES OF MIXTURES OF TETRACHLOR ETHYLENE AND OTHER COMPOUNDS.

(Cornish, Archibald, Murphy and Evans, 1934.)

Mixture		Crit. Solution Temp.
$CCl_2:CCl_2$ + CH_3CN	(Acetonitrile)	13.
" + $NH_2CH_2CH_2NH_2$	(Ethylene diamine)	15.8
" + $HOCH_2CH_2Cl$	(Glycol chlor hydrine)	30.
" + CH_3NO_2	(Nitro methane)	41.

HEXA CHLORO ETHANE $CCl_3:CCl_3$.

Results for the solubility of hexa chloro ethane in ethane, liquid and vapor, over a temperature range from 40° to 50° are given by Holder and Maass, 1940. An apparatus consisting of a central main phosphor bronze bomb in which the solvent and solute were placed and to which two small bombs equipped with needle valves were attached, was used for measuring the solubilities both in the liquid and vapor phases up to and above the critical temperature.

The critical solution temperature of this system C_2Cl_6 + $C_6H_{10}O_4$ (ethyl oxalate) is at about 105°. (Lecat, 1928.)

Results for the melting points of the system $CCl_3:CCl_3$ + $C_{10}H_8$ (Naphthalene) are given by Parijs, 1936.

TETRA CHLORO DINITRO ETHANE $C_2(NO_2)_2Cl_4$.

30 cc. of dry nitrogen peroxide (N_2O_4), distilled from P_2O_5, dissolve 15.7 gms. $C_2(NO_2)_2Cl_4$ at 0°. The solubility of tetrachlor dinitro ethane in superpalite and in chlorpicrin is about of the same order of magnitude.

(Argo, James and Donnelly, 1919.)

CYANOGEN AZIDO DITHIOCARBONATE $CN.SCSN_3$.

SOLUBILITY OF CYANOGEN AZIDO DITHIO-CARBONATE IN SEVERAL SOLVENTS AT 0°.

(Audrieth and Browne, 1930.)

Solutions saturated at room temperature were cooled in an ice bath and after crystallization 5 cc samples of the supernatant liquid were withdrawn, the solvent removed by evaporation, and the residue weighed.

Solvent	Gms. $CN.SCSN_3$ per 100 cc sat. sol.	Solvent	Gms. $CN.SCSN_3$ per 100 cc sat. sol.
Water	0.15	Chloroform	3.17
Carbon tetra chloride	0.22	Methyl Alcohol	6.27
Carbon disulfide	0.29	Ethyl Acetate	13.19
Ethyl Ether	1.11	Acetone	24.69
Ethyl Alcohol	2.61		

TRI BROMO DI CHLORO ETHANES

Freezing-point data for the system $CH\ BR_2.C\ Cl_2\ Br + CH\ Cl\ Br.C\ Cl\ Br_2$ are given by Van de Walle, 1925.

PER CHLORO ETHANE CCl_3CCl_3.

100 gms. H_2O dissolve 0.005(?) gm. CCl_3CCl_3 at 22.3°. (Van Arkel and Vles, 1936.)

PENTA CHLORO ETHANE $CHCl_2CCl_3$.

100 gms. H_2O dissolve 0.047 gm. $CHCl_2CCl_3$ at 20°. (Van Arkel and Vles, 1936.)

The critical solution temperature of mixtures of Penta chloro Ethane and Acetamid is at about 95°. (Lecat, 1928.)

Freezing-point data are given for the systems $C_2HCl_5 + CH_2ClCH_2Cl$ (Ethylene Chloride) and $C_2HCl_5 + CHCl_2{:}CHCl_2$ (1.1.2.2.-tetrachloro ethane) by Timmermans and Mme. Vesselovsky, 1931.

TRI CHLORO ETHYLENE C_2HCl_3.

SOLUBILITY OF WATER IN TRI CHLORO ETHYLENE.
(Carlisle and Levine, 1932.)

The authors give their results in the form of a curve from which the following results were read.

t°	Gms. H_2O per 100 gms. sat. sol.	t°	Gms. H_2O per 100 gms. sat. sol.
−38	0.0008	+10	0.0165
−26	0.003	22	0.0270
−14	0.006	28	0.0333
− 2	0.010		

CHLORAL CCl_3CHO.

Freezing-point data are given for:

$CCl_3.CHO + H_2O$ (van Rossem, 1908.)
$CCl_3.CHO + C_2H_5OH$ (Leopold, 1909.)

TRI CHLORO ACETIC ACID CCl_3COOH.

100 gms. sat. solution of tri chloro acetic acid in water has the d_{25} = 1.615 and contains 92.32 gms. CCl_3COOH at 25°. (Seidell, 1910.)

Results for the reciprocal solubility of tri chloro acetic acid and water determined by the freezing-point method are given by Pickering, 1895.

EQUILIBRIUM IN THE SYSTEM TRICHLORO ACETIC ACID BENZENE AND WATER AT 15°.

(Bell, 1930.)

d. of sat. solution	Gm. Mols. per 1000 gms. sat. sol.		d. of sat. solution	Gm. Mols. per 1000 gm. sat. sol.	
	CCl_3COOH	H_2O		CCl_3COOH	H_2O
0.878	0.0278	0.0426	0.885	0.140	0.165
0.878	0.0506	0.0690	0.888	0.176	0.210
0.887	0.0950	0.115	0.892	0.219	0.247

DISTRIBUTION OF TRI CHLORACETIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Ether.

Millimols. CCl_3COOH per liter of		
H_2O layer (C_1).	Ether layer (C_2).	$\frac{C_2}{C_1}$.
1.95	0.85	0.436
3.20	2.50	0.781
5.10	5.40	1.060
7.10	10.40	1.465
8.825	17.00	1.928

Acetone and Glycerol.

Millimols. CCl_3COOH per liter of		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.50	0.600	2.50
2.8375	0.7625	3.72
5.40	1.075	5.02
7.70	1.25	6.17
20.90	1.70	12.30

DISTRIBUTION OF TRI CHLORACETIC ACID AT 25° BETWEEN:

(Kolossowsky and Kulikow, 1934, 1934a.)

Water and Carbon Tetrachloride

Gm. Equiv. CCl_3COOH per liter of		
H_2O layer(C_1)	CCl_4 layer(C_2)	$\frac{C_1}{C_2}$
0.2772	0.0012	231
0.6237	0.0063	99
0.8392	0.0183	50.4
1.2285	0.0268	45.8
2.0034	0.0598	33.5
3.1972	0.0949	33.8
4.1126	0.1169	35.2
5.5014	0.3391	16.2
5.600	0.6388	8.77

Water and Chloroform

Gm. Equiv. CCl_3COOH per liter of		
H_2O layer(C_1)	$CHCl_3$ layer(C_2)	$\frac{C_1}{C_2}$
0.0488	0.0017	28.71
0.1716	0.0094	18.26
0.2960	0.0218	13.58
0.4673	0.0512	9.13
0.7617	0.1119	6.81
1.1708	0.2238	4.83
2.0781	0.5490	3.79
3.1401	0.8114	3.87
3.6039	1.0011	3.60

DISTRIBUTION OF TRICHLORO ACETIC ACID AT 25° BETWEEN:

(Kolossowski and Koulikow, 1934a.)

Water and Methyl Iodide

Gm. Equiv. CCl_3COOH per liter of		$\frac{C_1}{C_2}$
H_2O layer(C_1)	CH_3I layer(C_2)	
0.1974	0.0080	24.70
0.3345	0.0211	15.85
0.5638	0.0544	10.36
0.839	0.124	6.77
1.650	0.544	3.03
2.594	0.981	2.64
3.440	1.324	2.60
3.174	1.933	1.64
2.931	2.167	1.35

Water and Ethyl Bromide

Gm. Equiv. CCl_3COOH per liter of		$\frac{C_1}{C_2}$
H_2O layer (C_1)	C_2H_5 Br layer(C_2)	
0.063	0.0069	9.13
0.146	0.030	4.87
0.272	0.076	3.58
0.496	0.178	2.79
0.699	0.285	2.45
1.017	0.530	1.92
1.548	1.305	1.19
1.809	2.003	0.90
2.481	2.901	0.86

Water and Toluene

Gm. Equiv. CCl_3COOH per liter of		$\frac{C_1}{C}$
H_2O layer(C_1)	$C_6H_5CH_3$ layer(C_2)	
0.0690	0.0015	46.0
0.0910	0.00225	40.4
0.1400	0.0038	36.8
0.2223	0.0076	29.3
0.4185	0.0233	18.0
0.7275	0.0597	12.2
1.1565	0.1505	7.68
1.5794	0.2922	5.41
2.2074	0.5198	4.25
2.9380	0.6952	4.23
3.7103	0.9887	3.75
4.1598	1.2312	3.38

Water and Cumene

Gm. Equiv. CCl_3COOH per liter of		$\frac{C_1}{C_2}$
H_2O layer(C_1)	$C_6H_5CH(CH_3)_2$ layer(C_2)	
0.1215	0.0220	5.52
0.1588	0.0300	5.29
0.407	0.081	5.02
0.680	0.150	4.53
0.819	0.189	4.33
1.046	0.277	3.78
1.298	0.359	3.62
1.751	0.529	3.31
2.029	0.611	3.32
2.545	0.693	3.67
4.001	0.806	4.96
4.599	0.779	5.96

Water and Nitrobenzene

Gm. Equiv. CCl_3COOH per liter of		$\frac{C_1}{C_2}$
H_2O layer(C_1)	$C_6H_5NO_2$ layer(C_2)	
0.0186	0.0031	6.02
0.0485	0.0088	5.51
0.0831	0.0181	4.59
0.1057	0.0286	3.70
0.2206	0.0945	2.33
0.3774	0.2487	1.52
0.5884	0.5551	1.08
0.7741	0.9431	0.821
1.0011	1.6614	0.603
1.2548	2.7421	0.458
1.4519	3.4728	0.418
1.6129	3.7090	0.435

Water and o Nitrotoluene

Gm. Equiv. CCl_3COOH per liter of		$\frac{C_1}{C_2}$
H_2O layer(C_1)	o $C_6H_4CH_3NO_2$ layer(C_2)	
0.0508	0.0054	9.41
0.0819	0.0121	6.77
0.140	0.0317	4.42
0.248	0.083	2.99
0.376	0.176	2.14
0.788	0.747	1.06
1.164	1.304	0.89
1.395	1.956	0.71
1.559	2.539	0.61
2.110	4.323	0.49
2.384	4.392	0.54
2.580	3.504	0.74

TRICHLOR ACETIC ACID

DISTRIBUTION OF TRICHLOR ACETIC ACID AT 25° BETWEEN:

(Kolossowski and Koulikow, 1934, 1934a.)

Water and n Amyl Alcohol			Water and i Amyl Alcohol		
Gms. Equiv. CCl_3COOH per liter of:			Gms. Equiv. CCl_3COOH per liter of:		
H_2O layer(C_1)	n $C_5H_{11}OH$ layer(C_2)	$\frac{C_1}{C_2}$	H_2O layer(C_1)	i $C_5H_{11}OH$ layer(C_2)	$\frac{C_1}{C_2}$
0.0045	0.0208	0.216	0.0284	0.0426	0.667
0.0069	0.0350	0.197	0.0319	0.1084	0.294
0.0095	0.0600	0.158	0.0456	0.2342	0.195
0.0313	0.2590	0.121	0.0581	0.3129	0.186
0.0460	0.4605	0.100	0.0749	0.4456	0.168
0.0607	0.7194	0.084	0.0939	0.6031	0.156
0.0964	1.3213	0.073	0.1347	1.3580	0.099
0.1225	1.8635	0.066	0.1709	2.1763	0.0785
0.2114	2.7359	0.077	0.2736	3.0048	0.091
0.2406	2.9473	0.082	0.4726	3.9484	0.120
0.4539	3.4821	0.130	0.6697	4.4987	0.149
0.8736	3.7121	0.235	1.1752	5.0055	0.235

In the above systems the aqueous is the lower layer in the case of the first eight results and the upper layer in the case of the last four.

Water and Benzyl Alcohol			Water and Benzyl Alcohol (Con.)		
Gm. Equiv CCl_3COOH per liter of:			Gm. Equiv. CCl_3COOH per liter of		
H_2O layer(C_1)	$C_6H_5CH_2OH$ layer(C_2)	$\frac{C_1}{C_2}$	H_2O layer(C_1)	$C_6H_5CH_2OH$ layer(C_2)	$\frac{C_1}{C_2}$
0.0087	0.0174	0.500	0.2518	1.7286	0.146
0.0375	0.1216	0.308	0.3824	2.4312	0.157
0.0715	0.3513	0.204	0.5347	2.9846	0.179
0.1005	0.5627	0.179	0.8540	3.6064	0.237
0.1586	1.0944	0.145	1.0489	3.9084	0.268

DISTRIBUTION OF TRICHLORO ACETIC ACID BETWEEN WATER AND OLIVE OIL.

(Bodansky and Meigs, 1932.)

t°	Gm. Mols. CCl_3COOH per liter of:		$\frac{C_1}{C_2}$
	H_2O layer(C_1)	Olive Oil Layer(C_2)	
25	0.0820	0.0170	4.60
37	0.0792	0.0224	3.53

Freezing-point data are given for mixtures of Trichloro Acetic Acid and each of the following compounds.

Acetophenone(1)
Anisaldehyde(1)
Azobenzene(11)
Benzene (2)
Benzaldehyde(1)
m Hydroxy Benzaldehyde(1)
p " " (1)
o Nitro " (1)
m " " (1)
p " " (1)
Benzophenone(1)
Benzil(1)
Benzoquinone(1)
Benzoic Acid(3)
Camphene(4)
Camphor(10)
Chloro Acetic Acid(16)
Dichloro " " (16)
Cinnamic Acid(3)
Crotonic Acid(3)
o Cresol(3)
m " (3)
p " (3)
Diethyl Oxalate(2)
" Succinate(2)
Dimethyl Oxalate(2)
" Malonate(2)
" Succinate(2)
" Terephthalate(2)
" Pyrone(5)(6)
Diphenylamine (10)
Erythritol(12)
Ethyl Ether(7)
" Acetate(2)
" Benzoate(2)
Methyl Anisate(2)
" Benzoate(2)
" Cinnamate(2)
" p Toluate(2)
Naphthalene(10)
α Naphthol(8)
β " (8)
α Naphthyl Acetate(2)
β " " (2)
β Naphthyl amine(10)
Phenol(8)
o Nitro Phenol(8)
m " " (8)
p " " (8)
Piperonal(1)
Nitro Piperonal(1)
Phenyl Anisylketone(1)
" Benzoate(2)
" Salicylate(2)
Phosphoric Acid(15)
Pyrocatechol(10)
Pyrogallol(10)
Quinol(10)
Resorcinol(10)
Salicylic Aldehyde(2)
Sulfuric Acid (9)
Thymol(8)
o Toluic Acid(3)
m " " (3)
p " " (3)
α " " (3)
Urea(13)(14).
Urethan(10)(14)
Vanillin(1)

(1) Kendall and Gibbons, 1915; (2) Kendall and Booge, 1916; (3) Kendall, 1914; (4) Timofeiew and Kravtzov, 1915,1917; (5) Plotnikov, 1911; (6) Kendall, 1914a; (7) Tsakalotos and Guye, 1910; (8) Kendall, 1916; (9) Kendall and Carpenter, 1914; (10) Kitran, 1924; (11) Kremann and Zechner, 1925; (12) Puschin and Dezelic, 1932; (13) Puschin and König, 1928; (14) Puschin and Pikovsky, 1932; (15) Redfield and King, 1936,Kendall, 1914.

ACETYLENE C_2H_2.

SOLUBILITY IN WATER.

The results of Winkler, 1906, Schœn, 1923, Manchot, 1924 (25°) and Gatterer, 1926, were plotted and the following values read from the smoothed curve.

t°.	Absorption coefficient a.	t°.	Absorption coefficient a.	t°.	Absorption coefficient a.
0	1.73–1.77	20	1.05	40	0.71
5	1.49–1.52	25	0.94	45	0.65
10	1.31–1.33	30	0.85	50	0.61
15	1.16–1.17	35	0.77	55	0.57

Absorption Coefficient a = the volume of gas (reduced to 0° and 760 mm. pressure) taken up by one volume of the liquid at the given temperature when the partial pressure of the gas equals 760 mm. mercury.

SOLUBILITY OF ACETYLENE IN BLOOD AND IN BLOOD SERUM. (Schœn, 1923.)

In Blood.				In Blood Serum.	
t°	Abs. coef. a.	t°.	Abs. coef. a.	t°.	Abs. coef. a
9.5	1.305	37	0.731–0.739	10	1.280
10.0	1.302	38	0.720	10.5	1.271
15.0	1.136–1.140	39	0.703	11.0	1.244–1.256

Solubility of Acetylene in Aqueous Solutions of Prussian Blue.

(Gatterer, 1926.)

The Prussian Blue solution (Ferri ferrocyanide) was prepared by mixing 2.0 normal sodium ferrocyanide and ferric chloride, washing the resulting precipitate, redissolving in a small quantity of ferrocyanide solution and evaporating in a vacuum to a concentration of about 8 per cent. For purposes of calculation the gram equivalent of Prussian Blue was taken as $^1/_2\,Fe_4[Fe(CN)_6]_3 = 71.603$. The solubility of the acetylene is given in terms of the *Ostwald Solubility Expression l*, which is the volume of gas dissolved by unit volume of solvent at the temperature of the experiment.

Normality of Prussian Blue Solution.	Solubility *l* of C_2H_2 at 30°.	25°.	20°.	15°.	10°.
0.0 (= H_2O)	0.952	1.030	1.126	1.239	1.382
0.250	0.9289	1.007	1.102	1.212	1.358
0.548	0.9149	0.9937	1.088	1.199	1.339
0.750	0.9010	0.9760	1.071	1.179	1.282
1.028	0.8816	0.9527	1.044	1.145	1.282

Solubility of Acetylene in Aqueous Solutions of Ferric Hydroxide.

(Gatterer, 1926.)

In order to prepare the solvents a solution of pure ferric hydroxide in acetic acid was diluted and boiled untill the ratio of acetic acid to ferric hyroxide became 1:30-1:60. It was then evaporated under reduced pressure, whereby a much higher degree of dispersion, as shown by the Tyndall effect, was obtained. The gram equivalent of the ferric hydroxide was taken as $^1/_3\,Fe(OH)_3 = 35.621$.

Normality of Ferric Hydroxide solution.	Solubility *l* of C_2H_2 at 30°.	25°.	20°.	15°.	10°.
0.871	0.9400	1.018	1.111	1.227	1.364
0.521	0.9360	1.016	1.111	1.224	1.364
0.336	0.9495	1.029	1.126	1.241	1.383
0.120	0.9450	1.024	1.126	1.236	1.379

Solubility of Acetylene in Aqueous Solutions of Salts at 25°.

(Manchot, Jahrstorfer and Zepter. 1924.)

Note. — An apparatus designed to eliminate the disadvantages of the Ostwald type was used. The gas volumes were measured in a water-jacketed mercury sealed gas buret. An absorption flask, provided with a separate recepticle for the solvent, was connected to the gas buret by glass tubing made sufficiently flexible either by a grid or by two short rubber connections. The apparatus was filled with the pure gas and this then saturated with the vapor of a small portion of the solvent. The reading was taken and the main portion of the solvent introduced and the volume of gas that it dissolved measured directly. The rubber connections of the apparatus were soaked in paraffine to render them impervious to the gas.

The authors desired to compare the amount of gas dissolved per unit weight of water in the salt solutions employed, rather than per unit volume of solution. The densities of the salt solutions were, therefore, determined. The original tables show the *absorption coefficient a* (See p. 71) calculated not only to unit volume of solution but also to unit weight of solution. Further calculations permitted deductions in regard to the H_2O of hydration of the salts studied.

Salt.	d_{25} of salt. sol.	Gms. anhy. salt per 100 cc. sol.	Abs. coef. *a* per 100 cc. sol.	Salt.	d_{25} of salt. sol.	Gms. anhy. salt per 100 cc. sol.	Abs. coef. *a* per 100 cc. sol.
None (=H_2O)	0.9971	0.00	94.1	$NaNO_3$	1.0556	9.181	78.5
NH_4Cl	1.0141	5.818	82.7	»	1.1106	18.362	66.7
»	1.0294	11.631	74.7	»	1.2189	36.724	49.0
»	1.0600	23.258	64.3	$Ca(NO_3)_2$	1.1503	22.398	64.8
KCl	1.0807	13.757	65.3	»	1.2927	44.796	44.1
»	1.1588	27.513	48.1	$Zn(NO_3)_2$	1.1210	15.700	74.5
$NaCl$	1.0420	6.548	70.6	»	1.2406	31.401	59.7
»	1.0850	13.212	54.1	$Al(NO_3)_3$	1.0822	11.846	75.5
»	1.1660	26.424	32.0	»	1.1502	21.771	62.9
$CaCl_2$	1.0806	10.593	60.6	$(NH_4)_2SO_4$	1.0911	18.158	52.4
»	1.1675	22.665	39.1	»	1.1501	30.464	36.3
$BaCl_2$	1.1085	13.135	67.5	K_2SO_4	1.0753	10.351	64.9
»	1.2266	27.328	49.1	Na_2SO_4	1.0538	6.640	67.0
$MgCl_2$	1.0802	10.511	58.4	»	1.1111	13.730	47.6
»	1.1501	20.265	39.7	$MgSO_4$	1.0999	10.792	54.8
$FeCl_3$	1.1030	13.433	63.0	»	1.1944	21.584	31.1
»	1.1638	21.558	51.6	$ZnSO_4$	1.1359	14.771	54.9
$AlCl_3$	1.0672	8.3146	62.3	»	1.2666	29.542	31.9
»	1.1150	14.349	47.1	$MnSO_4$	1.1283	14.747	54.8
NH_4Br	1.0540	10.465	84.4	»	1.2507	29.544	31.4
»	1.1100	20.931	78.8	$NiSO_4$	1.1096	11.42	59.9
»	1.2215	41.862	68.6	»	1.2156	22.84	38.0
KBr	1.0866	12.973	77.9	$CoSO_4$	1.1139	12.356	58.8
»	1.1750	25.947	65.5	»	1.2238	24.712	37.1
»	1.3459	51.893	47.8	$FeSO_4$	1.1017	10.938	61.6
$NaBr$	1.0829	11.527	72.7	»	1.2011	21.845	41.1
»	1.1668	23.054	57.9	$Al_2(SO_4)_3$	1.1558	17.688	41.6
»	1.3307	46.108	36.1	»	1.2381	27.875	25.4
KNO_3	1.0618	10.8794	82.4	$Fe_2(SO_4)_3$	3.2240	26.390	45.8
»	1.1232	21.7589	73.7	»	1.4319	52.781	22.7
$Mg(NO_3)_2$	1.0916	14.092	74.3	$Cr_2(SO_4)_3$	1.1657	22.356	56.7
»	1.1821	28.184	59.8	»	1.3280	44.712	32.4

Freezing-point data for mixtures of C_2H_2 + $(CH_3)_2O$ are given by Baume, 1924.

SOLUBILITY OF ACETYLENE IN WATER, AQUEOUS SOLUTIONS OF ALKALIES AND SULFURIC ACID AT 15°.

(Billitzer, 1902.)

Aq. Solution of:	l_{15} of Acetylene in Aq. Solutions of Normality:									
	0.01	0.025	0.05	0.10	0.15	0.25	0.50	1.00	2.00	3.00
$Ba(OH)_2$	...	1.218	...	1.230	1.240	...	...	...	...	...
$Ca(OH)_2$	1.230	...	...	...	...	...	...	...	...	...
NH_4OH	1.216	...	...	1.218	...	1.220	1.225	1.230	1.235	1.240
$NaOH$	1.210	...	1.200	1.180	...	1.128	1.040	0.885	0.600	0.370
KOH	1.212	...	...	1.185	...	1.130	1.056	0.912	0.660	0.460
Na_2SO_4	...	...	...	1.170	...	1.068	0.940	0.720	0.340	...
H_2SO_4	...	...	...	1.190	...	...	1.120	1.040	0.900	0.780

SOLUBILITY IN WATER, $l_{15} = 1.251$.

The above results were determined by the method of Ostwald (Handbuch physiko-chemischen Messungen 207 ff.). A thermostat was used and great care taken to reduce experimental errors and purify the acetylene. The results are in terms of the *Ostwald Solubility Expression*, for which see page 37.

SOLUBILITY OF ACETYLENE IN AQUEOUS ACETONE SOLUTIONS.

(Kremann and Hönel, 1913; See also Müller and Kumpfmiller, 1928.)

Vol. Per Cent H_2O in Solvent (H_2O + Acetone).	Gms. C_2H_2 dissolved per Liter Sat. Solution at:		
	0°	18°	25°
0	37	21	15.2
5	31	18.2	13.5
10	26	15.0	10.5
20	15	9.5	8.0
35	8.4	5.5	4.45
50	5.7	1.23	2.22
75	...	...	1.23
100	...	...	0.98

The freezing-point curve for mixture of acetylene and methyl ether are given by Baume and German (1911, 1914).

SOLUBILITY OF ACETYLENE IN WATER, BLOOD AND BLOOD FLUIDS AT 37.5°.

(Grollman, 1929.)

Solvent	Solubility in terms of the Bunsen Coef. β	
	cc C_2H_2 per cc solution	cc C_2H_2 per gm. H_2O
Water	0.747	0.752
Whole Dog Blood	0.759	0.943
" Human "	0.740	0.916
" Rabbit "	0.703	0.812
" Blood (polycythemia patient)	0.710	—
" " (mycloid lencemia patient)	0.735	0.881
Dog plasma	0.690	0.751
" Corpuscles	0.778	0.986
Aq. Lipoidal suspension(1)	0.748	—

(1) Containing per 100 cc of H_2O, 0.3 gm. of Blood Lipoid prepared by extracting blood corpuscles with ethyl ether and petroleum ether.

SOLUBILITY OF ACETYLENE IN SEVERAL ORGANIC SOLVENTS AT -10°.

(James, 1913.)

Solvent	Abs. Coef. a	Solvent	Abs. Coef. a
Acetal	28.8	Iso Amyl Acetate	29.3
Acetaldehyde	60.2	" " Formate	17.5
Ethyl Acetate	44.5	Methyl Acetate	52.3
" Formate	42.2	Methylal (b. pt. 45.5°)	54.3

Abs. coef a = the volume of gas (reduced to 0° and 760 mm pressure) taken up by one volume of liquid at the given temperature and when the partial pressure of the gas equals 760 mm Hg.

SOLUBILITY OF ACETYLENE IN SEVERAL ORGANIC SOLVENTS.

Solvent	t°	Gms. C_2H_2 per 100 gms. solvent at 760 mm.	Authority
Benzene	+4	0.749	Garelli, 1925.
Nitrobenzene	3	0.573	" "
Dimethyl aniline	2.1	0.746	" "
Cyclohexanol	2.6	0.963	Cauquil, 1927.

SOLUBILITY OF ACETYLENE IN SEVERAL SOLVENTS AT PRESSURES UP TO ATMOSPHERIC.

(Kirijew and Romantchouk, 1936.)

Solvent	t°	cc C_2H_2 (reduced to 0° and 760 mm) per 1 vol. of solvent at:							
		100	200	300	400	500	600	700	760mm Hg
Kerosene	-20	0.35	0.7	1.1	1.5	1.9	2.35	2.9	3.3
"	0	0.2	0.5	0.8	1.05	1.3	1.6	1.9	2.05
"	+20	0.15	0.45	0.7	0.9	1.15	1.35	1.6	1.7
Heavy Oil	0	0.6	1.0	1.6	2.1	2.6	3.1	3.7	4.0
Di chlor ethane	0	1.3	2.6	3.9	5.2	6.4	7.7	9.0	9.8
Ethyl alcohol	0	1.1	2.2	3.3	4.4	5.5	6.7	7.8	8.5

SOLUBILITY OF ACETYLENE IN SEVERAL SOLVENTS.

(Horiuti, 1931.)

t°	Solubility of C_2H_2 in terms of the Ostwald Expression l in:				
	CCl_4	$(CH_3)_2CO$	CH_3COOCH_3	C_6H_6	C_6H_5Cl
0	3.967	38.60	38.04	—	5.186
5	3.717	34.40	33.90	—	4.772
10	3.482	30.68	30.13	6.184	4.399
15	3.278	27.33	26.80	5.661	4.082
20	3.102	24.47	23.82	5.202	3.800
25	2.932	22.00	21.25	4.816	3.540
30	2.778	19.80	18.97	4.449	3.316
40	2.499	16.19	15.03	3.849	2.930
50	—	—	—	—	2.628
60	—	—	—	—	2.386
70	—	—	—	—	2.180

The Ostwald Solubility Expression l is the ratio of the volume (v) of the gas absorbed at any pressure and temperature to the volume (V)

TETRA BROMO ETHANE $\underline{s}$ $CHBr_2.CHBr_2$.

1000 cc H_2O dissolve 0.651 gm. $\underline{s}$ $CHBr_2.CHBr_2$ at 30° as determined by interferometer measurement. (Gross, Saylor and Garman, 1933.)

Freezing-points of the system $\underline{s}$ $CHBr_2.CHBr_2$ + $CH_2Cl.CH_2Cl$ (1.2 dichlor ethane) are given by Timmermans and Mme Vesselovsky, 1931.

DI CHLORO ETHYLENE sym. and unsym., $CHCl{:}CHCl$, CH_2CCl_2.

Freezing-point data are given by Timmermans, 1927, for each of the following systems:

sym. Dichlor ethylene:

- + unsym. Dichlor ethylene
- + Ethylene bromide
- + Ethylene chloride
- + 1.2 dibromo ethane
- + 1.2 dichloro ethane
- + 1.1.2.2 Tetra chloro ethane

Unsym. Dichlor ethylene

- + Ethylene bromide
- + Ethylene chloride
- + 1.2 dibromo ethane
- + 1.2 dichloro ethane
- + 1.1.2.2 tetra chloro ethane

TETRA CHLORO ETHANE $\underline{s}$ $CHCl_2.CHCl_2$.

100 gms. H_2O dissolve 0.288 gm. $CHCl_2.CHCl_2$ at 25° and 0.336 gm. at 55.6°. (Van Arkel and Vles, 1936.)

Freezing-points are given for mixtures of $\underline{s}$ tetra chloro ethane and each of the following compounds:

1.2 di bromo ethane	(1)	penta chloro ethane	(1)
1.2 di chloro ethane	(1)	1.2 di cyan ethane	(1)
cis. di chloro ethylene	(2)	succinic acid	(1)
trans " " "	(2)	p di chloro benzene	(3)
tetra chloro ethylene	(1)	naphthalene	(4)
1.1.2 tri chloro ethane	(1)		

(1) Timmermans and Mme. Vesselovsky, 1931; (2) Timmermans, 1927; (3) Timmermans, 1934; (4) Cohen, de Meester and Moesfeld, 1925, 1930.

ACETYLENE TETRA BROMIDE $CHBr_2.CHBr_2$.

Freezing-point data are given by Timmermans and Mme. Vesselovsky, 1931, for:

$$\begin{array}{ll} CHBr_2.CHBr_2 & + C_2H_4Br_2 \\ \quad " & + C_2H_2Cl_4 \\ \quad " & + C_2H_4Cl_2 \end{array}$$

ACETYLIDENE TETRA CHLORIDE $CH_2Cl\ CCl_3$.

SOLUBILITY OF ACETYLIDENE TETRA CHLORIDE IN WATER.

(Van Arkel and Vles, 1936.)

t°	Gms. $CH_2Cl\ CCl_3$ per 100 gms. H_2O	Gm. Mol. $CH_2Cl\ CCl_3$ per 100 gms. H_2O
0	0.120	0.00072
20	0.109	0.00065
35	0.115	0.00069
50	0.125	0.00074

DI IODO ETHYLENE CHI:CHI.

Freezing-point data for mixtures of Diiodo Ethylene and Dioxan are given by Rheinboldt and Luyken, 1932.

ACETYLENE DI IODIDE cis and trans $C_2H_2I_2$.

Results for the freezing-points of these two isomers are given by Chavanne and Vox, 1914.

KETENE CH_2CO.

Freezing-point data for mixtures of ketene and carbazol are given by Pascal, 1914.

TRI BROMO ACETAMIDE CBr_3CONH_2.

Freezing-point data for mixtures of Tri bromo Acetamide and Tri chloro Acetamide are given by Küster, 1891.

DICHLORO ACETIC ACID $CHCl_2COOH$.

Results for the reciprocal solubility of dichloro acetic acid and water, determined by the freezing-point method are given by Pickering, 1895.

EQUILIBRIUM IN THE SYSTEM DICHLORO ACETIC ACID, BENZENE AND WATER AT 15°.

(Bell, 1930.)

d. of sat. solution	Gm. Mols. per 1000 gms. sat. sol.		d. of sat. solution	Gm. Mols. per 1000 gms. sat. sol.	
	$CHCl_2COOH$	H_2O		$CHCl_2COOH$	H_2O
0.880	0.0350	0.0408	0.895	0.179	0.130
0.880	0.0710	0.0550	0.890	0.195	0.138
0.883	0.123	0.101			

DISTRIBUTION OF DI CHLORACETIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Ether.

Millimols. $CHCl_2COOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	
1.25	1.025	0.82
2.325	2.675	1.15
4.05	6.95	1.72
6.5	14.8	2.28
9.5	25.9	2.72

Acetone and Glycerol.

Millimols. $CHCl_2COOH$ per liter of		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer (G).	
0.830	0.43	1.93
2.20	0.61	3.61
4.625	0.925	5.02
9.725	1.375	7.07
17.8	1.90	19.38
37.9	2.40	15.8

DISTRIBUTION OF DICHLORO ACETIC ACID AT 25° BETWEEN:

(Kolossowsky, 1934; Kolossowsky and Kulikow, 1934, 1935.)

Water and Carbon Tetrachloride

Gm. Equiv. $CHCl_2COOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	CCl_4 layer (C_2)	
0.216	0.000853	253
0.462	0.00281	164
0.846	0.00778	109
1.481	0.0178	83.2
2.203	0.0289	76.2
4.926	0.0628	78.4
6.081	0.095	64.0
6.953	0.147	47.3
7.881	0.452	17.4
5.798	2.870	2.0

Water and Chloroform

Gm. Equiv. $CHCl_2COOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$CHCl_3$ layer (C_2)	
0.054	0.006	90.0
0.095	0.0025	38.0
0.113	0.0044	25.7
0.160	0.0070	22.9
0.360	0.020	18.0
0.470	0.028	16.8
0.670	0.046	14.6
1.250	0.106	11.8
3.58	0.29	12.3
5.86	0.74	7.9

Water and Ethyl Bromide

Gm. Equiv. $CHCl_2COOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	C_2H_5Br layer (C_2)	
0.0548	0.0095	5.77
0.0726	0.0156	4.92
0.344	0.093	3.70
0.569	0.164	3.41
0.866	0.264	3.28
1.520	0.480	3.7
2.002	0.628	3.19
3.238	0.910	3.56
4.681	1.343	3.49

Water and Toluene

Gm. Equivl $CHCl_2COOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$C_6H_5CH_3$ layer (C_2)	
0.0277	0.00038	72.9
0.0638	0.0014	45.6
0.1121	0.0033	33.96
0.2180	0.0068	26.06
0.5040	0.0295	17.08
1.8270	0.1449	12.61
3.1802	0.2331	13.64
4.6872	0.3314	14.14
6.1866	0.5689	10.87
6.3630	1.0080	6.31

Water and Nitro Benzene

Gm. Equiv. $CHCl_2COOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$C_6H_5NO_2$ layer (C_2)	
0.015	0.003	5.00
0.051	0.015	3.40
0.088	0.033	2.66
0.1953	0.086	2.27
0.3150	0.1688	1.87
0.6363	0.4725	1.35
1.0256	0.9601	1.07
1.4238	1.6632	0.86

Water and o Nitro Toluene

Gm. Equiv. $CHCl_2COOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$C_6H_4CH_3NO_2$ layer (C_2)	
0.228	0.0043	5.30
0.0494	0.0106	4.66
0.0976	0.0268	3.68
0.1872	0.0639	2.93
0.3558	0.1577	2.24
0.5827	0.3026	1.93
1.039	0.721	1.44
[illegible]	[illegible]	

DISTRIBUTION OF DICHLORO ACETIC ACID BETWEEN WATER AND OLIVE OIL.

(Bodansky and Meigs, 1932.)

t°	Gm. Mols. $CHCl_2COOH$ per liter of: H_2O layer (C_1)	Gm. Mols. $CHCl_2COOH$ per liter of: Olive oil layer (C_2)	$\frac{C_1}{C_2}$
25	0.0440	0.0070	6.30
"	0.0822	0.0216	3.80
37.5	0.0395	0.0070	5.64
"	0.0755	0.0180	4.19

DISTRIBUTION OF DICHLORO ACETIC ACID AT 25° BETWEEN AQUEOUS MAGNESIUM SULFATE SOLUTIONS AND n DIBUTYL ETHER.

(Randall and Failey, 1927.)

d. of aq. $MgSO_4$ solution	Ionic conc. of added $MgSO_4$	Molality of $CHCl_2COOH$ in Aq. layer	Mol. Fraction of $CHCl_2COOH$ in n dibutyl ether layer
1.009	0.242	0.1925	0.04606
1.017	0.492	0.1952	0.04795
1.029	0.970	0.1663	0.03423
1.054	1.880	0.1871	0.03883

Freezing-point data are given for mixtures of DiChloro Acetic Acid and each of the following compounds:

Azobenzene (1)
Benzoic acid (2)
Chloro acetic acid (2)
Tri chloro acetic acid (2)
Cinnamic acid (2)
Crotonic acid (2)
Dimethyl Pyrone (2)
o, m and p Toluic Acids (2)
α Toluic acid (Phenyl acetic acid) (2)
Urea (3)
Urethan (3)

(1) Kremann and Zechner, 1925; (2) Kendall, 1914; (3) Puschin and Ribovsky, 1932.)

OXALIC ACID $H_2C_2O_4.2H_2O$.

SOLUBILITY IN WATER.

(Koppel and Cahn, 1908; for older data see Alluard, Miczynski, 1886; Lamouroux, 1899.)

t°.	Gms. $H_2C_2O_4$ per 100 Gms. Sat. Sol.	Solid Phase.	t°.	Gms. $H_2C_2O_4$ per 100 Gms. Sat. Sol.	Solid Phase.
− 0.064	0.1805	Ice	20	8.69	$H_2C_2O_4.2H_2O$
− 0.152	0.452	"	30	12.46	"
− 0.533	1.820	"	40	17.71	"
− 0.936	3.291	"	50	23.93	"
− 1.50	5.836	"	60	30.71	"
− 0.95	3.302	$H_2C_2O_4.2H_2O$	70	37.92	"
0	3.416	"	80	45.80	"
+10	5.731	"	90.2	54.67	"

$H_2C_2O_4.2H_2O$ melts in its H_2O of crystallization at 98°.

The following more recent determinations are by Flöttmann, 1928.

t°	d. of sat. sol.	Gms. $H_2C_2O_4$ per 100 gms. sat. sol.	Solid Phase
15	1.0318	6.71	$H_2C_2O_4.2H_2O$
20	1.0318	8.34	"
25	1.0437	9.81	"

100 cc. sat. sol. of Oxalic acid in water contain 10.4 gms. $H_2C_2O_4$ at 23°.5. } (Schilow and
» » ether » 1.37 » » } Lepin, 1922.)

SOLUBILITY OF OXALIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID.

(Chapin and Bell, 1931.)

d. of sat. sol.	Results at 0° Gms. per 100 gms. sat. solution HCl	Results at 0° Gms. per 100 gms. sat. solution $H_2C_2O_4$	Results at 50° Gms. per 100 gms. sat. solution HCl	Results at 50° Gms. per 100 gms. sat. solution $H_2C_2O_4$	Results at 80° Gms. per 100 gms. sat. solution HCl	Results at 80° Gms. per 100 gms. sat. solution $H_2C_2O_4$
1.0178	0.0	3.43	0.0	24.00	0.0	47.63
—	0.23	3.13	1.03	21.45	1.60	44.84
—	0.55	2.86	5.17	17.17	4.77	40.77
1.0190	1.25	2.45	9.13	14.06	6.33	39.37
1.0278	3.67	1.87	12.17	12.38	7.86	38.44
1.0356	5.15	1.65	14.63	11.47	9.27	37.70
1.0518	8.51	1.34	17.10	11.02	9.87	37.80
1.0690	12.01	1.13	20.16	11.08	11.18	37.91
1.1083	19.67	0.97	22.61	11.76	12.51	39.34
1.1428	25.72	1.05	24.91	13.20	13.66	41.22
1.1796	31.57	1.73	26.38	15.07	14.67	43.74

The solid phase was $C_2H_2O_4 \cdot 2H_2O$ in all cases.

Determinations of the solubility of oxalic acid at room temperature (18-22°) in aqueous hydrochloric acid up to 16.40% concentration are given by Trapp, 1935. The author gives no references to previous determinations.

SOLUBILITY OF OXALIC ACID AT 25° IN AQUEOUS SOLUTIONS OF :

(Herz and Neukirch, 1923.)

Hydrochloric Acid.

Mols. per liter HCl.	Mols. per liter $H_2C_2O_4$.	Mols. per liter HCl.	Mols. per liter $H_2C_2O_4$.
0.708	0.884	5.098	0.424
0.996	0.795	5.370	0.414
1.562	0.699	6.662	0.419
2.247	0.605	6.820	0.423
3.191	0.517	7.356	0.434
3.380	0.499	8.228	0.479
4.476	0.441	9.170	0.568

Nitric Acid

Mols. per liter HNO_3.	Mols. per liter $H_2C_2O_4$.	Mols. per liter HNO_3.	Mols. per liter $H_2C_2O_4$.
0.00	1.181	9.054	0.495
1.032	0.894	9.830	0.502
2.962	0.703	11.798	0.528
4.676	0.605	11.778	0.537
5.914	0.554	14.064	0.708
7.380	0.530		

SOLUBILITY OF OXALIC ACID IN AQUEOUS HCl AND IN AQUEOUS HNO_3 AT 30°.

(Masson, 1912.)

In Aq. Hydrochloric Acid. G. Mols. HCl per liter Sat. Sol.	d_{30} Sat. Sol.	G. Mols. $(COOH)_2$ per liter Sat. Sol.	Gms. $(COOH)_2$ per liter Sat. Sol.	In Aq. Nitric Acid. G. Mols. HNO_3 per liter Sat. Sol.	d_{30} Sat. Sol.	G. Mols. $(COOH)_2$ per liter Sat. Sol.	Gms. $(COOH)_2$ per liter Sat. Sol.
0	1.0594	1.479	133.1	0.478	1.0648	1.268	114.1
0.503	1.0561	1.190	107.1	1.606	1.0932	1.039	93.48
0.970	1.0577	1.032	92.85	4.224	1.1666	0.790	71.09
1.939	1.0654	0.821	73.88	9.590	1.3074	0.639	57.50
2.959	1.0757	0.675	60.74	13.62	1.3938	0.847	76.23
4.528	1.0957	0.555	49.95	14.12	1.4060	0.966	86.94
6.026	1.1165	0.525	47.25	15.59	1.4319	1.114	100.2 *
7.907	1.1494	0.607	54.63	16.92	1.4443	0.840	75.6 *
9.680	1.1843	0.871	78.38	20.84	1.4819	0.524	47.15*
				21.63	1.4917	0.553	49.76*

* The solid phase was $C_2H_2O_2 \cdot 2H_2O$ in all cases except these solutions in which it was the anhydrous acid, $C_2H_2O_4$.

SOLUBILITY OF OXALIC ACID IN AQUEOUS SOLUTIONS OF PHOSPHORIC ACID.

Results at 18–22° (Trapp, 1935.)

Gms. per 100 gms. sat. solution		Gms. per 100 gms. sat. solution	
H_3PO_4	$H_2C_2O_4 \cdot 2H_2O$	H_3PO_4	$H_2C_2O_4 \cdot 2H_2O$
0.0	11.20	15.10	6.05
3.06	12.06	18.48	5.65
3.91	10.77	21.58	5.24
6.48	9.40	24.80	3.72
9.00	9.86	26.01	4.75
10.39	8.86	28.92	3.49
11.81	8.10	28.93	3.17
12.03	6.97	29.35	2.95
14.51	7.04		

Results at 25° (Walton and Kepfer, 1930.)

Gm. Equiv. per liter	
H_3PO_4	$C_2H_2O_4$
0.0	2.412
3.14	2.020
8.85	1.383
13.36	1.025
19.51	0.699
24.98	0.571
30.55	0.575
35.44	0.768
38.62	1.121
40.15	1.504

SOLUBILITY OF OXALIC ACID IN AQUEOUS SOLUTIONS OF PHOSPHORUS ACID AT 25°.

(Redfield and King, 1936.)

Normality of Aq. H_3PO_3 solutions	Normality of dissolved $(COOH)_2$	Normality of Aq. H_3PO_3 solutions	Normality of dissolved $(COOH)_2$
0.0	2.407	23.39	1.00
8.48	1.71	30.77	0.77
12.78	1.51	36.66	0.71
15.11	1.38	42.02	0.81
18.38	1.21	44.73	0.84
20.21	1.13		

SOLUBILITY OF OXALIC ACID AT 25° IN AQUEOUS SOLUTIONS OF SULFURIC ACID.

(Average results of Knox and Richards, 1919, and Herz and Neukirch, 1923.)

Equiv. Normalities		Equiv. Normalities		Equiv. Normalities.	
H_2SO_4.	$H_2C_2O_4$.	H_2SO_4.	$H_2C_2O_4$.	H_2SO_4.	$H_2C_2O_4$.
0.0	2.38	6.0	0.85	12.0	0.69
1.0	1.90	7.0	0.76	13.0	0.76
2.0	1.54	8.0	0.70	14.0	0.87
3.0	1.31	9.0	0.66	15.0	1.00
4.0	1.11	10.0	0.65	16.0	1.30
5.0	0.97	11.0	0.66	17.0	1.80

SOLUBILITY OF OXALIC ACID IN AQUEOUS SOLUTIONS OF H_2SO_4 AT 25°. (Wirth, '08.)

Conc. of Aq. H_2SO_4 Normality.	d_{25} of Sat. Sol.	Gms. per 100 Gms. Sat. Sol.		Conc. of Aq. H_2SO_4 Normality.	d_{25} of Sat. Sol.	Gms. per 100 Gms. Sat. Sol.	
		SO_3.	$(COOH)_2$.			SO_3.	$(COOH)_2$.
0	1.047	0	10.23	4.85	1.157	14	3.92
1	1.064	2.98	8.03	5.67	1.177	16.44	3.51
2.39	1.140	7.30	6.02	6.45	1.220	17.84	3.12
4.36	1.146	12.57	4.26	8.9	1.280	25.92	2.37

Additional determinations of the solubility of oxalic acid at 18–22° in aqueous solutions of sulfuric acid up to 47 wt. % H_2SO_4, are given by Trapp, 1935.

SOLUBILITY OF OXALIC ACID AT 25° IN AQUEOUS SOLUTIONS OF:

(Knox and Richards, 1919.)

Acetic Acid.

Equiv. Normalities.	
CH_3COOH.	$H_2C_2O_4$.
0.135	2.356
0.321	2.361
0.923	2.395
1.361	2.402
1.844	2.401
3.563	2.351
5.721	2.168
8.005	1.839
9.864	1.546
12.55	1.100
14.03	0.896
14.21	0.875
14.83	0.802

Formic Acid

Equiv. Normalities.	
$HCOOH$.	$H_2C_2O_4$.
0.097	2.382
0.437	2.385
0.967	2.411
1.287	2.414
1.825	2.441
2.678	2.430
5.360	2.326
8.13	2.131
11.00	1.868
12.17	1.758
16.63	1.496
19.25	1.568
21.11	2.339

Lactic Acid.

Equiv. Normalities.	
$CH_3CHOHCOOH$.	$H_2C_2O_4$.
0.0	2.409
1.337	2.228
2.718	2.054
4.051	1.856
5.357	1.633
6.477	1.412
7.647	1.171
8.709	0.938
9.52	0.832

SOLUBILITY OF OXALIC ACID IN AQUEOUS SALT SOLUTIONS AT 25°.

(Herz and Hiebenthal, 1928; 1929.)

Results for aqueous solutions of:

Potassium Chloride

Gms. per liter	
KCl	$C_2H_2O_4.2H_2O$
0.0	155
30	158
53	137
72	122
114	72
175	75
315	68*

Ammonium Chloride

Gms. per liter	
NH_4Cl	$C_2H_2O_4.2H_2O$
25	158
65	179
78	151
128	131
188	94
213	87
304	88*

Sodium Chloride

Gms. per liter	
NaCl	$C_2H_2O_4.2H_2O$
25.7	156
62.6	164
108.7	179
140.3	195
201.7	213
239.7	186
304	174*

* Solid Phase $C_2H_2O_4.2H_2O$ + KCl, + NH_4Cl or + NaCl.

SOLUBILITY OF OXALIC ACID IN AQUEOUS SOLUTIONS OF DIOXANE AT 25°.

(Herz and Lorentz, 1929.)

cc $C_4H_8O_2$ (m or p?) per 100 cc Aq. solvent	Gm. Equiv. $(COOH)_2$ per liter	cc $C_4H_8O_2$ (m or p?) per 100 cc Aq. solvent	Gm. Equiv. $(COOH)_2$ per liter
10	1.30	80	2.26
30	1.66	90	2.29
50	1.97	100	1.33
75	2.19		

SOLUBILITY OF OXALIC ACID IN SEVERAL ALCOHOLS.

(Timofeiew, 1894.)

Alcohol.	t°.	Gms. $(COOH)_2$ per 100 Gms. Sat. Sol.	Alcohol.	t°.	Gms. $(COOH)_2$ per 100 Gms. Sat. Sol.
Methyl Alcohol	− 1.5	34.2	Propyl Alcohol	− 1.5	12.2
" "	+20.2	39.8	" "	+18.5	16.7
Ethyl Alcohol	− 1.5	22.4	" "	20.2	17.5
" "	+18.5	26.2	Isobutyl Alcohol	20.2	10.9
" "	20.2	26.9			

SOLUBILITY OF OXALIC ACID IN ABSOLUTE AND IN AQUEOUS ETHER AT 25°.

(Bödtker, 1897; Bourgoin.)

100 gms. absolute ether dissolve 1.47 gms. $(COOH)_2.2H_2O$.
100 gms. absolute ether dissolve 23.59 gms. $(COOH)_2$.

In Aqueous Ether Solutions.

Gms. Solid Acid Added per 100 cc. Ether Solution.		Gms. per 100 cc. Ether Solution.	
$(COOH)_2.2H_2O$.	$(COOH)_2$.	H_2O.	$(COOH)_2$.
(1) 5	0	1.250	0.742
(2) 5	0	0.788	0.720
5	0	0.418	1.044
5	2.44	0.360	3.388
5	4.82	0.484	6.038
5	7.14	0.558	8.538
5	9.42	0.632	10.996
5	11.63	0.676	13.316
5	13.79	0.760	15.684
5	18.18	0.816	17.818
5	22.73	0.816	17.818

(1) Ether saturated with water. (2) Ether containing 0.694 per cent water.

100 gms. glycerol dissolve 15 gms. oxalic acid at 15.5°. (Ossendowski, 1907.)
100 gms. 95% formic acid dissolve 9.74 gms. anhydrous oxalic acid at 16.8°. (Aschan, 1913.)

DISTRIBUTION OF OXALIC ACID BETWEEN WATER AND ETHER:

At 19° (Schilow and Lepin, 1922.)

Gms. $H_2C_2O_4$ per 100 cc.	
H_2O layer.	$(C_2H_5)_2O$ layer.
0.594	0.0322
1.298	0.0792
2.600	0.1830
4.970	0.4140
10.50	1.06*

* Solid Phase present.

At 25° (Smith, 1921, 1922.)

Millimols. $H_2C_2O_4$ per liter.		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$(C_2H_5)_2O$ layer C_2.	
5.9375	0.525	0.0885
14.10	1.31	0.0930
22.625	2.0375	0.0902
39.35	3.80	0.0965
84.25	9.60	0.113

DISTRIBUTION OF OXALIC ACID BETWEEN WATER AND AMYL ALCOHOL AT 20°.

(Herz and Fischer, 1904.)

Millimols ½ $(COOH)_2$ per 10 cc.		Gms. $(COOH)_2$ per 100 cc.	
Aq. Layer.	Alcoholic Layer.	Aq. Layer.	Alcoholic Layer.
0.6806	0.1451	0.306	0.0653
2.364	0.7233	1.064	0.326
6.699	2.550	3.015	1.148
10.029	4.300	4.511	1.934

Data for the distribution of oxalic acid between mixtures of amyl alcohol + ether and water at 25° are given by Herz and Kurzer (1910).

DISTRIBUTION OF OXALIC ACID BETWEEN WATER AND ETHER.

(Pinnow, 1915.)

Results at 15°.				Results at 27°.			
Gm. Mols. $(COOH)_2$ per Liter.		Dist. Coef. of:		Gm. Mols. $(COOH)_2$ per Liter.		Dist. Coef. of:	
Water Layer.	Ether Layer.	Total Acid.	Undissoc. Acid.	Water Layer.	Ether Layer.	Total Acid.	Undissoc. Acid.
0.3435	0.02945	11.6	8.49	0.760	0.0637	11.9	8.18
0.1885	0.01395	13.5	8.81	0.561	0.0433	13	8.37
0.124	0.00845	14.8	8.69	0.3575	0.0250	14.3	8.26
0.0892	0.00553	16.1	8.72	0.2550	0.0165	15.5	8.12
0.0470	0.00248	19	8.19	0.1754	0.01025	17.1	7.94
0.0435	0.0022	19.8	8.26				

Data for the effect of H_2SO_4 upon the above distribution are also given.

Data similar to the above for a greater range of conc. at 25° are given by Chandler (1908).

VINYL CHLORIDE CH_2CHCl.

SOLUBILITY OF VINYL CHLORIDE IN SEVERAL SOLVENTS AT PRESSURES UP TO ATMOSPHERIC.

(Kirijew and Romantchouk, 1936.)

Solvent	t°	cc C_2H_3Cl (reduced to 0° and 760 mm) per 1 volume of solvent at:							
		100	200	300	400	500	600	700	760 mm Hg.
Kerosene	-20	37	77	125	—	—	—	—	—
"	0	8	18	29	43	62	85	110	125
"	+20	4.5	9	13.5	19	25	31	37	40
Heavy Oil	0	13	28	48	64	—	—	—	—
Dichlor Ethane	0	24	48	76	106	—	—	—	—
Ethyl Alchol	0	10	22	33	47	—	—	—	—
Oil of ———	0	8	16	24	33	44	60	—	—

TRI CHLORO ETHANES α Ethylene Tri-Chloride CH_3CCl_3.
β Vinyl Trichloride $CH_2ClCHCl_2$.

SOLUBILITY OF EACH SEPARATELY IN WATER.

(Van Arkel and Vles, 1936.)

Results for α Ethylene Trichloride			Results for β Vinyl Trichloride		
t°	Gms. CH_3CCl_3 per 100 gms. H_2O	Gm. Mols. CH_3CCl_3 per 100 gms. H_2O	t°	Gms. $CH_2ClCHCl_2$ per 100 gms. H_2O	Gm. Mols. $CH_2ClCHCl_2$ per 100 gms. H_2O
0	0.159	0.00119	0	0.466	0.00350
20	0.132	0.00099	20	0.436	0.00327
35	0.126	0.00094	35	0.458	0.00344
50	0.128	0.00096	55	0.532	0.00399

Freezing-point data are given by Timmermans and Mme. Vesslovsky, 1931, for:

β Vinyl Trichloride + 1.2 Dichloro Ethane
" " + 1.1.22 Tetra chloro Ethane

ACETONITRILE CH_3CN.

The upper critical solution temperature of a mixture of acetonitrile and water (H_2O) containing 62 percent CH_3CN is -0.9°.
The upper critical solution temperature of a mixture of acetonitrile and heavy water (D_2O) containing 62.05 percent CH_3CN is +5.1°.
(Timmermans and Poppe, 1935.)

THE CRITICAL SOLUTION TEMPERATURES OF MIXTURES OF ACETONITRILE AND WATER.

(Ewert, 1937.)

Critical Solution Temperature	Gm. Mols. CH_3CN per 100 gm. mols. sat. Solution	Critical Solution Temperature	Gm. Mols. CH_3CN per 100 gm. mols. sat. Solution
-8.9	16.3	-1.2	43.3
-4.0	18.9	-4.8	57.9
-1.8	26.6	-4.8	58.3
-0.9	32.9		

THE FREEZING-POINTS OF MIXTURES OF ACETONITRILE AND WATER.

(Ewert, 1937.)

t°	Gm. Mols. CH_3CN per 100 gm. mols. mixture	t°	Gm. Mols. CH_3CN per 100 gm. mols. mixture
-4.2	10.0	-45.8 (Eutectic)	
-9.0	14.5	-12.7	70.0
-9.2	14.6	-13.3	79.2
-13.2	16.3	-21.4	86.0
-13.2	51.3	-45.2	100.0

The critical solution temperature of the system Acetonitrile and 2.2.4 Tri methyl Pentane (i Octane) is 81°. That for the system acetonitrile and n Heptane is 84°. (Cornish, Archibald, Murphy and Evans, 1934.)

Freezing-point data are given by Joukovsky, 1934 for mixtures of Acetonitrile and each of the following compounds: Proprionitrile, Butyronitrile, Valeronitrile, Benzene, Nitrobenzene and Formic Acid. This author also gives results for the total and partial vapor pressures of mixtures of acetonitrile and ether, and acetonitrile and methyl alcohol.

METHYL THIOCYANATE CH_3SCN.

Complete data for the T, *r* diagram of the pseudo binary system methyl thiocyanate (m. pt. —53°.58) + methyl isothiocyanate (CH_3NCS) m. pt. +35°.93 are given by Gillis, 1918. A single eutectic at —64.4° was found. The author also gives data for the curve of fusion of methyl iso thiocyanate + trimethyl tri thiocyanate $(CH_3SCN)_3$. A single eutectic at 34.9° was found. The boiling-point curve for $CH_3SCN + CH_3NCS$ is also given.

BromACETIC ACID $CH_2.Br.COOH$.

DISTRIBUTION OF BROMACETIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $CH_2BrCOOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1)	$CHCl_3$ layer (C_2).	
9.40	0.45	0.0478
14.45	0.75	0.0519
18.45	1.05	0.0570
32.00	2.08	0.065

Water and Ether.

Millimols. $CH_2BrCOOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	
0.9625	1.3375	1.390
1.3125	1.8875	1.438
1.475	3.475	1.760
3.05	6.30	2.063
4.25	9.55	2.245

Water and Xylene.

Millimols. $CH_2BrCOOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Xylene layer (C_2).	
23.30	0.70	0.0300
26.70	0.90	0.0337
37.40	1.15	0.0325

Acetone and Glycerol.

Millimols. $CH_2BrCOOH$ per liter of		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer (G).	
2.00	0.645	3.10
4.70	1.60	2.94
7.25	2.25	3.22
14.20	4.35	3.26

DISTRIBUTION OF BROM ACETIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Benzene

Millimols $CH_2BrCOOH$ per liter of		Millimols $CH_2BrCOOH$ per liter of	
H_2O layer	C_6H_6 layer	H_2O layer	C_6H_6 layer
13.39	0.35	37.99	1.06
17.76	0.48	42.41	1.19
24.21	0.65	62.25	1.88
30.58	0.82	91.85	2.78

Water and Toluene

Millimols $CH_2BrCOOH$ per liter of		Millimols $CH_2BrCOOH$ per liter of	
H_2O layer	$C_6H_5CH_3$ layer	H_2O layer	$C_6H_5CH_3$ layer
13.56	0.260	38.49	0.805
17.95	0.358	42.85	0.970
24.43	0.535	63.15	1.43
30.90	0.660	92.90	2.25

DISTRIBUTION OF BROMO ACETIC ACID BETWEEN WATER AND OLIVE OIL.

(Bodansky and Meigs, 1932.)

t°	Gm. Mols. $CH_2BrCOOH$ per liter of:		$\frac{C_1}{C_2}$
	H_2O layer (C_1)	Olive Oil layer C_2	
25	0.0878	0.0114	7.70
"	0.1690	0.0300	5.63
37.5	0.0938	0.0060	15.60
"	0.1780	0.0220	8.10

BROMAL HYDRATE $CBr_3CH(OH)_2$.

EQUILIBRIUM IN THE SYSTEM BROMAL-WATER. (Efremov, 1918.)

The sealed tube method was used. The tubes were constantly shaken and the rate of change of temperature during the observation of the disappearance of the last crystal was not more than 0°.1 to 0°.2 per hour. The temperature of the separation of the liquid into two layers was very sharp and the interval between separation and unification was only 0.2°.

The original results were plotted and the following values read from the curves.

t° of Crystallization or melting.	t° of separation into 2 layers.	Gms. CBr_3COH per 100 gms. sat. sol.	Solid Phase.	t° of Crystallization or melting.	t° of separation into 2 layers.	Gms. CBr_3COH per 100 gms. sat. sol.	Solid Phase.
— 1.0	–	2.5	Ice	40.0	107.2	76.0	$CBr_3CH(OH)_2$
— 1.5	–	5.0	»	45.0	107.6	85.0	»
— 2.0	–	7.0	»	47.0	106.8	88.2	»
— 2.6 (Eutec.)	–	11.3	» + $CBr_3CH(OH)_2$	48.0	106.5	90.0	»
— 1.5	–	12.5	$CBr_3CH(OH)_2$	49.0	106.0	92.0	»
0.0	–	14.5	»	49.7	107.4	94.0	»
+ 5.0	–	21.5	»	49.0	106.9	94.5	»
10.0	–	29.5	»	47.0	103.5	95.9	»
20.0	–	44.5	»	45.0	99.0	96.5	»
25.0	110.2	52.0	»	40.0	85.0	98.0	»
30.0	109.6	60.0	»	30.0	69.0	98.7	»
35.0	108.2	67.5	»	20.0	57.0	99.2	»

The author also gives data for the density and viscosity of mixtures of bromal and water at different temperatures.

The distribution coefficient of bromal hydrate between olive oil and water is 0.665 at ord. temp. (Baum, 1899); 0.7 at ord. temp. (Meyer, 1909).

CHLORO ACETIC ACID

SOLUBILITY OF THE α, β, AND γ MODIFICATION OF MONOCHLOROACETIC ACID IN WATER AT DIFFERENT TEMPERATURES.

(Miers and Isaac, 1908; Pickering, 1895.)

The determinations were made by the sealed tube method. The following figures were obtained by plotting the original results on cross-section paper:

	Gms. per 100 Gms. of Each Sat. Solution.				Gms. per 100 Gms. of Each Sat. Solution.		
t°.	α Modification.	β Modification.	γ Modification.	t°.	α Modification.	β Modification.	γ Modification.
20	...	...	88.0	50	95.0	97.0	99.6
25	...	85.8	90.0	51 (m. pt.)	...	...	100.0
30	86.0	88.2	92.2	55	97.2	99.3	...
35	88.4	90.6	94.1	56.5 (m. pt.)	...	100.0	...
40	90.8	93.0	95.8	60	99.0	...	...
45	93.0	95.0	97.8	62.4 (m. pt.)	100.0	...	...

Results for the reciprocal solubilities of chloro acetic acid and water, determined by the freezing-point method, are given by Pickering, 1895.

Equilibrium in the System Chloro Acetic Acid, Benzene and and Water at 15°.

(Bell, 1930.)

d. of sat. sol.	Gm. Mols. per 1000 gms. sat. solution	
	$CH_2ClCOOH$	H_2O
0.884	0.0620	0.0329
0.881	0.115	0.0423
0.880	0.174	0.0574
0.885	0.217	0.0645
0.888	0.284	0.0776
0.886	0.325	0.0828
0.892	0.404	0.1000

Distribution of Chloracetic Acid between:

(Herz and Lewy.)

Water and Chloroform at 25°.

Gms. $CH_2ClCOOH$ per 100 cc.		G. M. $CH_2ClCOOH$ per 100 cc.	
H_2O Layer.	$CHCl_3$ Layer.	H_2O Layer.	$CHCl_3$ Layer.
5*	0.283	0.05	0.0025
10	0.614	0.10	0.0060
20	1.088	0.20	0.0135
40	2.948	0.40	0.029
50	3.684	0.60	0.045
60	4.440	0.70	0.061
70	7.086	0.75	0.077

Water and Bromoform at 25°.

Gms. $CH_2ClCOOH$ per 100 cc.		G. M. $CH_2ClCOOH$ per 100 cc.	
H_2O Layer.	$CHBr_3$ Layer.	H_2O Layer.	$CHBr_3$ Layer.
40*	0.850	0.45	0.011
50	1.889	0.50	0.0165
60	2.994	0.60	0.028
70	4.241	0.70	0.040
80	5.620	0.80	0.053
90	7.560	0.90	0.067
91.6	11.340	0.97	0.120

Distribution of Chloracetic Acid between:

(Herz and Lewy.)

Water and Carbon Disulphide at 25°.

Gms. $CH_2ClCOOH$ per 100 cc.		G. M. $CH_2ClCOOH$ per 100 cc.	
H_2O Layer.	CS_2 Layer.	H_2O Layer.	CS_2 Layer.
60*	0.426	0.6	0.0042
80	0.691	0.8	0.007
90	0.803	1.0	0.009
100	1.040	1.05	0.0105
105	1.464	1.10	0.015
106.7	1.890	1.13	0.020

Water and Carbon Tetrachloride at 25°.

Gms. $CH_2ClCOOH$ per 100 cc.		G. M. $CH_2ClCOOH$ per 100 cc.	
H_2O Layer.	CCl_4 Layer.	H_2O Layer.	CCl_4 Layer.
90*	1.417	0.95	0.0150
95	2.031	1.00	0.0195
100	2.645	1.05	0.0270
105	4.26	1.10	0.0415
106.7	5.19	1.13	0.0550

* See Note, page 106

Results showing the influence of sulfuric acid upon the distribution of monochloroacetic acid between water and ethyl ether at 26° are given by Hantzsch and Vagt (1901).

DISTRIBUTION OF CHLORACETIC ACID BETWEEN:

(Herz and Fischer.)

Water and Benzene at 25°.

Gms. $CH_2ClCOOH$ per 100 cc.		G. M. $CH_2ClCOOH$ per 100 cc.	
H_2O Layer.	C_6H_6 Layer.	H_2O Layer.	C_6H_6 Layer.
0.25*	8.69	0.0025	0.090
0.5	15.59	0.005	0.155
1.0	27.87	0.010	0.28
1.5	41.10	0.015	0.415
2.0	52.90	0.02	0.54
3.0	68.01	0.03	0.70
4.0	76.52	0.04	0.79

Water and Toluene at 25°.

Gms. $CH_2ClCOOH$ per 100 cc.		G. M. $CH_2ClCOOH$ per 100 cc.	
H_2O Layer.	$C_6H_5CH_3$ Layer.	H_2O Layer.	$C_6H_5CH_3$ Layer.
0.1*	5.22	0.001	0.055
0.5	20.31	0.005	0.20
1.0	34.87	0.010	0.36
1.5	49.14	0.015	0.50
2.0	60.46	0.02	0.62
3.0	72.28	0.03	0.77
4.0	81.72	0.04	0.85
5.0	86.94	0.05	0.90

* See Note, page 106

Additional data for the distribution of monochloroacetic acid between water and benzene as well as similar results for dichloroacetic acid are given by Georgievics, 1915.

DISTRIBUTION OF MONO CHLORACETIC ACID BETWEEN WATER AND ETHER AT :

18° (Schreiner, 1922.)				25° (Smith, 1921-1922.)		
Concentration of $CH_2ClCOOH$ in		Concentration of $CH_2ClCOOH$ in		Millimols. $CH_2ClCOOH$ per liter in		
H_2O layer.	Ether layer.	H_2O layer.	Ether layer.	H_2O layer (C_1).	Ether layer (C_2).	$\frac{C_2}{C_1}$.
0.0103	0.0206	0.0761	0.181	1.40	1.55	1.08
0.0165	0.0348	0.150	0.390	2.85	3.70	1.299
0.0260	0.0571	0.169	0.452	5.11	8.48	1.66
0.0320	0.0760	0.290	0.795	7.80	13.40	1.718
0.0492	0.118	0.430	1.200	8.58	15.20	1.770

Schreiner also gives results for the distribution in presence of sodium monochlor acetate.

DISTRIBUTION OF MONO CHLORACETIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $CH_2ClCOOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
42.75	0.625	0.0146
68.25	1.250	0,0183
86.50	1.6875	0.0195
199 00	5.50	0.0276
194.25	5.50	0,0283

Acetone and Glycerol.

Millimols. $CH_2ClCOOH$ per liter in		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.30	0.325	4.00
3.90	0.975	4.00
8.60	2.00	4.30
15.925	3.125	4.60
29.25	6.15	4.76

Distribution of Chloro Acetic Acid at 25° Between:

(Kolossowsky, 1934; Kolossowsky and Kulikow, 1934, 1935.)

Water and Carbon Tetrachloride

Gm. Equiv. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	CCl_4 layer (C_2)	
0.2588	0.000748	346
0.525	0.00225	233
1.033	0.00549	188
1.523	0.00935	163
2.432	0.0163	149
3.854	0.0264	146
5.524	0.0445	124
7.082	0.073	97
9.098	0.206	44.2
9.813	0.437	22.5
10.029	0.0605	16.6

Water and Chloroform

Gm. Equiv. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$CHCl_3$ layer (C_2)	
0.1302	0.0034	38.3
0.2047	0.0072	28.4
0.3200	0.0130	24.6
0.5587	0.0258	21.7
1.1340	0.0661	17.2
1.8300	0.1300	14.1
2.410	0.1660	14.5
2.9250	0.2106	13.9
4.3275	0.3018	14.3
6.6141	0.4777	13.8
8.1900	1.1000	7.44
8.2678	1.6875	4.90

Water and Ethyl Bromide

Gm. Equiv. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	C_2H_5Br layer (C_2)	
0.0951	0.0061	15.59
0.246	0.0169	14.56
0.747	0.0565	13.22
1.421	0.118	11.96
2.289	0.191	11.98
3.336	0.267	12.50
5.315	0.398	13.35
7.066	0.607	11.64
7.831	1.512	5.18
7.982	1.616	4.94

Water and Methyl Iodide

Gm. Equiv. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	CH_3I layer (C_2)	
0.213	0.0046	46.3
0.352	0.0082	42.9
0.617	0.0162	38.1
1.468	0.0501	29.3
2.503	0.0929	26.9
3.485	0.131	26.6
4.811	0.174	27.65
6.028	0.243	24.8
7.464	0.366	20.4
8.623	0.700	12.3
8.688	1.103	7.88

Water and Nitrobenzene

Gm. Equiv. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$C_6H_5NO_3$ layer (C_2)	
0.1260	0.0164	7.68
0.3314	0.0496	6.68
0.4070	0.0693	5.87
0.9160	0.1688	5.43
1.5750	0.3106	5.07
2.1420	0.4662	4.59
2.8728	0.6993	4.11
3.5595	0.8946	3.98
4.5665	1.2141	3.76
5.7441	1.7852	3.22

Water and Toluene

Gm. Equiv. $CHCl_2COOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_2)	$C_6H_5CH_3$ layer (C_2)	
0.113	0.00126	89.6
0.176	0.0025	71.2
0.396	0.0088	45.0
0.746	0.019	39.5
1.191	0.032	37.2
2.394	0.066	36.0
4.397	0.124	35.5
6.733	0.228	29.5
8.417	0.385	21.8
9.337	0.730	12.8

CHLORO ACETIC ACID

DISTRIBUTION OF CHLORO ACETIC ACID AT 25° BETWEEN:

(Kolossowsky, 1934; Kolossowsky and Kulikow, 1934, 1935.)

Water and o Nitro Toluene

Gm. Equiv. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$C_6H_4CH_3NO_2$ layer (C_2)	
0.0524	0.0055	9.53
0.1247	0.0142	8.78
0.2754	0.0319	8.63
0.832	0.1064	7.82
1.892	0.279	6.78
3.239	0.541	5.99
4.392	0.758	5.79
7.053	1.231	5.73*
7.991	3.774	2.12*
8.128	1.807	4.50*
8.342	3.431	2.43*
8.601	2.661	3.23*

* The aqueous phase is the lower layer.

Water and Iso Butyl Alcohol

Gm. Equiv. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	i C_4H_9OH layer (C_2)	
0.0405	0.2596	0.156
0.0667	0.4221	0.158
0.1131	0.6779	0.167
0.2205	1.1718	0.188
0.2709	1.3356	0.203
0.3654	1.5530	0.235
0.3874	1.7104	0.227
0.5040	2.1136	0.239
0.6541	2.6813	0.244
0.8355	2.6738	0.312
0.8996	2.6705	0.337
1.4412	3.2570	0.442
2.1773	3.9782	0.547

Water and Normal Amyl Alcohol

Gm. Equiv. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	n $C_5H_{11}OH$ layer (C_2)	
0.0718	0.2577	0.279
0.1612	0.6426	0.251
0.2530	1.2017	0.211
0.3937	2.0034	0.197
0.4945	2.3782	0.208
1.1538	3.5489	0.325
1.7516	3.9966	0.438
2.2042	4.1655	0.529
3.0182	4.8469	0.623
3.7117	5.7644	0.644

Water and Iso Amyl Alcohol

Gm. Equiv. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	i C_6H_5OH layer (C_2)	
0.0170	0.1242	0.137
0.0409	0.2425	0.169
0.0756	0.4447	0.170
0.1588	0.9148	0.174
0.3150	1.2915	0.244
0.4630	1.9719	0.234
0.7056	3.0966	0.228
1.0232	3.1360	0.326
1.2889	3.3537	0.384
2.7910	4.4419	0.628

DISTRIBUTION OF CHLORO ACETIC ACID BETWEEN WATER AND OLIVE OIL.

(Bodansky and Meigs, 1932.)

Results at 25°

Gm. Mol. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	Olive oil layer (C_2)	
0.0092	0.0006	15.30
0.0928	0.0090	10.31
0.1850	0.0180	10.27

Results at 37.5°

Gm. Mol. $CH_2ClCOOH$ per liter of:		$\frac{C_1}{C_2}$
H_2O layer (C_1)	Olive oil layer (C_2)	
0.0092	0.0005	18.40
0.0175	0.0010	17.50
0.0455	0.0030	15.15
0.0895	0.0090	9.95

DISTRIBUTION OF CHLORO ACETIC ACID AT 25° BETWEEN n DIBUTYL ETHER AND:

(Randall and Failey, 1927.)

Aq. Magnesium Sulfate Solutions				Aq. Potassium Sulfate Solutions			
d. of aq. $MgSO_4$ solution	Ionic Conc. of added $MgSO_4$	Molality of $CH_2ClCOOH$ in aq. layer	Mol. Fraction $CH_2ClCOOH$ in ether layer	d. of aq. K_2SO_4 solution	Ionic Conc. of added K_2SO_4	Molality of $CH_2ClCOOH$ in aq. layer	Mol. Fraction $CH_2ClCOOH$ in ether layer
1.003	0.242	0.1012	0.004554	1.008	0.300	0.1036	0.004356
1.010	0.492	0.1044	0.004661	1.039	1.000	0.1135	0.004358
1.023	0.970	0.1055	0.004783	1.058	1.500	0.1128	0.004298
1.049	1.880	0.1035	0.004992	1.078	2.000	0.1173	0.004372

The critical solution temperature of mixtures of chloro acetic acid and o Cresol is at about 37°. (Lecat, 1927a.)

Freezing-point data are given for mixtures of Chloro Acetic Acid and each of the following compounds:

Di chloro Acetic Acid (1)
Tri chloro Acetic Acid (1)
Acetophenone (2)
Benzene (4)
Benzil (3)
Benzoic Acid (1)
Camphor (5)
Cetyl Alcohol (6)
Cinnamic Acid (1)
o, m, p Cresol (1) (12)
Crotonic Acid (1)
Di benzyl Acetone (2)
Di methyl Oxalate (7)
Di methyl Succinate (7)
Di methyl pyrone (8)
Erythritol (13)
Guaicol (12)(14)
Methyl cinnamate (7)
Naphthalene (6)(9)(10)
α, β Naphthol (12)
Phenol (10)(11)(12)
Piperonal (2)(6)
Salol (6)
Sulfuric Acid (15)
Thymol (12)
o m p α Toluic Acids (1)
Urea (14)
Urethan (14)
Vanillin (3)

(1) Kendall, 1914; (2)(3) Kendall and Gibbons, 1915; (4)(7) Kendall and Booge, 1916; (5) Pawlewski, 1893; (6) Mameli and Mannessier, 1913; (8) Kendall, 1914a; (9) Miers and Isaac, 1908; (10) Mameli and Mannessier-Mameli, 1933; (11) Kendall, 1916; (12) Mameli and Cocconi, 1923; (13) (13) Puschin and Dezelic, 1932; (14) Puschin and Rikovsky, 1933; (15) Kendall and Carpenter, 1914.

CHLORAL HYDRATE $CCl_3.CH(OH)_2$.

SOLUBILITY OF CHLORAL HYDRATE IN WATER, ETHYL ALCOHOL, CHLOROFORM AND IN TOLUENE. (Speyers, 1902.)

t°	In Water		In Alcohol		In Chloroform		In Toluene	
	W.	S.	W.	S.	W.	S.	W.	S.
0...	1.433	239	1.11	188	1.530	3.8	0.848	3.25
5...	1.460	292	1.16	200	1.515	4.1	0.900	5.5
10...	1.485	375	1.23	220	1.510	5.2	0.910	8.0
15...	1.510	495	1.30	310	1.505	8.0	0.915	13.0
20...	1.535	660	1.36	425	1.510	15.5	0.94	21.0
25...	1.555	825	1.42	610	1.520	33.0	0.97	31.0
30...	1.580	1005	1.49	950	1.540	65.0 (27°.7)	1.02	50.0
35...	1.590	1210	1.55	1590	1.570	–	1.13	77.0
40...	1.605	1430	1.60	2780	1.590	∞	1.40	124.0
45...	1.620	–	–	5600	–	–	–	200.0

W = Wt. in gms. of 1 cc. sat. sol.; S = Gms. $CCl_3.CH(OH)_2$ per 100 gms. solvent.

CHLORAL HYDRATE $CCl_3.CH(OH)_2$.

100 gms. abs. alcohol dissolve 215.0 gms. $CCl_3.CH(OH)_2$ at 20-25°. } (Pucher and
» quinoline » . 12.56 » » » » } Dehn, 1921.)

100 gms. equi molecular mixture of alcohol and quinoline dissolve 0.58 gms. $CCl_3.CH(OH)_2$ at 20-25°

SOLUBILITY OF CHLORAL HYDRATE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $CCl_3COH.H_2O$ per 100 Gms. Solvent.		Solvent.	t°.	Gms. $CCl_3COH.H_2O$ 100 Gms. Solvent.	
50% Aq. Pyridine	20–25	374	(Dehn, 1917.)	Ether	ord. t.	200	(Squires.)
Pyridine	20–25	80.9	"	Oil turpentine	cold	10	"
Carbon Disulfide	ord. t.	1.47	(Squires.)		hot	20	"
Glycerol	ord. t.	200	"	Olive Oil	ord. t.	100	"

DISTRIBUTION OF CHLORAL HYDRATE BETWEEN WATER AND ORGANIC SOLVENTS.

Immiscible Solvents.	t.	Dist. Coef. $\frac{\text{Conc. in } H_2O}{\text{Conc. in Org. Solvent.}}$	Authority.
Water and Ether	0–30°	0.235	(Hantzsch and Vagt, 1901.)
Water and Benzene	...	...	(Bubanovic, 1913.)
Water and Olive Oil	ord.	4.9	(Baum, 1899.)
" " "	30°	4.3	(Meyer, 1901; 1909.)
" " "	3	16.7	(Meyer, 1901.)
" " Toluene	0–20°	58–74.5	(Hantzsch and Vagt, 1901.)

Experiments designed to show the distribution of chloral hydrate between water and gelatine and between water and egg albumin are described by Cooper and Treadgold, 1934.

THE SOLIDIFICATION POINTS OF MIXTURES OF ANTIPYRINE AND CHLORAL HYDRATE.

(Tsakalatos, 1913.)

t° of Solidification.	Gms. $C_{11}H_{12}N_2O$ per 100 Gms. Mixture.	Solid Phase.	t° of Solidification.	Gms. $C_{11}H_{12}N_2O$ per 100 Gms. Mixture.	Solid Phase.
108.9	100	$C_{11}H_{12}N_2O$	60	40.9	1.2
90	86.1	"	61.8 m. pt.	36.7	"
70	73	"	57	30.1	"
50.5 Eutec.	64.2	"+1.1	50	26.1	"
60	56.8	1.1	40	20.2	"
62.3 m. pt.	53.2	"	33.8 Eutec.	16.5	1.2+$CCl_3.COH.H_2O$
60	50.3	"	40	6	$CCl_3.COH.H_2O$
56 Eutec.	47.2	"+1.2	51.6	0	"

1.1 = $C_{11}H_{12}N_2O.CCl_3COH.H_2O$ (Hypnal).
1.2 = $C_{11}H_{12}N_2O.2(CCl_3.COH.H_2O)$ (Bihypnal).

Freezing-point data are given for:

Chloral hydrate + Acetanilide (Angeletti, 1928.)
" " + Salol (Bellucci, 1912, 1913.)
" " + Camphor (Tsakalotos, 1915.)
" " + Menthol (Pawlewski, 1893.)
" " + Sarcosine anhydride (Pfeiffer and Seydel, 1928.)

IODO ACETIC ACID CH_2ICOOH.

DISTRIBUTION OF IODO ACETIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform				Water and Benzene			
Gm. Mols. CH_2ICCOH per liter of:		Gm. Mols. CH_2ICOOH per liter of:		Gm. Mols. CH_2ICOOH per liter of:		Gm. Mols. CH_2ICOOH per liter of:	
H_2O layer	$CHCl_3$ layer	H_2O layer	$CHCl_3$ layer	H_2O layer	C_6H_6 layer	H_2O layer	C_6H_6 layer
0.01388	0.00187	0.03213	0.00496	0.01543	0.00111	0.03221	0.00266
0.01655	0.00230	0.03831	0.00621	0.01996	0.00151	0.03530	0.00300
0.02080	0.00301	0.04190	0.00708	0.02531	0.00197	0.03840	0.00334
0.02350	0.00345	0.05085	0.00895	0.02748	0.00222	0.04840	0.00457
0.02788	0.00430	0.06465	0.01220	0.02950	0.00240	0.07070	0.00758

DISTRIBUTION OF IODO ACETIC ACID BETWEEN WATER AND OLIVE OIL.

(Bodansky and Meigs, 1932.)

t°	Gm. Mols. CH_2ICOOH per liter of: H_2O layer (C_1)	Gm. Mols. CH_2ICOOH per liter of: Olive oil layer (C_2)	$\frac{C_1}{C_2}$
25	0.0145	0.0050	2.90
37.5	0.0355	0.0140	2.54
"	0.0745	0.0250	2.98

ETHYLENE C_2H_4.

SOLUBILITY IN WATER AND IN ALCOHOL.

(Bunsen and Carius; Winkler, 1906.)

t°.	β.	q.
0	0.226	0.0281
5	0.191	0.0237
10	0.162	0.0200
15	0.139	0.0171
20	0.122	0.0150
25	0.108	0.0131
30	0.098	0.0118

For β and q see Ethane, p. 126

Solubility in Alcohol.

t°.	Vols. C_2H_4 per 100 Vols. Alcohol.
0	359.5
4	337.5
10	308.6
15	288.2
20	271.3

The solubility of Ethylene in Water at 25° in terms of the Bunsen Absorption Coefficient, β, was found by Orcutt and Seevers, 1936, to be 0.108. The authors made use of a modification of the Van Slyke-Neill, 1924, manometric apparatus which is based upon the principle of extracting the gas from the saturated solution and measuring its pressure. By means of a special technique and method of calculating the correction for unextracted gas, this becomes a simple method of determining the solubility of any gas in any liquid without the aid of previously determined constants.

100 cc H_2O dissolve 11.6 cc C_2H_4 (reduced to 0° and 760 mm.) at 21°.
(Venable and Fuwa, 1922.)

SOLUBILITY OF ETHYLENE IN WATER, PLASMA, BLOOD AND HAEMOGLOBIN SOLUTION AT 25°.

(Grollman, 1929.)

Partial pressure of C_2H_4	Solubility in terms of the Ostwald Expression l in:			
	Water	Dog Plasma	Dog Blood	Aq. 8.5% Dog Haemoglobin Solution
550	0.112	0.114	0.141	0.104
650	0.113	0.114	0.141	0.105
700	0.112	0.115	0.142	0.106
800	0.113	0.115	0.141	0.106
900	0.114	0.115	0.142	0.106
1000	0.113	0.117	0.144	0.107

SOLUBILITY OF ETHYLENE IN WATER AND IN BLOOD AT 37.5°.

(Grollman, 1929.)

Solvent	Solubility in terms of the Bunsen Abs. Coef. β	
	cc C_2H_4 per 1.0 cc solution	cc C_2H_4 per 1.0 gm. H_2O
Water	0.078	0.0785
Whole Human Blood	0.123	0.156
" Dog "	0.141	0.167
" Rabbit "	0.128	0.148
Aq. Lipoidal suspension (1)	0.120	

(1) Containing per 100 cc of H_2O, 0.3 gm. Blood Lipoid prepared by extracting blood corpuscles with ethyl ether and petroleum ether.

SOLUBILITY OF ETHYLENE IN AQUEOUS SOLUTIONS OF ALKALI HYDROXIDES, ETC., AT 15°. (Billitzer, 1902.)

Results in terms of the Ostwald Solubility Expression l. See p. 37.

Aqueous Solution of:	Solubility l_{15} in Aq. Solution of Normality:				
	0.1.	0.25.	0.5.	0.75.	1.0.
KOH	0.154	0.144	0.130	0.118	0.1056
NaOH	0.153	0.144	0.128	0.114	0.101
NH_4OH	...	0.157	0.156	0.155	0.154
½ Na_2SO_4	0.1525	0.1425	0.127	0.109	0.093
In H_2O alone	0.1593	...	...	...	...

SOLUBILITY OF ETHYLENE IN METHYL ALCOHOL AND IN ACETONE. (Levi, 1901.)

Results in terms of the Ostwald Solubility Expression l. See p. 37.

t°.	In Methyl Alcohol.	In Acetone.	t°.	In Methyl Alcohol.	In Acetone.
0	3.3924	4.0652	30	1.8585	1.8680
10	2.8831	3.3580	40	1.3432	1.0852
20	2.3718	2.6278	50	0.8259	0.2772
25	2.1154	2.2500	60	0.3506	...

The formulas from which the above figures were calculated are:

In Methyl Alcohol, $l = 3.3924 - 0.05083\,t - 0.00001\,t^2$.

In Acetone, $l = 4.0652 - 0.06946\,t - 0.000126\,t^2$.

SOLUBILITY OF ETHYLENE IN SEVERAL SOLVENTS. (McDaniel, 1911.)

Solvent.	t°.	Abs. Coef. *A*.	Bunsen Coef. *β*.	Solvent.	t°.	Abs. Coef. *A*.	Bunsen Coef. *β*.
Benzene	22	3.010	2.786	Heptane	22.4	3.463	3.207
"	35	2.655	2.353	"	35	3.186	2.824
"	50	2.482	2.100	"	39	3.110	2.722
Hexane	22	3.038	2.8141	Acetone	20	2.571	2.290
"	35	2.826	2.505	"	35	2.308	2.046
"	45	2.586	2.219	Limonene	22	no constant equilibrium	

Abs. Coef. *A* = vol. of ethylene absorbed by unit vol. of solvent at temp. stated.
For definition of Bunsen Coef. *β*, see p. 37.
The Coef. of Abs. *β* of ethylene in Russian petroleum is 0.164 at 10° and 0.142 at 20°.
(Gniewosz and Walfisz, 1887.)

1.0 cc. of absolute ethyl alcohol dissolves at t° (pressure not stated) $3.59498 - 0.057716\ t + 0.0006812\ t^2$ cc. of ethylene. (Spörry, 1922. 1926.)
100 cc. of rubber dissolve 144.0 cc. (reduced to 0° of 760 mm.) ethylene at 21°. (Venable and Fuwa, 1922.)

The solubility of Ethylene in cyclohexanol is 0.299 at 26° in terms of the Ostwald Solubility Expression. (Cauquil, 1927.)

SOLUBILITY OF ETHYLENE IN SEVERAL SOLVENTS AT VARIOUS TEMPERATURES.

(Horiuti, 1931.)

t°	Solubility of C_2H_4 in terms of the Ostwald Solubility Expression *l* in:				
	CCl_4	$(CH_3)_2CO$	CH_3COOCH_3	C_6H_6	C_6H_5Cl
0	5.027	4.843	4.618	—	3.882
5	4.689	4.572	4.379	4.268	3.640
10	4.415	4.308	4.156	4.017	3.425
15	4.159	4.074	3.914	3.796	3.221
20	3.922	3.847	3.709	3.591	3.018
25	3.711	3.640	3.521	3.403	2.887
30	3.511	3.473	3.348	3.241	2.714
35	3.341	3.285	3.185	3.087	2.576
40	3.163	3.142	3.049	2.955	2.460
50	—	—	—	2.708	2.265
60	—	—	—	—	2.084
70	—	—	—	—	1.932
80	—	—	—	—	1.815
90	—	—	—	—	1.707

SOLUBILITY OF ETHYLENE IN SEVERAL SOLVENTS AT VARIOUS TEMPERATURES AND PRESSURES.

(Kirejew, Kaplan and Romantchouk, 1935.)

Solvent	t°	cc C_2H_4 (reduced to 0° and 760 mm) dissolved by 1 cc. solvent at:								
		50	100	200	300	400	500	600	700	760 mm Hg pressure
Kerosene	-21	—	1.0	2.0	3.05	4.10	5.10	6.10	7.10	7.65
"	-10	—	0.80	1.60	2.40	3.25	4.10	4.90	5.65	6.15
"	0	—	0.70	1.40	2.05	2.65	3.25	3.85	4.50	4.90
"	+20	—	0.55	1.10	1.55	1.95	2.30	2.70	3.10	3.32
"	40	—	0.35	0.65	0.95	1.30	1.65	1.95	2.20	2.35
Xylol	-21	0.85	1.35	2.60	3.82	5.00	6.15	7.35	8.45	9.40
"	-10	0.70	1.20	2.40	3.25	4.10	5.00	5.95	6.90	7.50
"	0	0.55	0.90	1.80	2.30	3.40	4.10	4.80	5.50	5.95
"	+20	0.39	0.45	0.90	1.45	1.95	2.50	3.00	3.50	3.80
"	40	0.25	0.40	0.85	1.20	1.75	2.25	2.60	2.80	3.03
Cracked gasoline	-21	—	1.35	2.75	3.95	5.15	6.30	7.45	8.45	9.05
" "	-10	—	1.10	2.20	3.30	4.30	5.25	6.25	6.95	7.40
" "	0	—	0.95	1.95	2.95	3.80	4.55	5.30	5.95	6.40
" "	+20	—	0.75	1.50	2.30	3.05	3.70	4.20	4.50	4.60
" "	40	—	0.65	1.30	1.80	2.30	2.70	3.05	3.40	3.60
Di chloro Ethane	0	0.25	0.55	11.15	1.80	2.40	3.00	3.55	4.15	4.50
Heavy Solvent	0	0.30	0.60	1.25	1.90	2.60	3.25	3.85	4.45	4.80

Freezing-point data are given for mixtures of ethylene and di methyl ether by Baume and Germann, 1911, 1914.)

BROMO ETHANE 1,2 (Ethylene Bromide) CH_2BrCH_2Br.

SOLUBILITY OF ETHYLENE BROMIDE IN WATER.

(Gross and Saylor, 1931; Van Arkel and Vles, 1936.)

t°	Gms. $C_2H_4Br_2$ per 100 gms. H_2O	t°	Gms. $C_2H_4Br_2$ per 100 gms. H_2O
0	0.335	30	0.431
15	0.392	35	0.451
20	0.404	50	0.532

Freezing-point data are given for mixtures of 1.2 Di bromo Ethane (Ethylene Bromide) and each of the following compounds.

Acetic Acid (1)(2)
Aniline (8)(9)
Azoxyanisol (11)
Benzene (1)(5)(6)
Bromo Toluene (4)
Carbon Tetra Chloride (5)
Chloro Benzene (5)
1.2-Dichloro Ethane (7)
Di ethyl di acetyl tartrate(14)
cis Dichloro Ethylene (7)
trans " " (7)
Di phenyl amine (1)
Ethyl Bromide (8)(10)
Menthol (1)
Naphthalene (1) (2)
β Naphthol (3)
" + Picric Acid (3)
Ethylene Chloride (10)
o,m and p Nitroaniline (11)
Nitro Benzene (1)(5)
Paraldehyde (4)
Propylene Bromide (12)
1,1,2,2 Tetra Bromo Ethane(1
" " Chloro " (1
Toluene (2)
p Xylene (4)
Cyclohexane(13)

(1) Dahnes, 1895; (2) Baud, 1912; (3) Bruni, 1898; (4) Paterno and Ampola, 1897; (5) Linard, 1925; (6) Baud and Gay, 1911; (7) Timmermans, 1927; (8) Timmermans, 1928; (9) Timmermans, 1930; (10) Timmermans and Mme. Vesselovsky 1931; (11) Bogojewlensky, Winogradow and Bogolubow, 1906; (12) Timmermans, 1934.

BROMO CHLORO ETHANE CH_2ClCH_2Br.

1000 gms. H_2O dissolve 6.88 gms. C_2H_4BrCl at 30°. (Gross, Saylor and Gorman, 1933.)

DICHLORO ETHANE 1.2 (Ethylene Chloride) CH_2ClCH_2Cl.

SOLUBILITY OF ETHYLENE CHLORIDE IN WATER.

(Rex, 1906; Gross, 1929, 1929 (a); Gross and Saylor, 1931.)

t°	Gms. $C_2H_4Cl_2$ per 100 gms. H_2O	t°	Gms. $C_2H_4Cl_2$ per 100 gms. H_2O
0	0.922 (0.873)	20	0.869 (0.849)
10	0.885	25	0.865 (0.895, 35°)
15	0.872	30	0.894 (1.930, 56°)

The results in parentheses are by Van Arkel and Vles, 1936.

100 gms. aq. 0.5 n KCl dissolve 0.752 gm. $C_2H_4Cl_2$ at 25°.
" " " 0.5 n $MgSO_4$ " 0.552 gm. " " "

Determinations of the vapor pressures of concentrations of ethylene chloride less than saturation in water at 30° are given by Saylor, Stuckey and Gross, 1938.

MISCIBILITY OF ETHYL ALCOHOL (see Note, p. 4) AT 0° WITH MIXTURES OF:

Ethylene Chloride and Water.

(Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $CH_2Cl.CH_2Cl$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.971	0.029	0.191	1.15
0.90	0.10	0.42	1.08
*0.88	0.12	0.46	...
0.792	0.208	0.670	1.01
0.70	0.30	0.80	0.98
0.60	0.40	0.93	0.96
0.50	0.50	0.99	0.95
0.40	0.60	1.01	0.94
0.30	0.70	0.99	0.94
0.20	0.80	0.95	0.94
0.095	0.905	0.842	0.96
0.02	0.980	0.514	0.97

Ethylidene Chloride and Water.

(Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $CH_3.CHCl_2$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.985	0.015	0.226	1.10
0.90	0.10	0.43	1.03
0.805	0.195	0.586	1.01
0.70	0.30	0.69	0.98
*0.67	0.33	0.72	...
0.60	0.40	0.77	0.96
0.50	0.50	0.82	0.95
0.437	0.563	0.857	0.94
0.30	0.70	0.88	0.93
0.20	0.80	0.86	0.93
0.10	0.90	0.79	0.94
0.03	0.97	0.576	0.95

Freezing-point data are given for mixtures of 1.2 Dichloro Ethane and each of the following compounds.

Carbon Disulfide (3)
Benzene (4) (5)
Benzene Tetra Chloride (6)
cis Dichloro Ethylene (1)
trans " " (1)
1.2 Dicyan Ethane (2)
1.2 Dibrom Ethane (1)(2)
Ethylene Bromide (1)
Ethyl Ether (4)
Penta chloro Ethane (2)
Succinic Acid (2)
1.1.2.2-Tetra bromo Ethane (2)
1.1.2.2 Tetra chloro Ethane (2)
1.1.2 Tri chloro Ethane (2)

(1) Timmermans, 1927; (2) Timmermans and Mme. Vesselovsky, 1931; (3) Hammick and Howard, 1932; (4) Huettig and Smyth, 1935; (5) Baud and Gay, 1910, 1911; (6) Timmermans, 1934.

DICHLORO ETHANE 1.1 (Ethylidene Chloride) $CHCl_2CH_3$.

SOLUBILITY OF ETHYLIDENE CHLORIDE IN WATER.

(Rex, 1906; Gross and Saylor, 1931.)

t°	Gms. $C_2H_4Cl_2$ per 100 gms. H_2O
0	0.656 (0.594)
10	0.595
20	0.550 (0.506)
25	0.506
30	0.540 (0.482, 35°)
50	— (0.519)

The results in parentheses are by Van Arkel and Vles, 1936.)

100 gms. Aq. 0.5 n KCl dissolve 0.443 gms. $C_2H_4Cl_2$ at 25°.
" " " 0.5 n $MgSO_4$ " 0.316 " " " "

Freezing-point data are given by Timmermans, 1934 for mixtures of Ethylidene Chloride and Methylene Chloride, iso butyl bromide and toluene.

DI IODO ETHANE 1.2-$CH_2I.CH_2I$.

Freezing-point data for mixtures of di iodo ethane and dioxan are given by Rheinboldt and Luyken, 1932.

DiCYANODIAMIDE $(H_2CN_2)_2$ (Polymerized cyanamide).

SOLUBILITY IN WATER, IN ALCOHOL AND IN ETHER.

(Hetherington and Braham, 1923.)

In Water.		In Ethyl Alcohol $\left(d_{\frac{20}{4}} = 0.790\right)$.		In Ethyl Ether (dried over Na).	
t°	Gms. $(H_2CN_2)_2$ per 100 gms. H_2O.	t°.	Gms. $(H_2CN_2)_2$ per 100 gms. Alcohol.	t°.	Gms. $(H_2CN_2)_2$ per 100 gms. Ether.
0	1.27	0	0.937	0	0.0006
13	2.26	13.0	1.26	13.0	0.01*
15	2.56	26.4	1.70	25.0	0.0015
25	4.13	35.0	2.26	35.3	0.0026
39.9	7.76	49.9	3.30		
49.8	11.80	60.1	4.13		
60.1	18.75				
74.5	32.58–33.41				

* Pohl, *J. prakt. Chem.* [2]. 77, 534, 1908.

Freezing-point data are given for:

Dicyan di amide	+ Urea	(Jänecke and Rahlfs, 1930.)
"	+ Cyanamide	(Pratolonga, 1914.)

GLYOXIME CH(:NOH).CH(:NOH).

Freezing-point data are given by Semeria and Bocca, 1926, for the following systems: glyoxime + xanthone, methyl glyoxime + xanthone, dimethyl glyoxime + xanthone and methyl ethyl glyoxime + xanthone.

GLYCOL DINITRATE $CH_2ONO_2.CH_2ONO_2$.

One liter of water dissolves 6.2 gms. $CH_2O\,NO_2.CH_2ONO_2$ at 15°, 6.8 gms. at 20° and 9.2 gms. at 50°. (Rinkenbach, 1926, quoted from Naoum, 1924

ACETALDEHYDE CH_3COH.

SOLUBILITY IN ETHYL ALCOHOL DETERMINED BY THE METHOD OF LOWERING OF FREEZING-POINT (de Leeuw, 1911). Liquid air was used as the cooling medium and temperatures were measured with the aid of a specially constructed resistance thermometer.

t°.	Wt. Per Cent CH_3COH in Mixture.	Mol. Per Cent CH_3COH in Mixture.	Solid Phase.	t°.	Wt. Per Cent CH_3COH in Mixture.	Mol. Per Cent CH_3COH in Mixture.	Solid Phase.
−123.3	100	100	CH_3COH	−122.3	51.8	50.7	$CH_3COH.C_2H_5OH$
−125.4	90.7	90.3	"	−125.3	45.6	44.5	"
−127.6	84.5	83.9	"	−128	40.6	39.5	$CH_3COH.2C_2H_5OH$
−132	80.9	80.2	(Eutectic)	−123.2	35.3	34.3	"
−126	78.1	77.3	$CH_3COH.C_2H_5OH$	−126.8	30.2	29.3	"
−126	75.2	74.4	"	−130.6	17.9	17.3	C_2H_5OH
−124.3	67.0	66.0	"	−120.6	10.2	9.8	"
−123.5	60.8	59.7	"	−114.9	0.0	0.0	"

Freezing-point data for mixtures of acetaldehyde and paraldehyde as well as the complete $x - T$ diagrams are given by Holleman (1903). Results for mixtures of paraldehyde and *p* xylene are given by Paterno and Ampola (1897).

Results for mixtures of the α and β forms of Acetaldehyde phenyl hydrazone are given by Laws and Sidgwick (1911).

ETHYLENE OXIDE $(CH_2)_2O$.

SOLUBILITY OF ETHYLENE OXIDE IN WATER AND IN DICHLORO ETHANE.

(Kaplan and Reformatskaja, 1937.)

Solvent	t°	cc $(CH_2)_2O$ (reduced to 0° and 760 mm.) dissolved per 1.0 cc solvent at a pressure of:							
		150	200	300	400	500	600	700	760mm Hg
Water	5	45	60	105	162	240	—	—	—
"	10	33	46	76	120	178	294	—	—
"	20	20	29	49	74	101	134	170	195
Dichloro ethane	0	99	130	380	—	—	—	—	—
" "	10	50	80	199	365	—	—	—	—
" "	20	22	42	101	180	274	412	506 (650)	—

The authors also give results for the vapor pressures of ethylene oxide in water and di chloro ethane.

ETHYLENE OXIDE C_2H_4O.

FREEZING-POINTS OF MIXTURES OF ETHYLENE OXIDE AND WATER.
(Maass and Boomer, 1922.)

t°.	Per cent C_4H_4O.	t°.	Per cent C_2H_4O.	t°.	Per cent C_2H_4O.
− 0.2...	6.0	10.5...	34.0	7.2...	63.5
+ 6.7...	11.4	10.0...	40.8	6.9...	65.5
9.4...	16.4	9.5...	46.0	6.0...	70.5
10.4...	21.3	9.0...	51.0	4.3...	78.5
10.7...	24.9	8.4...	55.0	− 0.9...	92.0
10.7...	28.0	7.5...	62.0	−111.3...	100.0

METHYL FORMATE $HCOO(CH_3)$.

FREEZING-POINTS OF MIXTURES OF METHYL FORMATE AND TIN TETRACHLORIDE
(Kournakov and Perelemouter, 1916.)

Final t° of melting......	−5.	+26.	50.6.	80.	83.3.	81.7.	74.2.	68.	54.4.	38.4.	−33.
Mol. % $SnCl_4$......	10	15	20	27.5	33.3	40	52.3	64	84	94	100

The mol. compound has the composition $SnCl_4.2\,HCOO(CH_3)$ and m. pt. 83°.3.

Freezing-point data for mixtures of methyl formate and ethyl acetate are given by Sapgir, 1929.

ACETIC ACID CH_3COOH.

RECIPROCAL SOLUBILITY OF ACETIC ACID AND WATER DETERMINED BY THE METHOD OF LOWERING OF THE FREEZING-POINT.

t°.	Gms. CH_3COOH per 100 Gms. Sat. Solution.	Solid Phase.	t°.	Gms. CH_3COOH per 100 Gms. Sat. Solution.	Solid Phase.
0	0	Ice	−20	67.0	CH_3COOH
− 5	15.2	"	−15	72.3	"
−10	28.5	"	−10	77.5	"
−15	40.0	"	− 5	82.2	"
−20	49.2	"	0	87.0	"
−25	57.0	"	+ 5	91.8	"
−26.7	60.0	(Eutectic)	10	95.8	"
−25	62.5	CH_3COOH	16.6	100.0	"

The data in the above table were obtained by plotting the results of Pickering (1893), Roloff (1895), Dahms (1896) (1899), de Coppet (1899), Kremann (1907), Faucon (1910), Balló (1910), Groschuff (1911), Paterno and Salimei (1913), and Tsakalotos (1914), on cross-section paper and drawing a curve through the points in best agreement. In addition to making determinations of the freezing-points of the mixtures, Balló also analyzed the solid phases which separated, and showed that these contained, in all cases, increasing percentages of acid and, therefore, must have consisted of mixed crystals. This formation of mixed crystals is offered as an explanation of the abnormality of the freezing-point lowering of the system.

SOLUBILITY OF ACETIC ACID IN ETHYL ALCOHOL (98.9%) DETERMINED BY THE METHOD OF LOWERING OF FREEZING-POINT. (Pickering, 1893.)

t°.	Gms. CH_3COOH per 100 Gms. Sat. Solution.	Solid Phase.	t°.	Gms. CH_3COOH per 100 Gms. Sat. Solution.	Solid Phase.
−75	26.0	CH_3COOH	−10	67.7	CH_3COOH
−70	27.7	"	− 5	73.2	"
−60	33.0	"	0	79.1	"
−50	38.2	"	+ 5	85.2	"
−40	43.7	"	10	91.5	"
−30	50.2	"	15	98.0	"
−20	58.0	"	16.6	100.0	"

(The original results were plotted on cross-section paper and the above figures

RECIPROCAL SOLUBILITY OF ACETIC ACID, ETHYL ETHER AND WATER AT 20°

(Sasaki, 1938.)

The determinations were made by titrating mixtures of two of the components with the third just to appearance of turbidity. The results show the binodal curve. Tie lines determined by a graphical method are shown on the author's diagram but the values are not marked in the table.

cc per 100 cc sat. sol.			cc per 100 cc sat.ssol.			cc per 100 cc sat. sol.		
CH_3COOH	$(C_2H_5)_2O$	H_2O	CH_3COOH	$(C_2H_5)_2O$	H_2O	CH_3COOH	$(C_2H_5)_2O$	H_2O
0	12.3	87.7	17.8	71.5	10.7	25.8	48.4	25.8
0	98.0	2.0	21.6	64.0	14.4	26.4	46.0	27.6
8.7	13.5	77.8	23.8	20.6	55.6	26.5	33.8	39.7
9.5	85.7	4.8	23.8	55.6	20.6	27.0	32.5	40.5
16.7	16.7	66.6	25.0	25.0	50.0	60.0	40.0	∞
						70.0	∞	30.0

ACETIC ACID CH_3COOH.

SOLUBILITY IN AQUEOUS SOLUTIONS OF EPICHLORHYDRINE.

(Leone and Benelli, 1922.)

The authors give data for the system $H_2O + CH_3COOH + CH_2.O.CH\,CH_2Cl$. As a part of this study they determined the temperature of clearing and of clouding when weighed amounts of acetic acid were added to aqueous solutions of epichlorhydrine of definite weight per cent concentrations. These results when plotted on cross-section paper yield straight lines from which the following figures were read. At temperatures above 80° the epichlorhydrine begins to react with the water.

	Gms. CH_3COOH per 100 gms. saturated solution in aqueous :				
t°.	9.97 % C_3H_5OCl.	20.04 % C_3H_5OCl.	39.77 % C_3H_5OCl.	59.66 % C_3H_5OCl.	89.04 % C_3H_5OCl.
10.....	13.1	25.5	29.9	29.2	17.9
20.....	11.2	23.6	28.2	27.5	16.5
30.....	9.2	21.7	26.5	25.9	15.0
40.....	7.3	19.8	24.8	24.2	13.6
50.....	5.4	17.9	23.2	22.5	12.2
60.....	3.5	16.0	21.5	20.9	10.7
70.....	1.6	14.1	19.8	19.2	9.3
80.....	0.0	12.2	18.2	17.5	7 9

SOLUBILITY OF EPICHLORHYDRIN IN AQUEOUS SOLUTIONS OF ACETIC ACID.

(Leone and Benelli, 1922.)

Weighed amounts of aqueous acetic acid solutions of three concentrations were mixed with weighed amounts of epichlorhydrin and the temperatures of clearing and clouding determined. The results are all expressed in weight per cent. On account of reaction of the constituents, determinations could not be made above 80°. The authors' results were plotted and the following values for regular intervals of temperature were read from the curves. At each temperature there are two concentrations of epichlorhydrin at which saturation occurs. One represents the epichlorhydrin rich layer and the other the epichlorhydrin poor layer.

	Aqueous 14.93 per cent CH_3COOH. Wt. per cent C_3H_5OCl in		Aqueous 30.49 per cent CH_3COOH. Wt. per cent C_3H_5OCl in		Aqueous 50.0 per cent CH_3COOH. Wt. per cent C_3H_5OCl in	
t°	lighter layer.	heavier layer.	lighter layer.	heavier layer.	lighter layer.	heavier layer.
25	9.0	98.5	16.5	97.2	50.0	94.2
30	9.5	98.7	18.0	97.0	52.0	93.8
35	10.0	98.0	19.0	96.5	54.5	93.2
40	10.5	97.8	20.0	96.0	57.0	92.0
45	11.0	97.5	22.0	95.3	60.0	91.0
50	11.5	97.0	24.0	94.7	63.5	89.5
55	12.0	96.5	26.0	94.0	67.5	87.5
60	13.0	96.0	29.0	93.5	72.5	85.0
63 (crit. temp.)	–	–	–	–	81.0	
65	14.0	95.5	33.0	93.0		
70	15.0	95.0	37.5	92.5		
75	16.5	94.0	43.0	91.5		
80	18.5	93.0	50.0	90.0		

ISOTHERMS FOR THE SYSTEM EPICHLORHYDRIN, ACETIC ACID AND WATER AT 0°, 10°, 40° AND 60°.

(Leone and Benelli, 1922.)

The authors' determinations were plotted on cross section paper and from the four curves the following values for regular intervals of concentration of acetic acid were read. At each concentration of acetic acid there are two concentrations of epichlorhydrin at which saturation occurs. There is a maximum for each curve which corresponds to the concentration of acetic acid above which the three constituents mix in all proportions. The results show for both acetic acid and epichlorhydrin the grams of each per 100 gms. of homogeneous mixture of the two with water.

	Gms. C_3H_5OCl per 100 gms. sat. solution at							
Gms. CH_3COOH per 100 gms. sat. sol.	0°.		10°.		40°.		60°.	
0	6.48	98.91	6.52	98.72	7.00	98.0	8.0	97.0
5	6.7	93.2	7.3	92.3	8.0	90.5	9.3	89.0
10	7.5	86.2	8.3	85.2	9.2	82.0	11.4	80.0
15	8.4	79.0	9.7	77.5	10.6	72.5	14.5	69.0
20	9.7	70.0	11.5	68.5	13.8	60.7	22.5	53.5
22	10.5	66.4	12.5	64.0	16.0	55.0	30.0	40.0
24	11.0	62.0	13.5	59.0	20.0	48.0		
26	12.1	56.7	15.0	53.5	27.0	39.0		
28	13.8	51.0	17.5	45.5				
30	16.5	43.0	25.0	30.0				
31	18.7	37.0						
32	25.0	27.0						

ACETIC ACID

EQUILIBRIUM IN THE SYSTEM ACETIC ACID, ANILINE AND WATER.

(Angelescu and Motzoc, 1925.)

The determinations were made by titration with the aid of weight pipets, mixtures of two of the components with the third just to the appearance or disappearance of clouding. In order to locate the tie lines of the binodal curve determined by titration, the distribution of acetic acid between the aqueous and aniline layers was also determined.

Results at 0°

Gms. per 100 gms. sat. solution		
$C_6H_5NH_2$	CH_3COOH	H_2O
3.68	—	96.32
7.13	2.89	89.98
10.00	5.91	84.09
17.10	12.41	70.49
20.82	14.02	65.16
26.76	15.33	57.88
30.10	15.73	54.17
32.17	15.88	51.95
34.75	16.01	49.24
37.76	16.16	46.08
38.72	16.20	45.08
47.68	16.26	36.06
58.15	15.60	26.25
68.92	13.38	17.70
76.83	10.68	12.49
86.36	6.23	7.41
90.37	4.02	5.61
95.71	—	4.29

Results at 20°

Gms. per 100 gms. sat. solution		
$C_6H_5NH_2$	CH_3COOH	H_2O
3.59	—	96.41
4.14	0.35	95.51
5.30	1.41	93.29
7.58	3.87	88.55
9.31	6.08	84.61
11.05	8.08	80.87
13.29	10.25	76.46
15.73	12.16	72.11
18.68	13.68	67.64
22.26	14.86	62.88
26.56	15.67	57.77
30.80	16.18	53.02
34.03	16.40	49.57
43.91	16.59	39.50
58.64	16.39	24.97
67.90	14.33	17.77
76.68	10.73	12.59
86.58	5.94	7.48
91.18	3.07	5.75
94.84	—	5.16

The distribution results at 20° are as follows:

Gms. CH_3COOH per 100 gms.		$\frac{C_1}{C_2}$	Gms. CH_3COOH per 100 gms.		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$C_6H_5NH_2$ layer (C_2)		H_2O layer (C_1)	$C_6H_5NH_2$ layer (C_2)	
1.68	0.65	2.58	5.22	3.11	1.68
2.15	0.92	2.33	6.82	4.33	1.57
3.05	1.51	2.02	8.77	6.22	1.45
4.65	2.56	1.82	9.63	7.25	1.33
			11.19	9.30	1.20

The authors also studied the equilibrium in this system as influenced by temperature. For this there was used, on the one hand a mixture of aniline and acetic acid of given concentration and on the other a mixture of water and acetic acid of the same concentration of acetic acid. Mixtures of these in any proportion give a ternary mixture of constant acetic acid concentration. Such ternary mixtures containing respectively 15.83, 16.56 percent CH_3COOH were each found to have an upper and a lower critical solution temperature and thus yield a closed solubility curve. The explanation of this was considered to be the hydrolysis of the aniline acetate

The following additional determinations of the system Acetic Acid, Aniline and Water at 0° are given by Ust-Kachkintsev and Nertshin, 1936.

Gms. per 100 gms. sat. solution		
$C_6H_5NH_2$	CH_3COOH	H_2O
9.8	6.0	84.2
25.5	15.8	58.7
41.7	16.8	41.5
42.5	16.5	44.0
59.1	15.8	25.1
74.3	12.1	13.6

These authors also give results for the quarternary systems Acetic Acid, Aniline, Pyridine and Water and Acetic Acid, Aniline, Piperidine and Water at 0°.

DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND CHLOROFORM:

At Room Temperature.

(Wright, Thomson and Leon — Proc. Roy. Soc. 49, 185, 1891.)

Results in parts per 100 parts of solution.

Upper Layer.			Lower Layer.		
CH_3COOH.	$CHCl_3$.	H_2O.	CH_3COOH.	$CHCl_3$.	H_2O.
0	0.84	99.16	0	99.01	0.99
6.46	0.92	92.62	1.04	98.24	0.72
17.69	0.79	81.52	3.83	94.98	1.19
25.10	1.21	73.69	6.77	91.85	1.38
33.71	2.97	63.32	11.05	87.82	1.13
44.12	7.30	48.58	17.72	80.00	2.28
50.18	15.11	34.71	25.75	70.13	4.12

At 25°.

(Herz and Lewy; Rothmund and Wilsmore.)

Gms. CH_3COOH per 100 cc.		G. M. CH_3COOH per 100 cc.	
H_2O Layer.	$CHCl_3$ Layer.	H_2O Layer.	$CHCl_3$ Layer.
2	0.089	0.05	0.0032
4	0.313	0.075	0.0062
6	0.596	0.100	0.0100
8	0.974	0.150	0.0198
10	1.430	0.175	0.0260
12	1.982	0.200	0.0325
20	5.10	0.30	0.070
30	10.2	0.50	0.170
40	15.3	0.70	0.275
50	21.9	0.80	0.335
52.3	39.54	0.87	0.659

See Note, page 106

In addition to the above results, data for somewhat lower concentrations of acetic acid determined at 20° are given by Dawson and Grant (1901).

Results showing the influence of electrolytes upon the distribution of acetic acid between water and chloroform are given by Rothmund and Wilsmore and by Dawson and Grant.

DISTRIBUTION OF ACETIC ACID AT 25° BETWEEN:

Water and Carbon Disulphide.

(Herz and Lewy.)

Gms. CH_3COOH per 100 cc.		G. M. CH_3COOH per 100 cc.	
H_2O Layer.	CS_2 Layer.	H_2O Layer.	CS_2 Layer.
65	2.64	1.1	0.45
70	3.0	1.2	0.55
75	3.3	1.2	0.80
80	5.4	1.35	0.97
85	6.4	1.4	1.3

Water and Carbon Tetrachloride.

(Herz and Lewy.)

Gms. CH_3COOH per 100 cc.		G. M. CH_3COOH per 100 cc.	
H_2O Layer.	CCl_4 Layer.	H_2O Layer.	CCl_4 Layer.
30	1.8	0.5	0.03
40	3.0	0.7	0.055
50	4.8	0.9	0.095
60	5.8	1.1	0.155
70	12.0	1.2	0.235
76.2	25.2	1.27	0.420

Results for the distribution of acetic acid between water and mixtures of equal volumes of carbon disulfide and carbon tetrachloride at 25° are given by Herz and Kurzer (1910).

DISTRIBUTION OF ACETIC ACID AT 25° BETWEEN:

Water and Bromoform.

(H. and L. — Z. electro. Ch. 11, 818, '05.)

Gms. CH_3COOH per 100 cc.		G. M. CH_3COOH per 100 cc.	
H_2O Layer.	$CHBr_3$ Layer.	H_2O Layer.	$CHBr_3$ Layer.
20	1.5	0.4	0.035
30	3.0	0.6	0.070
40	4.8	0.8	0.120
50	7.8	1.0	0.20
60	12.0	1.1	0.28
65	15.6	1.15	0.395
70	27.0	...	...

See Note below

Water and Toluene.

(H. and F. — Ber. 38, 1140, '05.)

Gms. CH_3COOH per 100 cc.		G. M. CH_3COOH per 100 cc.	
H_2O Layer.	$C_6H_5CH_3$ Layer.	H_2O Layer.	$C_6H_5CH_3$ Layer.
5	0.119	0.1	0.0025
10	0.328	0.2	0.0075
20	1.132	0.4	0.0260
30	2.265	0.6	0.0530
40	3.725	0.8	0.090
50	5.841	1.0	0.140
60	8.344	...	...

DISTRIBUTION OF ACETIC ACID AT 25° BETWEEN WATER AND SEVERAL ORGANIC SOLVENTS.

(Archibald, 1932.)

Immiscible Solvents	Gm. Mols. CH_3COOH per liter		$\frac{C_2}{C_1}$
	H_2O layer (C_1)	Organic layer (C_2)	
Water and Ethyl Methyl Ketone	0.14828	0.17866	1.2050
" " " " "	0.46045	0.54351	1.1804
" " Tertiary Amyl Alcohol	0.13205	0.19531	1.4971
" " " " "	0.37427	0.52829	1.4115
" " Secondary Butyl Alcohol	0.15100	0.19212	1.2723
" " " " "	0.46670	0.53182	1.1395
" " Normal Butyl Alcohol	0.15072	0.18757	1.2445
" " " " "	0.42054	0.51302	1.2200
" " Normal Amyl Alcohol	0.16451	0.15305	0.9303
" " " " "	0.48828	0.45864	0.9393

DISTRIBUTION OF ACETIC ACID BETWEEN:

Water and Amyl Alcohol at 20°.

(Herz and Fischer, 1904.)

Gms. CH_3COOH per 100 cc.		G. M. CH_3COOH per 100 cc.	
H_2O Layer.	Alcoholic Layer.	H_2O Layer	Alcoholic Layer.
1	0.923	0.01	0.0095
2	1.847	0.03	0.0280
3	2.741	0.05	0.0460
4	3.694	0.07	0.0645
5	4.587	0.09	0.0830
6	5.475	0.11	0.1010
7	6.434	0.13	0.1190
8	7.328	...	...

Water and Benzene at 25°.

(Herz and Fischer, 1905.)

Gms. CH_3COOH per 100 cc.		G. M. CH_3COOH per 100 cc.	
H_2O Layer.	C_6H_6 Layer.	H_2O Layer.	C_6H_6 Layer.
5	0.130	0.05	0.0014
10	0.417	0.10	0.0005
20	1.55	0.20	0.0030
30	3.03	0.30	0.0290
40	4.95	0.50	0.051
..	...	0.70	0.090

NOTE. — The distribution results of Herz and co-workers are reported in millimolecules per 10 cc. portions of each layer in the several cases. To obtain the figures given in the tables here shown, the original results, before and after calculating to gram quantities, were plotted on cross-section paper, and from the curves thus obtained, readings for regular intervals of concentration of acetic acid in the aqueous layer were selected.

DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND BENZENE.

(Waddell, 1898; see also Lincoln, 1904.)

The measurements were made by adding varying amounts of benzene or water to 5 cc. of acetic acid and then running in water or benzene till saturation was reached. The observed readings were calculated to grams per 100 grams of the liquid mixture.

	Upper Layer.			Lower Layer.		
t°.	CH_3COOH.	C_6H_6.	H_2O.	CH_3COOH.	C_6H_6.	H_2O.
25	0.46	99.52	0.02	9.4	0.18	90.42
25	3.10	96.75	0.15	28.2	0.53	71.27
25	5.20	94.55	0.25	37.7	0.84	61.46
25	8.7	90.88	0.42	48.3	1.82	49.88
25	16.3	82.91	0.79	61.4	6.1	32.5
25	30.5	67.37	2.13	66.0	13.8	20.2
25	52.5	39.60	7.60	52.8	39.6	7.6
35	1.2	98.68	0.08	16.4	0.62	82.98
35	5.7	93.97	0.33	36.8	1.42	62.78
35	9.0	90.42	0.58	49.0	2.10	48.90
35	45.0	49.00	6.0	61.3	25.5	13.2
35	52.2	39.4	8.4	52.2	39.4	8.4

Additional data in connection with the distribution of acetic acid between water and benzene are given by King and Narracutt (1909), Kuriloff (1898), Farmer (1903), Bubanovic (1913), and Lincoln (1904). This latter investigator points out that the same degree of clouding does not represent the end point in all cases as was assumed by Waddell (1900).

Data for the distribution of acetic acid between benzene and aqueous solutions of sodium acetate at 25° are given by Farmer (1903).

DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND BENZENE.

(Bektourov, 1939.)

Results at 0°			Results at 25°			Results at 60°		
Gm. Equiv. CH_3COOH per liter		$\frac{C_1}{C_2}$	Gm. Equiv. CH_3COOH per liter		$\frac{C_1}{C_2}$	Gm. Equiv, CH_3COOH per liter		$\frac{C_1}{C_2}$
H_2O layer	C_6H_6 layer		H_2O layer	C_6H_6 layer		H_2O layer	C_6H_6 layer	
0.3123	0.00387	82.6	0.7760	0.0199	39.0	0.9274	0.0346	26.6
0.6151	0.0113	54.4	1.0031	0.0284	35.3	1.4194	0.0661	21.5
1.3911	0.0416	33.4	1.2680	0.0417	30.4	1.8547	0.1230	15.1
2.4604	0.1072	22.96	2.6496	0.1325	20.0	3.3310	0.3020	11.0
3.9934	0.2555	15.6	4.0343	0.2792	14.4	3.9366	0.3785	10.4
5.6589	0.4542	12.5	5.6589	0.4731	12.0	3.7500	0.5299	8.96
7.2676	0.7570	9.60	7.7407	0.8233	9.4	4.7500	0.5299	8.96
9.7468	1.2775	7.63	8.9709	1.1639	7.71	6.4159	0.8237	7.70
11.7341	2.4604	4.77	10.1254	1.4951	6.77	8.7249	1.3437	6.49
12.7750	4.0785	3.13	12.2073	4.8640	2.51	10.7310	2.4414	4.40
11.8069	6.4443	1.83	11.1285	6.1131	1.82	11.6773	4.1069	2.84
						11.605	5.6778	2.04

Distribution of Acetic Acid Between Water and Chloroform.

(Bektourov, 1939.)

Results at 0°

Gm. Equiv. CH_3COOH per liter		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$CHCl_3$ layer (C_2)	
0.1773	0.00827	21.44
0.3901	0.0260	15.0
0.8984	0.1158	7.76
1.6548	0.3310	5.00
3.4517	1.0402	3.32
5.7214	2.1751	2.64
7.7776	3.5696	2.18
8.7239	4.3261	2.02
9.4804	5.3194	1.78

Results at 50°

Gm. Equiv. CH_3COOH per liter		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$CHCl_3$ layer (C_2)	
0.0709	0.00355	20.0
0.1891	0.0118	16.0
0.2482	0.0189	13.1
0.9109	0.1300	7.0
2.1987	0.4610	4.77
4.3028	1.3000	3.31
6.5015	2.3642	2.75
8.0619	3.3808	2.38
9.3386	4.8702	1.92

Distribution of Acetic Acid Between Water and Carbon Tetrachloride.

(Bektourov, 1939.)

Results at 25°

Gm. Equiv. CH_3COOH per liter		$\frac{C_1}{C_2}$
H_2O layer (C_1)	CCl_4 layer (C_2)	
0.0733	0.000945	77.6
1.0284	0.0260	39.6
1.8560	0.0709	26.2
2.6952	0.1418	19.0
3.5699	0.2128	16.8
4.9412	0.3664	13.5
7.7546	0.7447	10.4
10.2370	1.3358	7.66
11.1354	1.7022	6.54

Results at 60°

Gm. Equiv. CH_3COOH per liter		$\frac{C_1}{C_2}$
H_2O layer (C_1)	CCl_4 layer (C_2)	
0.1182	0.00236	50.1
0.5437	0.0142	38.3
0.8275	0.02719	30.4
1.6786	0.0874	19.2
3.0262	0.2009	15.1
7.4945	0.7093	10.6
9.5514	1.1466	8.33
10.8517	1.6786	6.46
11.4191	1.9859	5.75

Distribution of Acetic Acid Between :

Water and Benzene at 25°

(Brown and Bury, 1923.)

Gms. mols. CH_3COOH per liter of	
H_2O layer.	C_6H_6 layer.
0.531	0.0125
0.633	0.0165
1.148	0.0443
1.510	0.0714
1.858	0.1015
2.976	0.224
4.743	0.486
5.444	0.614
6.101	0.739
7.546	1.089
8.710	1.463
10.812	2.692
11.137	3.111

Water and Epichlorhydrine at 10°

(Leone and Benelli, 1922.)

Gms. CH_3COOH per 100 gms. of		$\frac{a}{b}$.
upper layer (*a*).	lower layer (*b*).	
3.47	1.07	3.22
6.71	2.29	2.93
9 47	3.59	2.63
12.02	5.00	2.40
16.58	7.72	2.17
20.00	10.00	2.00
23.70	13.21	1.75
26.43	16.59	1.63
27.45	18.00	1.52
29.25	21.83	1 34
30.10	23.33	1.29
29.07	24.97	1.16
28.50	25.33	1.12

ACETIC ACID

Distribution of Acetic Acid Between the Conjugate Layers Formed with Water and Benzene at 25°.

(Hand, 1930.

The binodal curve was determined by titrating mixtures of two of the liquids with the third to an end point which was the mean of the amount which was unmistakably insufficient to produce clouding and that which was definitely in excess. The tie lines were determined by mixing sufficient quantities of the three liquids to yield two layers, and after attainment of equilibrium at 25°, about 2 gram quantities of each layer were removed, weighed and titrated for acetic acid with standard barium hydroxide.

Results for the Binodal Curve

Gms. present in the homogeneous mixture			Gms. present in the homogeneous mixture		
CH_3COOH	C_6H_6	H_2O	CH_3COOH	C_6H_6	H_2O
37.46	9.30	9.985	10.47	0.15	29.83
36.26	7.09	10.86	20.54	1.50-1.61	11.20
30.88	14.43	5.87	20.57	0.98-1.06	15.89
33.2	16.56	6.04	20.32-20.45	28.38	1.83
31.29	4.10	12.16	20.80	0.89-0.90	17.59
36.39	6.44	11.64	20.83	2.09-2.14	9.74
36.74	22.23	5.89	10.09-10.21	11.04	1.11
26.10	17.53	4.13	9.85	8.23	1.31-1.36
30.88	17.66	5.38	10.45-10.85	19.50	0.717
20.23	0.48	30.16	10.19-10.33	31.53	0.404
14.21	0.21	29.98	52.3	40.5	7.2 PP.

Results for the Tie Lines

Upper Layer			Lower Layer		
Gms. per 100 gms. solution			Gm. per 100 gms. solution		
CH_3COOH	C_6H_6	H_2O	CH_3COOH	C_6H_6	H_2O
0.15	99.849	0.001	4.56	0.04	95.2
1.4	98.56	0.04	17.7	0.20	82.1
3.27	96.62	0.11	29.0	0.40	70.6
13.3	86.4	0.4	56.9	3.3	39.8
15.0	84.5	0.5	59.2	4.0	36.8
19.9	79.4	0.7	63.9	6.5	29.6
22.8	76.35	0.85	64.8	7.7	27.5
31.0	67.1	1.0	65.8	18.1	16.1
35.3	62.2	2.5	64.5	21.1	14.4
37.8	59.2	3.0	63.4	23.4	13.2
44.7	50.7	4.6	59.3	30.0	10.7
52.3	40.5	7.2	52.3	40.5	7.2 P.P.

P.P. = Plait Point

Data showing the solubility of water in benzene as influenced by the presence of acetic and other fatty acids are given by Briegleb, 1930.

DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND ETHYLETHER.

(Lofman, 1919.)

The author points out the discrepancies in previous determinations. In his experiments equal volumes of the two liquids were shaken together for one-half hour at constant temperature and each layer analyzed by titration, using phenolphthalein as indicator. Acetic acid forms double molecules in ether.

t°.	Gms. mols. CH_3COOH per liter. H₂O layer (C_1).	Gms. mols. CH_3COOH per liter. Ether layer (C_2).	$\frac{C_1}{C_2}$	t°.	Gms. mols. CH_3COOH per liter. H₂O layer (C_1).	Gms. mols. CH_3COOH per liter. Ether layer (C_2).	$\frac{C_1}{C_2}$
0...	0.01273	0.00684	1.86	25...	0.01323	0.006097	2.17
0...	0.03122	0.01667	1.87	25...	0.03309	0.01528	2.17
0...	0.06292	0.03401	1.85	25...	0.06654	0.0311	2.14
0...	0.1262	0.06971	1.81	25...	0.1341	0.06355	2.11
0...	0.3140	0.1809	1.73	25...	0.3265	0.1624	2.01
0...	0.6210	0.3819	1.62	25...	0.6497	0.3406	1.91
0...	1.1940	0.8145	1.45	25...	1.2600	0.7413	1.70

Similar determinations are also given for 5°, 10°, 15° and 20°. Additional data at 15° are given by Pinnow, 1921; at 20-22° by Behrens, 1926, at 25° by Smith 1921-2.

DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND ETHYL ETHER.

(de Kolossovsky, 1911.)

Results at Several Temperatures.

t°.	Gms. CH_3COOH per 100 cc. of H₂O Layer (p).	Gms. CH_3COOH per 100 cc. of Ether Layer (p').	$\frac{p}{p'}$
13	0.365	0.207	1.76
18	0.367	0.201	1.82
27	0.379	0.195	1.94
7.5	0.799	0.551	1.45
12	0.803	0.529	1.52
18	0.802	0.501	1.60
25	0.789	0.474	1.66

Results at 18°.

Gms. CH_3COOH per 100 cc. of H₂O Layer (p).	Gms. CH_3COOH per 100 cc. of Ether Layer (p').	$\frac{p}{p'}$
1.0	0.5	2.0
2.0	1.0	2.0
4.0	2.1	1.9
6.0	3.5	1.7
8.0	4.9	1.6
10.0	6.6	1.5
15.0	11.4	1.3
20.0	17.0	1.2
25.0	23.3	1.07

According to results obtained at 25° by Morgan and Benson (1907), the ratio of distribution for concentrations of acetic acid up to 12 grams per 100 cc. of the H_2O layer is more nearly constant (1.92) than shown above for 18°. A similar constancy of distribution (approx. 2.08 at 15°) was also found by Pinnow (1915).

Results showing the influence of varying concentrations of a large number of electrolytes upon the distribution of acetic acid between water and ether are given by de Kolossovsky, Dubrisay (1912), and by Hantzsch and Vagt (1901).

Data for the distribution of acetic acid between ether and molten $CaCl_2.6H_2O$ and ether and molten $LiNO_3.3H_2O$ are given by Morgan and Benson (1907).

One determination of the distribution of acetic acid between sat. aq. $CaCl_2$ solution (20 gms. per l.) and kerosene gave 97.7 gms. acid per 100 gms. aq. layer and 27 gms. per 100 gms. kerosene layer at ordinary temperature. (Crowell, 1918.)

DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND TOLUENE AT 25°.

(Woodman, 1926.)

Mixtures of weighed amounts of water and toluene were titrated with glacial acetic acid untill only a slight turbidity remained after shaking. The mixture was then placed in a thermostat and the titration continued to homogeneity.

Gms. per 100 gms. sat. solution.		Gms. per 100 gms. sat. solution.		Gms. per 100 gms. sat. solution.		Gms. per 100 gms. sat. solution.	
H_2O.	$C_6H_5CH_3$.	H_2O.	$C_6H_5CH_3$.	H_2O.	$C_6H_5CH_3$.	H_2O.	$C_6H_6CH_3$.
0.4721	81.3979	10.82	22.34	14.50	14.62	25.30	5.454
1.474	66.866	11.53	19.89	16.00	12.54	25.80	5.308
2.966	55.124	11.93	19.30	17.10	11.32	26.52	5.02
4.594	45.84	12.02	19.48	18.00	10.29	28.13	4.446
4.689	44.72	12.38	18.37	20.08	8.662	33.42	2.975
6.871	35.38	12.83	17.43	21.76	7.415	43.89	1.419
8.507	29.27	12.98	17.53	23.23	6.342	57.597	0.6533
9.809	25.28	13.56	16.07	24.34	5.97	67.8344	0.2856

In order to locate the points (tie lines) corresponding to upper and lower liquid layers, mixtures of the three components, yielding two layers, were brought to equilibrium in a thermostat and measured volumes of each layer weighed and titrated for acetic acid. The following results were obtained.

Aqueous layer.		Toluene layer.		Aqueous layer.		Toluene layer.	
d_4^{25}.	wt. % CH_3COOH.	d_4^{25}.	wt. % CH_3COOH	d_4^{25}.	wt. % CH_3COOH.	d_4^{25}.	wt. % CH_3COOH.
1.025	21.38	0.8614	1.374	1.049	67.70	0.8847	18.55
1.035	30.87	0.8630	2.797	1.044	69.71	0.8846	21.50
1.042	37.69	0.8650	4.072	1.039	70.55	0.8952	24.88
1.050	47.50	0.8676	6.363	1.024	69.85	0.9099	32.96
1.054	58.05	0.8730	10.35	1.006	66.68	0.9276	40.64
1.052	64.86	0.8796	14.98	0.9757	58.46	0.9588	53.07

DISTRIBUTION OF ACETIC ACID AT 25° BETWEEN:

(de Kolossowsky, 1934; de Kolossowsky, Kulikow and Bekturov, 1935.)

Water and Nitro Benzene			Water and o Nitro Toluene		
Gm. Mols. CH_3COOH per liter		$\frac{C_1}{C_2}$	Gm. Mols. CH_3COOH per liter		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$C_6H_5NO_2$ layer (C_2)		H_2O layer (C_1)	o $C_6H_4CH_3NO_2$ layer (C_2)	
0.178	0.0075	23.7	0.1418	0.0049	28.9
0.515	0.0248	20.8	0.2955	0.0108	27.4
0.842	0.0468	18.0	1.1075	0.0539	20.55
1.684	0.131	12.85	1.657	0.0969	17.1
2.414	0.234	10.32	2.860	0.216	13.06
4.116	0.543	7.58	3.889	0.366	10.63
5.314	0.805	6.60	5.449	0.612	8.90
7.881	1.581	4.98	6.919	0.808	7.71
9.337	2.510	3.72	8.717	1.422	6.15
9.880	3.690	2.68	10.827	3.581	3.02
9.488	5.095	1.86	9.752	5.987	1.63

Distribution of Acetic Acid at 25° Between Water and Toluene.

(de Kolossowsky and Megenine, 1932.)

Gm. Equiv. CH_3COOH per liter		$\frac{C_1}{C_2}$	Gm. Equiv. CH_3COOH per liter		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$C_6H_5CH_3$ layer (C_2)		H_2O layer (C_1)	$C_6H_5CH_3$ layer (C_2)	
0.9624	0.03758	25.61	7.1623	0.8377	8.55
1.8963	0.10373	18.28	8.782	1.218	7.21
2.8072	0.1928	14.56	10.256	1.744	5.88
3.7041	0.2959	12.52	11.473	2.527	4.51
4.5840	0.4160	11.02	12.190	3.810	3.20
5.4393	0.5670	9.70	12.5	12.5	1.0

Distribution of Acetic Acid at 25° between:

Water and *o* or *p* Xylene.

(Herz and Fischer.)

Gms. CH_3COOH per 100 cc.		G. M. CH_3COOH per 100 cc.	
H_2O Layer.	*o* or *p* Xylene Layer.	H_2O Layer.	*o* or *p* Xylene Layer.
5	0.24	0.1	0.004
10	0.48	0.2	0.010
20	1.13	0.4	0.025
30	2.15	0.6	0.047
40	3.40	0.8	0.079
50	5.10	1.0	0.122
60	7.27	1.2	0.230
70	12.52	...	...

See Note, page 106

Water and *m* Xylene.

(Herz and Fischer.)

Gms. CH_3COOH per 100 cc.		G. M. CH_3COOH per 100 cc.	
H_2O Layer.	*m* Xylene Layer.	H_2O Layer.	*m* Xylene Layer.
5	0.06	0.1	0.0015
10	0.30	0.2	0.007
20	0.95	0.4	0.022
30	1.91	0.6	0.042
40	3.04	0.8	0.072
50	4.65	1.0	0.111
60	6.65	1.2	...

Distribution of Acetic Acid at 20° Between Water and Iso Propyl Ether.

(Smith and Elgin, 1935.)

Gm. Mols. CH_3COOH per liter		$\frac{C_2}{C_1}$	Gm. Mols. CH_3COOH per liter		$\frac{C_2}{C_1}$
H_2O layer (C_1)	Ether layer (C_2)		H_2O layer (C_1)	Ether layer (C_2)	
0.0732	0.0136	0.185	0.8900	0.1733	0.196
0.0785	0.0140	0.178	1.1070	0.2290	0.207
0.1450	0.0254	0.177	1.3600	0.2803	0.206
0.2980	0.0560	0.188	1.4300	0.3260	0.228
0.3030	0.0577	0.190	1.7970	0.3994	0.222
0.6025	0.1186	0.196	2.7800	0.6740	0.242
0.6925	0.1430	0.206			

Iso Propyl Ether = $(CH_3)_2CHOCH(CH_3)_2$.

A method for the determination of the composition of mixtures of fatty acids, based upon their relative distribution between water and iso propyl ether is described by Werkman, 1930. A table of results for the distribution constants of mixtures of varying proportions of pairs of formic, acetic, proprionic, butyric and lactic acids between water and iso propyl ether at 25° is given.

DISTRIBUTION OF ACETIC ACID AT ROOM TEMPERATURE BETWEEN WATER AND PETROLEUM ETHER.

(Grossfeld and Miermeister, 1932.)

cc 0.1 n NaOH required for the CH_3COOH in 25 cc of:		cc 0.1 n NaOH required for the CH_3COOH in 25 cc of:	
H_2O layer	Pet. Ether layer	H_2O layer	Pet. Ether layer
6.6	0.030	46.7	0.080
13.6	0.045	97.8	0.228
22.6	0.056	172.4	0.608
		242.3	1.220

DISTRIBUTION OF ACETIC ACID AT 25° BETWEEN:

(Gordon and Reid, 1922.)

Water and Cotton Seed Oil.						Water and Kerosene.	
Gms. CH_3COOH per 100 gms.		Gms. CH_3COOH per 100 gms.		Gms. CH_3COOH per 100 gms.		Gms. CH_3COOH per 100 gms.	
H_2O layer.	C. S. oil layer.	H_2O layer.	C. S. oil layer	H_2O layer.	C. S. oil layer.	H_2O layer.	Kerosene layer.
1.9	0.0525	12.7	0.435	46.9	2.34	9.1	0.0676
2.1	0.0544	14.1	0.494	50.9	2.76	17.0	0.189
2.4	0.0698	16.1	0.583	62.1	3.94	27.2	0.445
7.5	0.239	28.9	1.22	70.2	5.37	46.9	1.145
8.2	0.267	31.8	1.34	81.8	9.70	59.2	1.915

DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND OLIVE OIL.

(Bodansky, 1928; Bodansky and Meigs, 1932.)

Results at 25°			Results at 37.5°		
Gm. Mols. CH_3COOH per liter			Gm. Mols. CH_3COOH per liter		
H_2O layer (C_1)	Oil layer (C_2)	$\frac{C_1}{C_2}$	H_2O layer (C_1)	Oil layer (C_2)	$\frac{C_1}{C_2}$
0.0102	0.0001	102.0	0.0102	0.0001	102.0
0.0492	0.0012	41.0	0.0492	0.0012	41.0
0.0960	0.0050	19.2	0.0962	0.0054	17.8
0.1970	0.0094	20.9	0.1930	0.0096	20.1

Data showing effect of camphor on the reciprocal solubility of acetic acid and olive oil are given by Wingard, 1917.

DISTRIBUTION OF ACETIC ACID BETWEEN WATER AND COLLODION.

(Northrop, 1929.)

Gm. Mols. CH_3COOH per liter of		
H_2O layer (C_1)	Collodion layer (C_2)	$\frac{C_2}{C_1}$
0.01	0.01	1.0
0.10	0.099	1.0
1.00	0.87	0.87
5.00	3.05	0.61

Results are also given for the distribution of acetic acid between aqueous sodium acetate solution and collodion

DISTRIBUTION OF ACETIC ACID BETWEEN AQUEOUS SODIUM ACETATE SOLUTIONS AND ETHYLETHER AT 20°. (Löfman, 1919.)

Concentration of CH_3COOH.	Distribution Coefficient $\frac{C_1}{C_2}\left(\frac{\text{G. M. } CH_3COOH \text{ per liter Aq. layer}}{\text{G. M. } CH_3COOH \text{ per liter Ether layer}}\right)$ in 0.0 normal CH_3COONa (=H_2O).	1.0 normal CH_3COONa sol.	2.0 normal CH_3COONa sol.	3.0 normal CH_3COONa sol.
0.0200 normal..	2.10	2.07	2.15	2.25
0.03125 » ..	2.10	2.15	2.15	2.25
0.0625 » ..	2.09	2.23	2.24	2.34
0.125 » ..	2.04	2.25	2.24	2.36
0.25 » ..	2.00	2.20	2.30	2.42
0.50 » ..	1.92	2.16	2.21	2.33
1.00 » ..	1.71	1.97	2.17	2.27
2.00 » ..	1.45	1.70	2.00	2.18

Results showing the distribution of acetic acid between aqueous salt solutions and benzene at 35° are given by Mittra, 1928.

DISTRIBUTION OF ACETIC ACID BETWEEN ACETONE AND GLYCEROL AT 25°.

(Smith, 1921-22.)

Millimols. CH_3COOH per liter in Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.	Millimols. CH_3COOH per liter in Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.
0.9425	1.725	1.83	3.875	7.00	1.81
1 00	1.825	1.82	4.60	8.20	1.78
1.60	3.025	1.80	4.85	8.60	1.77
2.77	4.70	1.70	10.00	17.60	1.76
2.775	4.775	1.72	17.30	29.30	1.69

Data for the distribution of mixtures of *Acetic Acid* and *Hydrogen Peroxide* between water and amyl alcohol, and between water and ether are given by Perschke and Tschufaroff, 1926. They also give results for the distribution of these compounds determined separately, which agree with those of Herz and Fischer, 1904-05, and Calvert 1901

DISTRIBUTION OF ACETIC ACID BETWEEN 2.2.4-TRIMETHYL PENTANE (i OCTANE) AND β METHOXY ETHANOL.

(Henriqies, 1933.)

Results at -19.5°

Gm. Mols. CH_3COOH per liter Pentane layer (1)	Ethanol layer (2)	$\frac{1}{2}$
0.0013	0.1709	0.0078
0.0029	0.3743	0.0077
0.0064	0.6652	0.0096

Results at 0°

Gm. Mols. CH_3COOH per liter Pentane layer (1)	Ethanol layer (2)	$\frac{1}{2}$
0.0033	0.1563	0.021
0.0046	0.1613	0.028
0.0084	0.3619	0.023
0.0105	0.3302	0.032
0.0169	0.6212	0.027

EQUILIBRIUM IN THE SYSTEM ACETIC ACID AND PYRIDINE.

(Sweringen and Ross, 1934.)

Mixtures of the two compounds contained in small sealed glass tubes were frozen and after removing from the freezing bath the point was determined at slowly rising temperature at which the last crystal disappeared in the melted mixture.

t°	Mol. Percent CH_3COOH in Mixture	Solid Phase	t°	Mol. Percent CH_3COOH in Mixture	Solid Phase
-43.5	0.00	C_5H_5N	-52.9	68.202	$C_5H_5N.4CH_3COOH$
-47.1	6.345	"	-47.5	72.438	" "
-50.6	12.566	"	-44.5 tr.pt.	74.790	" + CH_3COOH
-55.3	18.529	"	-31.8	76.256	CH_3COOH
-62.3	24.359	"	-26.9	77.722	"
-67.5 Eutec.	29.943	" + $C_5H_5N.CH_3COOH$	-17.7	80.771	"
-57.4	35.225	$C_5H_5N.CH_3COOH$	- 9.2	83.720	"
-51.6	40.268	"	- 5.9	84.773	"
-48.6	45.440	"	0.0	86.790	"
-48.2 m. pt.	50.004	"	+ 3.7	88.568	"
-49.1	54.890	"	6.6	90.710	"
-52.3	59.594	"	10.95	94.834	"
-56.7	63.927	"	16.3	100.000	"
-59. Eutec.	66.0	" + $C_5H_5N.4CH_3COOH$			

RECIPROCAL SOLUBILITY OF ACETIC ACID AND ANILINE.

(O' Connor, 1921.)

The freezing-point method could not be used in all cases and saturated solutions in contact with large amounts of solid at definite temperatures were prepared. These were analyzed by titrating the acetic acid in weighed portions and calculating the aniline by difference. The determinations were plotted and the following results read from the curve.

t°.	Mols. CH_3COOH per 100 mols. sat. sol.	Solid Phase.	t°.	Mols. CH_3COOH per 100 mols. sat. sol.	Solid Phase.
16.6....	100.0	CH_3COOH	16.7 (crit. t.)	67.0	$C_6H_5NH_2.2CH_3COOH$
15.0....	97.0	»	10.0....	46.5	»
10.0....	91.5	»	5.0....	38.7	»
5.0....	88.2	»	0.0....	32.2	»
0.0....	85.5	»	− 5.0....	27.0	»
− 2.4 tr. pt.	84.2	$CH_3COOH + C_6H_5NH_2.2CH_3COOH$	− 10.0....	22.5	»
− 5.0....	83.5	CH_3COOH (unstable)	− 15.6 tr. pt..	18.2	» + $C_6H_5NH_2$
− 10.0....	81.8	» »	− 17.0....	17.5	$C_6H_5NH_2.2CH_3COOH$ (unstable)
− 15.0....	80.4	» »	− 20.0....	40.0	$C_6H_5NH_2$ (unstable)
− 18.2....	79.7	» »	− 17.5....	22.0	» »
− 8.0....	85.5	$C_6H_5NH_2.2CH_3COOH$ (unstable)	− 15.0....	16.5	»
− 5.0....	84.7	» »	− 12.5....	11.0	»
0.0....	83.3	»	− 10.0....	6.5	»
+ 5.0....	81.5	»	− 7.5....	2.2	»
10.0....	79.0	»	− 6.0....	0.0	»

More recent determinations especially of the unstable regions, are given by Puschin and Rikovski, 1932(a).

EQUILIBRIUM IN THE SYSTEM ACETIC ACID AND NITROSOBENZENE.

(Hammick and Illingworth, 1930.)

The synthetic, sealed tube, method was used and the end point taken as that at which the last small trace of solid just failed to disappear.

t°		Mol. Percent C_6H_5NO in Mixture	Solid Phase	t°	Mol. Percent C_6H_5NO in Mixture	Solid Phase
16.3		0.0	CH_3COOH	52.0	39.57	C_6H_5NO
16	Eutec.	7.0	" $+ C_6H_5NO$	57.7	55.31	"
27.5		11.06	C_6H_5NO	58.5	58.82	"
41.0		20.49	"	62.0	69.42	"
47.0		29.16	"	68.5	100.00	"

SOLUBILITY OF ACETIC ACID IN CARBON DISULFIDE, CYCLOHEXANE AND IN PETROLEUM.

(Jones, 1923.)

The synthetic method was used and attention was directed particularly to the region of the critical solution temperature. The author was interested in the effect of small amounts of water upon the critical solution temperature and the use of this data as a criterion of purity of acetic acid. In addition to the results for pure acetic acid he gives data for the change in C. S. T. caused in each case by increasing amounts of water.

$CH_3COOH + CS_2$.		$CH_3COOH + C_6H_{12}$.		$CH_3COOH + $ Petroleum (b. pt. 185°-195°).	
Miscibility temp.	Gms. CH_3COOH per 100 gms. sat. sol.	Miscibility temp.	Gms. CH_3COOH per 100 gms. sat. sol.	Miscibility temp.	Gms. CH_3COOH per 100 gms. sat. sol.
0.5	19.6	1.0	34.5	22.9	25.54
3.9*	42.7	3.2	42.3	36.2	26.92
2.9	56.1	4.2*	54.6	47.2	41.0
2.6	24.6	2.8	67.03	49.80	52.72
3.9	49.3	—2.8	76.0	50.15*	56.91
—5.2	66.1			50.5*	65.57
				48.9	73.5
				39.6	82.51
				25.6	88.51

*Denotes critical solution temp.

SOLUBILITY OF ACETIC ACID IN COTTON SEED OIL AND IN KEROSENE AND VICE VERSA.

(Gordon and Reid, 1922.)

The mixtures were constantly shaken at 25° for four hours. After separation of the two layers the acetic acid in weighed amounts of each was determined by titration. The weight of oil was calculated by difference.

100 gms.	Cotton Seed Oil	dissolve	55.7	gms. CH_3COOH at 25°
»	Kerosene	»	21.77	gms. »
»	Anhydrous acetic acid	»	5.6	gms. Cotton Seed Oil at 25°
»	»	»	12.5	gms. Kerosene at 25°

ACETIC ACID

Freezing-point data are given for mixtures of Acetic Acid and each of the following compounds:

Acetamide (25)
Acetic Anhydride (8)
Aniline (21)(23)
Azobenzene (22)(31)
Benzamide (25)
Benzene (3)(9)(10)(11)(12)(13)(14)
Benzene + Water (10)
Benzene + Naphthalene (11)
Benzene + Vaseline (11)
Benzoic Acid (1)
Carbon Disulfide (8)
Chloro Acetic Acid (1). (6)
Chloro Benzene (27)(18)
Cyclohexane (16)(17)
Di chloro Acetic Acid (1)
Di methyl Aniline (24)(29)
Di methyl Oxalate (3)
Di methyl Pyrone (2)
Di methyl Succinate (3)
Ethyl Ether (8)
Ethylene Bromide (9)(14)(15)
Formamide (19)
Formic Acid (18)
Mesidine (24)
Mercuric Acetate (7)
Mercuric Acetate + Phenol (7)
α and β Naphthylamine (21)
Nitrobenzene (9) (18)
o, *m*, *p* Phenylene diamine (21)
Phenol (7)
Phenyl Hydrazine (32)(29)
Picric Acid (4)
Piperidine (29)
Propyl Alcohol (8)
Pyridine (29)
Phosphorus Acid (26)
Quinoline (29)
Sodium Acetate (5)
Sulfuric Acid (8)
Styryl Ketone (30)
o, *m*, *p* Toluidine (21) (24)
Thymol (20)
Trichloro Acetic Acid (1)
Urea (28)(21)
Urethan (28)
p Xylene (20)

(1) Kendall, 1914; (2) Kendall, 1914(a); (3) Kendall and Booge, 1916; (4) Kendall, 1916; (5) Kendall and Adler, 1921; (6) Mameli and Mannessier, 1913; (7) Mameli and Cocconi, 1922; (8) Pickering, 1893; (9) Dahms, 1895; (10) Dahms, 1896; (11) Roloff, 1895; (12) Groschuff, 1911; (13) Baud, 1912; (14) Baud, 1912(a); (15) Baud, 1912(b); (16) Baud, 1913(a); (17) Baud, 1913(b); (18) Baud, 1913(c); (19) English and Turner, 1915; (20) Paterno and Ampola, 1897; (21) Kremann, Weber and Zechner, 1925; (22) Kremann and Zechner, (1925); (23) O'Connor, 1921; (24) O'Connor, 1924; (25) Kremann Mauermann and Oswald, 1922; (26) Redfield and King, 1936; (27) Burnham and Madgin, 1936; (28) Puschin and Rikovsky, 1932; (29) Puschin and Rikovsky, 1932(a); (30) Puschin and König, 1928; (31) Bradley and Marsh, 1933; (32) Trifonov and Tscherbow, 1929.

GLYCOLIC ACID $CH_2OH.COOH$.

SOLUBILITY IN WATER. (Emich, 1884.)

t°.	20°.	60°.	80°.	100°.
Gms. $CH_2OH(COOH)$ per 100 gms. H_2O	0.033	0.102	0.235	0.850

DISTRIBUTION OF GLYCOLIC ACID BETWEEN WATER AND ETHER.

(Pinnow, 1919.)

Results at 15°.

Concentration of acid in		$\frac{(1)}{(2)}$.
H_2O layer (1).	$(C_2H_5)_2O$ layer (2)	
0.741	0.0235	31.5
0.3695	0.0114	32.4
0.179	0.0055	32.5
0.120	0.00375	32.0
1.258	0.0398	31.6

Results at 25°–8°.

Concentration of acid in		$\frac{(1)}{(2)}$.
H_2O layer (1).	$(C_2H_5)_2O$ layer (2).	
1.0975	0.0307	35.7
0.3442	0.0090	38.2
0.174	0.0048	36.3
0.1125	0.0026	44.1

Distribution of Glycolic Acid at 20° Between:

(Dietzel and Schmitt, 1932.)

Water and Ethyl Ether

Gm. Mols. $CH_2OH.COOH$ per liter H_2O layer	Gm. Mols. $CH_2OH.COOH$ per liter $(C_2H_5)_2O$ layer
0.250	0.0087
0.442	0.0141
0.634	0.0195
0.890	0.0267
1.146	0.0339

Water and Amyl Alcohol

Gm. Mols. $CH_2OH.COOH$ per liter H_2O layer	Gm. Mols. $CH_2OH.COOH$ per liter $C_5H_{11}OH$ layer
0.243	0.0415
0.429	0.0769
0.677	0.1241
0.925	0.1713
1.173	0.2185

THIACETIC ACID CH_3COSH.

Distribution of Thiacetic Acid at 25° Between: (Smith, 1921, 1922.)

Water and Ethyl Ether Millimols. CH_3COSH per liter. H_2O layer (C_1).	Water and Ethyl Ether Millimols. CH_3COSH per liter. $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone and Glycerol. Millimols. CH_3COSH per liter. Acetone layer (A).	Acetone and Glycerol. Millimols. CH_3COSH per liter. Glycerol layer (G).	$\frac{A}{G}$.
0.967	0.802	0.830	3.04	1.56	1.95
1.39	1.165	0.839	5.36	2.36	2.27
3.175	2.675	0.843	9.40	3.60	2.62
6.00	5.30	0.884	14.30	4.60	3.10
9.70	8.50	0.877	30.10	9.40	3.20

ETHYL BROMIDE (Bromo Ethane) CH_3CH_2Br.

Solubility of Ethyl Bromide in Water.

t°	Gms. C_2H_5Br per 100 gms. H_2O	Authority
0	1.067	Rex, 1906
10	0.965	" "
17.5	0.963	Führer, 1924
20	0.914	Rex, 1906
30	0.896	" "
30	0.893	Van Arkel and Vles, 1936

Solubility of Ethyl Bromide in Ethyl Ether.

(Parmentier, 1892.)

t°	Gms. C_2H_5Br per 100 gms. $(C_2H_5)_2O$	t°	Gms. C_2H_5Br per 100 gms. $(C_2H_5)_2O$
-13	632	22.5	302
0	561	32	253
12	462		

Freezing-point data are given for:

Ethyl Bromide + Carbon disulfide (Timmermans, 1934.)
" " + Benzene (Wyatt, 1929.)
" " + n Butyl bromide (Timmermans, 1934.)
" " + iso Butyl bromide " "
" " + Ethylene bromide (Timmermans, 1928; (a).)
" " + Methylene bromide (Timmermans, 1934.)
" " + iso Pentane (Sapgir, 1929.)
" " + Propyl bromide " "

(a) Timmermans and Mme. Vesselovsky, 1931.

ETHYL CHLORIDE (Chloro Ethane) CH_3CH_2Cl.

SOLUBILITY OF ETHYL CHLORIDE IN WATER.

t°	Gms. C_2H_5Cl per 100 gms. H_2O	Authority
0	0.447	Van Arkel and Vles, 1936
17.5	0.57	Fühner, 1924

SOLUBILITY OF ETHYL CHLORIDE IN CARBON TETRACHLORIDE AND IN DICHLORO ETHANE.

(Kaplan and Romantchouk, 1936.)

Solvent	t°	cc C_2H_5Cl (at 0° and 760mm) dissolved per 1cc solvent at:						
		100	150	200	240	300	500	640mm Hg pressure
CCl_4	-10	16	30	58	148	—	—	—
"	0	10	16	40	58	114	—	—
"	+20	10	16	22	30	40	118	300
$C_2H_4Cl_2$	-10	50	112	190	300	—	—	—
"	0	37	70	107	150	227	—	—
"	+20	25	38	52	67	85	182	340

SOLUBILITY OF ETHYL CHLORIDE IN ORGANIC SOLVENTS AT 32°.

(Zellhoeffer, 1937; Zellhoeffer, Copley and Marvel, 1938.)

Solvent	Formula Formula	Gms. C_2H_5Cl per 100 cc. Solvent at 557 mm pressure(1)
Carbitol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	23.8
Carbitol ethyl ether	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	27.8
Dimethyl ether of tetraethylene glycol	$CH_3O(CH_2CH_2O)_4CH_3$	21.8
" " "	"	23.7 (2)
Diethyl ether of tetraethylene glycol	$C_2H_5O(CH_2CH_2O)_4C_2H_5$	21.2
Dimethyl ether of triethylene glycol	$[CH_3O(CH_2)_2OCH_2]_2$	17.0
Butyl carbitol acetate	n $C_4H_9O(CH_2CH_2O)_2COCH_3$	22.5
Diethylene glycol diacetate	$[CH_3COOCH_2CH_2]_2O$	18.1
1.1.2.2 Tetrachloro ethane	$Cl_2CHCHCl_2$	30.8
Ethyl ether of diethylene glycol acetate	$C_2H_5O(CH_2CH_2O)_2COCH_3$	24.5 (2)
Diethyl ether of diethylene glycol	$C_2H_5O(CH_2CH_2O)_2C_2H_5$	30.6 (2)

(1) Vapor pressure of C_2H_5Cl at 4.5°.
(2) Gms. per 100 gms. solvent at 557 mm pressure and 32.2°.

GLYCOL CHLOR HYDRINE CH_2ClCH_2OH.

Results for the critical solution temperature of mixtures of glycol chlor hydrine and i Octane are given by Cornish, Archibald, Murphy and Evans, 1934.

ETHYL IODIDE (Iodo Ethane) CH_3CH_2I.

SOLUBILITY OF ETHYL IODIDE IN WATER.

t°	Gms. C_2H_5I per 100 gms. H_2O	Authority
0	0.441	Rex, 1906
10	0.414	"
20	0.403	"
22.5	0.390	Fühner, 1924
30	0.404	Gross and Saylor, 1931
30	0.415	Rex, 1906

The distribution coefficient, defined as the milligrams of C_2H_5I per liter of blood divided by the mgs. per liter of the saturaging gas mixture, composed of approximately 40 mgs. C_2H_5I per liter of air, was found to be 6.7 at 37°, for the bloods of 15 normal individuals. A correlation of this value and the number of red blood cells and the percentage of haemoglobin was made.

Freezing-point data for mixtures of Ethyl Iodide and Ethyl Ether are given by Wroczynski and Guye, 1910.

ETHYL HYPOCHLORITE C_2H_5OCl

DISTRIBUTION OF ETHYL HYPOCHLORITE BETWEEN WATER AND CARBON TETRACHLORIDE.

(Taylor, Mac Mullin and Gammal, 1925.)

Carbon tetrachloride containing ethyl hypochlorite was stirred with an equal volume of water untill equilibrium was reached, and samples of each layer were withdrawn and analyzed for available chlorine.

	Mols. C_2H_5OCl per liter of	
t°.	CCl_4.	H_2O.
5..........	0.3355	0.0805
»..........	0.1583	0.0541
»..........	0.0690	0.0341
22.5........	0.3499	0.08019
»	0.1997	0.0597
22.5.......	0.0637	0.0321
36.0.......	0.3121	0.0759
»	0.1642	0.0540
»	0.0692	0.0344

ACETAMIDE $CH_3CO.NH_2$.

SOLUBILITY IN WATER AND IN ALCOHOL. (Speyers, 1902)

	In Water.			In Ethyl Alcohol.		
t°.	(*a*).	(*b*).	(*c*).	(*a*).	(*b*).	(*c*).
0.....	105.5	138.0	29.6	85.62	29.0	18.5
10.....	104.9	170.0	34.0	86.2	43.0	26.0
20.....	104.3	220.0	40.8	87.3	65.0	33.8
30.....	103.7	300.0	47.7	88.8	100.0	43.0
40.....	103.0	410.0	55.5	90,7	145.0	53.5
50.....	102.3	560.0	64.0	93.0	220.0	64.5
60.....	101.6	850.0	74.0	95.5	370.0	76.5

(*a*) Wt. of 100 cc. sat. solution in gms. (*b*) Gms. Acetamide per 100 gms. solvent. (*c*) Gm. mols. Acetamide per 100 gm. mols. solution.

100 gms. commercial absolute ethyl alcohol dissolve 31.5 gms. Acetamide at 20-25° C.

(Pucher and Dehn, 1921.)

Results for the freezing-point depressions of aqueous acetamide solutions containing increasing gram formular weights of CH_3CONH_2 per 1000 gms. of H_2O are given by Chadwell and Poleti, 1938.

SOLUBILITY OF ACETAMIDE IN BENZENE BY THE SYNTHETIC METHOD.

(Moles and Jimeno, 1913.)

t°.	Gms. Acetamide per 100 gms.		t°.	Gms. Acetamide per 100 gms.	
	Acetamide layer.	Benzene layer.		Acetamide layer.	Benzene layer.
100	86.0	4.0	135	59.0	11.5
110	81.0	5.0	137.5	55.0	14.0
120	74.0	6.5	140	50.0	19.0
125	70.0	7.0	142	39.0	24.0
130	65.0	8.5	142.5 crit. t.	34.0	

SOLUBILITY OF ACETAMIDE IN URETHAN AND IN *p* TOLUIDINE.

(Mortimer, 1923.)

t°.	In Urethan.		t°.	In *p* Toluidine.	
	Gms. acetamide per 100 gms. Urethan.	Mols. per cent Acetamide.		Gms. acetamide per 100 gms. *p* Toluidine.	Mols. per cent acetamide.
40	65.7	49.8	40	27.2	33.0
60	179.2	73.0	60	35.5	60.8
70	295.8	87.1	70	213.8	79.5

100 gms. pyridine dissolve 17.75 gms. acetamide at 20–25°; 100 gms. aq. 50 per cent pyridine dissolve 84.7 gms. acetamide at 20–25°. (Dehn, 1917.)

CRITICAL SOLUTION TEMPERATURES OF SEPARATION OF MIXTURES OF ACETAMIDE AND OTHER COMPOUNDS.

(Lecat, 1927a; 1928, 1929, 1930.)

Mixture of CH_3CONH_2 and:	t^0 of Separation	Percent CH_3CONH_2 in Mixture	Mixture of CH_3CONH_2 and:	t^0 of Separation	Percent CH_3CONH_2 in Mixture
Acenaphthene	178	64	Ethyl oxalate	31.5	—
i Amyl Benzoate	140	55	Ethyl benzoate	70.8	—
i Amyl butyrate	126.8	12	Eugenol	59.5	—
i Amyl valerate	163	16	Eugenol methyl ether	61.5	—
i Amyl oxalate	113	—	i " " "	74	—
Benzyl acetate	56	—	Guaicol	20.5	—
Borneol	116	—	Geraniol	58.6	—
Bornyl acetate	134	32	Indol (from Indene)	144	17.5
Bromo benzene	110	4	p Iodo toluene	175	—
Bromo α naphthalene	175	56.5	β Iso safuol	128.5	47
p Bromo toluene	156	—	Menthol	45	—
i Butyl benzoate	126	42.5	Methyl benzoate	61.7	—
n " "	132	49	p Methyl acetophenone	54.4	—
i " valerate	119	10.5	Methyl cinnamate	60.8	—
i " valerianate	163	—	Methyl salicylate	80.6	29
Chloro α naphthalene	168.3	52	Methyl α naphthalene	169.5	44
p chloro nitro benzene	73.2	—	Naphthalene	148.5	27
Cineol	67	—	o Nitro phenol	43	—
Citronelal	50	—	Penta chloro ethane	95	3
p Cresol methyl ether	107	11	Phenetol	108.5	11
Di benzyl	185	68	Phenyl acetate	30	—
p Di bromo benzene	180	18	Phenyl ether	113	—
o Di chloro benzene	150	11	Phenyl oxide	160.8	52
p " "	148.5	10	Pulegon	66	36
Di methyl aniline	120.5	17.3	Propyl benzoate	115	—
o Di methyl toluidine	174	16.5	Saf rol	136.5	32
Di phenyl	167	50.5	i "	128.5	—
" methane	178	56.5	o Toluidine	24.3	—

ACETAMIDE

Freezing-point data are given for mixtures of Acetamide and each of the following compounds:

Acetic acid (1)
Acetic anhydride (1)
Benzene (7)
Benzoic Acid (1)
Benzoic anhydride (1)
Camphor (9)
o, m & p Dioxy benzene (2)
α & β Naphthol (2)
o, m & p Nitrophenol (2)
Nitroso dimethyl aniline (3)
Oxy benzoic acid (2)
Phthalide (8)
Phenol (4)(10)
Phenol + C_2H_5OH (4)
Pyrogallol (5)
Salicylic acid (6)
Triphenyl guanidine (8)

(1) Kremann, Mauerman and Oswald, 1922 (2) Kremann and Auer, 1918; (3) Kremann and Wlk, 1919; (4) Kremann and Wenznig, 1917; (5) Kremann and Zechner, 1918; (6) Rheinboldt, Henning and Kircheisen, 1925; (7) Moles and Jimeno, 1913; (8) Lautz, 1913; (9) Jefremow, 1915; (10) Boon, 1939.

METHYL URETHAN NH_2COOCH_3.

DISTRIBUTION OF METHYL URETHAN BETWEEN WATER AND OLIVE OIL.

(Baum, 1899; H. von Meyer, 1909.)

t°	Gms. NH_2COOCH_3 per 100 cc		$\frac{C_2}{C_1}$
	H_2O layer (C_1)	Oil layer (C_2)	
room temp.	7.50	0.275	0.037

Freezing-point data for mixtures of Methyl Urethan and Menthol are given by Scheuer, 1910

GLYCINE (Glycocoll) CH_2NH_2COOH.

SOLUBILITY OF GLYCINE IN WATER.

(Dalton and Schmidt, 1933.)

The following values are those derived from a solubility equation based upon the results of thirty very careful solubility determinations made at ten temperatures between 0° and 60°. Previous determinations by Dehn, 1917,; Pfeiffer and Wüngler, 1916; Pfeiffer and Angern, 1924; Cohn, 1932, Sano, 1926a and Ando, 1926, differ more or less from the present results. The authors also give density determinations at 25° of aqueous glycine solutions varying in concentration from 9.2 to 20.4 per-cent CH_2NH_2COOH. The following results shown in parentheses are by Dunn, Ross and Reed, 1933. The density of the saturated solution at 25° is given as 1.0831 by McMeekin, Cohn and Weare, 1936.

t°	Gms. CH_2NH_2COOH per 100 gms. H_2O	t°	Gms. CH_2NH_2COOH per 100 gms. H_2O	t°	Gms. CH_2NH_2COOH per 100 gms. H_2O
0	14.18 (14.31)	30	27.59	60	45.26
5	16.03	35	30.32	65	48.35
10	18.04	40	33.16	70	51.39
15	20.20	45	36.19	75	54.39 (57.49)
20	22.52	50	39.10 (40.15)	100	67.17 (75.20)
25	24.99 (25.31)	55	42.18		

GLYCINE

SOLUBILITY OF GLYCINE IN WATER AND IN AQUEOUS SOLUTIONS OF SALTS AT 20°.

(Pfeififfer and Würgler, 1916.)

Solutions of the neutral salts of known content were shaken with glycine two days at 20°. This period was sufficient for complete saturation. The glycine present in the saturated solution was determined by the Sörensen titration method. Tests showed that the salts present did not interfere with the accuracy of the method. For the solutions in which large quantities of glycine dissolved, a correction of the concentration of the salt resulting from the expansion of the solution, was applied. This was 0.58 cc. for each gram of glycol in 2 cc. of the sat. solution made with salt solution containing *m* mols of salt per 10 cc. The correction ormula is $x = m\left(\frac{2 - n \cdot 0.58}{2}\right)$ in which *n* is the grams of glycol per 2 cc.

Salt used.	Mols. salt per liter of		Gms. Glycine per 100 cc. sat. sol.	Salt used.	Mols. salt per liter of		Gms. Glycine per 100 cc. sat. sol.
	original solution.	final sol. sat. with glycine.			original solution.	final sol. sat. with glycine.	
$LiCl$	0.96	0.843	20.94	$CaCl_2$	0.267	0.234	21.48
$LiBr$	0.97	0.851	21.22	»	0.534	0.461	23.48
$NaCl$	1.00	0.881	20.49	»	0.57	0.49	24.24
»	2.00	1.76	20.90	»	1.07	0.90	27.35
»	4.00	3.50	21.28	»	2.14	1.70	35.08
$NaBr$	1.00	0.88	20.62	$Ca(NO_3)_2$	0.5	0.426	25.57
NaI	0.96	0.844	20.90	$Ba(ClO_4)_2$	0.412	0.351	25.45
$NaNO_3$	0.5	0.44	20.75	»	0.617	0.520	27.66
»	1.0	0.874	21.76	»	0.836	0.693	29.49
»	2.0	1.73	23.12	$BaCl_2$	0.5	0.431	23.75
»	4.0	3.42	24.89	$BaBr_2$	0.5	0.428	24.54
$NaClO_4$	1.0	0.870	21.74	$Ba(NO_3)_2$	0.5	0.428	24.85
Na_2SO_4	0.5	0.439	20.95	$SrCl_2$	0.25	0.219	21.36
KCl	0.5	0.443	19.78	»	0.5	0.432	23.31
»	1.0	0.886	19.78	»	1.0	0.849	26.05
»	2.0	1.77	19.60	»	2.0	1.62	33.01
»	4.0	3.59	17.81	$SrBr_2$	0.49	0.421	24.40
$CaBr_2$	0.5	0.436	24.97	$Sr(NO_3)_2$	0.5	0.428	24.91

Several determinations in 2.0 normal solutions of LiBr, NaBr and KBr made with 2.0 normal H Cl instead of water gave 34.7 gms. glycine per 100 cc. in each case. A similar determination made with 2.0 *n* Na NO_3 in 2.0 *n* HCl gave 37.56 gms. glycine.

100 cc aqueous solution simultaneously saturated with potassium chloride and glycine at 20° contain 18.0 gms. CH_2NH_2COOH + 27.0 gms. KCl. (Pfeiffer and Modelski, 1912.)

10 cc of saturated cold aqueous magnesium perchlorate solution dissolve about 8.0 gms. of NH_2CH_2COOH. (Du claux and Durand-Gasselin, 1938.)

SOLUBILITY OF GLYCINE IN AQUEOUS SALT SOLUTIONS AT 22°.

(Ando, 1931.)

Aqueous Solution of:	Conc. of Aq. Sol.	Gms. NH_2CH_2COOH per liter sat. sol.	Aqueous Solution of:	Conc. of Aq. Sol.	Gms. NH_2CH_2COOH per liter sat. sol.
RbCl	1.0 n	195.1	K_2SO_4	1.0 n	208.5
KCl	1.0 n	203.9	KI	1.0 n	209.2
"	3.0 n	199.2	CH_3COONa	1.0 n	196.1
NaCl	1.0 n	209.8	$BaCl_2$	1.0 n	234.9
"	3.0 n	215.4	$CaCl_2$	1.0 n	242.9
LiCl	1.0 n	217.6	Mannitol	0.5 n	186.7
KBr	1.0 n	205.1	Cane Sugar	1.0 n	155.7
KNO_3	1.0 n	208.5	" "	1.0 n	196.9

SOLUBILITY OF GLYCINE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL.

(Dunn and Ross, 1938.)

t°	Wt. Percent C_2H_5OH in Solvent	d. of sat. solution	Gms. CH_2NH_2COOH per 100 gms. solvent	t°	Wt. Percent C_2H_5OH in Solvent	d. of sat. solution	Gms. CH_2NH_2COOH per 100 gms. solvent
0	20.32	0.988	3.95	45	20.32	1.01	15.0
0	42.52	0.942	1.03	45	42.52	0.928	4.62
0	67.27	0.884	0.20	45	66.94	0.856	0.756
0	92.54	0.820	0.008	45	92.61	0.795	0.0294
25	20.32	0.994	8.72	65	20.32	1.03	24.5
25	42.52	0.931	2.47	65	42.52	0.930	8.03
25	66.94	0.869	0.448	65	66.94	0.847	1.23
25	92.61	0.806	0.0172	65	92.61	0.784	0.0488

SOLUBILITY OF GLYCINE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(Cohn, McMeekin, Edsall and Weare, 1934.)

Vol. Percent C_2H_5OH in Solvent	d. of Solvent	d. of sat. Solution	Gms. CH_2NH_2COOH per 100 gms. sat.sol.	Vol. Percent C_2H_5OH in Solvent	d. of Solvent	d. of sat. Solution	Gms. CH_2NH_2COOH per 100 gms. sat. sol.
0.0	0.9971	1.0831	20.00	20.0	0.9717	1.0140	9.944
5.0	0.9901	1.0646	17.31	40.0	0.9447	0.9611	3.962
10.0	0.9935	1.0464	14.64	60.0	0.9051	0.9107	1.296
15.0	0.9774	1.0307	12.16	80.0	0.8550	0.8598	0.243

Data for the solubility of glycine in aqueous and in aqueous alcohol solutions of different hydrogen ion concentrations are given by Sano, 1926a.

SOLUBILITY OF GLYCINE AT 25° IN 80 VOLUME PERCENT ETHYL ALCOHOL CONTAINING INCREASING AMOUNTS OF SODIUM CHLORIDE.

(Cohn, McMeekin, Greenstein and Weare, 1936.)

Gms. NaCl per liter of solvent	d. of solvent	d. of sat. solution	Gms. CH_2NH_2COOH per liter sat. sol.
0.0	0.8550	0.8598	2.09
0.05	0.8569	0.8580	2.34
0.15	0.8603	0.8617	3.00
0.25	0.8646	0.8654	3.73

Similar results are given for Hydantoic Acid, and α Amino-caproic Hydantoic Acid, and in terms of gm. mols. per liter, for a number of Glycine Peptides and Hydantoic Acids.

DISTRIBUTION OF GLYCINE BETWEEN WATER AND BUTYL ALCOHOL AT 25°.

(England and Cohn, 1935.)

Gm. Mols. CH_2NH_2COOH per liter of:		$\frac{C_2}{C_1}$	Gm. Mols. CH_2NH_2COOH per liter of:		$\frac{C_2}{C_1}$
H_2O layer(C_1)	Alcohol layer(C_2)		H_2O layer(C_1)	Alcohol layer(C_2)	
0.208	0.0029	0.0142	1.760	0.0113	0.0065
0.701	0.0083	0.0119	2.443	0.0129	0.0053 (1)
1.353	0.0108	0.0081			

(1) In this case solid CH_2NH_2COOH was present and these results correspond respectively to the solubility of glycine in water saturated with butyl alcohol and to the solubility in butyl alcohol saturated with water.

The solubility of butyl alcohol in water saturated with glycine at 25° was found to be 0.44 gm. mols. per liter.

SOLUBILITY OF GLYCINE IN SEVERAL SOLVENTS AT 25°.

((McMeekin, Cohn and Weare, 1936.)

Solvent	Formula	d. of sat. solution	Gm. Mols. CH_2NH_2COOH per liter sat. sol.
Water	H_2O	1.0831	2.886
Formamide	$HCONH_2$	1.13306	0.0838
Methanol	CH_3OH	0.78696	0.00426
Ethanol	C_2H_5OH	0.7851	0.00039
Butanol	$CH_3(CH_2)_2CH_2OH$	0.80674	0.0000959
Acetone	CH_3COCH_3	0.78566	0.0000305

SOLUBILITY OF GLYCINE IN SEVERAL SOLVENTS.

(Dehn, 1917; Pucher and Dehn, 1921.)

Solvent	t°	Gms. CH_2NH_2COOH per 100 gms. solvent
Pyridine	20-25	0.61
Aq. 50% Pyridine	"	0.74
Quinoline	"	0.07
Ethyl Alcohol	"	0.06
Equiv. mol. mixture of Quinoline and Ethyl Alcohol	"	0.17

BIURET (Carbamyl urea) $NHCONH_2CONH_2.H_2O$.

Freezing-point data for mixtures of Buiret and Urea are given by Janecke and Rahlfs, 1932.

Phosphono**ACETIC ACID** $HOOC.CH_2PO(OH)_2$.

100 gms. saturated solution in Water contain 64.5 gms. $HOOC.CH_2PO(OH)_2$ at 0°.

(Nylén, 1926.)

ETHANE C_2H_6.

SOLUBILITY IN WATER.

(Winkler, 1901.)

t°.	β.	β'.	q.	t°.	β.	β'.	q.
0	0.0987	0.0982	0.0132	40	0.0292	0.0271	0.0037
5	0.0803	0.0796	0.0107	50	0.0246	0.0216	0.0029
10	0.0656	0.0648	0.0087	60	0.0218	0.0175	0.0024
15	0.0550	0.0541	0.0073	70	0.0195	0.0135	0.0018
20	0.0472	0.0462	0.0062	80	0.0183	0.0097	0.0013
25	0.0410	0.0398	0.0054	90	0.0176	0.0054	0.0007
30	0.0362	0.0347	0.0049	100	0.0172	0.0000	0.0000

β = Absorption coefficient, *i.e.*, the volume of gas (reduced to 0° and 760 mm.) absorbed by 1 volume of the liquid when the pressure of the gas itself without the tension of the liquid amounts to 760 mm.

β' = Solubility, *i.e.*, the volume of gas (reduced to 0° and 760 mm.) which is absorbed by one volume of the liquid when the barometer indicates 760 mm. pressure.

q = the weight of gas in grams which is taken up by 100 grams of the pure solvent at the indicated temperature and a total pressure (that is, the partial pressure of the gas plus the vapor pressure of the liquid at the absorption temperature) of 760 mm.

Freezing-point data for mixtures of ethane and hydrochloric acid are given by Baume and Georgitses, 1912, 1914.

SOLUBILITY OF ETHANE IN SEVERAL ALCOHOLS AND OTHER SOLVENTS.

(McDaniel, 1911.)

Solvent	t°	Abs. Coef. A	Bunsen Coef. B.
Methyl alcohol (99%)	22.5	2.0235	1.8710
" "	30.1	1.8817	1.6952
" "	42.5	1.7304	1.4852
Ethyl alcohol (99.8%)	22.0	2.3344	2.1616
" "	30.0	2.2151	1.9951
" "	40.0	2.0657	1.8020
Hexane	22.1	3.3508	3.1035
"	30.0	3.1842	2.8680
"	55.0	2.8812	2.4008
Heptane	30	4.4200	3.9820
"	40	4.2632	3.7182
Ethyl Acetate	22	3.0800	2.8521
" "	30	3.0601	2.7575
" "	40	3.003	2.6178
Amyl Acetate	22	3.5761	3.3085
" "	30	3.3891	3.0518
" "	50	2.8909	2.4433

Abs. coef. A = vol. of ethane absorbed by unit volume of solvent at the temp. stated.

For definition of Bunsen Coef. B, see β above.

Additional data for the solubility of ethane in amyl alcohol are given by (Friedel and Gorgeu, 1908).

ETHANE C_2H_6.

SOLUBILITY OF ETHANE IN SEVERAL SOLVENTS AT VARIOUS TEMPERATURES.

(Horiuti, 1931.)

t^0	Solubility of C_2H_6 in terms of the Ostwald Solubility Expression l in:				
	CCl_4	$(CH_3)_2CO$	CH_3COOCH_3	C_6H_6	C_6H_5Cl
0	7.648	4.202	4.195	—	4.900
10	6.604	3.761	3.780	4.885	4.270
20	5.716	3.389	3.414	4.360	3.750
25	5.366	3.225	3.246	4.120	3.534
30	5.016	3.067	3.106	3.921	3.340
40	4.446	2.790	2.825	3.552	3.013
50	—	—	—	3.255	2.745
60	—	—	—	—	2.509
70	—	—	—	—	2.312
80	—	—	—	—	2.146

The Ostwald Solubility Expression l is the ratio of the volume (v) of the gas absorbed at any pressure and temperature, to the volume (V) of the absorbing liquid, that is $l = \frac{v}{V}$

One liter of Cyclohexanol dissolve 711.5 cc C_2H_6 at 26° and 766 n pressure. Cauquil, 1927.

Results for the pressure-temperature diagrams of the following systems are given by Scheffer and Smittenberg, 1933.

C_2H_6 + p dichloro benzene
" + p chloro bromo benzene
" + p chloro iodo benzene
" + 1.3.5 tri chloro benzene
" + p chloro aniline

C_2H_6 + o chloro nitro benzene
" + m " " "
" + o nitro phenol
" + as o Xylidene
" + p toluidine

METHYL ETHER $(CH_3)_2O$.

SOLUBILITY OF METHYL ETHER IN SEVERAL SOLVENTS AT 25° AND AT VARIOUS PRESSURES.

(Horiuti, 1931.)

Results for solubility in:

CCl_4		$(CH_3)_2CO$		CH_3COOCH_3	
Pressure mm	Mol. fraction $(CH_3)_2O$ in sat. sol.	Pressure mm	Mol. fraction $(CH_3)_2O$ in sat. sol.	Pressure mm	Mol. fraction $(CH_3)_2O$ in sat. sol.
112.4	0.000	229.2	0.000	213.4	0.000
237.6	0.030	311.7	0.0179	293.2	0.0175
360.1	0.0596	403.1	0.0378	440.6	0.0508
464.8	0.0852	548.2	0.0701	576.0	0.0817
612.8	0.1217	650.8	0.0933	704.4	0.1117
782.4	0.1633	762.3	0.1183	812.3	0.1365
932.7	0.1993	939.1	0.1577	923.5	0.1627
1072.9	0.2330	1075.0	0.1893	1039.7	0.1950

C_6H_6		C_6H_5Cl	
Pressure mm	Mol. fraction $(CH_3)_2O$ in sat. sol.	Pressure mm	Mol. fraction $(CH_3)_2O$ in sat. sol.
93.7	0.000	11.6	0.000
196.9	0.0230	120.4	0.0621
372.6	0.0632	310.5	0.0720
503.0	0.0932	423.3	0.0974
634.8	0.1229	550.8	0.1278
761.4	0.1529	795.3	0.1855
913.0	0.1884	957.9	0.2214
1006.7	0.2100	1072.1	0.2471

Freezing-point data are given for:

$(CH_3)_2O$ + H_2O (Baume and Perrot, 1914.)
" + $CHCl_3$ (Baume, 1909, 1914.)
" + C_2H_2 (Baume, 1914.)
" + C_2H_4 (Baume, 1914.)
" + CH_3Cl (Baume, 1914.)
$(CH_3)_2O$ + CO_2 (Baume & Borowski, 1914)
" + NO (Baume and Germann, 1914.)
" + SO_2 (Baume, 1914.)

ETHYL ALCOHOL C_2H_5OH.

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL AND WATER AT LOW TEMPERATURES, DETERMINED BY THE FREEZING-POINT METHOD.

(Pictet and Altschul, 1895; Pickering, 1893.)

t°. of Freezing.	Sp. Gr. Sat. Sol.	Gms. C_2H_5OH per 100 Gms. Sat. Sol.	Solid Phase.	t°. of Freezing.	Sp. Gr. Sat. Sol.	Gms. C_2H_5OH per 100 Gms. Sat. Sol.	Solid Phase.
− 1	0.9962	2.5	Ice	− 23.6	0.9512	33.8	Ice
− 2	0.9916	4.8	"	− 28.7	0.9417	39	"
− 3	0.9870	6.8	"	− 33.9	0.9270	46.3	"
− 5	0.9824	11.3	"	− 41	0.9047	56.1	"
− 6.1	0.9793	13.8	"	− 50	...	68	"
− 8.7	0.9747	17.5	"	− 60	...	75	"
− 9.4	0.9732	18.8	"	− 70	...	80	"
−10.6	0.9712	20.3	"	− 80	...	83.5	"
−12.2	0.9689	22.1	"	−100	...	89.5	"
−14	0.9662	24.2	"	−118 Eutec.	...	93.5	" + C_2H_5OH
−16	0.9627	26.7	"	−115	...	96	C_2H_5OH
−18.9	0.9578	29.9	"	−110.5	...	100	"

The result for the eutectic and for the f.-pt. of C_2H_5OH are by Puschin and Glagoleva, 1914, 1915; the other data for concentrations of C_2H_5OH above 70% were obtained by exterpolation. Additional data for the freezing-point lowering are given by Rozsa (1911).

Later determinations of the freezing-points of Ethyl Alcohol Water Mixtures by Tarassenkow, 1928, and Laland, 1934, gave an average curve from which the following values were taken.

t° of freezing	Gms. C_2H_5OH per 100 gms. sat. sol.	Solid Phase	t° of freezing	Gms. C_2H_5OH per 100 gms. sat. sol.	Solid Phase
- 2.0	5.0	Ice	-38.0	50	Ice
- 4.5	10.	"	-43.5	60	"
- 7.2	15	"	-50.5	70	"
-11.0	20	"	-67.0	80	"
-15.8	25	"	-87.5	85	"
-20.5	30	"	-113.0	90	"
-30.5	40	"	-125 Eutec.	92.5	" + C_2H_5OH
			-120	95	C_2H_5OH
			-114.5	100	"

Laland also gives density determinations of $C_2H_5OH + H_2O$ mixtures.

LIQUID-VAPOR EQUILIBRIUM IN ETHYL ALCOHOL-WATER MIXTURES.

(Wiley and Harden, 1935.)

The apparatus permitted withdrawing samples of the liquid and of the vapor in a cooled recepticle. The samples of liquid and of condensed vapor thus withdrawn were analyzed by means of specific gravity determinations.

Density 25°/25° of:		Mol. Percent C_2H_5OH in:		Density 25°/25° of:		Mol. Percent C_2H_5OH in:	
Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor
0.9890	0.9320	2.5	25.0	0.8879	0.8437	37.7	59.5
0.9811	0.8867	4.8	35.7	0.8839	0.8442	39.3	59.0
0.9777	0.8820	6.0	40.0	0.8629	0.8365	49.3	64.0
0.9635	0.8693	11.0	46.0	0.8348	0.8230	65.3	73.5

ETHYL ALCOHOL C_2H_5OH

THE FREEZING-POINTS OF MIXTURES OF DENATURED ALCOHOL AND WATER.

(Davis and Harvey, 1919).

The denatured alcohol was composed of 100 parts of ethyl alcohol ($d_{20} = 0.811$) 10 parts of methyl alcohol ($d_{20} = 0.817$) and 0.5 part benzolene ($d_{20} = 0.800$, b. pt. 150°-265°). The freezing temperatures were measured by a nickel resistance thermometer. The resistance was read at intervals at a slowly increasing temperature and the break in the curve was taken to indicate the point of change from solid to liquid phase, that is, the melting-point.

t° of m. pt.	d_{20} of mixture.	Vol. per cent denatured alcohol in mixture.	t° of m. pt.	d_{20} of mixture.	Vol. per cent denatured alcohol in mixture.
— 2.8...	0.9935	5.0	—35.7...	0.9264	55.0
— 4.0...	0.9873	10.0	—38.9...	0.9138	60.0
— 6.0...	0.9816	15.0	—41.0...	0.9037	65.0
— 8.5...	0.9753	20.0	—43.6...	0.8926	70.0
—11.5...	0.9715	25.0	—48.0...	0.8802	75.0
—14.8...	0.9656	30.0	—53.7...	0.8677	80 0
—18.3...	0.9592	35.0	—62.0...	0.8529	85.0
—22.1...	0.9515	40.0	—73.7...	0.8413	90.0
—26.9...	0.9442	45.0	— ...	0.8268	95.0
—31.1...	0.9845	50.0	— ...	0.8117	100.0

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, ETHYL ETHER AND WATER AT 15°.

(Boutin and Sanfourche, 1919.)

The amount of one constituent necessary to produce clouding or clearing in known mixtures of the other two was determined.

Gms. per 100 gms. Homogeneous mixture			Gms. per 100 gms. Homogeneous mixture		
H_2O.	C_2H_5OH.	$(C_2H_5)_2O$.	H_2O.	C_2H_5OH.	$(C_2H_5)_2O$.
93.0	0.0	7.0	29.5	27.8	42.9
87.6	4.9	7.4	23.0	27.0	50.0
82.5	9.7	7.7	18.0	24.9	57.1
77.1	14.9	8.0	10.7	19.4	69.9
69.7	20.3	10.0	6.8	14.7	78.5
61.3	23.9	13.8	4.4	9.9	85.7
55.7	26.1	18.3	2.5	5.0	92.4
49.1	27.4	23.5	1.1	0.0	98.9
39.9	28.2	35.9			

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, ETHYL ETHER AND WATER AT 15°.

(Desvergnes, 1921.)

The volume of ether of $d_{15} = 0.724$, necessary to produce clouding in mixtures of alcohol of $d_{15} = 0.812$ and water, at 15° was determined.

Aq. — C_2H_5OH Mixture		cc. Ether to produce clouding.	Sum of Volumes employed.	Actual Volume of mixture.	Volume of upper layer in mixture of 100 cc. of cloudy liquid + 30 cc. of ether.
cc. H_2O.	cc. C_2H_5OH.				
100	110	159.0	369.0	356.0	97.0
100	100	131.0	331.0	321.0	90.0
100	90	112.0	312.0	298.0	83.0
100	80	81.0	261.0	251.0	72.5
100	70	59.0	229.0	221.0	61.0
100	60	40.0	200.6	192.0	52.0
100	50	32.0	182.0	177.0	43.5
100	40	22.5	162.5	156.5	39.0
100	30	15.0	145.0	141.0	32.0
100	20	13.5	133.5	129.5	31.5
100	10	12.5	122.5	119.0	30.0

DISTRIBUTION OF ETHYL ALCOHOL AT 25° (Bugarszky, 1910) BETWEEN:

Bromobenzene and Water.		Carbon Tetrachloride and Water.		Carbon Disulfide and Water.	
Gms. C_2H_5OH per Liter.		Gms. C_2H_5OH per Liter.		Gms. C_2H_5OH per Liter.	
C_6H_5Br Layer.	H_2O Layer.	CCl_4 Layer.	H_2O Layer.	CS_2 Layer.	H_2O Layer.
0.72	18.5	0.45	18.7	0.27	19.1
1.36	36.9	0.93	36.5	1.87	37.
2.68	68.2	2.55	68.1	10.23	69.3

MISCIBILITY OF ETHYL ALCOHOL (see Note p. 4) AT 0° WITH MIXTURES OF:

Chloroform and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $CHCl_3$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.907	0.093	0.434	1.19
0.90	0.10	0.45	1.18
0.80	0.20	0.60	1.12
0.70	0.30	0.68	1.07
0.593	0.407	0.726	1.04
0.501	0.499	0.729	1.03
*0.420	0.58	0.73	...
0.404	0.596	0.733	1.01
0.300	0.70	0.70	0.99
0.197	0.803	0.672	0.98
0.100	0.90	0.61	0.98
0.088	0.912	0.608	0.98

Diethylketone and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $C_2H_5.CO.C_2H_5$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.938	0.062	0.136	0.85
0.900	0.10	0.19	0.85
0.895	0.105	0.201	0.86
0.800	0.20	0.31	0.87
0.781	0.219	0.317	0.87
0.702	0.298	0.356	0.88
0.600	0.400	0.392	0.89
0.547	0.453	0.410	0.90
0.499	0.501	0.411	0.91
0.458	0.542	0.415	0.92
0.407	0.593	0.404	0.91

Additional data for the miscibility of alcohol with chloroform + water mixtures are given by Miller and McPherson, 1908.

MISCIBILITY OF ETHYL ALCOHOL WITH MIXTURES OF ETHYL ETHER AND WATER AT 0°. (Corliss, 1914; Bonner, 1910; see also Kremann, 1910a.)

Composition of the Lower Layer.				Composition of Upper Layer.			
Gms. $(C_2H_5)_2O$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.	Gms. $(C_2H_5)_2O$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.10	0.90	0.163	0.970	...	...	...	...
...	...	...	...	0.957	0.043	0.151	0.757
0.16	0.84	0.297	0.951	0.902	0.098	0.230	0.778
0.178	0.822	0.318	0.945	0.87	0.13	0.26	0.788
0.192	0.808	0.332	0.941	0.85	0.15	0.275	0.794
0.204	0.796	0.34	0.937	0.825	0.175	0.292	0.800
0.227	0.773	0.352	0.932	0.79	0.210	0.313	0.808
0.250	0.75	0.36	0.926	0.759	0.243	0.33	0.815
0.293	0.707	0.37	0.916	0.70	0.30	0.35	0.827
0.335	0.665	0.375	0.906	0.645	0.355	0.366	0.839
0.422	0.578	0.385	0.886	0.562	0.438	0.385	0.857
*0.49	0.51	0.385	0.874	0.49	0.51	0.385	0.874

The data for the binodal curve given by Corliss and by Bonner agree closely. The Sp. Gr. determinations of Corliss were made on larger amounts of solution and appear to be the more accurate. In addition, Corliss gives the specific gravities of each layer of a series of liquids in contact with each other, and from these and the binodal curve, the above data for the composition of the several conjugate layers have been calculated. Data are also given by Corliss for the distribution of colloidal arsenious sulfide between the two layers of the system.

Data for the distribution of ethyl alcohol between ether and water and between ether and molten $CaCl_2.6H_2O$ are given by Morgan and Benson (1907).

MISCIBILITY OF ETHYL ALCOHOL WITH MIXTURES OF ETHYL ETHER AND WATER AT 25°. (Horiba, 1911–12.)

Composition of Lower Layer.			Composition of Upper Layer.		
Gms. $(C_2H_5)_2O$.	Gms. H_2O.	Gms. C_2H_5OH.	Gms. $(C_2H_5)_2O$.	Gms. H_2O.	Gms. $C_2H_5O_2H$.
5.77	94.23	0	98.72	1.28	0
6.3	85.7	8	94.5	2.2	3.3
7.2	79.2	13.6	88.5	3.7	7.8
8	76	16	84.4	4.9	10.7
9.7	70.4	19.9	75.1	8.4	16.5
13.3	62.8	23.9	60.8	15.5	23.7
22.1	50.6	27.3	43.8	28.1	28.1
28.4	43.4	28.2	35.8	35.6	28.6
*31.6	40	28.4 (Plait point)	31.6	40	28.4

The binodal curve was determined in the usual way (see Note, p. 4). A series of conjugate liquids was then prepared and the Sp. Gr., refractive index and viscosity of each layer determined. From specially prepared curves for variations of physical constants with composition of mixture, the composition of the several conjugate liquids was ascertained. The results thus obtained, are given in the above table.

Data for the miscibility of ethyl alcohol with mixtures of water, ethyl ether and sulfuric acid at 0° and with mixtures of ethyl ether, water and ethylsulfuric acid at 0° are given by Kremann, 1910a.

MISCIBILITY OF ETHYL ALCOHOL (see Note p. 4) AT 0° WITH MIXTURES OF:

Ethyl Acetate and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $CH_3COOC_2H_5$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.92	0.080	0.100	0.91
0.90	0.10	0.13	0.91
0.799	0.201	0.228	0.93
0.699	0.301	0.265	0.92
0.60	0.40	0.29	0.95
0.50	0.50	0.30	0.95
*0.48	0.52	0.30	...
0.40	0.60	0.31	0.96
0.30	0.70	0.31	0.96
0.197	0.803	0.282	0.97
0.102	0.898	0.143	0.99

Ethyl Bromide and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. C_2H_5Br.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.967	0.033	0.240	1.23
0.90	0.10	0.37	1.15
*0.83	0.17	0.45	...
0.80	0.20	0.51	1.09
0.70	0.30	0.64	1.06
0.60	0.40	0.754	1.03
0.50	0.50	0.83	1
0.40	0.60	0.89	0.99
0.30	0.70	0.89	0.97
0.10	0.90	0.73	0.97
0.017	0.983	0.182	0.99

MISCIBILITY OF ETHYL ALCOHOL (see Note p. 4) AT 0°, WITH MIXTURES OF:

Ethyl Butyrate and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $C_3H_7COOC_2H_5$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp.Gr. Sat. Sol.
0.97	0.030	0.166	0.96
0.90	0.10	0.32	...
0.80	0.20	0.483	0.88
0.70	0.30	0.567	0.89
0.599	0.401	0.628	0.90
0.494	0.506	0.659	0.91
*0.46	0.54	0.67	...
0.40	0.60	0.69	0.92
0.297	0.703	0.693	0.93
0.193	0.807	0.684	0.94
0.10	0.90	0.63	0.94

Ethyl Propionate and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $C_2H_5COOC_2N_5$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.977	0.023	0.138	0.90
0.90	0.10	0.27	0.90
0.80	0.20	0.38	0.90
0.695	0.305	0.453	0.92
0.60	0.40	0.49	0.91
0.50	0.50	0.52	0.92
*0.46	0.54	0.53	...
0.398	0.602	0.532	0.93
0.30	0.70	0.55	0.94
0.201	0.799	0.517	0.95
0.10	0.90	0.46	0.96

ETHYL ALCOHOL

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, ETHYL ETHER AND WATER.

(Leland, 1934.)

The following results are given for the freezing-points of:

$C_2H_5OH + (C_2H_5)_2O$				$(C_2H_5)_2O + H_2O$			
t°	Wt. % C_2H_5OH	t°	Wt. % C_2H_5OH	t°	Wt. % C_2H_5OH	t°	Wt. % C_2H_5OH
-116.3	0.0	-123.0	49.2	-0.24	1.0	-2.20	8.10
-117.3	4.0	-125.0 Eutec	57.8	-0.50	2.07	-2.40	8.75
-117.7	7.4	-123.4	64.5	-0.78	3.05	-2.62	10.08
-118.3	13.5	-121.5	72.0	-1.00	3.80	-3.22	11.50
-119.2	22.1	-119.2	80.2	-1.29	5.0	-3.38	11.95
-120.0	31.3	-117.8	87.1	-1.54	5.92	-3.45	12.03
-121.3	39.2	-114.5	100.0	-1.79	6.79	-3.78 tr.pt.	12.85

The author then gives the freezing-points of a series of mixtures of $C_2H_5OH + H_2O$ to which increasing amounts of $(C_2H_5)_2O$ were added and obtains the following values for the line of the quadruple points.

t°	Gms. per 100 gms. Mixture		t°	Gms. per 100 gms. Mixture	
	C_2H_5OH	$(C_2H_5)_2O$		C_2H_5OH	$(C_2H_5)_2O$
- 3.78	0.0	12.8	-21.65	27.4	33.8
- 5.95	4.0	12.6	-21.56	26.95	45.65
- 8.4	7.8	12.3	-20.63	22.2	63.23
-12.86	14.2	12.2	-16.5	9.8	85.6
-17.95	20.8	14.2	- 8.0	1.7	96.8
-21.5	27.1	23.5	- 3.7	0.0	99.1

The author also gives results for the densities at 0° of binary and ternary mixtures of C_2H_5OH, $(C_2H_5)_2O$ and H_2O, which together with chemical determinations of $(C_2H_5)_2O$ serve for the analysis of ternary mixtures.

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, ETHYL ETHER AND WATER AT 20°

(Bancroft, 1895.)

Per 5.0 cc C_2H_5OH	
cc H_2O (1)	cc $(C_2H_5)_2O$ (2)
50	1.30
25	1.70
10	2.41
8	3.35
6	5.10
5.21	6

Per 5.0 cc C_2H_5OH	
cc H_2O (1)	cc $(C_2H_5)_2O$ (2)
4.45	7
4.0	7.8
3.87	8
3.10	10
2.08	15
1.77	17.5

(1) Saturated with $(C_2H_5)_2O$

(2) Saturated with H_2O

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, ETHYL ACETATE AND WATER.

(Beech and Glasstone, 1938.)

The solubility (binodal) curve was determined by the titration method. The compositions of conjugate layers were determined by preparing mixtures of known amounts of the three constituents and analyzing the upper layer for acetate. These results and the solubility curve fix the tie lines. The points of intersection of the tie lines with the binodal curve correspond to the solutions in contact with each other.

t°	Gms. per 100 gms. lower layer			Gms. per 100 gms. upper layer		
	H_2O	$CH_3COOC_2H_5$	C_2H_5OH	H_2O	$CH_5COOC_2H_5$	C_2H_5OH
0	86.9	9.3	3.8	2.4	97.5	0.1
"	84.2	9.1	6.7	2.9	95.6	1.5
"	80.2	9.0	10.8	3.6	93.1	3.3
"	76.9	9.2	13.9	4.6	89.6	5.8
"	73.8	9.7	16.5	6.7	84.1	9.2
"	68.9	11.3	19.8	10.7	75.9	13.4
20	88.1	7.9	4.0	3.6	94.4	2.0
"	84.0	8.4	7.6	5.3	89.2	5.5
"	80.4	9.2	10.4	7.0	85.2	7.8
"	75.6	10.7	13.7	8.6	81.2	10.2
"	70.5	13.0	16.5	13.4	72.1	14.5
"	62.6	17.9	19.5	21.3	60.4	18.3

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, ETHYL ACETATE AND WATER AT 20°.

(Bancroft, 1895.)

Per 1 cc C_2H_5OH		Per 1 cc C_2H_5OH	
cc H_2O (1)	cc $CH_3COOC_2H_5$ (2)	cc H_2O (1)	cc $CH_3COOC_2H_5$ (2)
10	0.25	1.06	2.50
8	0.27	0.69	5
4	0.35	0.54	7
2	1.12	0.44	10

(1) Saturated with $CH_3COOC_2H_5$ (2) Saturated with H_2O

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL AND NITROGLYCEROL.

(Copeman, 1936.)

The determinations were made by the titration method using Ethyl Alcohol of d_{15} = 0.812 = 93.9 wt. % C_2H_5OH and filtered and dried Nitroglycerol of d_{25} = 1.591, determined by hydrometer. In the case of the solubility of alcohol in nitroglycerol the end point was that at which a faint permanent opalescence remained after long shaking. In the reverse case the end point was that at which the mixture just became clear on shaking.

t°	Solubility in terms of Wt. Percent of:		t°	Solubility in terms of Wt. Percent of:	
	Alcohol in Nitroglycerol	Nitroglycerol in Alcohol		Alcohol in Nitroglycerol	Nitroglycerol in Alcohol

EQUILIBRIUM IN THE SYSTEM NORMAL BUTYL ALCOHOL, ETHYL ALCOHOL AND WATER. (Drouillon, 1925.)

The synthetic method was used. Known mixtures were heated in sealed tubes to complete solution of the three constituents and then cooled slowly, while being shaken, untill clouding appeared. A series of aqueous-ethyl alcohol mixtures were prepared and to each of these, increasing amounts of normal butyl alcohol were added and the temperatures of complete solution determined. The results were plotted and the following values for the isothermal curves were obtained.

Gms. C_2H_5OH per 100 gms. $H_2O+C_2H_5OH$ mixture.	Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol. at											
	20°.		40°.		60°.		80°		100°		120°.	
	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase
0.0 (= Water).	81.6	6.6	80.3	6.0	78.5	5.5	74.6	6.4	68.8	7.5	57.3	11.8
2.49.......	81.1	6.8	79 6	6.3	77.0	6.2	73.1	7.1	68.8	10 3	49.2	26.5
5.02.......	–	7.1	–	6.7	75.9	7.3	72.0	8.6	64.2	16.2		
7.51.......	–	7.4	–	7.7	74.0	8.5	69.7	12.8	59.4	28.9		
10.09.......	78.2	8.2	76.4	8.9	73.3	12.4	67.5	21.0		47.0		
12.06.......	–	10.7	–	11.6	71.5	17.5	64.8	28.5				
15.39.......	–	15.8	72.7	20.5	68.0	28.5	57.8	41.5				
17.54.......	74.7	19.4	71.0	24.4	66.1	33.6						
20.0........	73.3	24.0	68.9	31.3	62.3	40.5						
22.5........	69.7	32.3	64.5	40.1								
24.99.......	65.7	40.4										

The author also gives data from which the composition of a series of conjugated layers at 20° can be estimated.

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL METHYL BUTYRATE AND WATER AT 20°.

(Bancroft, 1895, from Pfeiffer, 1892.)

Per 3.0 cc $CH_3(CH_2)_2COOCH_3$		Per 3.0 cc $CH_3(CH_2)_2COOCH_3$	
cc H_2O	cc C_2H_5OH	cc H_2O	cc C_2H_5OH
2.34	3	28.13	15
6.96	6	38.80	18
12.62	9	54.64	21
19.45	12	∞	24

The distribution coefficient of ethyl alcohol between water and amyl alcohol was found by Fontein (1910) to be 1.13 at 15.5° and 1.21 at 28°.

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, METHYL VALERATE AND WATER AT 20°.

(Bancroft, 1895, from Pfeiffer, 1892.)

Per 3 cc $C_4H_9COOCH_3$		Per 3 cc $C_4H_9COOCH_3$	
cc H_2O	cc C_2H_5OH	cc H_2O	cc C_2H_5OH
1.66	3	36.72	24
5.06	6	44.15	27
9.03	9	52.37	30
13.40	12	62.25	33
18.41	15	74.15	36
24	18	91.45	39
30.09	21	∞	42

Miscibility of Ethyl Alcohol (see Note, p. 4) at 0° with Mixtures of:

Isoamyl Alcohol and Water.

(Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $(CH_3)_2CH(CH_2)_2OH$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.903	0.097	0.116	0.84
0.90	0.10	0.12	0.84
0.797	0.203	0.258	0.85
0.694	0.306	0.396	0.86
0.602	0.398	0.427	0.88
0.497	0.503	0.449	0.89
0.399	0.601	0.453	0.90
0.294	0.706	0.434	0.92
*0.27	0.73	0.43	...
0.196	0.804	0.411	0.94
0.10	0.900	0.369	0.96

Isobutyl Alcohol and Water.

(Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $(CH_3)_2CH.CH_2OH$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.70	0.30	0.13	0.87
0.589	0.411	0.177	0.89
0.502	0.498	0.194	0.90
0.50	0.50	0.20	0.90
0.40	0.60	0.20	0.92
0.387	0.613	0.204	0.92
*0.35	0.65	0.21	...
0.304	0.696	0.205	0.94
0.30	0.70	0.21	0.94
0.20	0.80	0.20	0.95
0.132	0.868	0.189	0.96

Miscibility of Ethyl Alcohol (see Note, p. 4) at 0° with Mixtures of:

Isoamyl Bromide and Water. (Bonner, '10.)

Composition of Homogeneous Mixtures.

Gms. $C_5H_{11}Br$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.975	0.025	0.251	1.10
*0.96	0.04	0.36	...
0.90	0.10	0.68	1.01
0.80	0.20	1.09	0.96
0.70	0.30	1.37	0.94
0.60	0.40	1.57	0.93
0.498	0.502	1.676	0.91
0.40	0.60	1.75	0.91
0.30	0.70	1.75	0.91
0.20	0.80	1.71	0.91
0.10	0.90	1.46	0.92
0.022	0.978	1.027	0.93

Isobutyl Bromide and Water. (Bonner, '10.)

Composition of Homogeneous Mixtures.

Gms. $(CH_3)_2CHCH_2Br$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.976	0.024	0.200	1.18
*0.93	0.07	0.42	...
0.90	0.10	0.52	1.09
0.80	0.20	0.83	1.01
0.70	0.30	1.05	0.98
0.60	0.40	1.21	0.96
0.501	0.499	1.30	0.94
0.40	0.60	1.35	0.93
0.30	0.70	1.36	0.93
0.20	0.80	1.32	0.92
0.10	0.90	1.20	0.93
0.047	0.953	0.937	0.94

Miscibility of Ethyl Alcohol (see Note, p. 4) at 0° with Mixtures of:

Isoamyl Ether and Water. (Bonner, '10.)

Composition of Homogeneous Mixtures.

Gms. $[(CH_3)_2CH.CH_2CH_2]_2O$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.958	0.042	0.368	0.81
0.90	0.10	0.70	0.82
*0.89	0.11	0.74	...
0.879	0.121	0.793	0.82
0.80	0.20	1.20	0.83
0.702	0.298	1.573	0.83
0.594	0.406	1.876	0.84
0.50	0.50	1.98	0.84
0.40	0.60	2.19	0.85
0.302	0.698	2.24	0.86
0.20	0.80	2.14	0.87
0.10	0.90	1.87	0.89

Mesitylene and Water. (Bonner, '10.)

Composition of Homogeneous Mixtures.

Gms. $C_6H_3(CH_3)_3$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
*0.97	0.03	0.48	...
0.963	0.037	0.516	0.86
0.90	0.10	1.09	0.85
0.80	0.20	1.66	0.84
0.70	0.30	2.04	0.85
0.60	0.40	2.32	0.85
0.50	0.50	2.52	0.85
0.40	0.60	2.64	0.86
0.30	0.70	2.68	0.87
0.199	0.801	2.49	0.87
0.10	0.90	2.28	0.89
0.051	0.949	1.615	0.90

COMPOSITION OF THE CONJUGATE LAYERS IN THE SYSTEM ETHYL ALCOHOL, BENZENE AND WATER.

(Tarassenkow and Pologieuzewa, 1932.)

t°	Gms. per 100 gms. upper layer			Gms. per 100 gms. lower layer		
	C_6H_6	C_2H_5OH	H_2O	C_6H_6	C_2H_5OH	H_2O
0	97.02	2.28	0.70	0.86	39.77	59.36
"	93.00	5.04	1.96	4.94	48.58	46.48
"	90.59	7.22	2.11	12.60	53.32	34.08
"	40.97	48.87	10.16	73.10	25.25	1.65
"	30.35	50.44	19.21	88.40	14.17	2.43
"	27.35	50.13	22.58	83.53	14.04	1.83
"	26.59	53.30	20.21	85.00	11.94	3.06
"	24.82	52.51	22.67	84.91	11.90	3.11
"	22.14	60.75	25.11	86.20	10.30	3.44
20	97.14	1.61	1.25	0.10	28.07	71.83
"	88.63	8.55	2.82	6.91	48.09	45.00
"	83.92	12.77	3.81	15.84	51.54	32.62
"	75.48	19.14	5.38	31.64	46.80	21.56
"	72.49	22.34	5.17	35.61	45.49	18.90
"	67.94	25.85	6.31	44.71	41.79	13.50
40	94.49	4.12	1.39	0.91	29.07	70.02
"	89.70	8.26	2.04	3.50	39.59	56.91
"	87.22	9.07	3.71	4.73	40.09	55.18
"	79.12	16.22	4.61	14.79	47.10	38.11
"	71.76	22.07	6.17	26.18	46.80	27.02
"	66.03	26.64	7.33	33.71	44.38	22.41
"	63.75	28.26	7.99	36.59	41.90	22.51
"	60.01	30.48	9.51	38.98	40.84	20.18

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, BENZENE AND WATER AT 25°.

(Washburn, Hnizda and Vold, 1931.)

The binodal curve was determined by titrating mixtures of ethyl alcohol and benzene with water to permanent cloudiness. The refractive indices of the saturated solutions were also determined as well as of separately prepared conjugate layers. From these results tie lines were located.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
C_2H_5OH	C_6H_6	C_2H_5OH	C_6H_6	C_2H_5OH	C_6H_6
8.2	91.1	29.1	64.6	51.8	23.0
10.0	89.0	34.3	57.0	51.2	11.4
12.9	85.7	41.6	46.2	46.6	5.1
17.9	79.5	44.8	39.8	37.4	2.1
25.3	70.2	50.4	27.9	29.9	0.83
				25.8	0.57

Similar determinations at 21 made by Perrakis, 1925, gave the following results:

Wt. % C_2H_5OH in $C_2H_5OH + C_6H_6$ mixture (A)	Gms. H_2O to cause clouding of 100 gms. mixture(A)	Wt. % C_2H_5OH in $C_2H_5OH + C_6H_6$ mixture (A)	Gms. H_2O to cause clouding of 100 gms. mixture(A)
15.87	0.9930	33.33	5.5077
20.28	1.8817	35.41	6.0985
23.50	2.7093	37.02	6.6902
26.45	3.4722	38.38	7.2826
28.75	4.2046	45.57	10.2794
30.92	4.9000		

Previous determinations of the binodal curve of this system and the distribution coefficients of ethyl alcohol between water and benzene are given by Bancroft, 1895; Taylor, 1897; Lincoln, 1900; Morgan and

$C_2H_6O_1$

EQUILIBRIUM IN THE SYSTEM BENZENE, ETHYL ALCOHOL AND WATER.

(Wehrmann, 1921.)

To given volumes of mixtures of alcohol and water of known percentage composition, as determined by specific gravity, benzene was added from a buret untill clouding occurred.

t°.	Per cent C_2H_5OH in Aq. Alcohol employed.	Composition of the mixture in vol. per cent at the point of Clouding. C_6H_6.	C_2H_5OH.	H_2O.
—10....	40	0.5	42.1	57.4
—10....	60	3.9	59.5	36.6
—10....	70	10.2	63.7	26.1
—10....	80	20.0	63.5	16.5
—10....	90	52.8	42.4	4.8
± 0....	10	0.32	10.38	89.3
± 0....	30	0.37	26.83	72.8
± 0....	40	0.9	40.9	58.2
± 0....	50	2.5	51.2	46.3
± 0....	60	4.55	57.9	37.55
± 0....	70	12.6	61.4	26.0
± 0....	80	24.8	59.5	15.7
± 0....	90	63.5	32.7	3.8
± 0....	96	92.7	7.1	0.2
+10....	40	1.4	40.8	57.8
+10....	60	5.3	56.9	37.8
+10....	70	14.5	60.0	25.5

t°.	Per cent C_2H_5OH in Aq:Alcohol employed.	Composition of the mixture in vol. per cent at the point of Clouding. C_6H_6.	C_2H_5OH.	H_2O.
10....	80	29.4	55.9	14.7
10....	90	68.0	28.7	3.3
20....	10	0.35	10.35	89.3
20....	30	0.95	26.65	72.4
20....	50	3.6	50.4	46.0
20....	60	7.2	55.7	37.1
20....	70	18.1	57.6	24.3
20....	80	33.7	52.2	14.1
20....	90	70.5	26.2	3.3
20....	96	98.5	1.46	0.04
30....	20	0.9	19.5	79.6
30....	40	2.6	40.2	57.2
30....	60	8.6	54.9	36.5
30....	70	18.9	57,0	24.1
30....	80	39.6	47.5	12.9
30....	90	74.0	23.3	2.7

EQUILIBRIUM IN THE SYSTEM BENZENE, ETHYL ALCOHOL AND WATER.

(Sidgwick and Spurrell, 1929.)

Benzene was added to known mixtures of alcohol and water untill two layers appeared or benzene crystallized out. For the two liquid equilibrium, the point was taken at which, on slow cooling, sufficient turbidity was produced to obscure a bright object placed behind the liquid. The extensive series of results were plotted on cross section paper and from the curves the following values for definite temperatures were interpolated.

Wt per cent C_6H_6 which yielded a second liquid layer (or crystallized benzene) when added to a mixture of $C_2H_5OH + H_2O$ containing.

t°.	100 wt. % C_2H_5OH.	99.5 wt. % C_2H_5OH.	98.0 wt. % C_2H_5OH.	94.26 wt. % C_2H_5OH.	90.06 wt. % C_2H_5OH.	86.0 wt. % C_2H_5OH.	80.1 wt. % C_2H_5OH.	74.48 wt. % C_2H_5OH.	69.08 wt. % C_2H_5OH.	57.66 wt. % C_2H_5OH.
[illegible]					87.22*	73.25*	59.41*	41.32*	27.46*	12,61*
[illegible]					[illegible]	70.95*	55.00*	35.10*	23.38*	10.47*
[illegible]					[illegible]	67.65*	46.92*	29.81*	20.08*	8.95*
[illegible]	[illegible]				[illegible]		46 18*	29.32*	19.75*	8.81*
[illegible]	[illegible]				[illegible]		45.42*	28.85*	19.45*	8.68*
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			—	—	—	8.61
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		39.24	26.00	17.70	8.21
[illegible]					[illegible]		44.50*	28.46*	19.10*	8.55*
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		33.15	23.60	16.45	7.86
[illegible]					[illegible]		43.70	27.95	18.78*	8.44*
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		29.85	21.74	15.35	7.53
[illegible]					[illegible]		43.08	27.59*	18.48*	8.32*
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		27.34	20.11	14.25	7.22
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	42.00		25.40	18.93	13.27	6.92
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		23.52	17.80	12.40	6.65
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		22.21	16.75	11.56	6.38
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		21.00	15 82	10.80	6.12
[illegible]				[illegible]	[illegible]	66.38	44 95	28 75	19.28	8.70
Triple pt.				[illegible]	[illegible]	+2.52*	+2.50*	+2.64*	+2.86*	3.20*

* Indicates two liquid layers. The results for 100 % C_2H_5OH are from Pickering.

EQUILIBRIUM IN THE SYSTEM BENZENE, ETHYL ALCOHOL AND WATER AT 25° AND AT 60°. (Barbaudy, 1926.)

The clouding points were determined by adding mixtures of $C_2H_5OH + H_2O$ to mixtures of $C_2H_5OH + C_6H_6$ containing in both cases approximately the same C_2H_5OH content.

Results at 25°.

Gms. per 100 gms. of mixture.

C_2H_5OH.	C_6H_6.	H_2O.
0.0	99.9	0.1
5.85	93.65	0.50
10.09	88.96	0.95
20.00	76.97	3.03
30.00	63.20	6.80
40.00	47.70	12.30
49.04	28.23	21.83
49.88	9.03	41.09
46.90	5.91	47.19
40.00	1.50	59.50
30.00	0.50	69.50

Results at 60°.

Gms. per 100 gms. of mixture.

C_2H_5OH.	C_6H_6.	H_2O.
0.0	0.23	99.77
36.58	4.08	59.34
40.81	6.91	52.28
43.84	10.74	45.42
45.22	16.95	37.83
46.13	20.76	33.11
43.84	29.97	26.19
40.00	41.46	18.54
34.78	52.39	12.83
26.96	65.54	7.50
17.87	78.60	3.53
0.00	99.75	0.25

In order to determine the conjugated solutions, mixtures were prepared to yield two layers and each of these were analyzed by determinations of density and index of refraction.

Composition of Conjugated Solutions at 25°.

Upper layer. Gms. per 100 gms.			Lower layer. Gms. per 100 gms.		
C_2H_5OH.	C_6H_6.	H_2O.	C_2H_5OH.	C_6H_6.	H_2O.
1.35	98.54	0.11	17.5	0.0	82.5
3.18	96.54	0.24	30.7	0.55	68.75
5.29	94.37	0.34	36.0	0.90	63.1
34.1	51.05	8.85	40.85	46.25	12.9

Composition of Conjugated Solutions at 60°.

Upper layer. Gms. per 100 gms.			Lower layer. Gms. per 100 gms.		
C_2H_5OH.	C_6H_6.	H_2O.	C_2H_5OH.	C_6H_6.	H_2O.
16.33	80.97	2.7	39.62	5.87	54.51
16.76	79.40	3.34	40.23	6.18	53.57
25.40	67.98	6.62	40.50	17.26	36.24
34.68	51.18	14.13	42.92	31.46	25.62
30.96	46.48	16.56	41.39	35.53	23.08

EQUILIBRIUM IN THE SYSTEM BENZENE, ETHYL ALCOHOL AND WATER AT 15°, 25° AND 30°. (Ormandy and Craven, 1921.)

The benzene is given in per cent by weight in the mixture and the alcohol in weight percent. The results therefore, show, for the points of clouding, the per cent by weight of benzene present in a mixture composed of benzene and aqueous alcohol of the particular weight per cent shown.

Results at 15°.		Results at 25°.		Results at 30°.	
Wt. % aq. Alcohol used.	Gms. C_6H_6 per 100 gms. final mixture.	Wt. % aq. Alcohol used.	Gms. C_6H_6 per 100 gms. final mixture.	Wt. % aq. Alcohol used.	Gms. C_6H_6 per 100 gms. final mixture.
58.5	10	95.11	97.13	93.14	96.06
67.9	20	91.86	90.53	91.20	90.00
72.9	30	87.98	80.60	88.91	84.01
76.7	40	86.52	76.48	85.98	76.46
79.3	50	84.71	71.00	83.25	69.32
82.0	60	82.99	67.02	80.75	63.13
85.1	70	81.34	62.52	77.91	55.03
88.4	80	79.83	58.33	76.57	50.99
92.3	90	78.44	54.24	72.61	38.17
		77.58	51.23	63.29	18.68

The results at 15° were read from the curve plotted from 30 determinations. They agree quite closely with similar determinations reported by Sidgwick and Spurrell, 1920; Taylor, 1897; and Bonner, 1910.

SOLUBILITY OF BENZENE IN DILUTE SOLUTIONS OF ETHYL ALCOHOL.

(Ormandy and Craven, 1922.)

A mechanical stirrer was used. Readings were taken at the point where turbidity was distinctly visible and at the point where the liquid became quite clear. The mean of these was taken as the true equilibrium point. The results, were plotted and the following table constructed from the curves.

Strength of Alcohol in wt. %.	Results for Benzene at 0°.	15°.	30°.	Results for Petrol A at 15°.	Results for Petrol + benzene (1:1) at 15°.
0	0.08	0.15	–	0.004	–
5	0.08	0.15	–	–	–
10	0.10	0.16	–	–	–
15	0.13	0.19	–	–	–
20	0.16	0.24	–	–	–
25	0.24	0.38	–	–	–
30	0.38	0.62	1.32	0.01	0.06
35	0.62	1.02	1.88	0.04	0.12
40	1.14	1.80	2.64	0.09	0.24
45	1.80	3.00	–	0.20	0.45
50	–	–	–	0.42	–

The figures show the percent by weight of benzene and petrol in the final equilibrium mixtures. It is evident from the results that benzene can be effectively removed from alcohol by dilution and extraction with petrol, hence, it is a rather poor denaturant for alcohol.

Data for equilibrium at — 15°, 0°, 15° and 30° in a system composed of 3 volumes of benzene + 1 volume of toluene (instead of benzene alone), alcohol and water, are given by Ormandy and Craven, 1921.

SOLUBILITY OF BENZENE IN : (Wright, 1926.)

Aq. 50 wt. % C_2H_5OH.		Aq. 50 wt. % C_2H_5OH containing 5 % NaCl.		Aq. 50 wt. % C_2H_5OH containing K_2CO_3, at 20°.		Aq. 50 wt. % C_2H_5OH sat. with various salts at 20°.	
t°.	Gms. C_6H_6 per 100 gms. sat. sol.	t°.	Gms. C_6H_6 per 100 gms. sat. sol.	Per cent K_2CO_3.	Gms. C_6H_6 per 100 gms. sat. sol.	Salt.	Gms. C_6H_6 per 100 gms. sat. sol.
1.2	4.57	9.1	5.80	1.12	6.4	None	5.8
3.2	4.78	11.8	6.10	1.67	6.5	Na Cl (10.6)	9.6
15.5	5.05	14.2	6.39	2.18	7.1	Na NO (21.2)	9.5
18.0	5.30	16.7	6.76	2.48	7.3	KCl (6.5)	6.7
20.2	5.61	19.2	7.23	2.68	7.6*	KNO_3 (3.9)	6.4
22.6	5.97	21.3	7.57	2.86	8.0	KBr (17.4)	7.8

*Two liquid layers form. The figures in parentheses show the grams of each salt per 100 gms. of sat. solution.

FREEZING-POINTS OF MIXTURES OF BENZENE AND AQUEOUS ETHYL ALCOHOL.

(Ormandy and Craven, 1921.)

Results for benzene and :

99.3 wt. % C_2H_5OH.		90.3 wt. % C_2H_5OH.		80.3 wt. % C_2H_5OH.		70.3 wt. % C_2H_5OH.	
F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.
—11.4	38.4	—10.2	26.9	—11.8	15.1	— 9.6	9.1
—13.3	35.7	—12.1	24.5	—16.9	11.9	—14.9	7.4
—15.3	33.3	—14.3	22.4	—19.9	10.6		
—17.3	31.1	—17.1	20.1	—22.4	9.6		
—19.3	29.0	—19.9	17.9	—25.4	8.6		
—21.4	27.1	—22.8	16.4	—29.0	7.6		
—24.1	25.0	—26.0	14.9	—30.6	7.3		
—26.0	23.6	—29.0	13.7				
—30.5	20.7	—30.1	13.3				

59.3 wt. % C_2H_5OH.

F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.
— 6.7	5.2	—18.1	3.1	—26.2	2.2
—12.5	3.9	—22.5	2.6	—30.1	1.9

Data for the freezing-points of mixtures composed of benzene-toluene (3 : 1 by volume) alcohol and water are given by Ormandy and Craven, 1921.

Data for the solubility of mixtures of benzene and petrol in aqueous 92 wt. per cent ethyl alcohol at 20° are given by Ormandy and Craven, 1921.

Data for mixtures of Ethyl alcohol, benzene and glycerol and for mixtures of ethyl alcohol, benzene and lactic acid are given by Rozsa, 1911.

RECIPROCAL SOLUBILITY OF CHLORO BENZENE AND AQUEOUS ETHYL ALCOHOL.

(Rossett, Marange and Vinter, 1923.)

The temperatures were determined at which given mixtures just became clear or cloudy while being stirred in a test tube.

t° of clouding.	Composition of mixture: cc. of C_6H_5Cl.	+ 5 cc. of aq. C_2H_5OH of.	t° of clouding.	Composition of mixture: cc. of C_6H_5Cl.	+ 5 cc. of aq. C_2H_5OH of.
66........	10	87°	28........	11	89°.8
34.5......	10	88°.9	38........	12	89°.8
19.5......	10	89°.8	44........	13	89°.8
7.5......	10	90°.7	52........	14	89°.8
			60........	15	89°.8

A few determinations are also given for mixtures of chlorobenzene + benzene in aqueous alcohol.

MISCIBILITY OF ETHYL ALCOHOL (see Note, p. 4) WITH MIXTURES OF:

Bromobenzene and Water at 0°.

(Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. C_6H_5Br.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.99	0.010	0.115	1.34
*0.96	0.040	0.32	...
0.90	0.10	0.65	1.07
0.80	0.20	1	0.96
0.70	0.30	1.19	0.96
0.60	0.40	1.30	0.98
0.50	0.50	1.39	0.95
0.40	0.60	1.43	0.91
0.30	0.70	1.43	0.92
0.20	0.80	1.36	0.93
0.10	0.90	1.16	0.93
0.024	0.976	0.803	0.92

Nitrobenzene and Water at 15°.

(Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $C_6H_5NO_2$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.965	0.035	0.248	1.08
*0.91	0.09	0.49	...
0.90	0.10	0.53	1.02
0.80	0.20	0.86	0.97
0.70	0.30	1.09	0.94
0.594	0.406	1.238	0.93
0.50	0.50	1.31	0.92
0.40	0.60	1.34	0.92
0.30	0.70	1.30	0.91
0.194	0.806	1.212	0.92
0.10	0.90	0.98	0.93
0.02	0.98	0.601	0.95

MISCIBILITY OF ETHYL ALCOHOL (see Note, p. 4) AT 0° WITH MIXTURES OF:

Benzyl Acetate and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $CH_3.CO_2.CH_2.C_6H_5$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.977	0.023	0.120	1.05
0.901	0.099	0.317	1.03
0.80	0.200	0.46	0.99
0.70	0.300	0.58	0.97
*0.68	0.32	0.60	...
0.60	0.40	0.69	0.95
0.50	0.50	0.78	0.94
0.40	0.60	0.85	0.94
0.30	0.70	0.88	0.93
0.20	0.80	0.88	0.93
0.10	0.90	0.80	0.94

Benzyl Alcohol and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $C_6H_5CH_2OH$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.90	0.10	0.13	1.03
0.80	0.20	0.26	1
0.70	0.30	0.35	0.98
0.60	0.40	0.39	0.98
0.50	0.50	0.40	0.97
0.40	0.60	0.41	0.97
*0.38	0.62	0.42	...
0.379	0.621	0.417	0.98
0.30	0.70	0.41	0.97
0.194	0.806	0.388	0.97
0.10	0.90	0.35	0.98

MISCIBILITY OF ETHYL ALCOHOL AT 0° WITH MIXTURES OF:

Benzaldehyde and Water

(Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. C_6H_5CHO.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. of Mixture.
0.957	0.043	0.159	1.02
0.898	0.102	0.283	1.01
0.800	0.200	0.420	0.99
0.700	0.300	0.550	0.98
0.598	0.402	0.601	0.97
*0.570	0.430	0.610	...
0.496	0.504	0.643	0.96
0.394	0.606	0.681	0.95
0.298	0.702	0.701	0.95
0.200	0.800	0.670	0.95
0.100	0.900	0.610	0.96
0.031	0.969	0.461	0.97

Benzylethyl Ether and Water.

(Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $C_6H_5CH_2.O.C_2H_5$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.971	0.029	0.189	0.94
0.90	0.10	0.37	0.92
0.80	0.20	0.54	0.92
0.70	0.30	0.67	0.91
*0.67	0.33	0.71	...
0.60	0.40	0.78	0.91
0.50	0.50	0.87	0.91
0.40	0.60	0.93	0.92
0.30	0.70	0.96	0.92
0.198	0.802	0.952	0.92
0.10	0.90	0.86	0.93
0.08	0.92	0.793	0.94

MISCIBILITY OF ETHYL ALCOHOL (see Note, p. 4) AT 0° WITH MIXTURES OF:

Methyl Aniline and Water. (Bonner, '10.)

Composition of Homogeneous Mixtures.

Gms. $CH_3NHC_6H_5$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.959	0.041	0.218	0.96
0.90	0.10	0.37	0.95
0.795	0.205	0.555	0.93
0.70	0.30	0.68	0.93
*0.66	0.34	0.72	...
0.60	0.40	0.76	0.93
0.50	0.50	0.84	0.93
0.40	0.60	0.89	0.93
0.30	0.70	0.91	0.93
0.20	0.80	0.87	0.94
0.098	0.902	0.734	0.95
0.041	0.959	0.581	0.96

Phenetol and Water. (Bonner, '10.)

Composition of Homogeneous Mixtures.

Gms. $C_6H_5OC_2H_5$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.992	0.18	0.157	0.96
*0.90	0.10	0.55	...
0.897	0.103	0.554	0.93
0.798	0.202	0.916	0.90
0.70	0.30	1.18	0.90
0.60	0.40	1.39	0.89
0.495	0.505	1.518	0.89
0.399	0.601	1.560	0.89
0.30	0.70	1.54	0.90
0.198	0.802	1.449	0.91
0.10	0.90	1.21	0.92
0.082	0.918	1.156	0.93

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, TOLUENE AND WATER.

(Ormandy and Craven, 1921.)

The determinations were made by the method outlined under heptane (p. 149). An extensive series of determinations were made at seven different temperatures. These results have been plotted and the following table constructed from the curves.

Wt. % C_2H_5OH in Aq. Alcohol mixture used.	Gms. $C_6H_5CH_3$ per 100 gms. sat. solution at						
	—30°.	—15°.	0°.	+5°.	15°.	25°.	30°.
60	–	–	–	–	–	–	8.0
65	5.5	6.5	8.5	9.5	10.2	(11.5)	12.5
70	8.6	10.5	12.7	14.0	15.6	(17.5)	19.5
75	13.5	16.2	19.2	21.0	23.7	(28.0)	31.0
80	20.7	25.0	30.5	33.5	38.5	46.0	49.5
85	33.2	41.0	52.0	55.5	62.5	66.5	68.7
90	62.5	71.0	77.0	79.5	82.0	?	83.7
95	92.5	94.5	94.5	95.0	93.7	?	95.7

Data for the reciprocal solubility of ethyl alcohol, water and a mixture of 3 volumes of benzene and 1 volume of toluene at —15°, 0°, + 15° and 30° are also given.

FREEZING-POINTS OF MIXTURES OF 99.3 WT. PER CENT ALCOHOL AND TOLUENE.

(Ormandy and Craven, 1921.)

F. pt.	Wt. % 99.3 Wt. % Alcohol in mixture.	F. pt.	Wt. % 99.3 Wt. % Alcohol in mixture.	F. pt.	Wt. % 99.3 Wt. % Alcohol in mixture.
—50.0	66.3	—20.8	39.8	—5.8	18.3
—40.6	59.7	—18.3	36.3	—2.2	12.6
—28.2	48.0	—15.4	32.6	+1.1	7.0
—27.1	46.6	—12.3	28.0	3.5	2.7
—24.0	43.4	— 8.8	23.4		

COMPOSITION OF THE CONJUGATE LAYERS IN THE SYSTEM ETHYL ALCOHOL, TOLUENE AND WATER.

(Tarassenkow and Pologienzewa, 1932.)

	Upper Layer				Lower Layer			
t°	Gms. per 100 gms. homogeneous liquid			d.	Gms. per 100 gms. homogeneous liquid			d.
	$C_6H_5CH_3$	C_2H_5OH	H_2O		$C_6H_5CH_3$	C_6H_5OH	H_2O	
0	95.55	3.00	1.45	—	3.02	47.61	46.73	—
"	93.43	5.31	1.26	—	8.00	55.92	36.08	—
"	91.40	5.98	2.88	0.8738	15.44	55.86	28.70	0.8791
"	27.50	35.06	17.44	0.8667	88.14	9.37	2.43	0.8717
20	96.20	1.60	2.20	0.8707	0.40	31.37	68.23	0.9424
"	98.88	4.67	1.55	0.8588	3.44	46.56	50.00	0.9024
"	88.27	9.66	2.07	0.8553	18.10	53.37	28.53	0.8652
"	39.50	47.38	13.12	0.8505	75.24	21.45	3.31	0.8510
40	96.18	1.64	2.18	0.8420	0.54	30.24	69.20	0.9351
"	91.24	5.25	3.50	0.8394	3.23	45.52	51.24	0.9020
"	89.81	7.45	2.74	0.8380	5.98	47.32	46.20	0.8862
"	81.35	13.92	4.73	0.8338	20.65	51.39	27.46	0.8510
"	70.67	22.82	6.54	0.8328	36.98	47.00	16.02	0.8382
"	70.55	23.99	5.43	0.8330	36.13	45.81	18.06	0.8384

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, TOLUENE AND WATER AT 25°.

(Washburn, Beguin and Beckord, 1939.)

The binodal curve was determined by the titration method. The refractive indices of the homogeneous solutions were determined as well as those of the layers formed by mixing appropriate amounts of the liquids and from these results the tie lines were located.

Gms. per 100 gms. homogeneous liquid			Gms. per 100 gms. homogeneous liquid		
$C_2H_5CH_3$	C_2H_5OH	H_2O	$C_6H_5CH_3$	C_2H_5OH	H_2O
89.84	9.36	0.81	29.52	52.89	17.59
81.13	16.74	2.13	19.96	56.42	23.63
70.46	25.29	4.25	12.94	56.66	30.39
60.61	32.66	6.73	6.37	53.04	40.59
49.26	40.83	9.91	3.72	48.89	47.39
39.40	47.37	13.23	1.75	42.48	55.76

MISCIBILITY OF ETHYL ALCOHOL (see Note p. 14) AT 0° WITH MIXTURES OF:

Pinene and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $C_{10}H_{16}$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.99	0.010	0.268	0.87
*0.985	0.015	0.47	...
0.897	0.103	1.595	0.85
0.795	0.205	2.268	0.84
0.70	0.30	2.67	0.84
0.60	0.40	2.94	0.85
0.493	0.507	3.135	0.85
0.393	0.607	3.126	0.86
0.293	0.707	3.038	0.86
0.194	0.806	2.799	0.87
0.094	0.906	2.331	0.89
0.035	0.965	1.639	0.91

Propyl Bromide and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $CH_3.CH_2.CH_2Br$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.975	0.025	0.190	1.26
*0.92	0.08	0.42	...
0.90	0.10	0.50	1.12
0.80	0.20	0.72	1.06
0.70	0.30	0.88	1.02
0.60	0.40	1.01	0.99
0.50	0.50	1.10	0.98
0.40	0.60	1.15	0.96
0.30	0.70	1.14	0.95
0.204	0.796	1.12	0.94
0.096	0.904	1.02	0.94
0.027	0.973	0.687	0.95

MISCIBILITY OF ETHYL ALCOHOL (see Note p. 14) AT 0° WITH MIXTURES OF:

Toluene and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $C_6H_5CH_3$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.948	0.052	0.388	0.87
0.90	0.10	0.61	0.86
0.80	0.20	0.95	0.86
0.70	0.30	1.21	0.86
0.60	0.40	1.41	0.86
0.50	0.50	1.53	0.87
0.40	0.60	1.59	0.87
0.30	0.70	1.56	0.88
0.20	0.80	1.44	0.89
0.10	0.90	1.23	0.91
0.028	0.972	0.817	0.94

o Toluidine and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $CH_3.C_6H_4.NH_2$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.954	0.046	0.025	1.01
0.90	0.10	0.21	0.93
0.80	0.20	0.32	0.97
0.70	0.30	0.41	0.96
0.60	0.40	0.455	0.96
0.50	0.50	0.48	0.96
0.40	0.60	0.50	0.96
0.30	0.70	0.50	0.96
0.20	0.80	0.49	0.96
0.098	0.902	0.462	0.98
0.027	0.973	0.262	...

MISCIBILITY OF ETHYL ALCOHOL (see Note p. 4) AT 0° WITH MIXTURES OF:

Bromotoluene (b. pt. 182–3) and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $BrC_6H_4.CH_3$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.98	0.02	0.33	...
0.951	0.049	0.522	1.09
0.90	0.10	0.87	1.06
0.80	0.20	1.28	0.97
0.70	0.30	1.54	0.94
0.60	0.40	1.71	0.93
0.50	0.50	1.81	0.92
0.40	0.60	1.89	0.91
0.30	0.70	1.89	0.90
0.20	0.80	1.78	0.90
0.10	0.90	1.533	0.91
0.033	0.967	1.307	0.92

p Nitrotoluene and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $NO_2.C_6H_4.CH_3$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.978	0.022	0.253	1.08
*0.95	0.05	0.50	...
0.90	0.10	0.84	0.97
0.80	0.20	1.29	0.96
0.70	0.30	1.57	0.92
0.60	0.40	1.73	0.91
0.506	0.494	1.782	0.91
0.398	0.602	1.868	0.91
0.294	0.706	1.816	0.91
0.20	0.80	1.63	0.91
0.10	0.90	1.30	0.92
0.056	0.944	1.105	0.93

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, XYLENE AND WATER AT −30°, 0° AND +30°. (Ormandy and Craven, 1921.)

The xylene was a commercial sample having $d_{\frac{15}{15}} = 0.8665$ and b. pt. 138°-148°. The determinations were made by the method outlined under heptane (p. 149).

Results at −30°.		Results at 0°.		Results at +30°.	
Wt % C_2H_5OH in aq. alcohol mixture used.	Gms. xylene per 100 gms. sat. sol.	Wt % C_2H_5OH in aq. alcohol mixture used.	Gms. xylene per 100 gms. sat. sol.	Wt % C_2H_5OH in aq. alcohol mixture used.	Gms. xylene per 100 gms. sat. sol.
78.65	11.59	72.35	9.47	66.55	8.67
80.60	13.92	74.24	11.25	69.40	11.45
82.96	17.40	76.97	14.39	73.00	15.77
85.46	22.20	80.33	19.57	77.24	23.12
87.14	26.73	84.05	28.02	81.30	34.70
90.90	41.89	87.24	40.92	84.68	52.01
92.66	53.49	90.24	64.09	92.20	82.67
94.11	70.77	93.90	83.18	91.90	92.22
95.66	83.87	93.70	92.67		
96.20	92.87				

FREEZING-POINTS OF MIXTURES OF 99.3 WT. % ETHYL ALCOHOL AND XYLENE. (Ormandy and Craven, 1921.)

The xylene was a mixture of *o*, *m* and *p* xylene.

t° of f. pt.	−30°.0.	−24°.7.	−19°.8.	−15°.9.	−10°.9.	−1°.0.
Wt. % of 99.3 wt. % alcohol in mixture.	56.1	49.6	43.1	35.8	29.7	11.9

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, PHENYL ETHER AND WATER AT 30°. (Perrakis, 1925.)

The amount of water required to produce clouding in various mixtures of ethyl alcohol and phenyl ether, $(C_6H_5)_2O$, was determined by a titration method.

Wt % C_2H_5OH in alc. phenyl ether mixture.	Gms. H_2O to cause clouding of 100 cc. of mixture.	Wt % C_2H_5OH in alc. phenyl ether mixture.	Gms. H_2O to cause clouding of 100 cc. of mixture.
13.18	0.6206	36.68	2.2654
22.01	1.1151	40.08	2.5709
28.41	.5360	43.16	2.8450
32.76	1.9230	50.57	3.5400

MISCIBILITY OF ETHYL ALCOHOL (see Note p. 4) AT 0° WITH MIXTURES OF:

o Xylene and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. *o* $C_6H_4(CH_3)_2$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.971	0.029	0.352	0.89
*0.96	0.04	0.53	...
0.90	0.10	0.93	0.87
0.786	0.21	1.32	0.87
0.70	0.30	1.53	0.87
0.60	0.40	1.72	0.87
0.50	0.50	1.87	0.87
0.40	0.60	1.96	0.88
0.30	0.70	1.94	0.88
0.20	0.80	1.81	0.89
0.031	0.969	1.19	0.93

m Xylene and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. *m* $C_6H_4(CH_3)_2$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.967	0.033	0.388	0.88
0.90	0.10	0.81	0.87
0.80	0.20	1.30	0.85
0.70	0.30	1.61	0.86
0.60	0.40	1.77	0.86
0.50	0.50	1.90	0.87
0.40	0.60	1.98	0.87
0.30	0.70	2.01	0.88
0.20	0.80	1.87	0.89
0.10	0.90	1.53	0.90
0.023	0.977	1.168	0.92

Additional data for the system ethyl alcohol, *m* xylene, water at 0°, 19°, 41°, 63° and 100° are given by Holt and Bell, 1914.

p XYLENE AND WATER. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. *p* $C_6H_4(CH_3)_2$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.966	0.034	0.306	0.84
*0.92	0.08	0.57	...

Composition of Homogeneous Mixtures.

Gms. *p* $C_6H_4(CH_3)_2$.	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.50	0.50	1.68	0.86
0.40	0.60	1.77	0.86

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, PENTANE AND WATER AT —30°, 0° AND +15°.

(Ormandy and Craven, 1922.)

The determinations were made by the method outlined under heptane (p. 147.).

Results at —30°.

Wt. % C_2H_5OH in Aq. Alcohol mixture used.	Wt. % Pentane in sat. sol.
76.54	7.90
82.60	14.10
85.25	18.82
88.53	28.48
90.35	38.11
91.42	45.66
92.16	58.82

Results at 0°.

Wt. % C_2H_5OH in Aq. Alcohol mixture used.	Wt. % Pentane in sat. sol.
79.55	15.89
84.26	25.51
86.05	32.24
87.98	42.66
89.29	53.66

Results at +15°.

Wt. % C_2H_5OH in Aq. Alcohol mixture used.	Wt. % Pentane in sat. sol.
74.56	13.38
78.22	18.35
84.63	27.67
85.45	37.54
86.91	47.05
88.08	58.55
89.04	68.23
90.27	77.39

FREEZING-POINTS OF MIXTURES OF 92.0 WT. PER CENT ALCOHOL AND:

(Ormandy and Craven, 1922.)

Pentane.

F. pt.	Wt. % Pentane.
—31.0	26.70
—22.5	30.41
—16.0	35.80
— 5.0	39.47
+ 4.9	45.62
14.0	55.91
21.0	63.68

Isopentane.

F. pt.	Wt. % Isopentane.
—28.5	31.59
—14.2	35.21
— 5.0	40.69
+ 4.3	48.07
12.5	57.42
21.5	67.18

Similar data are also given for the freezing-points of 92.0 wt. % alcohol containing different amounts of a 1 : 1 and a 3 : 1 mixture of pentane and benzene.

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, HEXANE AND WATER AT —30° AND +30°. (Ormandy and Craven, 1922.)

Three samples of hexane, obtained from different sources, were used. These had densities and boiling-points which differed from published data, and were, therefore, of unknown purity. Reciprocal solubility determinations were made as described under heptane (following page). The original determinations of the authors, when plotted on cross section paper, give average curves from which the following values were read.

Wt. % C_2H_5OH in aq. Alcohol Mixture used.	Gms. Hexane per 100 gms. sat. sol. at		Wt. % C_2H_5OH in aq. Alcohol Mixture used.	Gms. Hexane per 100 gms. sat. sol. at	
	—30°.	+30°.		—30°.	+30°.
75.0	—	8.0	92.0	21.0	60.0
80.0	—	12.5	94.0	29.5	81.0
84.0	8.0	19.0	95.0	36.0	92.0
86.0	10.0	23.5	96.0	47.0	—
88.0	12.5	30.0	97.0	68.5	—
90.0	16.0	41.0	98.0	92.0	—

Freezing-Points of Mixtures of 92.0 wt. per cent Alcohol and Various Samples of Hexane. (Ormandy and Craven, 1922.)

The samples of hexane were the same as used for the preceding determinations.

Results with: Sample I. F. pt.	Wt. % Hexane.	Results with: Sample II. F. pt.	Wt. % Hexane.	Results with: Sample III. F. t.	Wt. % Hexane.
—31.1	21.97	—31.4	21.81	—29.9	21.98
—26.2	23.18	—21.8	24.85	—21.0	24.71
— 9.5	29.58	— 8.2	30.12	—11.5	28.11
+ 7.6	39.16	+ 7.8	39.48	+ 0.3	33.70
20.6	53.71	20.3	52.89	10.7	40.59
30.5	66.57	30.7	66.63	20.8	51.32
				30.8	64.88

Data are also given for the freezing-points of 92.0 wt. % alcohol containing different amounts of a 1 : 1 and a 3 : 1 mixture of hexane and benzene.

Miscibility of Ethyl Alcohol (see Note, p. 4) at 0° with Mixtures of:

Heptane and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. Heptane.*	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.962	0.038	0.704	0.79
0.90	0.10	1.44	0.80
0.798	0.202	2.375	0.82
0.70	0.30	2.82	0.81
0.60	0.40	3.06	0.82
0.50	0.50	3.16	0.83
0.40	0.60	3.17	0.84
0.30	0.70	3.10	0.85
0.196	0.804	2.96	0.87
0.093	0.907	2.305	0.88

Hexane and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. Hexane.*	Gms. H_2O.	Gms. C_2H_5OH.	Sp. Gr. Sat. Sol.
0.97	0.03	0.59	...
0.90	0.10	1.30	0.77
0.80	0.20	2.04	0.79
0.70	0.30	2.45	0.81
0.60	0.40	2.73	0.82
0.50	0.50	2.93	0.83
0.40	0.60	3.00	0.83
0.20	0.80	2.75	0.85
0.10	0.90	2.23	0.86
0.014	0.986	1.056	...

* Kahlbaum's Heptane and Hexane "aus Petroleum" were used.

Reciprocal Solubility of Ethyl Alcohol, Heptane and Water. (Ormandy and Craven, 1922.)

The heptane was purified by acid washing and fractionation. The $d_{\frac{15}{15}} = 0.6887$ and the b. pt. was 98°.3-98°.4 (760 mm.). The aniline point was 71°. The determinations were made by adding to a given volume of the hydrocarbon a mixture of alcohol and water untill clouding appeared. Two concentrations of alcohol contained in two pipets were used and the clouding produced and discharged alternately. The weights of each constituent were calculated from the specific gravity of each and the results reported on the weight per cent basis.

Results at —30°. Wt. % C_2H_5OH in aq.-alc. mixture used.	Wt. % heptane in sat. sol.	Results at 0°. Wt. % C_2H_5OH in aq.-alc. mixture used.	Wt. % heptane in sat. sol.	Results at +30°. Wt. % C_2H_5OH in aq.-alc. mixture used.	Wt. % heptane in sat. sol.
98.23	90.97	98.30	90.59	98.17	91.18
98.51	81.14	97.92	80.65	95.82	80.15
98.25	69.37	97.98	69.29	95.35	69.42
98.18	59.19	96.91	58.78	94.26	58.84
97.99	49.52	96.41	48.68	93.47	49.44
97.06	39.31	95.72	38.61	92.78	39.00
96.28	29.54	94.36	29.57	91.16	29.28
94.62	20.56	91.98	19.75	88.61	19.96
92.93	15.24	90.27	15.42	85.94	14.25
89.37	8.92	85.35	8.50	80.94	8.39

Similar determinations made with unpurified heptane gave results close to the

FREEZING-POINTS OF MIXTURES OF 92.0 WT. PER CENT ALCOHOL AND VARIOUS SAMPLES OF HEPTANE.

(Ormandy and Craven, 1922.)

Three samples of heptane, obtained from different sources, were used. The densities and boiling-point fractionation figures of the samples show considerable differences from published data. The samples were, therefore, of unknown purity,

Results with : Sample I.

F. pt.	Wt. % Heptane.
—30.5	13.27
—22.2	14.91
—14.6	16.69
+ 0.4	20.77
21.9	29.93
32.0	37.06

Results with : Sample II.

F. pt.	Wt. % Heptane.
—30.3	13.66
—23.1	15.17
—11.0	18.04
+ 3.2	22.36
19.6	29.38
29.9	36.43

Results with : Sample III.

F. pt.	Wt. % Heptane.
—30.3	16.22
—20.5	18.48
—10.9	21.23
+ 0.9	25.18
10.7	29.35
20.7	35.02
30.9	44.40

Data are also given for the freezing-points of 92.0 wt. % alcohol containing different amounts of various mixtures of heptane and benzene.

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, HEXANE AND WATER.

(Tarassenkow and Paulsen, 1937.)

Results at 0°

Gms. per 100 gms. homogeneous mixture		
C_2H_5OH	C_6H_{14}	H_2O
6.53	92.70	0.77
44.30	54.10	1.60
53.32	45.39	1.29
63.34	35.18	1.48
74.01	21.67	4.32
79.22	11.86	8.92
78.74	7.96	13.30
79.08	7.32	13.60
76.82	4.00	19.18
69.85	2.13	28.02
69.43	1.57	29.00
60.04	0.94	39.02
43.12	0.42	56.46

Results at 25°

Gms. per 100 gms. homogeneous mixture		
C_2H_5OH	C_6H_{14}	H_2O
3.10	95.92	0.98
18.52	79.90	1.51
36.28	61.64	2.08
37.82	59.70	2.48
51.94	45.91	2.15
68.03	28.11	3.86
73.84	17.61	8.55
74.73	12.93	12.34
73.52	8.00	18.48
67.49	3.61	28.90
53.81	1.86	44.38
36.68	1.21	62.11

The composition of the following conjugate layers at 25° was also determined.

Gms. per 100 gms. upper layer			Gms. per 100 gms. lower layer		
C_2H_5OH	C_6H_{14}	H_2O	C_2H_5OH	C_6H_{14}	H_2O
0.08	99.31	0.61	37.67	0.23	62.10
1.75	97.71	0.54	56.92	2.91	40.47

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, CYCLOHEXANE AND WATER.

(Tarassenkow and Paulsen, 1937.)

Results at 0°

Gms. per 100 gms. homogeneous mixture		
C_2H_5OH	C_6H_{12}	H_2O
14.49	84.88	0.69
30.62	67.62	1.86
50.03	46.99	2.98
62.14	32.50	5.36
71.98	14.60	13.42
71.84	11.71	16.45
68.63	4.65	26.72
54.41	1.22	44.37

Results at 25°

Gms. per 100 gms. homogeneous mixture		
C_2H_5OH	C_6H_{12}	H_2O
33.10	64.80	2.10
48.18	47.54	4.28
55.24	39.45	5.31
59.11	34.97	5.92
64.91	26.14	8.95
69.20	16.27	14.53
68.45	8.85	22.65
60.07	2.17	37.76

The composition of the following conjugate layers at 25° was also determined.

Gms. per 100 gms. upper layer		
C_2H_5OH	C_6H_{12}	H_2O
0.61	99.07	0.32
1.56	98.09	0.35
9.89	88.96	1.15

Gms. per 100 gms. lower layer		
C_2H_5OH	C_6H_{14}	H_2O
45.98	1.19	52.83
54.98	1.35	43.67
66.24	22.19	11.57

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, CYCLOHEXANE AND WATER AT 25°.

(Vold and Washburn, 1932.)

The binodal curve was determined by the titration method. The refractive indices of these and of the two layers obtained with appropriate amounts of the three liquids gave results from which the distribution of alcohol between water and cyclohexane was calculated. Results for the freezing-points of mixtures of ethyl alcohol and cyclohexane are also given.

Gms. per 100 gms. homogeneous mixture		
C_2H_5OH	C_6H_{12}	H_2O
7.63	0.32	92.05
20.05	0.59	79.36
41.06	0.08	58.86
43.24	0.54	56.22
50.38	0.81	48.81
53.85	1.36	44.79
61.63	3.09	35.28
66.99	6.98	26.03

Gms. per 100 gms. homogeneous mixture		
C_2H_5OH	C_6H_{12}	H_2O
68.47	8.84	22.69
69.31	13.88	16.81
67.89	20.38	11.73
65.41	25.98	8.61
61.59	30.63	7.78
48.17	47.54	4.29
33.14	64.79	2.07
16.70	82.41	0.89

The coefficient of distribution of ethyl alcohol between olive oil and water is 0.026 at 3° and 0.047 at 30°. (Meyer, 1901; 1909.)

100 gms. cottonseed oil (0.922 Sp. Gr.) dissolve 22.9 gms. ethyl alcohol at 25°.

100 gms. ethyl alcohol dissolve 11.75 gms. cottonseed oil at 25°. (Wroth and Reid, '16.)

DISTRIBUTION OF ETHYL ALCOHOL BETWEEN COTTONSEED OIL AND WATER AT 25°. (Wroth and Reid, 1916.)

Gms. C_2H_5OH per 100 cc. *		Ratio.
Oil Layer.	H_2O Layer.	
0.2083	6.147	29.5
0.2251	6.738	29.9
0.2515	6.835	27.1
0.2783	6.876	24.7
0.3017	8.682	28.7

Data for the reciprocal solubility of ethyl alcohol and turpentine are given by Vèzes and Mouline, 1904, 1905–06.

Data for the system ethyl alcohol, water, petroleum are given by Rodt (1916).

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, GASOLINE AND WATER AT 5° AND AT 20°.

(Gay and Massol, 1925; Perrakis and Massol, 1924.)

A titration method was used. Various weighed mixtures of alcohol and gasoline were titrated with water to appearance of clouding. Above 75 per cent of alcohol it was necessary to titrate mixtures of alcohol and water with gasoline. The composition of the mixture was determined in all cases by weighing. The gasoline had a $d_{\frac{20}{4}}$ of 0.747. On distilling 200 cc. the first 10 cc. came over at 60-69° and the last 10 cc. at 215-236°. A diagram of the distillation curve shows a somewhat wavy line between these temperatures.

Isotherm at 5°.

Gms. per 100 gms. cloudy mixture.	
C_2H_5OH.	Gasoline.
17.485	82.320
29.800	69.700
36.150	62.970
55.880	42.490
77.880	13.930
78.880	8.860
76.725	3.485
69.215	0.890
63.570	0.570
57.907	0.333
54.151	0.117

Isotherm at 20°.

Gms. per 100 gms. cloudy mixture.		Gms. per 100 gms cloudy mixture.	
C_2H_5OH.	Gasoline.	C_2H_5OH.	Gasoline.
3.210	96.725	73.260	3.650
11.390	88.400	64.170	0.907
24.060	75.360	55.510	0.281
26.025	73.070	46.530	0.112
54.635	42.500	44.820	0.089
67.275	27.750	39.759	0.053
73.555	17.910	34.559	0.023
76.655	10.155	31.760	0.0105
74.310	4.700	24.299	0.0036

The authors also discuss the effect of salts upon the dehydration of alcohol. It was shown that ammonium sulfate and hyposulfite are poor dehydrating agents and potassium fluoride and carbonate are good dehydrating agents. They give results showing the composition of the upper layers in contact with sat. solutions of K_2CO_3. Much more complete data for the system alcohol + gasoline + water + K_2CO_3 at 20° are given by Gay, Mion and Servigne, 1924. These authors give numerical data and diagrams for the composition of each of the three layers which separate in this system

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, GASOLINE AND WATER.

(Bridgeman and Querfeld, 1933.)

The temperatures were determined at which a second phase separated on slowly cooling accurately prepared mixtures of gasoline (from different sources) and ethyl alcohol containing from 1 to 8 volume percent H_2O. Of the various gasoline samples the following two tables contain respectively the results for the one having the highest and the lowest critical solution temperatures.

Results for sample No. 1.

(Pennsylvania Gasoline of d = 0.738, having a volatility such that 10% distills up to 76°, 50% up to 135° and 90% up to 199°)

Vol. % H_2O in C_2H_5OH	Temperatures of separation in mixtures containing:								
	10	20	30	40	50	60	70	80	90 Vol. % Gasoline
1.11	—	—	-61.0	-46.4	-37.4	-33.4	-31.0	-28.3	-26.4
2.13	—	-60.0	-36.8	-24.0	-15.1	-10.3	- 7.4	- 2.5	—
3.14	—	-45.0	-18.0	- 4.1	3.7	7.7	11.3	16.6	22.3
4.14	-60.6	-26.2	- 3.2	11.5	18.7	22.4	26.4	33.1	39.4
5.18	-54.7	-12.7	11.3	24.3	30.8	34.4	39.5	47.7	52.9
6.20	-43.2	0.3	22.5	35.3	41.6	45.7	51.6	—	—
7.24	-30.2	12.6	33.7	45.0	—	—	—	—	—
8.24	-19.3	23.2	43.2	—	—	—	—	—	—

Results for Sample No. 7

(100% Cracked gasoline of d = 0.754, having a volatility such that 10% distills up to 54°, 50% up to 126° and 90% up to 188°)

Vol. % H_2O in C_2H_5OH	Temperature of separation in mixtures containing:								
	10	20	30	40	50	60	70	80	90 Vol. % Gasoline
1.13	—	—	—	—	—	—	—	—	-53.1
2.14	—	—	—	—	-49.8	-44.8	-40.1	-30.9	-19.9
3.18	—	—	-59.9	-40.0	-26.8	-19.3	-15.9	- 9.3	2.8
4.17	—	—	-38.8	-21.6	-10.9	- 4.6	0.7	9.6	24.5
5.19	—	-50.2	-23.7	- 6.5	3.5	8.6	14.8	24.4	42.6
6.20	—	-37.0	- 9.1	6.2	14.7	20.2	27.0	39.0	—
7.22	—	-23.6	4.0	18.0	25.8	32.0	39.4	51.4	—
8.29	-58.1	-11.6	14.5	27.4	35.5	41.1	50.5	—	—

The authors also present data showing the relation between volatility of a gasoline and its miscibility with ethyl alcohol containing water. The more volatile samples were found to be more miscible in that they gave mixtures having lower critical solution temperatures than similar mixtures with less volatile gasoline. Straight run gasolines of equal volatility show little difference in their miscibility temperatures with ethyl alcohol-water mixtures. Cracked gasolines may, however, show much lower critical solution temperatures than straight run products of the same volatility.

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL AND GASOLINE IN PRESENCE OF A THIRD SOLVENT. (Rothen and Boutier, 1923.)

The alcohol had $d_{15} = 0.812$, The gasoline was an American product of $d_{15} = 0.723$. The titration method was employed. The figures in the table below show the cubic centimeters of the third solvent (A) which must be added to 100 cc. of the following volume per cent mixtures of alcohol and gasoline to obtain a homogeneous solution at 0° and 15°.

Third solvent (A).	10% Alcohol.		20% Alcohol.		30% Alcohol.		40% Alcohol.		50% Alcohol.	
	0°.	−15°.	0°.	−15°.	0°.	−15°.	0°.	−15°.	0°.	−15°.
Benzene	*	*	*	*	23.0	*	13.0	24.0	11.0	18.0
Ether	–	–	11.8	16.3	7.9	13.2	6.0	10.6	4.2	8.8
Acetone	19.0	36.0	18.0	50.0	18.0	56.0	15.0	43.0	12.0	35.0
Iso propyl alcohol	6.3	10.4	7.5	14.8	8.4	17.0	8.6	14.5	6,2	13.0
Iso butyl »	–	–	–	–	7.5	12.0	–	–	6.0	12.0
Normal butyl alcohol.	4.1	5.3	4.6	6.7	4.7	7.5	4.5	5.8	3.8	7.5
Amyl alcohol	4.1	5.3	4.4	6.3	4.6	7.4	4.4	7.7	3.4	7.3
Cyclohexane	3.9	4.9	4.5	6.2	4.4	6.7	4.0	6.8	3.3	6.9
Butyl cresol	5.5	6.3	4.8	6.3	4.2	6.8	3.6	6.1	3.1	5.7
Castor oil	*	*	30.0	*	18.0	41.0	–	–	–	–
Terpineol	9.3	10.8	7.6	10.2	6.4	10.0	–	–	–	–

* Indicates that a homogeneous mixture could not be obtained.

The authors also give diagrams showing the amounts of the third solvent required at temperatures from about — 20 to + 20°.

It is pointed out by Boutaric and Corbet, 1927, that in cases where the determination of the end point of limiting miscibility is rendered difficult by nearness of the refractive indices of the liquids or when the critical solution temperature is very low, the presence of a third solvent may overcome these difficulties. Illustrative results are given for the system CH_3OH + benzene to which different amounts of oil of coloza were added and for the systems C_2H_5OH + benzene and C_2H_5OH + several gasolines to which definite percentages of H_2O were added.

MUTUAL MISCIBILITY TEMPERATURE OF A MIXTURE OF ETHYL ALCOHOL AND PARAFFINE. (Howard and Patterson, 1926.)

To a mixture of equal weights of absolute C_2H_5OH and paraffine (b. pt. 168-180°), which had a mutual miscibility temperature of 19°.9, increasing amounts of a large number of salts were added and the elevation of the mutual miscibility temperature determined. Results showing the effect of increasing amounts of water upon the mutual miscibility temperature are also given. The critical solution temperature of ethyl alcohol and paraffine was found to be at 33°.5 and at 13 per cent C_2H_5OH.

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL AND CARBON TETRACHLORIDE. (Wieth, 1929.)

t°	Gms. CCl_4 per 100 gms. sat. sol.	t°	Gms. CCl_4 per 100 gms. sat. sol.
−58.5	26.4	−38	50.8
−52.5	31.7	−35	57.7
−39.0	49.1	−30	70.8

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, ETHYL ETHER AND WATER.

(Låland, 1932, 1933,1934a.)

The binodal curve was located by titrating a carefully made mixture of C_2H_5OH + $(C_2H_5)_2O$ with H_2O. The points on the binodal curve which correspond to conjugate layers, were found by preparing mixtures which yield two layers and analytically determining the ether content of each of these.

Results at 0°

Gms. per 100 gms. homogeneous mixture		
C_2H_5OH	$(C_2H_5)_2O$	H_2O
8.7	10.5	80.7
18.6	11.0	70.4
25.3	17.3	57.4
27.7	29.4	42.8
27.8	39.3	32.8
26.8	48.2	25.0
24.0	58.0	18.0
20.8	66.1	18.9
16.0	74.7	8.9
11.2	82.9	5.7
4.1	93.3	2.6

Results at -15°

Gms. per 100 gms. homogeneous mixture		
C_2H_5OH	$(C_2H_5)_2O$	H_2O
5.8	91.3	2.8
11.3	83.3	5.3
11.8	82.2	5.8
14.9	77.1	7.9
20.8	66.0	13.1
24.7	55.6	19.7
26.9	46.9	26.1
27.6	41.4	31.0

The following results are given for the composition of conjugate layers at -15°.

Gms. per 100 gms. upper layer			Gms. per 100 gms. lower layer		
C_2H_5OH	$(C_2H_5)_2O$	H_2O	C_2H_5OH	$(C_2H_5)_2O$	H_2O
8.2	87.0	4.3	17.8	12.2	69.9
13.5	79.6	6.8	20.5	12.9	66.6
18.4	71.0	10.6	23.2	15.1	61.7
20.4	66.7	12.9	23.9	16.9	60.1
25.7	52.5	21.8	26.7	22.3	51.0
27.3	28.5	44.3	27.3	25.1	47.6

The following results are given for the composition of the quadruple points corresponding to the intersection of the miscibility and freezing-point curves.

t°	Gms. per 100 gms. homogeneous mixture		t°	Gms. per 100 gms. homogeneous mixture		t°	Gms. per 100 gms. homogeneous mixture	
	C_2H_5OH	$(C_2H_5)_2O$		C_2H_5OH	$(C_2H_5)_2O$		C_2H_5OH	$(C_2H_5)_2O$
- 3.78	0.0	12.8	-17.95	20.8	14.2	-20.65	22.2	83.25
- 5.95	4.0	12.65	-21.50	27.0	23.5	-16.5	9.8	85.6
- 8.40	7.8	12.35	-21.65	27.4	33.8	- 8.0	1.7	96.8
-12.86	14.2	12.2	-21.5	26.95	44.15	- 3.7	0.0	99.1

THE FREEZING-POINTS OF MIXTURES OF ETHYL ALCOHOL AND ETHYL ETHER.

(Lelande, 1933, 1934a.)

t°	Gms. C_2H_5OH per per 100 gms. mixture	Solid Phase	t°	Gms. C_2H_5OH per per 100 gms. mixture	Solid Phase
-116.32	0.0	$(C_2H_5)_2O$	123.09	49.23	$(C_2H_5)_2O$
-117.03	2.09	"	124.37	55.44	"
-117.32	4.02	"	125.05 Eutec.	57.85	" + C_2H_5OH
-117.74	7.43	"	124.38	59.97	C_2H_5OH
-118.32	13.55	"	123.32	64.48	"
-118.64	16.53	"	122.32	69.22	"
119.2	22.13	"	121.51	72.08	"
119.37	25.18	"	119.53	80.28	"
120.3	32.81	"	118.32	85.24	"
121.32	39.29	"	117.67	87.17	"
122.48	45.94	"	114.5	100	"

The previous results of Desmaroux, 1928, and Saphir, 1929, differ somewhat from the above values.

The author also determined the freezing-points of the ternary mixtures of ethyl alcohol, ethyl ether and water. The ternary eutectic is at -127° and contains 55.5 gms. C_2H_5OH, 39.5 gms. $(C_2H_5)_2O$, and 5.0 gms. H_2O per 100 gms. of mixture.

RECIPROCAL SOLUBILITY OF ETHYL ALCOHOL, GLYCOL AND A THIRD SOLVENT.

(Trimble and Fraser, 1929.)

The determinations were made by the titration method. The density of the glycol was 1.1131 at 20°.

$C_2H_5OH + CH_2OH.CH_2OH + C_6H_6$ at 25°

cc per 100 cc homogeneous mixture		
C_2H_5OH	$CH_2OH.CH_2OH$	C_6H_6
4.1	93.0	2.0
16.9	74.2	8.9
23.8	61.8	14.4
27.0	55.7	17.5
30.3	42.8	27.0
30.0	32.9	37.0
22.2	17.2	60.5
10.5	4.8	86.0

$C_2H_5OH + CH_2OH.CH_2OH + C_6H_5NO_2$ at 29°.

cc per 100 cc homogeneous mixture		
C_2H_5OH	$CH_2OH.CH_2OH$	$C_6H_5NO_2$
10.1	83.2	6.8
21.1	63.4	15.5
23.6	59.0	17.4
28.3	43.5	28.3
27.8	32.5	39.7
24.6	24.8	50.5
16.8	12.4	70.8
11.8	6.9	81.3

$C_2H_5OH + CH_2OH.CH_2OH + C_6H_5CH_3$

cc per 100 cc homogeneous mixture		
C_2H_5OH	$CH_2OH.CH_2OH$	$C_6H_5CH_3$
5.7	91.5	2.9
26.3	63.8	10.0
31.6	52.5	15.8
35.5	39.7	24.8
34.2	29.3	36.6
29.6	20.1	50.3
20.7	10.9	68.3

$C_2H_5OH + CH_2OH.CH_2OH + C_6H_4(CH_3)_2$

cc per 100 cc homogeneous mixture		
C_2H_5OH	$CH_2OH.CH_2OH$	$C_6H_4(CH_3)_2$
20.2	76.0	3.9
38.5	48.9	12.5
42.2	38.2	19.6
41.2	29.0	29.7
37.3	20.6	42.2
33.0	16.4	50.5
27.6	11.8	60.5
20.0	7.1	73.0

EQUILIBRIUM IN THE SYSTEM ETHYL ALCOHOL, GLYCEROL AND BENZENE AT 25°.

(McDonald, 1940.)

The determinations for the binodal curve were made by the titration method. Tie lines were located by means of viscosimetric determinations made of conjugate layers prepared from appropriate amounts of the three liquids.

Gms. per 100 gms. lower layer			Gms. per 100 gms. upper layer		
C_2H_5OH	$CH_2OHCHOHCH_2OH$	C_6H_6	C_2H_5OH	$CH_2OHCHOHCH_2OH$	C_6H_6
8.8	89.8	1.4	1.4	0.6	98.4
15.9	81.9	3.2	6.3	0.3	93.4
19.1	76.5	4.4	10.3	0.7	89.0
24.0	69.7	6.3	16.1	1.1	82.8
28.1	62.9	9.0	21.7	2.2	76.1
32.0	54.6	13.4	26.8	4.6	68.6
36.3	38.7	25.0	32.3	10.4	57.3

The compositions of the co-existing phases, the total pressures and the calculated partial pressures for the system Ethyl Alcohol + n Heptane at 30°, are given by Ferguson, Freed and Morris, 1933.

FREEZING-POINTS OF MIXTURES OF ETHYL ALCOHOL AND CARBON TETRACHLORIDE.

(Wyatt, 1928.)

The results are given only in the form of a diagram from which the following approximate values were read.

t°	Mol. Percent CCl_4	Solid Phase	t°	Mol. Percent CCl_4	Solid Phase
-114.5	0	C_2H_5OH	-47.6	44.6	$C_2H_5OH.?CCl_4 \rightarrow CCl_4$
-118. Eutec.	11	" + $C_2H_5OH.?CCl_4$	-42	50	CCl_4
- 76	20	$C_2H_5OH.?CCl_4$	-36	60	"
- 58	30	"	-28	80	"
- 50	40	"	- 24	100	"

FREEZING-POINTS OF MIXTURES OF ETHYL ALCOHOL AND ACETONE.

(Saphir, 1929.)

t°	Gms. $(CH_3)_2CO$ per 100 gms. mixture	Solid Phase	t°	Gms. $(CH_3)_2CO$ per 100 gms. mixture	Solid Phase
-114.1	0	C_2H_5OH	-104.8	60.3	$(CH_3)_2CO$
-116.6	9.6	"	-102.1	74.2	"
-118.7	20.5	"	-100.0	86.5	"
-119.1	25.0Eutec.	" + $(CH_3)_2CO$	- 95.6	100	"
-108.7	43.5	$(CH_3)_2CO$			

MUTUAL SOLUBILITY OF BENZENE AND ETHYL ALCOHOL. FREEZING-POINT METHOD.

(Viala, 1914; see also Rozsa, 1911 and Pickering, 1893.)

t°.	Gms. C_6H_6 per 100 Gms. Sol.	t°.	Gms. C_6H_6 per 100 Gms. Sol.	t°.	Gms. C_6H_6 per 100 Gms. Sol.
−113.9	0	−60	19.3	−10	57.6
−100	8	−50	24.1	0	85
− 90	10	−40	29.8	1	93
− 80	12	−30	37	5.5	100
− 70	15	−20	45.7		

FREEZING-POINTS OF MIXTURES OF ETHYL ALCOHOL AND PHENOL. (Perrakis, 1925.)

An ordinary cryoscopie apparatus was used and the usual precautions taken.

t° of cryst.	Mol. per cent C_2H_5OH in sat. sol.	t° of cryst.	Mol. per cent C_2H_5OH in sat. sol.
—30	49.23	17.1	19.38
—15.2	41.00	22.8	16.25
— 4.7	35.00	32.55	7.29
+ 2.6	30.91	39.9	0.00
9.9	25.09		

Similar data are given for mixtures of ethyl alcohol and phenyl ether $(C_6H_5)_2O$.

Freezing-point lowering data for mixtures of ethyl alcohol and hydrochloric acid are given by Maass and McIntosh, 1913.

Freezing-point data are given for:

C_2H_5OH + Chloral (Leopold, 1909.)
" + $(C_2H_5)_2.HBr$ (Maass and Russel, 1919.)
" + CH_3OH (Saphir, 1929.)
" + $CH_3COOC_2H_5$ (Saphir, 1929; Lelande, 1933.)
" + Acetamide + Phenol (Kremann & Wenzig, 1917; Speyers, 1902.)

METHYL UREA $NH_2.CONHCH_3$.

Freezing-point data for mixtures of methyl urea and phenol are given by Kremann, 1910.

(Dubroca, 1907.)

GLYCOL (Ethylene glycol) $CH_2OH.CH_2OH$.

SOLUBILITY OF GLYCOL IN WATER DETERMINED BY THE FREEZING-POINT METHOD.

(Ewert, 1937.)

t°		Gm. Mols. $CH_2OH.CH_2OH$ per 100 gm. mols. sat. sol.	Solid Phase	t°		Gm. Mols. $CH_2OH.CH_2OH$ per 100 gm. mols. sat. sol.	Solid Phase
-14.1		10.5	H_2O	-63.3	Eutec.	47.5	1.2 + 3.2
-20.9		14.1	"	-54.6		50.2	3.2
-28.3		18.9	"	-40.7		60.9	"
41.8		24.9	"	-49.4	Eutec.	66.0	" + $CH_2OH.CH_2OH$
51.2	Eutec.	28	" + 1.2	-45.3		67.8	$CH_2OH.CH_2OH$
49.6		31.8	1.2	-36.4		75.3	"
49.6		34.1	"	-22.4		90.1	"
-58.6		44.0	"	-12.8		100.0	"

1.2 = $CH_2OH.CH_2OH.2H_2O$; 3.2 = $3CH_2OH.CH_2OH.2H_2O$.

100 cc. sat. solution of glycol in Water contain 19.64 gm. $CH_2OH.CH_2OH$ at 21°.
» » » » $0.02n\,CH_3COOK$ » 17.20 » » »

(Pfeiffer and Angern, 1924.)

CRITICAL SOLUTION TEMPERATURES OF SEPARATION OF MIXTURES OF GLYCOL AND OTHER COMPOUNDS.

(Lecat, 1927, 1927a, 1928, 1929, 1930, 1930a, 1930b.)

Mixture of $CH_2OH.CH_2OH$ and:	t^o of Separation	Percent $CH_2OH.CH_2OH$ in mixture
Acetophenone	114.5	52
i Amyl benzoate	182	66
Anisol	134.5	10.5
Benzyl acetate	100	45
Bornyl acetate	110	53
Bromoform	142	6.5
n Butyl benzoate	178	—
i " "	172	—
Carvon	97.4	61
p chloro nitrobenzene	136.5	58
Citronellal	165	53
p Cresol methylether	152	23
Di methyl aniline	171.4	33.5
n Decanol	105	—
Ethyl acetate	57	— (1)
" benzoate	137	46.5
" aniline	126.5	43
Ethylene bromide	102	3.5
Eugenol methyl ester	144	68.5
β Iso safrol	172	64
Methyl acetate	26.8	— (1)
" benzoate	109.5	— (1)
" aniline	70	40.2
p " acetophenone	77.5	60
" cinnamate	101.5	85
" heptenone	65	22.5
" n hexyl ketone	66	21
" salicylate	143	48
Nitro benzene	120.2	59
o " toluene	142	48.5
p " "	141.5	63.5
Phenyl acetate	67.7	34
Propyl benzoate	165.	55
Safrol	187.5	55
s Tetra chloro ethane	88.5	7
o Toluidine	- 8.5	42.5

(1) Muchin and Machina, 1930, 1931.

EQUILIBRIUM IN TERNARY SYSTEMS COMPOSED OF GLYCOL ACETONE AND ANOTHER COMPOUND.

(Trimble and Fraser, 1929.)

The determinations of the binodal curves were made by titrating to the appearance or disappearance of clouding. Since glycol cannot be satisfactorily measured in ordinary volumetric apparatus it was weighed out from a dropping bottle of the ground-in pipet type and the volume calculated from the d = 1.1131 at 20°. Tie lines were determined by the method of Miller and McPherson, 1908. This method rests upon the principle that the distance from the point representing the gross composition of a mixture yielding two immiscible layers, to the ends of the tie lines through this point are inversely proportional to the volumes of the phases into which the mixture separates.

Results for mixtures of:

Glycol + Acetone + Xylene

cc per 100 cc of homogeneous mixture		
$CH_2OH.CH_2OH$	$(CH_3)_2CO$	$C_6H_4(CH_3)_2$
70.0	4.0	26.1
45.0	12.6	42.4
34.0	19.0	46.8
23.3	24.2	52.5
14.8	33.4	51.8
11.2	37.7	51.3
5.6	47.0	47.3

Glycol + Acetone + Toluene

cc per 100 cc of homogeneous mixture		
$CH_2OH.CH_2OH$	$(CH_3)_2CO$	$C_6H_5CH_3$
92.0	4.0	4.2
54.6	11.8	33.6
37.9	19.8	42.5
29.1	25.1	45.6
18.8	32.8	48.4
10.2	43.0	46.8
6.6	49.8	43.8

EQUILIBRIUM IN TERNARY SYSTEMS COMPOSED OF GLYCOL ACETONE AND ANOTHER COMPOUND—CONTINUED.

(Trimble and Fraser, 1929.)

Vol. % $(CH_3)_2CO$ in	
Glycol rich layer	Glycol poor layer
18.0	22.3
25.5	35.2
31.2	46.0
45.0	52.0

Glycol + Acetone + Chloro benzene

cc per 100 cc homogeneous mixture		
CH_2OHCH_2OH	$(CH_3)_2CO$	C_6H_5Cl
78.7	4.6	16.7
50.9	15.0	34.1
37.8	22.2	40.0
25.5	30.0	44.5
15.9	37.5	46.5
8.1	47.6	44.4
4.7	55.6	39.8
3.4	60.7	36.0
2.4	66.0	31.6

Vol. % $(CH_3)_2CO$ in:	
Glycol rich layer	Glycol poor layer
16.8	23.0
24.0	36.0
27.0	42.0
31.6	46.0

Glycol + Acetone + Bromo benzene

cc per 100 cc homogeneous mixture		
$CH_2OH.CH_2OH$	$(CH_3)_2CO$	C_6H_5Br
78.6	4.3	17.2
51.3	14.0	34.7
38.0	21.0	40.3
16.8	36.8	46.4
12.5	41.1	46.4
8.7	47.3	44.0
5.0	55.1	39.9
2.5	64.4	33.1
0.9	74.3	24.8

Vol. % $(CH_3)_2CO$ in:	
Glycol rich layer	Glycol poor layer
8.0	12.0
16.8	24.0
24.0	36.0
32.0	45.7

Vol. % $(CH_3)_2CO$ in	
Glycol rich layer	Glycol poor layer
16.0	24.0
23.0	37.0
30.0	45.7
39.0	46.8

Glycol + Acetone + Benzene

cc per 100 cc homogeneous mixture		
$CH_2OH.CH_2OH$	$(CH_3)_2CO$	C_6H_6
90.7	3.9	5.4
72.2	8.4	19.4
60.2	12.9	26.9
49.8	17.5	32.7
32.4	27.8	39.8
14.1	41.3	44.6
9.1	48.2	42.6
4.9	57.2	37.6
1.2	74.0	24.8
0.2	90.8	9.9

Vol. % $(CH_3)_2CO$ in:	
Glycol rich layer	Glycol poor layer
10.2	6.8
16.0	25.0
22.0	37.8
32.2	44.0

Glycol + Acetone + Nitro benzene

cc per 100 cc homogeneous mixture		
$CH_2OH.CH_2OH$	$(CH_3)_2CO$	$C_6H_5NO_2$
87.0	4.3	8.7
76.8	7.7	15.4
55.5	16.7	27.8
45.0	22.5	32.6
31.3	31.3	37.0
20.1	40.3	39.7
12.2	48.8	39.1
7.6	57.4	35.0
4.3	64.8	31.0
0.1	90.8	9.1

Vol. % $(CH_3)_2CO$ in:	
Glycol rich layer	Glycol poor layer
17.4	22.8
19.1	31.0
23.0	36.7

METHYL SULFATE $(CH_3)_2SO_4$.

100 cc. H_2O dissolve 2.8 gms dimethyl sulfate at 18°. Solution is, however, accompanied or quickly followed by decomposition. (Boulin and Simon, 1920.)

Reciprocal Solubility of Methyl Sulfate and Oil of Turpentine.

(Dubroca 1907.)

The determinations were made by the synthetic method (sealed tubes).

The d_{25} of the oil of turpentine, $C_{10}H_{16}$, was 0.8602, its absolute index of refraction for yellow light at 25° was 1.467 and its rotation in a 100-mm. tube was −32.25°.

t°.	Gms. $(CH_3)_2SO_4$ per 100 Gms.		t°.	Gms. $(CH_3)_2SO_4$ per 100 Gms.	
	$(CH_3)_2SO_4$ Rich Layer.	$C_{10}H_{16}$ Rich Layer.		$(CH_3)_2SO_4$ Rich Layer.	$C_{10}H_{16}$ Rich Layer.
30	95	4	80	87	13
40	93	5	90	84	17
50	92	6	100	76	27
60	91	8	105	68	37
70	89	10	108.2 (crit. t.)	50.5	

The results are influenced appreciably by the age and purity of the products and by the length of time the mixtures are kept in the sealed tubes. Somewhat different results were obtained with a sample of turpentine containing 5 vol. % of white spirit.

ETHYL Hydrogen **SULFATE** $C_2H_5HSO_4$.

Freezing-points of Mixtures of Ethyl Hydrogen Sulfate and Water.

(Berthoud, 1929.)

t^0	Mol. % $C_2H_5HSO_4$	Solid Phase	t^0	Mol. % $C_2H_5HSO_4$	Solid Phase
− 6	3.3	Ice	5.1	52.0	$C_2H_5HSO_4.H_2O$
−17	7.4	"	4.4	53.8	"
−23.5	9.2	"	− 1.4	62.0	"
— Eutec. —		" + $C_2H_5.HSO_4.H_2O$	− 5.0	64.0	"
−70	27.5	$C_2H_5HSO_4.H_2O$	−11.0	68.5	"
−58	29.4	"	−25.2	75.4	"
−35	32.7	"	−35.5	79.5	" + $C_2H_5HSO_4$
− 9.5	37.7	"	−32.3	80.3	$C_2H_5HSO_4$
− 2.5	40.2	"	−25	86.0	"
+ 4.3	45.5	"	−21	90.4	"
5.1	48.0	"	−17	100.0	"
5.4m.p.	50.5	"			

ETHYL Hydrogen **SULFATE** $C_2H_5HSO_4$.

Solubility in Ethyl Ether Containing Free Sulfuric Acid at 30°

(Hamid, Singh and Dunnicliff, 1926.)

Per cent free H_2SO	Per cent $C_2H_5HSO_4$.	Per cent free H_2SO_4.	Per cent C_2H_5HSO
0.092	1.125	0.372	0.722
0.152	1.061	0.516	0.509
0.186	0.999	0.533	0.470
0.314	0.818	4.06	0.242

By extrapolation the solubility of pure ethyl hydrogen sulfate in pure ether should be about 1.27 gms. $C_2H_5HSO_4$ per 100 gms. dry ether at 30°.

DI METHYL AMINE $(CH_3)_2NH$.

The solubility of dimethyl amine in water at 60°, calculated from the vapor pressures determined by an aspiration method was found by Doyer, 1890, to be 188 in terms of the Bunsen Absorpition Coefficient and 230 in terms of the Ostwald Solubility Expression, 1, at vapor pressure of 90.3 mm Hg.

Freezing-point data for mixtures of dimethyl amine and water are given by Pickering, 1893.

DISTRIBUTION OF DIMETHYL AMINE AT 25° BETWEEN WATER AND ETHER.

(Smith, 1921, 1922.)

Millimols. $(CH_3)_2NH$ per liter of H_2O layer (C_1).	Millimols. $(CH_3)_2NH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Millimols. $(CH_3)_2NH$ per liter of H_2O layer (C_1).	Millimols. $(CH_3)_2NH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.37	0.33	0.241	4.35	1.025	0.236
1.85	0.425	0.230	5.22	1.26	0.242
2.55	0.600	0.235	7.00	1.60	0.228
2.81	0.63	0.224	13.5	3.05	0.226

DISTRIBUTION OF DIMETHYL AMINE AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $(CH_3)_2NH$ per liter of H_2O layer (C_1)	Millimols. $(CH_3)_2NH$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.35	0.80	0.592
2.20	1.275	0.580
3.40	2.00	0.588
4.55	2.62	0.582
5.85	3.40	0.582

Water and Xylene.

Millimols. $(CH_3)_2NH$ per liter of H_2O layer (C_1).	Millimols. $(CH_3)_2NH$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
1.786	0.214	0.120
3.55	0.430	0.121
8.97	1.12	0.125
17.78	2.22	0.125

Acetone and Glycerol.

Millimols. $(CH_3)_2NH$ per liter of Acetone layer (A).	Millimols. $(CH_3)_2NH$ per liter of Glycerol layer (G).	$\frac{A}{G}$.
1.125	2.25	0.510
2.425	4.325	0.561
4.775	7.525	0.635
10.6	15.8	0.672
20.1	27.8	0.723

DISTRIBUTION OF DIMETHYL AMINE AT 25° BETWEEN:

(Herz and Stanner, 1927.)

Water and Benzene

Gm. Mols. $(CH_3)_2$ NH per liter H_2O layer C_1	Gm. Mols. $(CH_3)_2$ NH per liter C_6H_6 layer C_2	$\frac{C_2}{C_1}$
0.3212	0.0394	0.123
0.6243	0.0576	0.092
0.9061	0.0788	0.087
1.2001	0.1061	0.088

Water and Toluene

Gm. Mols. $(CH_3)_2NH$ per liter H_2O layer C_1	Gm. Mols. $(CH_3)_2NH$ per liter $C_6H_5CH_3$ layer C_2	$\frac{C_2}{C_1}$
0.3182	0.0333	0.105
0.6243	0.0503	0.081
1.9273	0.0655	0.071
1.2273	0.0847	0.069

DISTRIBUTION OF DIMETHYL AMINE BETWEEN WATER AND TOLUENE.

(Moore and Winmill, 1912.)

t°	Gm. Equiv. $(CH_3)_2NH$ per liter aq. layer	Dist. Coef.
18	0.0759	23.28
"	0.0975	23.29
25	0.1203	19.01
"	0.1010	19.05
32.35	0.1003	13.38

DI METHYL AMINE HYDROCHLORIDE $(CH_3)_2.NH.HCl$.

100 gms. H_2O dissolve 369.2 gms. $(CH_3)_2NH.HCl$ at 25°. (Peddle and Turner, 1913.)
100 gms. $CHCl_3$ dissolve 16.91 gms. $(CH_3)_2NH.HCl$ at 25°. (Peddle and Turner, 1913.)

DI METHYL AMINE CHLORO PLATINATE $(CH_3)_2NH.H_2PtCl_6$.

SOLUBILITY OF DIMETHYL AMINE CHLORO PLATINATE IN AQUEOUS ETHYL ALCOHOL AT 0°.
(Bertheaume, 1910.)

Concentration of Aq. Alcohol (Wt. or Vol. %?)	Gms. $(CH_3)_2NH.H_2PtCl_6$ per 100 gms. solvent
60	0.996
70	0.558
80	0.325
90	0.110
100	0.0048

ETHYL AMINE $C_2H_5.NH_2$.

Freezing-point data for mixtures of ethyl amine and water are given by Guthrie, 1884, and Pickering, 1893.

The solubility of ethyl amine in water at 60°, calculated from the vapor pressures determined by an aspiration method was found by Doyer, 1890, to be 321 in terms of the Ostwald Solubility Expression, l, and 263 in terms of the Bunsen Absorption Coefficient, β, at a vapor pressure of 64.5 mm. Hg.

DISTRIBUTION OF ETHYL AMINE AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $C_2H_5.NH_2$ per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.50	0.55	0.366
2.525	1.00	0.396
4.30	1.80	0.418
10.20	4.80	0.470
18.45	9.45	0.512
25.50	20.70	0.780

Acetone and Glycerol.

Millimols. $C_2H_5.NH_2$ per liter		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.67	1.20	0.558
1.25	1.625	0.77
1.26	1.76	0.715
2.25	2.70	0.835
4.76	4.72	1.01
9.76	8.20	1.19

Water and Ether.

Millimols. $C_2H_5.NH_2$ per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
2.550	0.450	0.176
3.975	0.675	0.170
6.075	1.125	0.185
9.8	1.60	0.163
14.8	2.50	0.169

Water and Xylene.

Millimols. $C_2H_5.NH_2$ per liter		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2)	$\frac{C_2}{C_1}$.
1.7955	0.2045	0.1140
3.654	0.346	0.0947
9.255	0.745	0.0805
19.284	1.426	0.074

Distribution of Ethyl Amine Between Water and Toluene.

(Moore and Winmill, 1912.)

Results at 18°		Results at 25°		Results at 32.35°	
Gm. Equiv. $C_2H_5NH_2$ per liter	Dist. Coef.	Gm. Equiv. $C_2H_5NH_2$ per liter	Dist. Coef.	Gm. Equiv. $C_2H_5NH_2$ per liter	Dist. Coef.
0.0756	26.09	0.1159	19.13	0.1287	14.76
0.0886	26.14	0.0999	19.11	0.2479	14.79

ETHYL AMINE HYDROCHLORIDE $C_2H_5NH_2.HCl$.

Solubility of Ethyl Amine Hydrochloride in Water and in Chloroform at 25°.

(Peddle and Turner, 1913.)

Solvent	Gms. $C_2H_5NH_2.HCl$ per 100 gms. solvent
Water	279.9
Chloroform	0.17

TAURINE $NH_2.CH_2.CH_2.SO_3H$.

Solubility of Taurine in Water.

(Dalton and Schmidt, 1935.)

The results of 10 determinations at temperatures between 0° and 62° were used for calculating the solubility equation and from this the following values for 5° intervals were obtained. The results above 70° are probably less accurate than the others.

t°	Gms. $C_2H_7SO_3$ per 100 gms. H_2O	t°	Gms. $C_2H_7SO_3$ per 100 gms. H_2O	t°	Gms. $C_2H_7SO_3$ per 100 gms. H_2O
0	3.931	30	12.38	60	27.42
5	4.878	35	14.49	65	30.26
10	5.992	40	16.78	70	33.05
15	7.291	45	19.26	75	35.71
20	8.784	50	21.88	100	45.76
25	10.48	55	24.62		

CACODYLIC ACID (Dimethyl Arsinic Acid) $(CH_3)_2AsO.OH$.

100 cc. H_2O dissolve about 200 gms. cacodylic acid at 15°. (Squire and Caines, 1905.)
100 cc. 90% alcohol dissolve about 28.5 gms. cacodylic acid at 15°. " "

DI METHYL HYDRAZINE $CH_3NH.NHCH_3$.

Freezing-point data for mixtures of Dimethyl Hydrazine and Benzalazine are given by Pascal, 1914.

ETHYLENE DI AMINE $NH_2CH_2.CH_2NH_2$.

The Critical Solution Temperature of Ethylene Diamine and i Octane (2.2.4 Tri methyl pentane) is 112.0°.
The Critical Solution Temperature of Ethylene Diamine and n Heptane is 108.0°. (Cornish, Archibald, Murphy and Evans, 1934.)
Freezing-point data are given by Puschin and Sladovich, 1928a for mixtures of Ethylene Diamine on the one hand and phenol, o and p cresol, pyrocatechol, and guaicol on the other.

DI IODO DI THIO CARBAMIDE $(CSN_2H_4)_2I_2$.

100 gms. chloroform dissolve 0.6–0.7 gm. diiododithio carbamide $(CSN_2H_4)_2I_2$ at temp. not stated. (Werner, 1912.)

Trichloro**ACRYLIC ACID** $CCl_2:CClCOOH$.

Solubility of Trichloroacrylic Acid in Water

(Boeseken and Carriere, 1915.)

t°.	Gms. CCl_2: CClCOOH per 100 Gms. Sat. Solution.	Solid Phase.
0.0	0.0	Ice
−0.36	2.0	“
− 0.6 Eutec.	4.5	Ice+CCl_2: CClCOOH.2½ H_2O
+13.7 “	64.1	CCl_2.CClCOOH.2½ H_2O
15.0	68.5	“
17.0	74.5	“
19.2 m. pt.	80.0	“
17.0 Eutec.	81.1	CCl_2: CClCOOH+ CCl_2: CClCOOH.2½ H_2O
20.3 “	82.8	CCl_2: CClCOOH
25.0	84.5	“
30.0	86.0	“
40.0	89.5	“
50.0	92.5	“
60.0	94.5	“
70.0	98.5	“
72.9	100.0	“

Between the concentration 4.5 and 64.1 two liquid layers are formed. The percentage of CCl_2: CClCOOH in each is as follows:

t°.	Gms. CCl_2:CClCOOH per 100 Gms. Sat. Solution.	
	Lower Layer.	Upper Layer.
10	5.0	...
20	5.2	64.1
30	6.0	63.8
40	7.5	62.2
50	13.0	59.5
55	18.0	56.0
60	27.0	49.0
62 crit. t.	38.0	

The original results were plotted on cross-section paper and the above figures read from the curves.

PROPIOLIC ACID HC⋮C.COOH

FREEZING-POINTS OF MIXTURES OF PROPIOLIC ACID AND WATER.

(Straus, Heyn, and Schwemer, 1930.)

The original results are given only in the form of a diagram from which the following approximate values were read.

t°	Gms. HC⋮C.COOH per 100 gms. mixture	Solid Phase	t°	Gms. HC⋮C.COOH per 100 gms. mixture	Solid Phase
-2.7	72.4	HC⋮C.COOH.H_2O	9.3	90.0	3HC⋮C.COOH.H_2O
-1.7	75.0	"	10.0m.pt.	92.1	"
-0.3m.pt.	79.5	"	8.5	95.0	"
-0.8Eutec.	82.8	" + 3HC⋮C.COOH.H_2O	7.5Eutec.	96.2	" + HC⋮C.COOH
+4.5	85.0	3HC⋮C.COOH.H_2O	10.0	97.4	HC⋮C.COOH
7.5	87.5	"	18.0	100.0	"

CyanoACETIC ACID $CH_2(CN)COOH$.

DISTRIBUTION OF CYANOACETIC ACID BETWEEN:

(Hantzsch and Sebalt, 1899.)

Water and Ethyl Ether.

t°.	Gms. $CH_2(CN)COOH$ per Liter.	
	H_2O Layer.	$(C_2H_5)_2O$ Layer.
0	0.070	0.042
10	0.076	0.044
21	0.083	0.030
30	0.089	0.027

Water and Benzene.

t°.	Gms. $CH_2(CN)COOH$ per Liter.	
	H_2O Layer.	C_6H_6 Layer.
6	0.067	0.020
25	0.130	0.019

Trichlor LACTIC ACID $CCl_3.CHOH.COOH$.

SOLUBILITY OF TRICHLOR LACTIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AND OF SULFURIC ACID AT 25°.

(Knox and Richards, 1919.)

In Aq. Hydrochloric Acid.

Equiv. normality.		Equiv. normality.	
HCl.	$C_3H_3O_3Cl_3$	HCl.	$C_3H_3O_3Cl_3$.
0.00	4.024	7.675	0.659
1.234	2.545	8.959	0.624
2.837	1.425	10.65	0.57
4.388	0.984	11 86	0.57
5.982	0.760	12.17	0.60

In Aq. Sulfuric Acid.

Equiv. normality.		Equiv. normality.	
H_2SO_4.	$C_3H_3O_3Cl_3$.	H_2SO_4.	$C_3H_3O_3Cl_3$
0.0	4.024	16.18	0.15
2.525	1.896	19.38	0.18
6.166	0.671	22.28	0.21
9.588	0.353	25.34	0.26
12.75	0.26		

ACROLEIN $CH_2 : CH.CHO$.

Reciprocal Solubility of Acrolein and Water.

(Boutaric, 1920; Boutaric and Corbet, 1926.)

The temperatures of clouding and of clearing in mixtures of weighed amounts of acrolein and water were determined. Sealed tubes were used at the higher temperatures. The acrolein was stabilized by the addition of $\frac{1}{250}$th of its weight of hydroquinol. The original determinations were plotted and the following results read from the curve. The authors also give a few results for the effect of different amounts of hydroquinol and of gallic acid upon the reciprocal solubilities. They found by extrapolation of the critical temperatures of acrolein stabilized with different amounts of hydroquinol, that the critical temperature of pure acrolein in water is 88°.2. Determinations are also given of the effect upon the critical temperature resulting from the presence of increasing amounts of soluble resin of acrolein.

	Gms. $CH_2 : CH.CHO$ per 100 gms.	
t°.	H_2O rich layer (lower).	Acrolein rich layer (upper).
—10....	20.0	96.0
0....	20.0	95.5
+10.....	20.5	94.5
20.....	21.0	93.2
30.....	21.5	92.0
40.....	22.5	90.0
50.....	25.0	87.5
60.....	29.0	84.5
70.....	34.0	80.0
80.....	41.5	73.0
85.....	48.0	67.0
88 crit. t.	56.2	

αβ Dibrom PROPIONIC ACID $CH_2Br.CHBrCOOH$.

Distribution of αβ Dibrom Propionic Acid at 25° Between : (Smith, 1921, 1922.)

Water and Chloroform.			Water and Ether			Water and Xylene.		
Millimols. $C_2H_3Br_2COOH$ per liter of			Millimols. $C_2H_3Br_2COOH$ per liter of			Millimols. $C_2H_3Br_2COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
1.85	0.313	0.169	0.2187	0.8562	3.92	3.70	0.50	0.135
2.66	0.560	0.210	0.2562	1.1312	4.42	5.20	0.75	0.144
3.54	0.985	0.278	0.350	2.1000	6.00	7.20	1.30	0.181
4.98	1.63	0.327	0.450	3.2625	7.25	7.35	1.45	0.197

CHLORAL FORMAMIDE $CCl_3.CH(OH).NH.CHO$.

100 gms. H_2O dissolve 5.3 gms. $CCl_3CH(OH).NHCHO$ at 25°. (U. S. P.)
100 gms. 95% alcohol dissolve 77 gms. $CCl_3CH(OH).NHCHO$ at 25°. "

Tri chloro ETHYL CARBAMATE (Voluntal) $NH_2COOCH_2CCl_3$.

Freezing-point data are given for mixtures of Tri chloro ethyl carbamate and:

Acetyl amino antipyrine	(Pfeiffer and Angern, 1926.)
Anti pyrine	(Pfeiffer and Seydel, 1928.)
Pyramidon	(Pfeiffer and Angern, 1926; Pfeiffer and Seydel, 1928.)
Di methyl amino antiyprine	(Pfeiffer and Seydel, 1928.)

HYDANTOIN (Glycolyl urea) $\underline{\text{NHCONHCOCH}}_2$.

SOLUBILITY OF HYDANTOIN IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1935.)

Vol. Percent C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mols. $C_3H_4O_2N_2$ per liter	Vol. Percent C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mols. $C_3H_4O_2N_2$ per liter
0.0	1.0105	0.397	70.0	0.8923	0.249
20.0	0.9846	0.348	90	0.8304	0.0987
40.0	0.9579	0.340	100.0	0.7867	0.0324
60.0	0.9207	0.294			

PYRUVIC ACID $CH_3.CO.COOH$.

DISTRIBUTION OF PYRUVIC ACID AT 25°, BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $CH_3.CO.COOH$ per liter of H_2O layer (C_1).	Millimols. $CH_3.CO.COOH$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
19.90	1.00	0.0592
31.2	2.00	0.064

Water and Ether.

Millimols. $CH_3.CO.COOH$ per liter of H_2O layer (C_1).	Millimols. $CH_3.CO.COOH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
3.65	0.55	0.151
5.00	0.80	0.160
7.05	1.15	0.163
14.10	2.40	0.170

Water and Xylene.

Millimols. $CH_3.CO.COOH$ per liter of H_2O layer (C_1).	Millimols. $CH_3.CO.COOH$ per liter of Xylene layer (C_2).	$\frac{C_2}{C_1}$.
19.6	0.40	0.0204
45.8	1.10	0.024
63.7	1.85	0.029

The freezing-points of mixtures of pyruvic acid and phosphorus acid are given by Redfield and King, 1936.

MALONIC ACID $CH_2(COOH)_2$.

SOLUBILITY IN WATER.

(Klobbie, 1897; Miczynski, 1886; Henry, 1884; Lamouroux, 1898, 1899.)

t°.	Gms. $CH_2(COOH)_2$ per 100. Gms. Solution.*	Gms. $CH_2(COOH)_2$ per 100. cc. Solution (L.).	t°.	Gms. $CH_2(COOH)_2$ per 100. Gms. Solution.*	Gms. $CH_2(COOH)_2$ per 100. cc. Solution (L.).
0	52	61	50	71	93
10	56.5	67	60	74.5	100
20	60.5	73	70	...	106
25	62.2	76.3	80	82	...
30	64	80	100	89	...
40	68	86.5	132 m. pt.	100	...

* Average curve from results of K., M., and H.

100 gms. 95% formic acid dissolve 22.42 gms. malonic acid at 19.5°. (Aschan, 1913.)

10 cc cold saturated aqueous magnesium perchlorate solution dissolve about 3.8 gms. malonic acid. (Duclaux and Durand-Gasselin, 1938.)

100 gms. of benzene dissolve 0.0014 gm. malonic acid at 25°. (Verkade and Coops, Jr., 1930.)

Solubility of Substituted Malonic Acids in Water.

(Lamouroux, 1899.)

t°.	Gms. per 100 cc. Saturated Aqueous Solution. Malonic Acid.	Methyl Malonic Acid.	Ethyl Malonic Acid.	*n* Propyl Malonic Acid.	*n* Butyl Malonic Acid.	Iso Amyl Malonic Acid.
0	61.1	44.3	52.8	45.6	11.6	38.5
15	70.2	58.5	63.6	60.1	30.4	51.8
25	76.3	67.9	71.2	70	43.8	79.3
30	92.6	91.5	90.8	94.4	79.3	83.4

Solubility of Malonic Acid in Aqueous Solutions of Dioxane at 25°.

(Herz and Lorentz, 1929.)

Vol. Percent Dioxane in Solvent	Gm. Mols. $C_4H_4O_4$ per liter sat. sol.	Vol. Percent Dioxane in Solvent	Gm. Mols. $C_4H_4O_4$ per liter sat. sol.
10	6.95	60	5.52
33	6.81	80	5.22
50	6.19	100	2.38

MALONIC ACID $CH_2(COOH)_2$.

Solubility of Malonic Acid at 25° in Aqueous Solutions of :

(Knox and Richards, 1919.)

Hydrochloric Acid. Equiv. normality of HCl.	$CH_2(COOH)_2$.	Sulfuric Acid. Equiv. normality of H_2SO_4.	$CH_2(COOH)_2$.
0.0	15.01	0.0	15.01
4.443	7.70	2.727	11.44
6.210	5.99	7.050	6.79
8.658	4.71	11.76	4.07
10.47	4.32	16.05	3.01
11.09	4.26	19.92	3.20
11.22	4.30	21.84	4.55

Distribution of Malonic Acid at 25° Between : (Smith, 1921, 1922).

Water and Ethyl Ether.

Millimols. $CH_2(COOH)_2$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
2.1875	0.29375	0.134
3.80	0.5125	0.135
7.90	1.05	0.133
22.30	3.44	0.154
34.42	5.17	0.150
94.60	14.00	0.148

Acetone and Glycerol.

Millimols. $CH_2(COOH)_2$ per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.475	1.20	0.396
1.05	2.4875	0.423
1.8875	3.775	0.500
2.80	6.05	0.462
6.05	14.0	0.433

The System Ethyl Ether–Malonic Acid–Water at 15°. (Klobbie, 1897.)

Results for Conjugated Liquid Layers Formed when Insufficient Malonic Acid to Saturate the Solutions Was Present.

Results for the Liquid Layers in Contact with Excess of Malonic Acid.

Gms. per 100 Gms. Lower Layer. Malonic Acid.	H₂O.	Ethyl Ether.	Gms. per 100 Gms. Upper Layer. Malonic Acid.	H_2O.	Ethyl Ether.	Gms. per 100 Gms. Liquid. Malonic Acid.	H_2O.	Ethyl. Ether.	Solid Phase.
0	92.23	7.77	0	1.20	98.80	8	0	92	Malonic Acid
4.63	87.42	7.94	0.72	1.54	97.74	9.96	0.42	89.61	"
11.60	79.92	8.48	2.19	1.99	95.82	19.41	2.79	77.80	"
20.45	69.55	9.99	5.01	3.08	91.91	27.22	5.23	67.54	"
27.43	60.57	12	9.52	5.19	85.29	35.51	10.73	53.75	"
33.63	47.45	18.80	21.89	13.42	64.91	46.48	20.86	32.66	"

DISTRIBUTION OF MALONIC ACID BETWEEN ETHER AND WATER AT [illegible]

([illegible])

Mols Acid per Liter		Coef. $\frac{\text{Conc. H}_2\text{O}}{\text{Conc. Ether}}$	[illegible]
H₂O Layer.	Ether Layer.		
0.1478	0.0135	[illegible]	[illegible]
0.1121	0.0102	[illegible]	[illegible]
0.0862	0.0076	[illegible]	[illegible]
0.0331	0.0027	[illegible]	[illegible]

DISTRIBUTION OF MALONIC ACID AT [illegible] BETWEEN WATER AND [illegible]

(Kolossowsky and [illegible], [illegible])

Iso butyl alcohol $(CH_3)_2CHCH_2OH$			Normal amyl alcohol $CH_3(CH_2)_3CH_2OH$			[illegible]		
Gm. equiv. $CH_2(COOH)_2$ per liter		$\frac{(1)}{(2)}$	Gm. equiv. $CH_2(COOH)_2$ per liter		$\frac{(1)}{(2)}$	[illegible]		$\frac{(1)}{(2)}$
H_2O layer (1)	Alcohol layer (2)		H_2O layer (1)	Alcohol layer (2)		[illegible]	[illegible]	
0.0178	0.0095	1.87	0.206	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.0356	0.0276	1.29	0.496	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.0755	0.0591	1.27	1.111	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.202	0.166	1.22	1.906	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.403	0.344	1.17	2.608	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.061	0.842	1.26	3.629	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.660	1.269	1.31	4.880	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.615	1.957	1.34	6.420	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.374	2.443	1.38	7.609	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3.997	3.000	1.33	10.827	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.204	3.261	1.29	11.986	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SOLUBILITY OF MALONIC ACID IN ALCOHOLS

([illegible])

Alcohol.	t°.	Gms. $CH_2(COOH)_2$ per 100 Gms. Sat. Sol.	Alcohol.	t°.	Gms. $CH_2(COOH)_2$ per 100 Gms. Sat. Sol.
Methyl Alcohol	−18.5	42.7	Ethyl Alcohol	[illegible]	[illegible]
" "	−15	43.1	Propyl Alcohol	[illegible]	[illegible]
" "	0	47.1	" "	[illegible]	[illegible]
" "	+19	52.3	" "	[illegible]	[illegible]
" "	+19.5	53.3	" "	[illegible]	[illegible]
Ethyl Alcohol	−18.5	30	" "	[illegible]	[illegible]
" "	−15	30.7	Isobutyl Alcohol	[illegible]	[illegible]
" "	0	35.1	" "	[illegible]	[illegible]
" "	+19	40.1			

SOLUBILITY OF MALONIC ACID IN ETHER

([illegible])

t°.	Gms. $CH_2(COOH)_2$ per 100 Gms. Solution.	t°.	Gms. $CH_2(COOH)_2$ per 100 Gms. Solution.	t°.	Gms. $CH_2(COOH)_2$ per 100 Gms. Solution.
0	6.25	30	10.5	[illegible]	[illegible]
10	7.74	[illegible]	11	[illegible]	[illegible]
20	9	[illegible]	[illegible]	[illegible]	[illegible]
25	9.7			[illegible]	[illegible]

Sodium **MALONATES**

100 cc aq. 66.0 Vol. percent Ethyl Alcohol dissolve 5.44 gms. $HOOCCH_2COONa$
" " aq. 61.8 " " " " " 3.46 gms. $NaOOCCH_2COONa$
(McDermott, 1940.)

ALLYLENE $CH_3.CH \vdots CH$

Freezing-point lowering data are given for mixture of $CH_3.CH \vdots CH + HBr$ by Maas and Russel, 1921

PROPIONITRILE C_2H_5CN.

SOLUBILITY IN WATER.

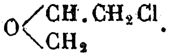
Synthetic method used. See Note, p. 292. (Rothmund, 1898.)

t°	Wt. per cent C_2H_5CN in: Aq. Layer.	Wt. per cent C_2H_5CN in: C_2H_5CN Layer.	t°.	Wt. per cent C_2H_5CN in: Aq. Layer.	Wt. per cent C_2H_5CN in: C_2H_5CN Layer.
40	10.7	92.1	95	19.6	78.0
50	11.6	90.5	100	22.4	75.5
60	12.7	88.5	105	26.0	72.1
70	13.2	86.1	110	32.0	66.5
80	14.9	83.4	113.1 (crit. temp.)	48.3	
90	17.6	80.2			

The freezing-points are given by Joukovsky, 1934, for mixtures of propionitrile and each of the following compounds: Acetonitrile, Butyronitrile, Valeronitrile and Benzene.

Results for mixtures of propio nitrile and cyclohexane are given by Hortenberg, 1926.

EPICHLORHYDRIN



$$O\left\langle\begin{matrix}CH.CH_2Cl\\CH_2\end{matrix}\right..$$

RECIPROCAL SOLUBILITY OF EPICHLORHYDRIN AND WATER. (Leoni and Benelli, 1922.)

Above 80° the epichlorhydrin begins to react with H_2O and data cannot be obtained above this temperature.

H_2O Rich Layer.

t°	Gms. C_3H_5OCl per 100 gms. sat. sol.
30.2	6.60
52.0	7.53
65.0	8.45
72.0	9.34
80.2	10.47

Epichlorhydrin Rich Layer.

t°.	Gms. C_3H_5OCl per 100 gms. sat. sol
25.0	98.48
45.0	97.43
70.0	95.82
80.4	94.17

α Bromo PROPIONIC ACID $CH_3CHBrCOOH$.

DISTRIBUTION BETWEEN ACETONE AND GLYCEROL AT 25°. (Smith, 1921, 1922.)

Millimols. $C_2H_4BrCOOH$ per liter of Acetone layer (A).	Millimols. $C_2H_4BrCOOH$ per liter of Glycerol layer (G).	$\frac{A}{G}$.	Millimols. $C_2H_4BrCOOH$ per liter of Acetone layer (A).	Millimols. $C_2H_4BrCOOH$ per liter of Glycerol layer (G).	$\frac{A}{G}$.
1.42	0.21	6.75	6.7625	0.4875	13.9
2.62	0.30	8.73	11.20	0.70	16.0
4.50	0.40	11.2	20.65	0.90	23.0

DISTRIBUTION OF α BROM PROPIONIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $C_2H_4BrCOOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
4.40	1.10	0.250
6.65	1.70	0.256
13.00	3.48	0.268
20.20	5.56	0.276

Water and Xylene.

Millimols. $C_2H_4BrCOOH$ per liter of		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
6.20	0.44	0.071
8.40	0.70	0.0835
10.50	1.00	0.095
13.10	1.40	0.107

Water and Ethyl Ether.

Millimols. $C_2H_4BrCOOH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.3125	1.1250	3.60
0.40875	1.68125	4.02
0.5000	2.275	4.55
0.5875	2.7875	4.75
0.700	3.450	4.93

Millimols. $C_2H_4BrCOOH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$
0.8625	4.8625	5.64
1.125	6.675	5.93
1.300	9.5000	7.30
1.725	2.275	7.11

DISTRIBUTION OF α BROMO PROPRIONIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. $CH_3CHBrCOOH$ per liter of:	
H_2O layer	$CHCl_3$ layer
0.01222	0.00311
0.01606	0.00441
0.02122	0.00608
0.02781	0.00849
0.03539	0.01191
0.04248	0.01518
0.04810	0.01805

Water and Benzene

Gm. Mols. $CH_3CHBrCOOH$ per liter of:	
H_2O layer	C_6H_6 layerr
0.01132	0.00192
0.01412	0.00254
0.01849	0.00352
0.02434	0.00507
0.02917	0.00638
0.03752	0.00910
0.04600	0.01180
0.06329	0.01856

Water and Toluene

Gm. Mols. $CH_3CHBrCOOH$ per liter of:	
H_2O layer	$C_6H_5CH_3$ layer
0.01195	0.00137
0.01496	0.00180
0.01956	0.00255
0.02581	0.00360
0.03100	0.00455
0.04012	0.00690
0.04909	0.00871
0.06760	0.01425

β Bromo PROPIONIC ACID $\cdot CH_2BrCH_2COOH$.

DISTRIBUTION OF β BROMO PROPIONIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. CH_2BrCH_2COOH per liter of:	
H_2O layer	$CHCl_3$ layer
0.00297	0.00063
0.00462	0.00108
0.00803	0.00185
0.01617	0.00456
0.02130	0.00633
0.02818	0.00862
0.04810	0.01845

Water and Benzene

Gm. Mols. CH_2BrCH_2COOH per liter of:	
H_2O layer	C_6H_6 layer
0.01520	0.00248
0.01881	0.00319
0.02203	0.00396
0.03201	0.00651
0.04840	0.01199
0.06280	0.01755
0.09170	0.03150

Water and Toluene

Gm. Mols. CH_2BrCH_2COOH per liter of:	
H_2O layer	$C_6H_5CH_3$ layer
0.01135	0.00126
0.01589	0.00179
0.02302	0.00297
0.03360	0.00492
0.05201	0.00838
0.06748	0.01287
0.09765	0.02355

Distribution of α and of β Bromo Propionic Acid Between Water and Olive Oil.

(Bodansky, Meyer and Meigs, 1932.)

Results for α Bromo Propionic Acid

t^o	Gm. Mols. $C_3H_5BrO_2$ per liter		$\frac{(1)}{(2)}$
	H_2O layer (1)	Oil layer (2)	
25	0.031	0.0168	1.845
"	0.065	0.0364	1.785
"	0.125	0.067	1.87
37.5	0.069	0.032	2.155
"	0.136	0.065	2.09

Results for β Bromo Propionic Acid

t^o	Gm. Mols. $C_3H_5BrO_2$ per liter		$\frac{(1)}{(2)}$
	H_2O layer (1)	Oil layer (2)	
25	0.0338	0.017	1.99
"	0.0694	0.0326	2.13
"	0.140	0.066	2.12

β Chloro **PROPIONIC ACID** CH_2ClCH_2COOH.

Distribution of β Chloro Propionic Acid Between:

(Smith and White, 1929.)

Water and Chloroform		Water and Benzene		Water and Toluene	
Gm. Mols. CH_2ClCH_2COOH per liter of:		Gm. Mols. CH_2ClCH_2COOH per liter of:		Gm. Mols. CH_2ClCH_2COOH per liter of:	
H_2O layer	$CHCl_3$ layer	H_2O layer	C_6H_6 layer	H_2O layer	$C_6H_5CH_3$ layer
0.01123	0.00156	0.01094	0.00096	0.01147	0.00069
0.01677	0.00250	0.01632	0.00152	0.01714	0.00111
0.01972	0.00308	0.01920	0.00183	0.02018	0.00134
0.02262	0.00354	0.02190	0.00213	0.02303	0.00157
0.02920	0.00480	0.02830	0.00296	0.02619	0.00185
0.04180	0.00778	0.04041	0.00459	0.04263	0.00348
0.05483	0.01120	0.05282	0.00661	0.05595	0.00504
0.08242	0.01958	0.07882	0.01159	0.08382	0.00934

Distribution of β Chloro Propionic Acid Between Water and Olive Oil.

(Bodansky, Meyer and Meigs, 1932.)

Results at 25°

Gm. Mols. $C_3H_5ClO_2$ per liter		$\frac{(1)}{(2)}$
H_2O layer (1)	Oil layer (2)	
0.014	0.0032	4.56
0.074	0.0216	3.43
0.149	0.043	3.47

Results at 37.5°

Gm. Mols. $C_3H_5ClO_2$ per liter		$\frac{(1)}{(2)}$
H_2O layer (1)	Oil layer (2)	
0.0155	0.00314	4.94
0.0744	0.0206	3.61
0.153	0.038	4.03

β Iodo **PROPIONIC ACID** $CH_2I.CH_2.COOH$.

One liter sat. solution in water contains 80 gms. CH_2ICH_2COOH at 25°. (Sidgwick, 1910.)

One liter sat. solution in 1 n aq. sodium β iodopropionate contains 126 gms. at 25°. (Sidgwick, 1910.)

β Iodo **PROPIONIC ACID** $CH_3CHICOOH$.

Distribution of β Iodo Propionic Acid at 25° Between: (Smith, 1921, 1922.)

Water and Chloroform.			Water and Ether.			Water and Xylene.		
Millimols. C_2H_4ICOOH per liter of			Millimols. C_2H_4ICOOH per liter of			Millimols C_2H_4ICOOC. per liter of		
H_2O layer (C_1)	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$	H_2O layer (C_2).	Xylene layer (C_2).	$\frac{C_2}{C_1}$
1.162	0.5375	0.462	0.175	1.275	7.3	2.97	0.525	0.1765
1.61	0.805	0.500	0.280	2.26	8.1	3.90	0.745	0.191
2.80	1.541	0.552	0.500	4.64	9.3	6.60	1.44	0.218
3.70	2.12	0.572	0.900	8.66	9.6	7.25	1.75	0.242
5.55	3.50	0.630	1.44	15.22	10.6	13.75	4.46	0.325

β Iodo **PROPIONIC ACID.**

Distribution of β Iodo Propionic Acid at 25° Between:
(Smith and White, 1929.)

Water and Chloroform		Water and Benzene		Water and Toluene	
Gm. Mols. CH_2ICH_2COOH per liter of:		Gm. Mols. CH_2ICH_2COOH per liter of:		Gm. Mols. CH_2ICH_2COOH per liter of:	
H_2O layer	$CHCl_3$ layer	H_2O layer	C_6H_6 layer	H_2O layer	$C_6H_5CH_3$ layer
0.000697	0.000274	0.00598	0.00217	0.00644	0.00177
0.00127	0.00056	0.00720	0.00278	0.00778	0.00226
0.00221	0.00096	0.00987	0.00424	0.01545	0.00592
0.00377	0.00208	0.01420	0.00717	0.02142	0.00992
0.00605	0.00366	0.01956	0.01178	0.02893	0.01612
0.01008	0.00727	0.02635	0.01870	0.03796	0.02542
0.01799	0.01650	0.03446	0.02892	0.05136	0.04290
0.03030	0.03575				

FORMYL GLYCINE $CH_2NH(COH)COOH$.

Solubility of Formyl Glycine in Aqueous Solutions of Ethyl Alcohol at 25°
(McMeekin, Cohn and Weare, 1936.)

Vol. Percent C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mols. $C_3H_5NO_3$ per liter	Vol. Percent C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mols. $C_3H_5NO_3$ per liter
0.0	1.0570	1.849	70.0	0.9310	1.312
20.0	1.0402	1.680	80.0	0.8989	1.055
40.0	1.0078	1.633	90.0	0.8556	0.712
50.0	0.9824	1.560	100.0	0.8023	0.295
60.0	0.9572	1.459			

One liter of Methyl alcohol dissolves 0.710 gm. mol. $C_3H_7NO_3$ at 25° and the density of the solution is 0.8280. (McMeekin, Cohn and Weare, 1936.)

One liter of Heptyl alcohol dissolves 0.0347 gm. mol. $C_3H_5NO_3$ at 25° and the density of the solution is 0.82412. (McMeekin, Cohn and Weare, 1936.)

GLYCEROL TRINITRATE (Nitroglycerin) $C_3H_5(O.NO_2)_3$.

SOLUBILITY OF NITROGLYCERIN IN WATER.

(Ledbury and Frost, 1927.)

t°	Gms. $C_3H_5(ONO_2)_3$ per 100 cc sat. sol.	t°	Gms. $C_3H_5(ONO_2)_3$ per 100 cc sat. sol.
15	0.127	50	0.196
20	0.138	60	0.236
30	0.149	70	0.288
40	0.169	80	0.344

Appreciable hydrolysis occurs at 100°.

SOLUBILITY OF TRINITROGLYCERIN AND OF DINITROGLYCERIN, IN AQUEOUS SOLUTIONS OF NITRIC ACID AND OF SODIUM CARBONATE.

(Ohman, 1931.)

The results are given only in the form of diagrams from which the following values were taken. The temperature is not stated. The author also gives distribution and other results having reference to practical manufacturing conditions. The results show that losses in washing depend upon the content of dinitroglycerin in the trinitroglycerin phase.

Results for Aq. HNO_3 Solutions

Gms. HNO_3 per 100 gms. solvent	Gms. per 100 gms. sat. sol.	
	Trinitro glycerin	Dinitro glycerin
0.0	0.0	8.0
5.0	0.1	10.0
10.0	0.5	14.0
15.0	0.7	19.0
20.0	0.9	27.0
29.0	1.3	—

Results for Aq. Na_2CO_3 Solutions

Gms. Na_2CO_3 per 100 gms. solvent	Gms. per 100 gms. sat. sol.	
	Trinitro glycerin	Dinitro glycerin
0	0.1	7.8
2.0	0.05	6.3
4.0	0.001	5.1
6.0	trace	4.1
8.0	"	3.3
10.0	"	2.5

FREEZING-POINTS OF MIXTURES OF GLYCEROL TRINITRATE AND TOLUENE TRINITRATE.

(Tamburrini, 1927.)

t°	Gms. $C_3H_5(ONO_2)_3$ per 100 gms. mixture	t°	Gms. $C_3H_5(ONO_2)_3$ per 100 gms. mixture
12.2-13.5	100	6.5-14.7	78
10.2-12.0	95	13.0-19.0	75
6.2- 9.8	88	21.0-22.0	70
6.5- 8.5	85	47.0-52.0	50
6.5- 7.1 (Eutec)	82.3	65.0-67.0	30
6.5-11.2	80	80.5-80.5	0

The temperatures are the beginning and end of fusion.

Freezing-point data are given by Kurita and Hagui, 1929, for mixtures of nitro glycerine with dinitro benzene and with trinitro toluene.

PROPYLENE C_3H_6.

Solubility in Water.

(Than, 1862.)

t°.	β.	q.
0	0.4465	0.0834
5	0.3493	0.06504
10	0.2796	0.0519
15	0.2366	0.0437
20	0.2205	0.0405

For values of β and q, see Ethane, p. 126

1 cc. abs. ethyl alcohol dissolves from 12 to 13 cc. of propylene at 19°. (Spörry, 1922, 1926.)

Solubility of Propylene in Several Solvents at Various Temperatures and Pressures.

(Kirijew, Kaplan and Romantchouk, 1935.)

Solvent	t°	cc. C_3H_6 (reduced to 0° and 760 mm.) dissolved by 1 cc solvent at: 50	100	200	300	400	500	600	700	760 mm Hg pressure
Kerosene	-21	3.0	5.5	10.5	15.5	21.0	27.5	35.0	42.1	76.1
"	-10	2.5	4.5	8.5	13.0	17.0	21.5	26.0	30.5	33.0
"	0	2.0	3.0	6.0	9.0	12.0	15.0	18.0	21.0	23.0
"	+20	1.0	1.8	3.0	5.0	7.0	8.5	10.3	12.0	13.8
"	40	0.8	1.0	2.0	3.0	4.5	5.5	6.5	7.8	8.5
Xylene	-21	4.8	9.7	19.1	28.4	37.9	48.0	59.4	69.9	76.0
"	-10	3.2	6.5	13.0	14.0	18.8	23.5	27.8	31.8	34.2
"	0	2.4	5.0	9.4	14.0	18.8	23.5	27.8	31.8	34.2
"	+20	1.4	3.0	5.4	8.0	10.8	13.2	15.8	18.4	20.0
"	40	0.8	1.6	3.2	5.0	6.4	7.9	10.0	11.6	12.6
Cracked benzin	-21	5.0	10.0	19.0	28.0	38.0	48.0	58.0	67.5	72.8
" "	-10	4.0	7.0	13.0	19.0	25.0	32.5	38.5	44.0	47.4
" "	0	2.5	4.5	9.0	14.0	18.0	22.5	26.5	31.3	33.8
" "	+20	1.5	3.0	5.0	8.0	10.0	12.0	14.0	16.0	17.2
" "	40	0.2	0.9	2.0	4.0	5.0	6.0	7.8	9.0	10.0
Di chloro ethane	0	2.8	3.6	7.1	10.6	14.1	17.3	20.2	23.2	25.2
Heavy benzin fraction	0	3.6	7.2	13.0	19.0	24.4	29.4	33.6	38.0	40.4
Light benzin fraction	0	1.4	2.8	7.8	9.4	13.3	17.1	21.6	25.7	28.2

PROPYLENE BROMIDE (1.3 Dibromo Propane) $CH_2BrCH_2CH_2Br$.

100 gms. H_2O dissolve 0.168 gms. 1.3-$CH_2BrCH_2CH_2Br$ at 30° (Gross, Saylor and Gorman, 1933.)

PROPYLENE BROMIDE (1.2 Dibromo Propane) $CH_2BrCHBrCH_3$.

Freezing-point data for mixtures of Propylene Bromide and Ethylene bromide are given by Timmermans, 1934.)

PROPYLENE CHLORIDE (1.2 and 1.3 Dichloro Propane)

SOLUBILITY OF EACH SEPARATELY IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 25°.

(Gross, 1929; 1929a.)

Solvent	Gms. per 100 gms. H_2O	
	1.2, $CH_2ClCHClCH_3$	1.3, $CH_2ClCH_2CH_2Cl$
Water	0.280	0.273 (0.287 at 30° (1)
Aq. 0.5n KCl solution	0.241	0.230
Aq. 0.5 n $MgSO_4$ solution	0.160	0.158

(1) Gross, Saylor and Gorman, 1933.

TETRA METHYL THIURAM SULFIDE $(CH_3)_2NCS_2$.

Determinations of the solubility of tetra methyl thiuram sulfides (Sulfide, bis (dimethyl thio carbamyl) and other compounds, in rubber, by means of microscope examinations of prepared samples are described by Morris, 1932.

PROPIONIC ALDEHYDE C_2H_5COH.

100 gms. H_2O dissolve 16 gms. aldehyde at 20°. (Vaubel, 1899.)

ACETONE $(CH_3)_2CO$.

SOLUBILITY OF ACETONE AT 25° IN AQUEOUS SOLUTIONS OF:

Electrolytes. Non-Electrolytes.

(Bell — J. Phys. Ch. 9, 544, 1905; Linebarger — Am. Ch. J. 14, 380, 1892.)

Gms. Electrolyte per 100 Gms. Aq. Solution.	Gms. $(CH_3)_2CO$ per 100 Gms. Solvent in Solutions of:				Gms. Non-Electrolyte per 100 Gms. Aq. Solution.	Gms. $(CH_3)_2CO$ per 100 Gms. Solvent in Solutions of:		
	K_2CO_3	Na_2CO_3	$(NH_4)_2CO_3$	$MgCO_3$		$C_{10}H_8$†	Anethol.*	$(C_6H_5)_2CO$.
1.25	...	...	...	83.5	5	92.5	103.0	90.0
2.50	...	51.0	110.0	65.0	10	117.0	123.0	108.5
5.00	65.0	38.0	73.5	47.0	20	137.0	144.5	126.0
7.5	46.5	27.5	57.0	38.0	30	148.5	155.0	133.0
10.0	34.5	19.5	44.5	29.0	40	155.5	162.0	136.0
12.5	25.5	14.0	35.0	...	50	159.5	166.0	135.5
15.0	18.0	9.0	28.0	...	60	160.2	165.0	131.5
20.0	8.0	2.7	...	...	70	155.0	158.0	123.0
25.0	3.7	...	...	...	80	...	...	108.5
30.0	1.6	...	...	...	90	...	...	82.0

* Anethol = *p* Propenylanisol, $CH_3.CH:CH.C_6H_4OCH_3$. † Naphthalene results at 35°.

NOTE. — In the case of the results for the aqueous solutions of electrolytes, the determinations were made by adding successive small quantities of acetone to the mixtures of given amounts of water and electrolyte, and noting the point at which a clouding, due to the separation of a second phase, occurred. In the case of the aqueous non-electrolyte solutions, successive small amounts of water were added to mixtures of known amounts of acetone and the non-electrolyte. In all cases the results, as given in the original papers, have been recalculated and plotted on cross-section paper. From the curves so obtained, the above table was constructed.

Additional data for systems containing acetone are given under the salt involved, as, for instance, Potassium Carbonate, Potassium Fluoride, etc. (see VOL. I.)

MISCIBILITY OF ACETONE AT 0° WITH MIXTURES OF:

Chloroform and Water (Bonner, 1910).

Gms. $CHCl_3$.	Gms. H_2O.	Gms. $(CH_3)_2CO$.	Sp. Gr. of Mixture.
0.988	0.012	0.501	1.18
0.900	0.100	1.300	1.01
0.792	0.208	1.633	0.98
0.696	0.304	1.750	0.96
0.600	0.400	1.770	0.95
0.500	0.500	1.720	0.94
*0.420	0.580	1.650	...
0.400	0.600	1.630	0.93
0.300	0.700	1.530	0.94
0.200	0.800	1.321	0.95
0.100	0.900	1.144	0.97
0.018	0.982	0.464	0.98

Bromobenzene and Water (Bonner, 1910).

Gms. C_6H_5Br.	Gms. H_2O.	Gms. $(CH_3)_2CO$.	Sp. Gr. of Mixture.
0.977	0.023	0.685	1.12
0.90	0.10	1.13	1.01
0.80	0.20	1.41	0.98
0.70	0.30	1.52	0.97
0.60	0.40	1.57	0.96
0.50	0.50	1.60	0.95
*0.49	0.51	1.60	...
0.40	0.60	1.59	0.94
0.30	0.70	1.55	0.93
0.20	0.80	1.46	0.93
0.10	0.90	1.30	0.93
0.02	0.98	0.849	0.95

NOTE. — The determinations were made by gradually adding acetone to the mixtures of the given amounts of water and the other constituent until a homogeneous solution was obtained. The results give the binodal curve for the system. The author also determined "tie lines" showing the compositions of the various pairs of liquids which may exist in equilibrium. When the two layers are practically of the same composition the tie line is reduced to a point designated as the "plait point" of the binodal curve. This point is indicated by a * in the above tables.

SOLUBILITY OF ACETONE IN AQUEOUS SOLUTIONS OF CARBOHYDRATES.

(Krug and McElroy — J. Anal. Ch. 6, 184, '92; Bell — J. Phys. Ch. 9, 547, '05.)

In Aqueous Solutions of Cane Sugar.

Per cent Sugar.	Gms. $(CH_3)_2CO$ per 100 Gms. Sugar Solution at: 15°.	20°.	25°.	30°.	35°.	40°.
10	597.2	...	581.8	...	574.8	...
20	272.5	...	250.0	...	251.8	...
30	172.4	...	150.0	...	150.6	...
35	...	...	...	...	...	110
40	...	96.4	92.8	89.8	...	85
45	...	71.9	68.8	65.7	...	62
50	...	50.8	48.1	45.9	...	42
55	...	35.8	33.8	32.5	...	29
60	...	25.2	24.2	23.4	...	...
65	...	18.3	17.7	17.0	...	...
70	...	13.2	12.8	12.5	...	...

In Aqueous Dextrose Solutions.

Per cent Dextrose.	Gms. $(CH_3)_2CO$ per 100 Gms. Solvent at: 15°.	25°.	35°.
10	736.7	747.9	761.5
20	255.3	247.7	240.8
30	157.5	149.8	142.5
40	86.9	79.6	74.0
50	36.2	33.0	31.2

In Aqueous Maltose Solutions.

Per cent Maltose.	Gms. $(CH_3)_2CO$ per 100 Gms. Solvent at: 15°.	25°.	35°.
10	353.6	348.1	342.0
20	185.4	181.2	176.9
30	119.9	116.0	112.4
40	78.4	74.7	70.5
50	46.2	42.9	39.8

The determinations were made as in the case of the solubility of acetone in aqueous solutions of electrolytes. See preceding page.

MISCIBILITY OF ACETONE, *n* BUTYLALCOHOL AND WATER AT 20°.

(Reilly and Ralph, 1919.)

Exceedingly great care was exercised in purifying the materials. The Acetone was of $d_{\frac{20}{4}} = 0{,}79091$ and b. pt. 56°-56°.5. The *n* Butylalcohol had $d_{\frac{20}{4}} = 0{,}80953$ and b. pt. 117°.6 at 760^{mm}. The densities of a complete series of mixtures of weighed amounts of Acetone, *n* Butylalcohol and water were determined at $\frac{20}{4}$ and the results plotted. The miscibility limits for *n* Butylalcohol and water were determined by bringing mixtures of the two liquids to equilibrium in a thermostat at 20° and calculating the composition of each layer from its density. In order to determine the miscibility of the three components, acetone was added from a buret to a mixture of slightly more *n* Butylalcohol than required to saturate a given amount of water, untill the cloudy mixture just became clear. From the increase in weight the relative amounts of *n* Butylalcohol, acetone and water were calculated. A series of these determinations located the boundary curve of the system.

Gms. per 100 gms. of mixture.			
n Butylalcohol.	Acetone.	Water.	$d_{\frac{20}{4}}$.
7.90	.....	92.10	0.9869
12.00	9.26	78.74	0.9670
18.64	11.62	69.74	0.9484
24.68	12.65	62.67	0.9340
28.15	12.95	58.90	0.9260
36.91	13.42	49.67	0.9071
47.02	13.10	39.88	0.8874
53.86	11.65	34.49	0.8764
63.68	8.28	28.04	0.8633
79.94	.....	20.06	0.8477

The authors also determined the contraction on mixing, and give tables showing the densities and contraction of mixtures of acetone and water and of *n* Butylalcohol and water.

EQUILIBRIUM IN THE SYSTEMS ACETONE, GLYCEROL AND WATER AND ACETONE GLYCEROL AND ACETIC ANHYDRIDE AT 20°.

(Ponomarev, 1938.)

Results for the binodal curve of:

Acetone, Glycerol and Water

Gm. Mols. per 100 gms mols. homogeneous mixture		
$(CH_3)_2CO$	$C_3H_5(OH)_3$	H_2O
64.0	13.5	22.5
54.5	13.7	31.8
40.1	16.8	43.1
25.7	26.1	48.2
16.7	40.4	42.9
14.5	53.9	31.6
14.8	62.8	22.4

Acetone, Glycerol and Acetic Anhydride

Gm. Mols. per 100 gm. mols. homogeneous mixture		
$(CH_3)_2CO$	$C_3H_5(OH)_3$	$(CH_3COO)_2O$
92.9	—	7.1
90.6	5.5	3.9
86.9	11.2	1.9
10.7	—	89.1
7.3	19.1	73.6
5.2	45.9	48.9
6.0	75.2	18.8

The author also determined the composition of the homogeneous layers formed in the quadruple system; Acetone, Glycerol, Acetic Anhydride and Water at 20°.

EQUILIBRIUM IN THE SYSTEM ACETONE, NORMAL BUTYL ALCOHOL AND WATER.

(Jones, 1929.)

Mixtures of n butyl alcohol and acetone were made up by weight and the solubility of each of these mixtures with water was determined by the synthetic method. These results were plotted and the isothermal (binodal) curves thus located. The author's curve for 20° agrees with the previous results of Reilly and Ralph, 1919. Results were also given showing the effect of impurities on the binary and ternary upper critical solution temperatures of the system.

t°	Gms. per 100 gms.					
	Upper layer			Lower layer		
	H_2O	$(CH_3)_2CO$	n $C_4H_{10}O$	H_2O	$(CH_3)_2CO$	n $C_4H_{10}O$
-15	19.1	0.0	80.9	87.9	0.0	12.1
"	24.0	6.9	69.10	86.0	1.27	12.73
"	34.9	11.71	53.39	83.9	2.90	13.20
"	54.0	13.63	32.37	82.2	5.27	12.53
"	64.1	13.54	22.36	80.5	7.35	12.5
+25	20.16	0.0	79.84	93.8	0.0	6.2
"	25.0	6.8	68.2	92.1	0.72	7.18
"	36.2	11.48	52.32	90.85	1.65	7.50
"	55.45	13.20	31.35	88.87	3.30	7.83
"	69.0	1.69	19.31	86.52	5.08	8.40
50	22.53	0.0	77.47	94.0	0.0	6.6
"	27.6	6.57	65.83	92.4	0.69	6.91
"	38.45	11.08	50.47	91.4	1.55	7.05
"	58.8	12.21	28.99	89.24	3.19	7.57
"	58.8	12.21	28.99	89.24	3.19	7.57
"	74.02	9.80	16.18	86.68	5.02	8.30
75	26.30	0.0	73.79	93.78	0.0	6.22
"	32.40	6.13	61.47	92.18	0.71	7.10
"	42.75	10.30	46.95	90.8	1.66	7.54
"	71.01	8.59	20.40	86.81	3.91	9.28
100	33.60	0.0	66.4	91.33	0.0	8.67
"	43.5	5.12	51.38	89.05	0.99	9.96
"	71.57	5.12	23.31	84.64	2.76	12.60

EQUILIBRIUM IN THE SYSTEM ACETONE, FURFURAL AND WATER AT 25°.

(Lloyd, Thompson and Ferguson, 1937.)

The binodal curve was determined by titration, using a closed container provided with a side tube through which the liquids were introduced from a weight buret having a long fine delivery tip. Tie lines were determined by analysis for furfural of liquid layers prepared from weighed amounts of the constituents.

Gms. per 100 gms. homogeneous mixture		Gms. per 100 gms. homogeneous mixture		Gms. per 100 gms. homogeneous mixture	
$(CH_3)_2CO$	C_4H_3OCHO	$(CH_3)_2CO$	C_4H_3OCHO	$(CH_3)_2CO$	C_4H_3OCHO
0	7.7	—	16.0(3)	—	64.0(3)
2.2	8.5	—	21.0(4)	19.3	70.1
4.7	9.3	24.1	23.4	—	74.5(2)
—	10.0(1)	27.4	35.8 PP	10.6	81.6
9.4	10.5	28.0	47.8	—	84.0(1)
—	12.2(2)	—	53.5(4)	4.0	90.3
17.9	15.1	25.8	57.7	0.0	94.7

(1)(2)(3) & (4) Furfural content of liquid layers in contact with each other. PP is the plait point.

EQUILIBRIUM IN THE SYSTEM ACETONE, BENZENE AND WATER AT 20°.

(Bancroft, 1895.)

Water was added to mixtures of known amounts of the other two liquids until clouding appeared.

Per 5 cc $(CH_3)_2CO$		Per 5 cc $(CH_3)_2CO$	
cc H_2O	cc C_6H_6	cc H_2O	cc C_6H_6
8.0	0.10	0.51	2.0
3.0	0.395	0.295	3.0
2.0	0.69	0.2	4.0
1.3	1.0	0.15	5.0

The Ternary System Acetone, Toluene and Water.

(Walton and Jenkins, 1923.)

Definite amounts of water and toluene were mechanically stirred at constant temperature and acetone slowly added untill the mixture just cleared. The volumes of the liquids were read from burets. A series of such determinations gave the equilibrium line between the one-liquid phase and the two-liquid phase systems.

Results at 0°: Gms. per 100 gms. sat. sol.			Results at 20°: Gms. per 100 gms. sat. sol.			Results at 30°: Gms. per 100 gms. sat. sol.		
Water.	Toluene.	Acetone.	Water.	Toluene.	Acetone.	Water	Toluene.	Acetone
0.5	70.3	29.2	0.5	76.0	23.5	1.5	61.5	37.0
1.0	60.0	39.0	1.0	68.9	33.1	2.0	56.1	41.9
1.5	53.3	45.2	1.5	58.5	40.0	2.5	51.6	45.9
2.0	48.6	49.4	2.0	53.6	44.4	3.0	48.5	48.5
2.5	44.4	52.6	2.5	49.4	48.1	4.0	43.1	52.9
3.0	41.6	55.4	3.0	45.9	51.1	5.0	38.6	56.4
4.0	36.8	59.2	4.0	40.6	55.4	7.0	32.3	60.7
5.0	33.2	61.8	5.0	36.6	58.4	10.0	26.0	64.0
7.0	28.1	64.9	7.0	30.6	62.4	15.0	19.7	65.3
10.0	23.0	67.0	10.0	25.0	65.0	14.6	20.1	65.3*
13.0	19.4	67.6*	14.2	19.8	66.0*	20.0	15.5	64.5
15.0	17.5	67.5	15.0	19.0	66.0	25.0	12.2	62.8
20.0	13.6	66.4	20.0	14.9	65.1	28.7	10.0	61.3
25.0	10.0	64.9	25.0	11.5	63.5	34.3	7.0	58.7
30.0	7.1	62.9	30.0	8.5	61.5	39.0	5.0	56.0
34.6	5.0	60.4	35.0	6.0	59.0	42.1	4.0	53.9
37.4	4.0	58.8	37.6	5.0	57.4	46.0	3.0	51.0
41.0	3.0	56.0	40.5	4.0	55.5	50.8	2.0	47.2
45.6	2.0	52.4	43.8	3.0	53.2	54.4	1.5	44.1
48.8	1.5	49.7	48.3	2.0	49.7	59.4	1.0	39.6
53.5	1.0	45.5	57.0	1.0	42.0	68.3	0.5	31.2
61.0	0.5	38.5	65.0	0.5	34.3	71.5	0.4	28.1

* Maximum.

Mutual Solubility of Acetone and Glycerol. (Mc Ewen, 1923.)

The synthetic method of Alexejeff was used. The temperatures at which separation of liquid phases occurred in mixtures of known amounts of acetone and glycerol were determined.

t°.	Wt. per cent of Acetone.	t°.	Wt. per cent of Acetone.	t°.	Wt. per cent of Acetone.	t°.	Wt per cent of Acetone.
9.5...	10.90	90.9...	34.74	95.6*..	51.28	93.5...	64.47
44.8...	15.77	95.2...	44,67	95.7...	53,07	91.7...	67.42
66.6...	20.40	95.3...	45.75	95.6*..	55.34	81.3...	76.96
81.3...	26.58	95.3*..	46.31	95.5...	56.59	58.5...	86.93
85.3...	29.24	95.5*..	48.43	95.5...	57.25	40.0 ..	89.61

* Indicates critical opalescence.

The critical temp. of solution of the system Acetone + Diisoamylene is at — 3°.8 and the mixture contains 52.5 per cent $C_{10}H_{20}[(CH_3)_2CHCH_2CH_2]_2$. (Hartenberg, 1926.)

DISTRIBUTION OF ACETONE BETWEEN:

(Herz and Rathmann, 1913a)

Water and Carbon Tetrachloride.

Mols. $(CH_3)_2CO$ per Liter.	
H_2O Layer.	CCl_4 Layer.
0.186	0.0833
0.322	0.146
1.01	0.514
1.66	0.997
2.87	2.10
...	...

Water and Chloroform.

Mols. $(CH_3)_2CO$ per Liter.	
H_2O Layer.	$CHCl_3$ Layer.
0.032	0.168
0.0781	0.399
0.145	0.676
0.263	1.17
0.493	1.98
1.01	3.06

Water and Pentachlorethane.

Mols. $(CH_3)_2CO$ per Liter.	
H_2O Layer.	C_2HCl_5 Layer.
0.144	0.251
0.271	0.469
0.541	0.859
0.806	1.275
1.149	1.763
...	...

Water and Tetrachlorethane.

Mols. $(CH_3)_2CO$ per Liter.	
H_2O Layer.	$C_2H_2Cl_4$ Layer.
0.0812	0.341
0.249	0.994
0.317	1.210
0.363	1.323
0.569	1.936

Water and Tetrachlorethylene.

Mols. $(CH_3)_2CO$ per Liter.	
H_2O Layer.	$CCl_2{:}CCl_2$ Layer.
0.274	0.081
0.562	0.174
1.020	0.343
1.545	0.629
2.007	0.891

Water and Trichlorethylene.

Mols. $(CH_3)_2CO$ per Liter.	
H_2O Layer.	$CHCl{:}CCl_2$ Layer.
0.160	0.193
0.350	0.359
0.654	0.719
0.946	1.029
1.389	1.562

The distribution coefficient of acetone between olive oil and water is given by Meyer (1901), as 0.146 at 3° and 0.235 at 30°.

DISTRIBUTION OF ACETONE BETWEEN WATER AND CHLOROFORM AT 25°.

(Hand, 1930.)

Suitable quantities of the three liquids to yield two layers were mixed and brought to equilibrium at 25°. Samples of each layer were withdrawn with extreme care and analyzed for chloroform and acetone.

Grams per 100 gms.					
Upper Layer			Lower Layer		
$CHCl_3$	H_2O	$(CH_3)_2CO$	$CHCl_3$	H_2O	$(CH_3)CO$
1.23	82.97	15.8	70.0	1.3	28.7
1.29	73.11	25.6	55.7	2.2	42.1
1.71	62.29	36.0	42.9	4.4	52.7
3.20	54.1	42.7	35.8	7.7	56.5
5.1	45.6	49.3	28.4	10.3	61.3
9.8	34.5	55.7	20.4	18.6	61.0

DISTRIBUTION OF ACETONE BETWEEN WATER AND METHYL ALCOHOL SEPARATED BY A RUBBER MEMBRANE AT 23°.

(Morton, 1929.)

Gms. $(CH_3)_2CO$ per 100 gms.		$\frac{(2)}{(1)}$	Gms. $(CH_3)_2CO$ per 100 gms.		$\frac{(2)}{(1)}$
H_2O layer(1)	CH_3OH layer(2)		H_2O layer	CH_3OH layer(2)	
10	17(16.1	1.7	50	69.5(69.9)	1.39
20	32(30.5)	1.6	60	77.5(76.2)	1.29
30	46(46.6)	1.53	70	85 (81.4)	1.21
40	59(59.4)	1.47	100	100	1.00

The values in parentheses were calculated from the vapor pressure.

DISTRIBUTION OF ACETONE BETWEEN:

Benzene and Water.

Results at 20°.
(Philip and Bramby, 1915.)

Gm. $(CH_3)_2CO$ per 1000 cc. H_2O Layer.	Gm. $(CH_3)_2CO$ per 1000 cc. C_6H_6 Layer.
0.10	0.08
0.20	0.12
0.30	0.25
0.40	0.34
...	...

Results at 25°.
(Herz and Fischer, 1905.)

Gms. $(CH_3)_2CO$ per 1000 cc. H_2O Layer.	Gms. $(CH_3)_2CO$ per 1000 cc. C_6H_6 Layer.
10*	12.0
50	41.7
100	101.5
150	155.9
200	225.0

Toluene and Water.

At Different Temps.
(Hantzsch and Vagt, 1901.)

t°.	Gms. $(CH_3)_2CO$ per 1000 cc. H_2O Layer.	Gms. $(CH_3)_2CO$ per 1000 cc. $C_6H_5CH_3$ Layer.
0	2.105	0.993
10	2.000	0.957
20	1.960	0.957
30	1.867	0.957
...	...	...

* See Note, page 106

Philip and Bramby also give data for the effect of NaCl, KCl and LiCl upon the distribution of acetone between benzene and water.

In the determinations by Hantzsch and Vagt the equilibrium was approached from above. The amount of acetone in the lower layer was determined by analysis, and that in the upper layer calculated by difference.

DISTRIBUTION OF ACETONE BETWEEN WATER AND BENZENE.

(Gross and Schwarz, 1930.)

Results at 15°

Gm. Mols. $(CH_3)_2CO$ per liter H_2O layer(1)	Gm. Mols. $(CH_3)_2CO$ per liter C_6H_6 layer(C_2)	$\frac{(2)}{(1)}$
0.02267	0.01740	0.767
0.02302	0.01768	0.768
0.02306	0.01768	0.766
0.1140	0.0887	0.778

Results at 25°

Gm. Mols. $(CH_3)_2CO$ per liter H_2O layer(1)	Gm. Mols. $(CH_3)_2CO$ per liter C_6H_6 layer (2)	$\frac{(2)}{(1)}$
0.01583	0.01437	0.898
0.03209	0.02898	0.901
0.08007	0.0726	0.907
0.1058	0.09659	0.912
0.3125	0.2909	0.931
0.6150	0.5940	0.966
0.904	0.906	1.002

DISTRIBUTION OF ACETONE BETWEEN AQUEOUS POTASSIUM CHLORIDE AND BENZENE AT 15°.

(Gross and Schwarz, 1930.)

Gm. Mols. KCl per liter aq. sol.	Gm. Mols. $(CH_3)_2CO$ per liter Aq. layer(1)	Gm. Mols. $(CH_3)_2CO$ per liter C_6H_6 layer(2)	$\frac{(2)}{(1)}$
0.5	0.02181	0.01883	1.158
1.0	0.02068	0.02002	1.033
1.5	0.01947	0.02119	0.919
2.0	0.01824	0.02232	0.817

The authors also give results for a number of other aqueous salt solutions. It is concluded that the salting out effect depends upon the nature of the substances to be salted out and little upon the concentration and temperature. It is also dependant upon the nature of the salt and is roughly proportional to the concentration of the salt solution.

Distribution of Acetone Between Water and Benzene and Between Aqueous Salt Solutions and Benzene at 25°.

(Herz and Stanner, 1927.)

Normality of aq. salt sol.	Gm. Mols. $(CH_3)_2CO$ per liter Aq. layer(1)	Gm. Mols. $(CH_3)_2CO$ per liter C_6H_6 layer(2)	$\frac{(2)}{(1)}$	Normality of aq. salt sol.	Gm. Mols. $(CH_3)_2CO$ per liter Aq. layer(1)	Gm. Mols. $(CH_3)_2CO$ per liter C_6H_6 layer(2)	$\frac{(2)}{(1)}$
Water alone	0.262	0.245	0.93	2.956 NaCl	0.168	0.336	2.00
" "	0.493	0.481	0.97	2.951 "	0.331	0.663	2.00
" "	0.587	0.581	0.99	2.941 "	0.486	0.989	2.04
" "	0.658	0.706	1.07	2.887 "	0.589	1.252	2.12
" "	1.372	1.433	1.04	2.988 NaBr	0.207	0.301	1.46
2.978 LiCl	0.172	0.250	1.45	2.910 "	0.415	0.615	1.48
2.922 "	0.396	0.611	1.54	2.949 "	0.581	0.897	1.54
2.899 "	0.611	0.946	1.55	2.890 "	0.757	1.235	1.63
2.854 "	0.731	1.144	1.57				

Distribution of Acetone Between Water and Aniline at 30°.

(Campbell and Broun, 1933.)

Gms. per 100 gms. Aqueous Layer $C_6H_5NH_2$	$(CH_3)_2CO$	H_2O	Aniline Layer $C_6H_5NH_2$	$(CH_3)_2CO$	H_2O
3.35	0.0	96.65	95.25	0.0	4.75
3.81	0.422	95.767	91.5	3.68	4.82
3.964	0.906	95.13	90.04	4.509	5.451
4.15	2.64	93.21	83.19	9.735	7.075
3.85	7.08	89.07	72.66	5.5	11.85
4.105	9.57	86.325	65.5	25.15	9.35
4.27	12.78	82.95	59.39	30.03	10.58
6.1	21.03	72.87	48.32	37.48	14.2
8.78	25.11	66.11	40.13	39.45	20.42
12.95	31.56	55.42	28.83	40.5	30.67
21.1	36.6	42.3	21.1	36.6	42.3*

* Critical composition

The authors also give the following determinations of the temperature of homogeneity of mixtures of the three liquids contained in sealed hard glass tubes.

t°	Gms. per 100 gms. Homogeneous mixture $C_6H_5NH_2$	$(CH_3)_2CO$	H_2O	t°	Gms. per 100 gms. Homogeneous mixture $C_6H_5NH_2$	$(CH_3)_2CO$	H_2O
86	21.0	31.68	47.32	136	71.54	7.92	20.5
92	71.54	15.84	12.62	156	48.6	5.0	46.4
101	30.0	25.00	45.0	159	71.54	7.92	20.5
104.5	48.6	31.68	19.72	166.5	48.6	1.4	50.0
122	21.0	15.84	63.16				

Reciprocal Solubility of Acetone and Carbon Disulfide.

(Wieth, 1929.)

t°	Gms. $(CH_3)_2CO$ per 100 gms. mixture	t°	Gms. $(CH_3)_2CO$ per 100 gms. mixture
-55	14.8	-43.5	51.4

RECIPROCAL SOLUBILITY OF ACETONE AND CHLOROFORM.

(Wyatt, 1928.)

The results are given only in the form of a diagram from which the following approximated values were read.

t°	Gm. Mol. $(CH_3)_2CO$ per 100 gm. mols. mixture	Solid Phase	t°	Gm. Mols. $(CH_3)_2CO$ per 100 gm. mols. mixture	Solid Phase
- 96	100	$(CH_3)_2CO$	-105	45.0	$(CH_3)_2CO.CHCl_3$
-110	79	"	-117	38.0	" + $CHCl_3$
-117 Eutec	73	" + $(CH_3)_2CO.CHCl_3$	-100	34.0	$CHCl_3$
-110	66.5	$(CH_3)_2CO.CHCl_3$	- 80	23.0	"
- 99.5m.pt.	50	"	- 62	0.0	"

RECIPROCAL SOLUBILITY OF ACETONE AND ETHYL ETHER.

(Saphir, 1929.)

t°	Wt. Percent $(CH_3)_2CO$	Mol. Percent $(CH_3)_2CO$	t°	Wt. Percent $(CH_3)_2CO$	Mol. Percent $(CH_3)_2CO$
- 95.6	100	100	-127.5 Eutec	—	—
-102.7	81.1	84.6	-125.5	11.0	13.6
-109.2	60.8	66.4	-123.4	0.0	0.0
-116.8	39.2	45.1			

RECIPROCAL SOLUBILITY OF ACETONE AND BENZENE.

(Yamamura, 1926.)

t°	Mol. Percent $(CH_3)_2CO$	Solid Phase	t°	Mol. Percent $(CH_3)_2CO$	Solid Phase
-94.8	100	$(CH_3)_2CO$	-40	69.1	C_6H_6
-96	96.6	"	-25	52.0	"
-98 Eutec.	—	"	-15	38.4	"
-87	89.9	C_6H_6	- 5	21.3	"
-72	86.0	"	+ 5.1	0.0	"

Freezing-point data are also given for:

$(CH_3)_2CO$	+ CCl_4	(Timmermans, 1928; Wyatt, 1929.)
	+ CH_3OH	(Sapgir, 1929.)
	+ C_2H_5OH	" "
	+ C_5H_{12}(iso pentane)	" "
	+ $C_6H_5NH_2$	(Timmermans, 1928.)
	+ $CHCl_3$	(Tskalotos, and Guye, 1910.)
"	+ o C_6H_4ClOH	(Bramby, 1916.)
"	+ Phenol	(Schmidlin and Lang, 1910.)
"	+ Resorcinol	" " " "
"	+ Pyrogallol	" " " "
"	+ Pyrocatechol	" " " "

Freezing-point data for mixtures of Dianisol acetone, Dibenzyl acetone, Tetra methyl diamido dibenzyl acetone and Cinnamyliden benzal acetone, each with a series of other compounds, are given by Pfeiffer, 1924, and Pfeiffer and Angern, 1926.

ETHYL FORMATE $HCOOC_2H_5$.

100 grams water dissolve 10 grams ethyl formate at 22°. (Traube, 1884.)

100 grams water dissolve 10 grams ethyl formate at 22°. (Traube, 1884.)

RECIPROCAL SOLUBILITY OF ETHYL FORMATE AND WATER.

(Kendall and Harrison, 1928.)

The determinations were made by the synthetic, sealed tube method.

t°	Mol. Percent $HCOOC_2H_5$ in sat. sol.	t°	Mol. Percent $HCOOC_2H_5$ in sat. sol.	t°	Mol. Percent $HCOOC_2H_5$ in sat. sol.
5.0	1.97	38.0	2.23	55.5	2.49
15.9	2.05	45.1	2.31	63.9	2.73
30.2	2.15	50	2.41	70.0	2.95
				75.5	3.20

The authors also give the following determinations of the depression of the freezing-point of water + ethyl formate mixtures.

t° of freezing	Mol. Percent $HCOOC_2H_5$ in mixture	t° of freezing	Mol. Percent $HCOOC_2H_5$ in mixture	t° of freezing	Mol. Percent $HCOOC_2H_5$ in mixture
-0.132	0.119	-0.569	0.507	-1.082	0.976
-0.184	0.164	-0.837	0.757	-1.847	1.638
-0.343	0.311	-0.859	1.768	-2.203	1.901
-0.404	0.354	-0.941	0.841		

FREEZING-POINTS OF MIXTURES OF ETHYL FORMATE AND TIN TETRACHLORIDE.

(Kournakov, Perelmouter and Kanov, 1916.)

t°.	Mol. per cent $SnCl_4$.	t°.	Mol. per cent $SnCl_4$.	t°.	Mol. per cent $SnCl_4$.
—10	10.0	48.6	33.7	28.0	58.0
+15	20.0	47.1	36.0	24.0	65.0
33.5	25.9	45.5	38.3	20.0	73.0
46.0	30.5	44.0	40.0	16.0	80.0
48.0	31.8	38.2	46.0	10.0	90.0
49.0(m.pt.)	33.3	32.7	-52.0	—33.0	100.0

The above results give the curve for the molecular compound $SnCl_4.2HCOO(C_2H_5)$.

The freezing-points of Ethyl formate + Ethyl propionate are given by Timmermans, 1934.

METHYL ACETATE CH_3COOCH_3.

SOLUBILITY OF METHYL ACETATE IN WATER.

t°	Gms. CH_3COOCH_3 per 100 gms. H_2O	Authority
20	32.19	(Fühner, 1924.)
22	25	(Traube, 1884.)

100 gms. 0.4 n Aq. Sodium Oleate Solution (= 10.8 gms. Na oleate per 100 gms. sol.) dissolve 71.0 gms. CH_3COOCH_3 at 20°. (Smith, 1932.)

METHYL ACETATE

RECIPROCAL SOLUBILITY OF METHYL ACETATE AND WATER.

(Kendall and Harrison, 1928.)

The determinations were made by the synthetic (sealed tube) method.

t°	Mol. Percent CH_3COOCH_3 in sat. sol.	t°	Mol. Percent CH_3COOCH_3 in sat. sol.	t°	Mol. Percent CH_3COOCH_3 in sat. sol.
5.0	6.62	58.0	7.00	70.5	7.66
21.0	6.70	61.7	7.11	71.9	7.73
35.0	6.79	69.1	7.51	83.5	8.83

These authors also give the following determinations of the depression of the freezing-point of water + methyl acetate mixtures.

t° of freezing	Mol. Percent CH_3COOCH_3 in mixture	t° of freezing	Mol. Percent CH_3COOCH_3 in mixture	t° of freezing	Mol. Percent CH_3COOCH_3 in mixture
-0.096	0.097	-0.355	0.373	-1.523	1.476
-0.139	0.157	-0.562	0.562	-1.758	1.703
-0.163	0.182	-0.704	0.690	-1.950	1.888
-0.172	0.193	-1.023	0.995	-3.154	3.045

PROPIONIC ACID C_2H_5COOH.

SOLUBILITY IN WATER, DETERMINED BY THE FREEZING-POINT METHOD.

(Faucon, 1910.)

t° of Solidif.	Gms. C_2H_5COOH per 100 Gms. Sol.	Solid Phase.	t° of Solidif.	Gms. C_2H_5COOH per 100 Gms. Sol.	Solid Phase.
− 1.33	4.98	Ice	−17.2	73.48	Ice
− 2.60	10.11	"	−21	81.75	"
− 3.76	15	"	−29.10	86.85	"
− 6.10	25	"	−29.40	87.65	" $+C_2H_5COOH$
− 7.70	35.28	"	−28.30	89.12	C_2H_5COOH
− 9.20	45.20	"	−26.90	92.40	"
−10.80	55	"	−23.90	97.22	"
−14.20	65.88	"	−19.30	100	"

Additional data for this system are given by Tsakalatos (1914), Herz (1917) and Balló (1910). The last-named investigator also determined the composition of the solid phases and explains the abnormal freezing-point lowering on the basis of production of mix-crystals.

The ratio of distribution of propionic acid between water and benzene was found by King and Narracott (1909) to be 1:0.129 at room temperature.

PROPIONIC ACID C_2H_5COOH.

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND CARBON TETRACHLORIDE AT 25°.

(Kolossowski, Bekturof and Kulikow, 1934; Kolossowski, Kulikow and Bekturof, 1935.)

Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$	Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$
H_2O layer(C_1)	CCl_4 layer(C_2)		H_2O layer(C_1)	CCl_4 layer(C_2)	
0.0129	0.0004	31.5	1.529	1.033	1.48
0.0368	0.00243	15.1	2.090	1.637	1.28
0.0898	0.00879	10.2	2.888	2.456	1.18
0.210	0.037	5.68	4.168	3.513	1.19
0.445	0.128	3.48	5.183	4.172	1.24
0.716	0.283	2.53	7.175	5.950	1.20

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND CHLOROFORM AT 25°

Results of Kolossowsky, Kulikow and Bekturow, 1934, 1935.						Results of Smith and White, 1929.	
Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$	Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$	Gm. Mols. C_2H_5COOH per liter of	
H_2O layer(1)	$CHCl_3$ layer(C_2)		H_2O layer(C_1)	$CHCl_3$ layer(C_2)		H_2O layer	$CHCl_3$ layer
0.036	0.0075	4.80	1.004	1.500	0.666	0.03305	0.00695
0.063	0.019	4.32	1.331	2.209	0.602	0.0515	0.0127
0.106	0.037	2.89	1.783	3.365	0.529	0.0643	0.0175
0.160	0.081	2.09	2.285	4.243	0.539	0.0948	0.0297
0.213	0.119	1.88	2.511	4.620	0.543	0.1298	0.0491
0.314	0.213	1.47	3.389	6.001	0.564	0.2005	0.1013
0.389	0.326	1.19	3.854	6.302	0.612	0.2580	0.1500
0.577	0.678	0.852	4.557	6.955	0.655	0.3427	0.2458
0.766	1.029	0.744	5.386	6.930	0.777	0.4150	0.3350

DISTRIBUTION OF PROPIONIC ACID AT 25° BETWEEN :

Water and Chloroform.

(Smith, 1921, 1922.)

Millimols. C_2H_5COOH per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CHCl_3$ layor (C_2).	
2.92	0.40	0.137
5.65	0.85	0.153
7.12	1.175	0.165
10.75	1.95	0.181

Water and Cotton Seed Oil

(Gordon and Reid, 1922.)

Gms. C_2H_5COOH per 100 gms. of		Gms. C_2H_5COOH per 100 gms. of	
H_2O layer.	C. S. oil layer.	H_2O layer.	C. S. oil layer.
3.4	0.58	36.2	9.20
7.4	1.53	59.8	14.00
14.3	3.48	62.5	15.00
23.0	6.10	67.3	17.40

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND ETHYL BROMIDE AT 25°.

(Kolossowski, Becturow and Kulikow, 1934; Kolossowski, Kulikow and Bekturow, 1935.)

Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$	Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$
H_2O layer(C_1)	C_2H_5Br layer(C_2)		H_2O layer(C_1)	C_2H_5Br layer(C_2)	
0.0502	0.0113	4.14	1.1860	1.0479	1.13
0.2280	0.0729	3.16	1.4658	1.4784	0.99
0.5083	0.2510	2.02	1.6441	1.7131	0.96
0.6746	0.3891	1.73	2.3757	2.9995	0.79
0.7781	0.5083	1.53	2.7798	3.6019	0.77
0.8973	0.6401	1.40	3.4450	4.4276	0.78

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND ETHYL ETHER.

Results at 18°. (de Kolossowsky, 1925.)

Gm. mols. C_2H_5COOH per liter of		Gm. mols. C_2H_5COOH per liter of		Gm. mols. C_2H_5COOH per liter of	
H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.
0.169	0.331	0.9427	2.4408	1.862	4.138
0.324	0.676	1.143	2.857	1.9086	4.1643
0.611	1.389	1.454	3.546	1.9665	4.3089
0.857	2.143	1.6022	3.8173	2.206	4.794

Results at 21°-22°

(Behrens, 1926.)

Concentration.			Concentration.		
H_2O layer (*b*).	$(C_2H_5)_2O$ layer (*a*).	$\frac{a}{b}$.	H_2O layer (*b*).	$(C_2H_5)_2O$ layer (*a*).	$\frac{a}{b}$.
0.01503	0.02560	1.703	0.03345	0.0573	1.713
0.0218	0.03715	1.704	0.0484	0.0840	1.736
0.03085	0.0529	1.715	0.06695	0.1175	1.755
0.03270	0.0559	1.710			

Results at 25°.

(Smith, 1921, 1922)

Millimols. per liter.		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	
0.675	0.8875	1.315
0.925	1.225	1.325
2.35	3.375	1.435
5.45	8.30	1.52

DISTRIBUTION OF PROPIONIC ACID BETWEEN ETHER AND AQUEOUS SALT SOLUTIONS AT 18°.

(de Kolossovsky, 1911.)

Aq. Salt Solution (2 Mols. per Liter).		C_2H_5COOH per 100 cc. of:		$\frac{q}{q'}$.
Salt.	Gms. Salt per 100 cc.	Aq. Layer (*q*).	Ether Layer (*q'*).	
Water alone		1.170	2.305	0.50
NaCl	11.69	0.762	2.543	0.30
$MgCl_2$	19.05	0.567	3.135	0.18
KNO_3	20.22	0.972	2.298	0.42
$KC_3H_4O_2$	22.43	1.324	2.406	0.55

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND ISO BUTYL ALCOHOL AT 25°.

(Kolossowski, Bektourov and Kulikow, 1935; Kolossowski, Kulikow and Bektourov, 1935.)

Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$	Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$
H_2O layer(C_1)	Iso C_4H_9OH layer(C_2)		H_2O layer (C_1)	Iso C_4H_9OH layer(C_2)	
0.0261	0.0593	0.440	0.2253	0.6642	0.339
0.0285	0.0712	0.401	0.3321	0.9607	0.346
0.0261	0.0796	0.328	0.5811	1.5662	0.372
0.0474	0.1502	0.316	0.7828	2.0281	0.386
0.0632	0.2016	0.314	0.9607	2.4194	0.397
0.0751	0.2372	0.317	1.3165	2.9887	0.441
0.1107	0.3439	0.322	1.5774	3.3089	0.477
0.1780	0.5456	0.326	1.9687	3.5461	0.565

PROPIONIC ACID

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND EACH OF SEVERAL ORGANIC SOLVENTS AT 25°.

(Archibald, 1932.)

Organic Solvent	Formula	Gm. Mols. C_2H_5COOH per liter		$\frac{C_2}{C_1}$
		H_2O layer(C_1)	Organic layer(C_2)	
Ethyl Methyl Ketone	$CH_3COC_2H_5$	0.07645	0.18950	2.4787
Tertiary Amyl Alcohol	$CH_3CH_2C(CH_3)OHCH_3$	0.05201	0.19829	3.8125
Secondary Butyl Alcohol	$CH_3CH_2CHOHCH_3$	0.07221	0.17846	2.4714
Normal Butyl Alcohol	$CH_3(CH_2)_2CH_2OH$	0.05702	0.18620	3.2315
Normal Amyl Alcohol	$CH_3(CH_2)_3CH_2OH$	0.05334	0.18600	3.4871

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND ISO AMYL ALCOHOL AT 25°.

(Kolossowski, Bektourow and Kulikow, 1935; Kolossowski, Kulikow and Bektourow, 1935.)

Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$	Gm. Mols C_2H_5COOH per liter		$\frac{C_1}{C_2}$
H_2O layer(C_1)	i $C_5H_{11}OH$ layer(C_2)		H_2O layer(C_1)	i $C_5H_{11}OH$ layer(C_2)	
0.003	0.006	0.50	0.251	0.711	0.35
0.005	0.014	0.36	0.486	1.361	0.36
0.014	0.043	0.33	1.054	2.598	0.406
0.023	0.071	0.32	2.089	4.292	0.487
0.049	0.147	0.33	2.861	4.556	0.608

DISTRIBUTION OF PROPIONIC ACID AT 25° BETWEEN WATER AND BENZENE.

(Brown and Bury, 1923.)

Normality of C_2H_5COOH in		Normality of C_2H_5COOH in		Normality of C_2H_5COOH in	
H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.
0.154	0.0223	0.416	0.128	1.401	1.002
0.191	0.0343	0.646	0.276	2.799	2.710
0.310	0.0778	1.060	0.644	3.562	3.556

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND BENZENE.

(Bektourow, 1939a.)

Results at 0°			Results at 60°		
Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$	Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$
H_2O layer(C_1)	C_6H_6 layer(C_2)		H_2O layer(C_1)	C_6H_6 layer(C_2)	
0.1104	0.0113	9.77	0.1419	0.0236	6.01
0.2366	0.0378	6.26	0.3217	0.0946	3.40
0.5394	0.1703	3.17	0.6485	0.2839	2.27
0.9084	0.4164	2.18	0.8463	0.5867	1.61
1.4573	0.9274	1.57	1.2491	0.8138	1.53
2.1292	1.8074	1.18	1.4005	1.0031	1.40
2.9051	2.8389	1.02	1.8737	1.5141	1.24
3.9271	4.0218	0.98	2.9335	2.7064	1.08
5.2046	4.9491	1.05	4.2962	4.2205	1.02
6.3402	5.6778	1.12	5.3939	5.1289	1.05

DISTRIBUTION OF PROPIONIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Benzene				Water and Toluene			
Gm. Mols. C_2H_5COOH per liter		Gm. Mols. C_2H_5COOH per liter		Gm. Mols. C_2H_5COOH per liter		Gm. Mols. C_2H_5COOH per liter	
H_2O layer	C_6H_6 layer	H_2O layer	C_6H_6 layer	H_2O layer	$C_6H_5CH_3$ layer	H_2O layer	$C_6H_5CH_3$ layer
0.0186	0.00131	0.1241	0.0179	0.01889	0.00102	0.1271	0.01490
0.0310	0.00245	0.2062	0.0398	0.03146	0.00199	0.2110	0.03500
0.0503	0.00472	0.2979	0.0792	0.05121	0.00382	0.3110	0.06110
0.0780	0.00858	0.4540	0.1560	0.07948	0.00705	0.4771	0.1329

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND TOLUENE AT 25°.

(Kolossowski and Megenine, 1932.)

Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$	Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$
H_2O layer (C_1)	$C_6H_5CH_3$ layer(C_2)		H_2O layer(C_1)	$C_6H_5CH_3$ layer(C_2)	
0.2508	0.04918	5.10	1.6664	1.1326	1.47
0.3925	0.1075	3.65	2.238	1.762	1.27
0.5280	0.1720	3.07	3.209	2.791	1.15
0.6568	0.2432	2.70	4.279	3.721	1.15
0.8396	0.3604	2.33	5.434	4.566	1.19
1.0613	0.5387	1.97	6.783	5.217	1.30
1.2701	0.7299	1.74	7.860	6.140	1.28
1.4734	0.9266	1.59	8.000	8.000	1.00

DISTRIBUTION OF PROPIONIC ACID AT 25° BETWEEN:

Water and Nitro Benzene

(Kolossowski, Bektourof and Kulikow, 1934, 1935.)

Gm. Mols. C_2H_5COOH per liter,		$\frac{C_1}{C_2}$
H_2O layer(C_1)	$C_6H_5NO_2$ layer(C_2)	
0.0188	0.0034	5.53
0.0548	0.0117	4.68
0.110	0.028	3.93
0.236	0.063	3.75
0.502	0.131	2.77
0.979	0.496	1.97
2.127	1.669	1.27
3.232	2.830	1.14
4.920	4.474	1.10
6.451	5.873	1.10

Water and o Nitro Toluene

(Kolossowski and Kulikow, 1934;
Kolossowski, Kulikow and Bektourov, 1935.)

Gm. Mols. C_2H_5COOH per liter		$\frac{C_1}{C_2}$
H_2O layer(C_1)	o $C_6H_4CH_3NO_2$ layer(C_2)	
0.0428	0.0059	7.25
0.0898	0.0158	5.68
0.1702	0.0346	4.92
0.3830	0.1040	3.68
0.8924	0.3877	2.30
1.619	0.931	1.74
3.369	2.559	1.32
4.501	3.505	1.28
6.714	5.177	1.30
8.620	7.991	1.08

DISTRIBUTION OF PROPIONIC ACID AT 25° BETWEEN: (Smith, 1921, 1922.)

Water and Xylene.

Millimols. C_2H_5COOH per liter of H_2O layer (C_1).	Millimols. C_2H_5COOH per liter of Xylene layer (C_2).	$\frac{C_2}{C_1}$.
3.80	0.20	0.0528
9.20	0.60	0.065
19.30	1.30	0.067

Acetone and Glycerol.

Millimols. C_2H_5COOH per liter of Acetone layer (A)	Millimols. C_2H_5COOH per liter of Glycerol layer (G).	$\frac{A}{G}$
1.73	0.43	4.05
3.06	0.78	3.93
5.76	1.48	3.80

Millimols. C_2H_5COOH per liter Acetone layer (A).	Millimols. C_2H_5COOH per liter Glycerol layer (G).	$\frac{A}{G}$.
7.45	2.15	3.46
10.85	3.50	3.10
19.40	5.80	3.34
31.00	9.60	3.23

PROPIONIC ACID

DISTRIBUTION OF PROPIONIC ACID AT 25° BETWEEN:

(Kolossowski, Bektourow and Kulikow, 1934; Kolossowski, Kulikow and Bektourow, 1935.)

Water and Xylene

Gm. Mols. C_2H_5COOH per liter H_2O layer(C_1)	Gm. Mols. C_2H_5COOH per liter $C_6H_4(CH_3)_2$layer(C_2)	$\frac{C_1}{C_2}$
0.108	0.008	13.5
0.119	0.012	9.92
0.301	0.046	6.51
0.552	0.129	4.28
1.060	0.410	2.59
1.544	0.816	1.89
2.423	1.443	1.68
4.394	2.862	1.53
5.310	3.364	1.58
6.566	4.092	1.60
7.683	5.000	1.53
8.374	6.732	1.245

Water and Decaline

Gm. Mols. C_2H_5COOH per liter H_2O layer(C_1)	Gm. Mols. C_2H_5COOH per liter $C_{10}H_{18}$ layer(C_2)	$\frac{C_1}{C_2}$
0.0337	0.00131	25.7
0.0642	0.00262	24.5
0.1642	0.0089	18.3
0.332	0.0215	15.4
0.676	0.0658	10.9
0.947	0.114	8.31
2.007	0.358	5.61
3.719	0.730	5.09
5.098	0.964	5.29
8.850	2.198	4.03
9.056	4.649	1.95
8.583	5.426	1.58

EQUILIBRIUM IN THE SYSTEM PROPIONIC ACID, ANILINE AND WATER.

(Angelscu, 1928.)

Results at 0°

Gms. per 100 gms. homogeneous mixture C_2H_5COOH	Gms. per 100 gms. homogeneous mixture $C_6H_5NH_2$	Gms. per 100 gms. homogeneous mixture C_2H_5COOH	Gms. per 100 gms. homogeneous mixture $C_6H_5NH_2$
0.0	3.68	28.68	36.84
0.98	4.63	28.99	41.06
2.56	6.03	27.92	48.13
4.59	7.52	25.30	55.0
10.03	10.46	23.32	60.25
15.55	14.19	20.93	64.88
20.25	19.39	14.75	75.51
23.36	24.35	7.86	85.74
25.63	28.57	1.26	94.21
27.61	33.12	0.0	95.71

Results at 20°

Gms. per 100 gms. homogeneous mixture C_2H_5COOH	Gms. per 100 gms. homogeneous mixture $C_6H_5NH_2$	Gms. per 100 gms. homogeneous mixture C_2H_5COOH	Gms. per 100 gms. homogeneous mixture $C_6H_5NH_2$
0.0	3.59	26.77	37.99
1.51	5.06	27.11	40.61
3.75	6.43	26.37	48.87
9.89	9.72	24.29	55.77
15.13	13.73	20.79	63.71
19.68	19.90	17.97	69.10
22.40	25.36	11.05	80.33
24.34	29.87	6.44	86.93
25.81	33.78	1.93	92.76
26.33	35.63	0.0	94.84

The author also determined the distribution of Propionic acid between water and aniline at 20°.

Gms. C_2H_5COOH per 100 gms. H_2O layer(C_1)	Gms. C_2H_5COOH per 100 gms. $C_6H_5NH_2$ layer(C_2)	$\frac{C_1}{C_2}$	Gms. C_2H_5COOH per 100 gms. H_2O layer(C_1)	Gms. C_2H_5COOH per 100 gms. $C_6H_5NH_2$ layer(C_2)	$\frac{C_1}{C_2}$
0.51	0.34	1.50	8.86	18.00	0.49
1.00	0.99	1.01	10.76	22.07	0.49
1.73	2.04	0.85	11.54	23.81	0.48
2.58	3.56	0.72	12.46	24.93	0.50
4.18	6.77	0.62	12.98	25.30	0.51
4.50	7.54	0.60	15.06	27.36	0.55
6.10	11.64	0.55	17.35	27.44	0.63
6.74	12.57	0.55			

It was also found that at concentrations of propionic acid between 24.56 and 30.16 percent, closed curves corresponding to the solubility of aniline at varying temperatures were obtained.

EQUILIBRIUM IN THE SYSTEM PROPIONIC ACID ORTHO TOLUIDINE AND WATER.

(Angelescu, 1928.)

Results at 0°				Results at 20°			
Gms. per 100 gms. homogeneous mixture		Gms. per 100 gms. homogeneous mixture		Gms. per 100 gms. homogeneous mixture		Gms. per 100 gms. homogeneous mixture	
C_2H_5COOH	o $CH_3C_6H_4NH_2$	C_2H_5COOH	o $CH_3C_6H_4NH_2$	C_2H_5COOH	o $CH_3C_6H_4NH_2$	C_2H_5COOH	o $CH_3C_6H_4NH_2$
0.0	1.68	34.22	33.70	0.0	1.69	33.81	38.59
1.71	3.26	34.42	41.01	5.80	4.28	32.74	45.59
4.01	4.48	32.37	48.56	10.16	5.66	29.51	54.38
9.68	6.63	28.38	57.30	14.26	7.33	24.87	63.25
16.49	9.87	23.23	66.22	19.36	10.52	19.17	72.52
20.88	12.90	16.87	75.93	24.09	15.54	12.34	81.92
24.92	17.16	6.45	89.64	28.54	22.57	8.54	86.91
29.85	24.30	2.23	94.75	31.72	28.74	3.39	93.34
33.26	30.94	0.0	97.65	33.31	33.45	0.0	97.50

The author also determined the distribution of Propionic Acid between Water and o Toluidine at 20°.

Gms. C_2H_5COOH per 100 gms. H_2O layer(C_1)	Gms. C_2H_5COOH per 100 gms. o $CH_3C_6H_4NH_2$ layer(C_2)	$\frac{C_1}{C_2}$	Gms. C_2H_5COOH per 100 gms. H_2O layer(C_1)	Gms. C_2H_5COOH per 100 gms. o $CH_3C_6H_4NH_2$ layer(C_2)	$\frac{C_1}{C_2}$
0.25	0.26	0.962	9.09	19.27	0.472
0.92	1.22	0.754	11.36	24.84	0.457
2.15	3.49	0.616	12.71	27.84	0.457
4.00	7.12	0.562	13.58	29.28	0.462
6.03	11.40	0.525	14.45	30.52	0.473
8.11	16.74	0.484	17.42	33.73	0.516

Results are also given for the upper temperatures of solution of mixtures containing from 30.61 to 34.10 percent Propionic acid and varying percentages of o toluidine.

Distribution of Propionic Acid Between Water and Petroleum Ether at Room Temperature.

(Grossfield and Miermeister, 1932.)

cc 0.1n NaOH required per 25 cc of:		$\frac{1}{2}$	cc 0.1n NaOH required per 25 cc of:		$\frac{1}{2}$
H_2O layer(1)	Pet. Ether layer(2)		H_2O layer(1)	Pet. Ether layer(2)	
1.0	0.046	21.7	62.9	2.85	22.1
3.47	0.078	44.5	100.4	7.63	13.2
11.1	0.168	65.9	183.5	20.7	8.87
25.9	0.595	43.5	293.5	48.5	6.05

Distribution of Propionic Acid Between Water and Olive Oil.

(Bodansky, 1928; Bodansky and Meigs, 1932.)

Results at 25°			Results at 37.5°		
Gm. Mols. C_2H_5COOH per liter		$\frac{1}{2}$	Gm. Mols. C_2H_5COOH per liter		$\frac{1}{2}$
H_2O layer(1)	Oil layer(2)		H_2O layer(1)	Oil layer(2)	
0.0176	0.0028	6.28	0.0406	0.0096	4.23
0.043	0.0072	5.96	0.0830	0.0185	4.49
0.087	0.0144	6.04	0.1680	0.0316	5.32
0.173	0.0290	5.97	0.2090	0.0430	5.19
0.218	0.0360	6.25			

Distribution of Propionic Acid Between Glycerol and Chloroform at 25°.

(Kolossowsky and Kulikow, 1935a.)

Gm. Mols. C_2H_5COOH per liter		$\frac{1}{2}$	Gm. Mols. C_2H_5COOH per liter		$\frac{1}{2}$
Glycerol layer(1)	$CHCl_3$ layer(2)		Glycerol layer(1)	$CHCl_3$ layer(2)	
0.348	0.405	0.859	2.328	4.022	0.579
0.543	0.817	0.665	2.981	4.468	0.667
0.793	1.538	0.516	3.489	4.455	0.783
1.299	2.598	0.500	3.545	4.462	0.794
1.801	3.489	0.516			

Freezing-point data are given for:

Propionic Acid + Methyl Alcohol	(Baume and Pamfil, 1914.)
" " + " " HCl	" " "
" " + iso Butyric Acid	(Timmermans, 1934.)
" " + n Valeric Acid	" "
" " + iso " "	" "
" " + 2- Naphthylamine	Brady and Truszkowski, 1924. Kremann, Weber and Zechner, 1925.

TRI METHYLENE TRISULFIDE DIOXIDE α and β $C_3H_6O_2S$.

TRI METHYLENE TRISULFOXIDE α and β $C_3H_6O_3S$.

Solubility of Each Separately in Water at 25°.

(Bell and Bennett, 1929.)

Compound	Formula	Gms. Compound per 100 gms. H_2O
α Tri methylene Trisulfide Dioxide	$C_3H_6O_2S_3$	1.70

LACTIC ACID (*i*) $CH_3CHOHCOOH$.

Distribution Between Water and Ether.

(Pinnow, 1915.)

Results at 15°. Gm. Mols. Acid per Liter: H₂O Layer (*w*).	Ether Layer (*e*).	$\frac{w}{e}$.	Results at 27.5°. Gm. Mols. Acid per Liter: H₂O Layer (*w*).	Ether Layer (*e*).	$\frac{(w)}{(e)}$.
1.98	0.215	9.19	1.354	0.130	10.42
1.351	0.133	10.15	0.3203	0.0278	11.52
0.297	0.0246	12.08	0.1855	0.0156	11.89
0.1448	0.0118	12.27			
0.0548	0.0046	11.88			

F.-pt. data for mixtures of trichlorolactic acid and dimethylpyrone are given by Kendall, 1914.

Distribution of Lactic Acid Between :

Water and Chloroform at 25°. (Smith, 1922, 1921.) Millimols. per liter. H_2O layer (C_1).	$CHCl_3$ layer, (C_2).	$\frac{C_2}{C_1}$	Water and Ether at 25°. (Smith, 1921, 1922.) Millimols. per liter. H_2O layer C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Water and Ether at 20°. (Behrens, 1926.) Concentration in H_2O layer C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
26.9	0.43	0.0160	3.95	0.550	0.139	0.0692	0.0056	0.0809
32.8	0.60	0.0183	5.95	1.000	0.155	0.1485	0.01205	0.0811
50.4	1.00	0.0198	9.35	1.525	0.163	0.298	0.02445	0.0820
79.8	1.80	0.0226	15.7	2.7	0.172			
			28.3	5.1	0.180			

Distribution of Anhydride Free Lactic Acid Between Water and Ethyl Ether at 20°.

(Dietzel and Rosenbaum, 1927; Dietzel and Schmitt, 1932.)

Gm. Mol. $CH_3CHOHCOOH$ per liter. H_2O layer	$(C_2H_5)_2O$ layer	Gm. Mol. $CH_3CHOHCOOH$ per liter H_2O layer	$(C_2H_5)_2O$ layer	Gm. Mol. $CH_3CHOHCOOH$ per liter H_2O layer	$(C_2H_5)_2O$ layer
0.1270	0.0144	0.3440	0.0321 (10°)	0.8020	0.0707
0.1470	0.0158	0.3350	0.0322 (0°)	0.8600	0.0752
0.1630	0.0173	0.3850	0.0354	0.9310	0.0814
0.2010	0.0201	0.4910	0.0446	0.985	0.0883
0.2550	0.0249	0.5660	0.0504	1.040	0.0934
0.3110	0.0295	0.6220	0.0553	1.095	0.0985
0.3522	0.0320	0.6770	0.0597	1.150	0.1036
0.3575	0.0320 (25°)	0.7500	0.0659	1.205	0.1087

Distribution of Anhydride Free Lactic Acid Between 0.5n Aq. Sulfuric Acid and Ethyl Ether at 20°.

(Dietzel and Rosenbaum, 1927.)

Gm. Mol. $CH_3CHOHCOOH$ per liter 0.5n H_2SO_4 layer	$(C_2H_5)_2O$ layer	Gm. Mol. $CH_3CHOHCOOH$ per liter 0.5n H_2SO_4 layer	$(C_2H_5)_2O$ layer	Gm. Mol. $CH_3CHOHCOOH$ per liter 0.5n H_2SO_4 layer	$(C_2H_5)_2O$ layer
0.0684	0.0058	0.2300	0.0199	0.6680	0.0600
0.0881	0.0075	0.3170	0.0278	0.7550	0.0680
0.1029	0.0088	0.4040	0.0360	0.8380	0.0758
0.1260	0.0108	0.4900	0.0440	0.9250	0.0835
0.1580	0.0137				

DISTRIBUTION OF ANHYDRIDE FREE LACTIC ACID BETWEEN WATER AND AMYL ALCOHOL AT 20°.

(Dietzel and Rosenbaum, 1927; Dietzel and Schmitt, 1932.)

Gm. Mol. $CH_3CHOHCOOH$ per liter		Gm. Mol. $CH_3CHOHCOOH$ per liter		Gm. Mol. $CH_3CHOHCOOH$ per liter	
H_2O layer	$C_5H_{11}OH$ layer	H_2O layer	$C_5H_{11}OH$ layer	H_2O layer	$C_5H_{11}OH$ layer
0.1040	0.0490	0.3880	0.1610	0.6800	0.2775
0.1330	0.0605	0.4250	0.1760	0.714	0.3170
0.1650	0.0725	0.4630	0.1910	0.918	0.4110
0.2030	0.0875	0.5000	0.2060	0.969	0.4345
0.2060	0.0825	0.5100	0.2230	1.020	0.4580
0.2420	0.1025	0.5370	0.2210	1.071	0.4815
0.2790	0.1170	0.5700	0.2320	1.122	0.5050
0.3190	0.1330	0.6070	0.2480	1.173	0.5285
0.3530	0.1470	0.6430	0.2625		

DISTRIBUTION OF ANHYDRIDE FREE LACTIC ACID BETWEEN 0.5n AQ. SULFURIC ACID AND AMYL ALCOHOL AT 20°.

(Dietzel and Rosenbaum, 1927.)

Gm. Mol. $CH_3CHOHCOOH$ per liter		Gm. Mol. $CH_3CHOHCOOH$ per liter		Gm. Mol. $CH_3CHOHCOOH$ per liter	
0.5n H_2SO_4 layer	$C_5H_{11}OH$ layer	0.5n H_2SO_4 layer	$C_5H_{11}OH$ layer	0.5n H_2SO_4 layer	$C_5H_{11}OH$ layer
0.0410	0.0190	0.2530	0.1100	0.4940	0.2100
0.0705	0.0320	0.2890	0.1250	0.5260	0.2235
0.1000	0.0455	0.3230	0.1390	0.5640	0.2450
0.1240	0.0560	0.3560	0.1525	0.5950	0.2520
0.1490	0.0680	0.3905	0.1675	0.6310	0.2660
0.1830	0.0825	0.4260	0.1825	0.6640	0.2800
0.2170	0.0950	0.4580	0.1950	0.6980	0.2940

The authors also give similar results for the distribution of commercial Lactic Acid containing 30% Lactyl Lactic Acid, [$CH_3.CH(OH).COOCH(CH_3).COOH$], between Water and Amyl Alcohol at 20°.

DISTRIBUTION OF LACTIC ACID BETWEEN WATER AND ISO AMYL ALCOHOL AT 25°.

(Kolossowsky and Bekturow, 1935; Kolossowsky, Kulikow and Bekturow, 1935.)

Gm. Mols. $CH_3CHOHCOOH$ per liter		$\frac{1}{2}$	Gm. Mols. $CH_3CHOHCOOH$ per liter		$\frac{1}{2}$
H_2O layer(1)	iso $C_5H_{11}OH$ layer(2)		H_2O layer(1)	iso $C_5H_{11}OH$ layer(2)	
0.152	0.058	2.62	1.750	0.884	1.98
0.358	0.145	2.47	2.760	1.616	1.71
0.526	0.221	2.38	3.218	2.051	1.57
0.8006	0.358	2.24	3.919	2.974	1.32
1.350	0.656	2.06	4.178	3.477	1.20

DISTRIBUTION OF LACTIC ACID BETWEEN WATER AND ORTHO TOLUIDINE AT 30°.

(Angelescu, 1927.)

Gms. $CH_3CHOHCOOH$ per 100 gms.		$\frac{1}{2}$	Gms. $CH_3CHOHCOOH$ per 100 gms.		$\frac{1}{2}$
H_2O layer(1)	o $CH_3C_6H_4NH_2$ layer(2)		H_2O layer(1)	o $CH_3C_6H_4NH_2$ layer(2)	
3.86	0.65	5.94	15.61	6.41	2.43
6.95	1.31	5.30	16.65	9.14	1.82
9.78	2.27	4.31	16.78	10.68	1.57

HYDANTOIC ACID $NH_2CONHCH_2COOH$.

SOLUBILITY OF HYDANTOIC ACID IN SEVERAL SOLVENTS AT 25°.

(McMeekin, Cohn and Weare, 1936.)

Solvent	d. of sat. sol.	Gm. Mol. $C_3H_6O_3N_2$ per liter sat. sol.	Solvent	d. of sat. sol.	Gm. Mol. $C_3H_6O_3N_2$ per liter sat. sol.
Water	1.0112	0.329	90 Wt. % Ethanol	0.82887	0.710
Formamide	1.15405	0.837	100 " "	0.7865	0.0242
Methanol	0.79178	0.0797	Butanol	0.80674	0.00643
Acetone	0.78566	0.00248			

SOLUBILITY OF HYDANTOIC ACID IN AQUEOUS ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1936.)

Vol. Percent C_2H_5OH in Aq. Solvent	d. of sat. sol.	Gm. Mols. $C_3H_6O_3N_2$ per liter	Vol. Percent C_2H_5OH in Aq. Solvent	d. of sat. sol.	Gm. Mols. $C_3H_6O_3N_2$ per liter
0.0	1.0112	0.329	60.0	0.9166	0.211
20.0	0.9835	0.272	80.0	0.8619	0.124
40.0	0.9575	0.246	100.0	0.7865	0.0242

TRI METHYLENE TRI NITRAMINE $(CH_2N)_3(NO_2)_3$.

SOLUBILITY OF TRI METHYLENE TRI NITRAMINE IN SEVERAL SOLVENTS, EACH SEPARATELY.

(Urbanski and Kwiatkowski, 1933.)

t°	Gms. $(CH_2N)_3(NO_2)_3$ per 100 gms. sat. sol. in:							
	CH_3OH	C_2H_5OH	Iso $C_5H_{11}OH$	$(CH_3)_2CO$	$CH_3COOC_2H_5$	CCl_4	C_6H_6	$C_6H_5CH_3$
0	0.140	0.040	0.020	4.18	—	—	—	0.016
10	0.180	0.070	0.023	5.38	0.050	—	0.020	0.018
20	0.235	0.105	0.026	6.81	0.055	—	0.045	0.020
30	0.325	0.155	0.040	8.38	0.075	—	0.055	0.025
40	0.480	0.235	0.060	10.34	0.090(a)	—	0.085	0.050
50	0.735	0.370	0.110	12.80	—	0.005	0.115	0.085
60	1.060	0.575	0.210	15.27(b)	—	0.007	0.195	0.125
70	1.250(c)	0.880	0.320	←	—	0.015	0.300	0.210
80	—	1.180(d)	0.500	—	—	—	0.400(e)	0.295
90	—	—	0.850	—	—	—	—	0.465
100	—	—	1.325	—	—	—	—	0.640
110	—	—	1.900	—	—	—	—	0.980
120	—	—	2.990	—	—	—	—	—
	—	—	3.870(f)	—	—	—	—	—

(a) 34°; (b) 58°; (c) 64.5°; (d) 78.1°; (e) 79.5°; (f) 131.6°.

Freezing-point data are given by Urbanski and Rabek-Gawronska, 1934, for mixtures of Tri methylene Tri nitramine and each of the following compounds: Dimethyl diphenyl urea, 1.2.3 Trinitro benzene, 2.4.6 Tri

PROPYL CHLORIDE, Bromide, etc.

SOLUBILITY IN WATER.

(Rex, 1906.)

Propyl Compound.	Grams P. Compound per 100 Gms. H_2O at: 0°.	10°.	20°.	30°.
$CH_3CH_2CH_2Cl$ (normal)	0.376	0.323	0.272	0.277
$CH_3CH_2CH_2Br$ "	0.298	0.263	0.245	0.247
$CH_3CH_2CH_2I$ "	0.114	0.103	0.107	0.103
$(CH_3)_2CHCl$ (iso)	0.440	0.363	0.305	0.304
$(CH_3)_2CHBr$ "	0.418	0.365	0.318	0.318
$(CH_3)_2CHI$ "	0.167	0.143	0.140	0.134

PROPYL ACETATE, BROMIDE, CHLORIDE, etc.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Fühner, 1924.)

The determinations were made simply by measuring from a buret the quantity of each compound just sufficient to saturated a given amount of water after thorough shaking. High accuracy is not claimed for the results.

Compound.	Formula.	t°.	Gms. cmpd. per 100 gms. sat. sol.
n Propyl Acetate..........	$CH_3COO.CH_3.CH_2CH_2$	20	1.89
Iso » »	$CH_3COO(CH_3)_2CH$	20	3.09
» Butyrate.........	$C_3H_7COO.C_3H_7$	17	0.162
» Benzene..........	$CH_3(CH_2)_2.C_6H_5$	15	0.006
» Bromide.........	$CH_3CH_2CH_2Br$	19.5	0.226
Iso » »	$(CH_3)_2CHBr$	18.	0.286
» Chloride.........	$CH_3CH_2CH_2Cl$	12.5	0.232
Iso » »	$(CH_3)_2CHCl$	12.5	0.342
» Iodide...........	$CH_3CH_2CH_2I$	20	0.087

PROPYL BROMIDE

100 gms. H_2O dissolve 0.231 gms. n Propyl Bromide at 30°.
100 gms. H_2O dissolve 0.104 gm. n Propyl Iodide at 30°. (Gross and Saylor, 1931.)

Freezing-Point data are given for:

n Propyl Bromide + Ethyl Bromide	(Sapgir, 1929.)
" " + iso Butyl Bromide	(Timmermans, 1934.)

PROPYL AMINES

Freezing-point data for mixtures of propylamine and water, isopropylamine and water and for dipropylamine and water are given by Pickering (1893).

DISTRIBUTION OF PROPYLAMINES BETWEEN WATER AND TOLUENE.

(Moore and Winmill, 1912.)

Amine.	Results at 18°. Gm. Equiv. Amine per Liter of Aq. Layer.	Partition Coef.	Results at 25°. Gm. Equiv. Amine per Liter of Aq. Layer.	Partition Coef.	Results at 32.35°. Gm. Equiv. Amine per Liter of Aq. Layer.	Partition Coef.
Propylamine	0.0973	5.434	0.03837	4.470	0.0602	3.311
"	0.0928	5.439	0.04300	4.470	0.0578	3.317
Dipropylamine	0.0764	0.1185	0.0722	0.0769	0.01168	0.05802
"	0.0794	0.1188	0.0681	0.0771	0.01199	0.05795
Tripropylamine	0.0003	0.003	...	...	...	...

PROPYLAMINE HYDROCHLORIDE α $NH_2(C_3H_7).HCl$.

100 gms. H_2O dissolve 278.2 gms. $NH_2(C_3H_7).HCl$ at 25°. (Peddle and Turner, 1913.)
100 gms. $CHCl_3$ dissolve 5.26 gms. $NH_2(C_3H_7).HCl$ at 25°. (Peddle and Turner, 1913.)

DiPROPYL AMINE HYDROCHLORIDE $NH(C_3H_7)_2.HCl$.

100 gms. H_2O dissolve 165.3 gms. $NH(C_3H_7)_2.HCl$ at 25°. (Peddle and Turner, 1913.)
100 gms. $CHCl_3$ dissolve 47.24 gms. $NH(C_3H_7)_2.HCl$ at 25°. (Peddle and Turner, 1913.)

PROPIONAMIDE $CH_3CH_2CONH_2$.

CRITICAL SOLUTION TEMPERATURES OF PROPIONAMIDE AND OTHER COMPOUNDS.

Mixture of Propionamide and:	Formula	Critical solution Temperature	Authority
p Chloro nitro benzene	$C_6H_4ClO_2N$	66.5	(Lecat, 1929.)
Methyl benzene	$C_6H_5CH_3$	about 57	(" 1927a)
p Methyl acetophenone	$C_9H_{10}O$	50(?)	(" ")
Benzyl acetate	$C_9H_{10}O_2$	about 50	(" 1928.)
Ethyl benzoate	$C_6H_5COOC_2H_5$	about 65	(" "
Geraniol	$C_{10}H_{18}O$	about 55	(" 1929.)
i Amyl valerianate	$C_{10}H_{20}O$	70	(" 1927a)
Eugenol methyl ether	$C_{11}H_{14}O$	about 55	(" 1928.)

ALLYLAMINE $CH_2 : CH.CH_2.NH_2$.

DISTRIBUTION BETWEEN WATER AND XYLENE AT 25°. (Smith, 1921-1922.)

Gm, mols. Allylamine per liter H_2O layer.....	1.85	3.30	6.50
" " Xylene layer.....	0.35	0,55	1.30

ALANINE (α Aminopropionic Acid) $CH_3CH(NH_2)COOH$.

SOLUBILITY OF *d* ALANINE AND OF *dl* ALANINE IN WATER AT DIFFERENT TEMPERATURES.

(Pellini and Coppola, 1913.)

Results for:

t°.	*d* Alanine. Gms. *d* Alanine per 100 Gms. H_2O.	*d* – *l* Alanine. Gms. *d* – *l* Alanine per 100 Gms. H_2O.	Mixtures *d* + *l* Alanine. Gms. per 100 Gms. H_2O. *d* Alanine.	*l* Alanine.
0	12.99	12.89	13.27	4.01
17	15.17	14.95	14.5	4.1
30	17.39	17.72	17.05	4.99
45	20.55	21.58	...	...

SOLUBILITY OF d ALANINE AND OF dl ALANINE, EACH SEPARATELY, IN WATER AT DIFFERENT TEMPERATURES.

(Dalton and Schmidt, 1933.)

The following results were derived from equations based in each case upon 18 very careful solubility determinations at 9 different temperatures between 0 and 65°.

Results are also given for the densities at 25° of solutions of d Alanine varying from 0.89 to 14.38 percent and for dl Alanine varying from 1.1 to 15.0 percent. The following results in parentheses are those of Dunn, Ross and Read, 1933.

t°	Gms. per 100 gms. H_2O		t°	Gms. per 100 gms. H_2O	
	d Alanine	dl Alanine		d Alanine	dl Alanine
0	12.73	12.11 (12.11)	40	19.57	20.29
5	13.43	12.91	45	20.65	21.64
10	14.17	13.78	50	21.79	23.09 (23.48)
15	14.96	14.69	55	22.99	24.63
20	15.78	15.67	60	24.26	26.27
25	16.65	16.72 (16.58)	65	25.60	28.02
30	17.57	17.88	70	27.02	29.90
35	18.54	19.02	75	28.51	31.89 (32.18)
			100	37.30	44.04 (43.2)

ALANINE (α Aminopropionic Acid) $CH_3CH(NH_2)COOH$.

Phenyl **ALANINE** (β Phenyl α Aminopropionic Acid) $C_6C_5.CH_2.CH(NH_2)COOH$.

SOLUBILITY OF *d. l.* ALANINE AND OF *d. l.* PHENYLALANINE IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 21°. (Pfeiffer and Angern, 1924.)

The saturated solutions in water were prepared by continuous agitation at constant temperature for 3 days. The filtered solution was analyzed by the Sörensen method of titration, in which formaldehyde is added and the resulting methylene aminoacid titrated with sodium hydroxide, using phenolphthalein as indicator. The solubility in salt solutions was determined by adding the amount of salt to 5.0 cc. of the saturated solution in water necessary to yield 0.02 molecular concentration, and continuing the agitation for another 3 days. The resulting precipitate of amino acid was filtered, dried at 120-130° and its weight (after correction for inorganic salts by ashing) subtracted from the aminoacid originally present in the water.

Results for Alanine.

Solvent.	Gms. Alanine per 100 cc. sat. sol.
Water	13.87
Aq. 0.02 molecular CH_3COOK.	12.12
» $(NH_4)_2SO_4$.	11.08

Results for Phenylalanine

Solvent	Gms. Phenylalanine per 100 cc. sat. sol.
Water	1.49
Aq. 0.02 molecular CH_3COOK.	1.24
» NaCl	1.20
» $(NH_4)_2SO_4$.	0.59

ALANINE (α Aminopropionic Acid) $CH_3CH(NH_2)COOH$.

SOLUBILITY IN MIXTURES OF ALCOHOL AND WATER AT 25°.

(Holleman and Antusch, 1894.)

Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.
0	16.47	1.0421	35	4.91	0.9670
5	14.37	1.0311	40	3.89	0.9577
10	12.43	1.0280	50	2.38	0.9355
15	10.49	1.0101	60	1.57	0.9102

The following additional results at 25° are given by Cohn, McMeekin, Edsall and Weare, 1934.

Wt. Percent C_2H_5OH in Aqueous Solvent	d. of sat. sol.	Gm. Mols. $C_3H_2O_2N$ per liter
0.0	1.0432	1.660
5.0	1.0320	1.460
10.0	1.0211	1.250

SOLUBILITY OF dl ALANINE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT SEVERAL TEMPERATURES.

(Dunn and Ross, 1938.)

t°	Vol. Percent C_2H_5OH in Aq. Solvent	d. of sat. sol.	Gms. $C_3H_7O_2N$ per 100 gms. Solvent	t°	Vol. Percent C_2H_5OH in Aq. Solvent	d. of sat. sol.	Gms. $C_3H_7O_2N$ per 100 gms. Solvent
0	24.93	0.979	3.84	45.16	25.28	0.989	10.6
"	50.10	0.934	1.16	44.96	50.10	0.928	4.25
"	74.50	0.880	0.305	44.98	74.20	0.856	0.949
"	95.14	0.817	0.0167	45.19	95.14	0.794	0.0545
24.97	24.93	0.984	7.09	64.96	24.93	0.994	15.9
"	50.10	0.929	2.52	"	50.10	0.922	6.68
"	74.20	0.868	0.573	"	74.20	0.847	0.847
25.09	95.14	0.807	0.0329	64.15	95.09	0.780	0.780

DISTRIBUTION OF dl-ALININE BETWEEN WATER AND BUTYL ALCOHOL AT 25°.

(England and Cohn, 1935.)

Gm. Mols. $C_3H_7O_2N$ per liter		
H_2O layer (1)	alcohol layer (2)	$\frac{(2)}{(1)}$
0.174	0.0041	0.0237
0.454	0.0090	0.0198
0.769	0.0163	0.0212
1.316 (sat.)	0.0198	0.0150

100 gms. Pyridine dissolve 0.16 gm. Alanine at 20-25°. (Dehn, 1917.)

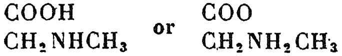
β ALANINE $NH_2CH_2CH_2COOH$.

SOLUBILITY OF β ALANINE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1936.)

Wt. Percent C_2H_5OH IN Aq. Solvent	d. of sat. sol.	Gm. Mols. $C_3H_7O_2N$ per liter	Wt. Percent C_2H_5OH in Aq. Solvent	d. of sat. sol.	Gm. Mols. $C_3H_7O_2N$ per liter
0.0(= H_2O)	1.1581	6.123	60.0	0.9596	1.687
5.0	1.1509	5.827	70.0	0.9086	0.814
10.0	1.1416	5.620	80.0	0.8638	0.242
20.0	1.1361	5.180	90.0	0.8271	0.0382

SARCOSINE (N-Methyl glycine)



$\begin{matrix}COOH\\CH_2NHCH_3\end{matrix}$ or $\begin{matrix}COO\\CH_2NH_2CH_3\end{matrix}$

100 cc. sat. solution of sarcosine in water contain 42.82 gms. of the compound at 20°.

100 cc. sat. solution of sarcosine in aqueous 0.02 molecular CH_3 CO OK solution contain 36.47 gm. of the compound at 20°. (See Alanine, p. 199 for details as to the manner in which the determinations were made.) (Pfeiffer and Angern, 1924.)

Freezing-point data for mixtures of SARCOSINE ANHYDRIDE and veronal are given by Pfeiffer and Angern, 1926.

Freezing-point data are given for mixtures of Sarcosine Anhydride, $(CH_3N\ CH_2CO)_2O$, and each of the following compounds: See also p. 430

m Amino benzoic acid(3)
p " " " (1)
" " " " methyl ester(3)
6 Amino, 3.4 dimethyl azobenzene(4)
Anisic acid(4)
Anthranilic acid(1)(3)
Barbital(2)
Barbituric acid(6)
Benzoic acid(4)(7)
Carbazole(3)
Chloral hydrate(5)
Cholesterol(5)
p Dimethyl amino benzoic acid(3)
n Dimethyl indole(3)
p Iodo biphenyl(9)
Di phenyl amine(2)(3)
Indole(3)
Mannite(5)
Menthol(2)
o Methoxy benzoic acid(4)
α Methyl indole(3)(8)
β Methyl indole(3)
Methyl amino benzoic acid(3)
n Methyl phenyl voluntal(5)
n Methyl veronal(6)
2-Naphthylamine(3)
Oxindole(3)
Oxybenzoic acid(4)
Phenobarbital (Luminal)(6)
n Phenyl urethan(5)
n Phenyl voluntal(5)
n Phenyl veronal(6)
o Phenylene diamine(3)
m " " (3)
Skatol(1)
p Toluyl acid(4)
2.3.5 Trimethyl pyurol carbonic acid ethyl ester(3)
p,p',p" Tri nitro tri methyl methane(2)
Tri phenyl methane(2)
Urethan(5)
Veronal (c-Diethyl barbituric acid(2)

(1) Pfeiffer and Angern, 1925; (2) Pfeiffer and Angern, 1926; (3) Pfeiffer, Angern and Wang, 1927; (4) Pfeiffer, Angern, Wang, Seydel and Quehl, 1930; (5) Pfeiffer and Seidel, 1928; (6) Pfeiffer and Seydel 1928a; (7) Hammick and Howard, 1932; (8) Miers and Isaac, 1930; (9) Pfeiffer, Schmitz and Inoue, 1929.

LACTAMIDE (d) and (l) $CH_3CHOHCONH_2$.

Freezing-point data are given by Timmermans, van Lancker and Jaffe, 1939, for the following mixtures:

(d) lactamide + (l) lactamide; (d) lactamide + dichloro succinic acid; (d) lactamide +(d)dichloro succinic acid; (d) lactamide + d phenyl glycolic acid; (l) lactamide + d phenyl glycolic acid

URETHAN (Ethyl Carbamate) $NH_2.CO_2.C_2H_5$.

SOLUBILITY OF URETHAN IN SEVERAL SOLVENTS.

(Speyers, 1902)

Solubility in Water.

	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. H_2O.
0.....	1.023	3.61	18.5
10.....	1.033	6.00	31.0
15.....	1.043	15.00	100
20.....	1.060	31.0	240
25.....	1.073	50.0	480
30.....	1.078	65.0	1370
40.....	1.065	77.0	Ca. 2200

Solubility in Methyl Alcohol.

	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ por 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. CH_3OH.
0.....	0.956	31.18	126
10.....	0.977	41.0	190
15.....	0.989	47.5	240
20.....	1.000	54.5	330
25.....	1.013	62.5	500
30.....	1.024	72.0	850
40.....	1.045	89.0	2250

Solubility in Ethyl Alcohol.

t.	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. C_2H_5OH.
0.....	0.891	23.91	76
10.....	0.930	36.0	120
15.....	0.950	43.0	150
20.....	0.968	50.0	200
25.....	0.985	59.0	280
30.....	1.001	70.0	430
40.....	1.035	88.0	1300

Solubility in Propyl Alcohol.

t.	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. C_3H_7OH.
0.....	0.880	19.48	35
10.....	0.906	31.0	66
15.....	0.923	40.0	105
20.....	0.942	51.0	150
25.....	0.963	60.0	220
30.....	0.983	68.0	317
40.....	1.025	85.0	820

Solubility in Chloroform

t°.	Wt. of 1 cc. sat. sol.	Mols. $NH_2.COC_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO\,C_2H_5$ per 100 gms. $CHCl_3$.
0.....	1.404	27.56	28.4
10.....	1.340	41	53
15.....	1.310	46	65
20.....	1.280	53	85
25.....	1.240	60	117
30.....	1.203	67	162
40.....	1.125	80	282

Solubility in Toluene

t°.	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. $C_6H_5CH_3$.
0.....	0.887	1.77	1.7
10.....	0.874	5.0	6
15.....	0.875	10.0	10
20.....	0.883	16.0	18
25.....	0.902	25.0	45
30.....	0.927	44.0	95
40.....	0.995	85.0	620

100 gms. quinoline dissolve 9.72 + gms. Urethan at 20-25°. (Pucher and Dehn, 1921.)

100 gms. sat. solution of **Methyl Urethan** in Water contain about 69.0 gms. $NH_2.CO.CH_3$ at 15°.5.

100 gms. sat. solution of **Propyl Urethan** in Water contain about 7.7 gms. $NH_2.CO.C_3H_7$ at 15°.5. (Fühner, 1924.)

100 gms. sat. solution of <u>Ethyl Urethan</u> in Water contain 48 gms. $NH_2COOC_2H_5$ at 15.5°. (Fühner, 1924.)

FREEZING-POINTS OF MIXTURES OF URETHAN AND WATER.

(Chadwell and Politi, 1938.)

t° of freezing	Gm. Mols. $NH_2COOC_2H_5$ per 1000 gms. H_2O	Solid Phase	t° of freezing	Gm. Mols. $NH_2COOC_2H_5$ per 1000 gms. H_2O	Solid Phase
-0.4642	0.2568	Ice	-1.7176	1.0377	Ice
-0.6863	0.3840	"	-1.8122	1.1320	"
-0.8426	0.4766	"	-1.9444	1.1935	"
-1.1885	0.6895	"	-2.6887 (Eutec.)	1.7609	" + $NH_2COOC_2H_5$

SOLUBILITY OF URETHAN IN AQUEOUS SALT SOLUTIONS AT 25°.

(Palitzsch, 1929.)

In aqueous solutions of:

Sodium Chloride		Potassium Chloride	
Gm. Mols. NaCl per liter aq. solvent	Gms. $NH_2COOC_2H_5$ per liter sat. sol.	Gm. Mols. KCl per liter aq. solvent	Gms. $NH_2COOC_2H_5$ per liter sat. sol.
0.0 (= H_2O)	875.	0.0 (= H_2O)	875.0
2.20	217.8	2.20	275.6
3.21	51.9	3.84	39.7

100 gms. sat. solution in liquid CO_2 contain 4 gms. urethan at the critical temperature, 23.5°; at 30.5° the mixture separates with two layers. (Büchner, 1905–06.)

100 gms. pyridine dissolve 21.32 gms. urethan at 20–25°. (Dehn, 1917.)
100 gms. aq. 50% pyridine dissolve 101.1 gms. urethan at 20–25°. "

SOLUBILITY OF URETHAN DERIVATIVES IN WATER.

(Odaira, 1915.)

Name.	Formula.	t°.	Gms. Cmpd. per 100 Gms. H_2O.
Detonal (Diethyl Aceturethan)	$(C_2H_5)_2CH.CO.NH.CO.OC_2H_5$	...	0.526
Epronal (Ethylpropyl Aceturethan)	$(C_2H_5)(C_3H_7)CH.CO.NH.CO.OC_2H_5$	cold	0.143
Dipronal (Dipropyl Aceturethan)	$(C_3H_7)CH.CO.NH.CO.OC_2H_5$	20	0.040
Probnal (Propylbutyl Aceturethan)	$(C_3H_7)(C_4H_9)CH.CO.NH.CO.OC_2H_5$	20	0.032
Dibnal (Dibutyl Aceturethan)	$(C_4H_9)_2CH.CO.NH.CO.OC_2H_5$	...	0.008
Oenanthyl Urethan	$CH_3(CH_2)_5CO.NH.CO.OC_2H_5$	...	0.021
n Isoamyl Urethan	$(C_2H_5)_2CH.NH.CO.OC_2H_5$	20	0.410
α Bromethyl Propyl Aceturea	$(C_2H_5)(C_3H_7)CBr.CO.NH.CO.NH_2$	20	0.041

DISTRIBUTION OF URETHAN DERIVATIVES BETWEEN WATER AND OLIVE OIL.

Name.	Formula.	t°.	Gms. Cmpd. per 100 cc.		Dist. Ratio $\frac{Conc._{oil}}{Conc._{H_2O}}$.
			H_2O Layer.	Olive Oil Layer.	
Ethyl Urethan	$NH_2COOC_2H_5$	ord.	4.52	0.615	0.136 (1)
Methyl Urethan	NH_2COOCH_3	ord.	7.50	0.275	0.037 (1)
Aceturethan	$CH_3CONH.COOC_2H_5$	17–20	2.94	0.389	0.132 (2)
Epronal	$(C_2H_5)(C_3H_7)CH.CO.NH.CO.OC_2H_5$	"	0.076	0.257	3.3 (2)
Detonal	$(C_2H_5)_2CH.CO.NH.CO.OC_2H_5$	"	0.122	0.213	1.8 (2)
			0.326	0.549	1.7 (2)
Veronal (diethylbarbituric acid)	$CO(NHCO)_2C.(C_2H_5)_2$	"	0.180	0.020	0.11 (2)
			0.268	0.032	0.12 (2)

(1) Baum, 1899; H. von Meyer, 1909. (2) Odaira, 1915.

Freezing-point data are given for Urethan +

Acetic Acid(21)
Mono chloro acetic acid(21)
Di " " " (21)
Tri " " " (11)(21)
Acetanilide(4)
Antipyrine(1)(2)(3)
4-di methyl amino antipyrine(1)
Antipyrine + Phenacetine(5)
" + Urea(5)(7)
" + Menthol(5)
Benzene(13)(14)(15)(19)(20)
Benzoic acid(17)
Camphor(9)
Di phenyl amine(10)(14)(15)
Di nitro benzene(18)
p Nitroso toluene(8)
p nitro toluene (8)
Erythritol(22)
Guiacol(16)
Menthol(2)(3)
Naphthalene(12)
α Nitro naphthalene(8)
p Nitro anisole(15)
Phenacetine(3)(11)
" + Urea(5)
Phenol(23)
Phenol + Urea(6)
Pyramidon(1)
Resorcinol(3)
Salicylic acid + Urea(6)
Salol(3)
Sarcosine anhydride(1)
Urea(2)(3)

(1) Pfeiffer and Seydel, 1928; (2) Adamanis, 1933; (3) Hrynokowski and Adamanis, 1933; (4) Hrynakowski and Adamanis, 1933a; (5) Hrynakowski, 1934; (6) Hrynakowski and Szmyt, 1935a; (7) Hrynakowski and Adamanis, 1935; (8) Mascarelli, 1908; (9) Migliacci and Calo, 1927; (10) Angelletti, 1928; (11) Kitran, 1924; (12) Vasilev, 1917; (13) Puschin, 1925; (14) Puschin, 1929; (15) Puschin and Grebenschikov, 1913; (16) Puschin and Vaic, 1926; (17) Puschin and Wilowitsch, 1925; (18) Puschin and Fioletova, 1922; (19) Puschin and Glagoleva, 1914; (20) Puschin and Mazarovich, 1914; (21) Puschin and Rikovsky, 1932; (22) Puschin and Dezelic, 1932; (23) Mascarelli and Pestaklozza, 1908, 1909.

β Phosphono**PROPIONIC ACID** $HCOO\,C_2H_4.PO(OH)_2$ (m. pt. = 178°).

100 gms. sat. sol. in water contain 39.7 gms. of the compd. at 0° and 48.8 gms. at 20°.
(Nylen, 1926.)

dl **SERINE** $CH_2OHCH(NH_2)COOH$.

SOLUBILITY OF SERINE IN WATER.

(Dalton and Schmidt, 1935.)

The results of 32 determinations at temperatures between 0-62° were used for calculating the solubility equation and from this the following values for 5° intervals were obtained. The values above 70° are not considered as accurate as those for the lower temperatures. Density determinations of several dilute aqueous solutions at 25° are also given.

t°	Gms. $C_3H_7O_3N$ per 100 gms. H_2O	t°	Gms. $C_3H_7O_3N$ per 100 gms. H_2O	t°	Gms. $C_3H_7O_3N$ per 100 gms. H_2O
0	2.204	30	5.852	60	13.41
5	2.620	35	6.787	65	15.18
10	3.103	40	7.842	70	17.11
15	3.658	45	9.024	75	19.21
20	4.295	50	10.34	100	32.24
25	5.023	55	11.80		

100 cc of Acetic acid dissolve 0.088 gm. dl Serine at 18°.
(v. Przylecki and Kasprzyk-Czarykowska, 1938.)

SERINE $CH_2OHCH(NH_2)COOH$.

SOLUBILITY OF dl SERINE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL.

(Dunn and Ross, 1938.)

t°	Wt. % C_2H_5OH in aq. solvent	d. of sat. sol.	Gms. $C_3H_7O_2N$ per 100 gms. solvent	t°	Wt. % C_2H_5OH in aq. solvent	d. of sat. sol.	Gms. $C_3H_7O_2N$ per 100 gms. solvent
0	20.32	0.975	0.530	45	20.32	0.968	3.14
"	42.52	0.938	0.146	"	42.52	0.912	0.985
"	67.27	0.882	0.0304	"	66.94	0.857	0.185
"	92.61	0.818	0.0008	"	92.61	0.793	0.0058
25	20.32	0.970	1.54	65	20.32	0.974	5.99
"	42.52	0.923	0.461	"	42.52	0.909	1.88
"	67.27	0.869	0.0840	"	67.27	0.844	0.318
"	92.61	0.806	0.0028	"	92.61	0.783	0.0152

PROPYL ALCOHOL C_3H_7OH.

Freezing-point data for mixtures of propyl alcohol and water are given by Pickering (1893).

Results for mixtures of isopropyl alcohol and water are given by Dreyer (1913)

100 gms. sat. solution of propyl alcohol in liquid carbon dioxide contain 36.5 gms. C_3H_7OH at −24° and 57.5 gms. at −30°. (Büchner, 1905–06.)

MISCIBILITY OF PROPYL ALCOHOL WITH MIXTURES OF CHLOROFORM AND WATER AT 0°.

(Bonner, 1910.)

See Notes, pp. 45 and 176

Composition of Homogeneous Mixtures.				Composition of Homogeneous Mixtures.			
Gms. $CHCl_3$.	Gms. H_2O.	Gms. C_3H_7OH.	Sp. Gr. of Mixture.	Gms. $CHCl_3$.	Gms. H_2O.	Gms. C_3H_7OH.	Sp. Gr. of Mixture.
0.977	0.023	0.304	1.28	0.500	0.50	1.34	0.97
0.926	0.074	0.631	1.13	0.394	0.606	1.32	0.98
0.90	0.10	0.76	1.11	0.293	0.707	1.235	0.96
0.80	0.20	1.06	1.04	0.194	0.806	0.996	0.95
0.70	0.30	1.20	1.01	0.097	0.903	0.672	0.97
0.60	0.40	1.30	0.98	0.030	0.97	0.39	0.97

MISCIBILITY OF PROPYL ALCOHOL AT 0° WITH MIXTURES OF:

Carbon Tetrachloride and Water. (Bonner, 1910.)

Ethyl Bromide and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.				Composition of Homogeneous Mixtures.			
Gms. CCl_4.	Gms. H_2O.	Gms. C_3H_7OH.	Sp. Gr. of Mixture.	Gms. C_2H_5Br.	Gms. H_2O.	Gms. C_3H_7OH.	Sp. Gr. of Mixture.
0.975	0.025	0.317	1.31	0.941	0.039	0.367	1.21
0.931	0.069	0.536	1.17	0.912	0.088	0.615	1.11
0.90	0.10	0.65	1.14	0.90	0.10	0.64	1.10
0.80	0.20	0.949	1.07	0.80	0.20	0.85	1.05
0.70	0.30	1.12	1.02	0.70	0.30	1	1.02
0.60	0.40	1.20	0.99	0.60	0.40	1.09	1
0.499	0.501	1.234	0.98	0.491	0.509	1.124	0.98
0.40	0.60	1.195	0.97	0.40	0.60	1.10	0.97
0.30	0.70	1.13	0.96	0.30	0.70	0.90	0.96
*0.25	0.75	1.06	...	0.20	0.80	0.81	0.96
0.194	0.806	0.912	0.96	0.14	0.86	0.671	0.96
0.100	0.90	0.68	0.96	0.10	0.90	0.56	0.97
0.013	0.987	0.354	0.96	*0.023	0.977	0.227	0.99

MISCIBILITY OF PROPYL ALCOHOL AT 0° WITH MIXTURES OF:

Bromobenzene and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. C_6H_5Br.	Gms. H_2O.	Gms. C_3H_7OH.	Sp. Gr. of Mixture.
0.983	0.017	0.186	1.29
0.909	0.091	0.56	1.11
0.90	0.10	0.58	1.11
0.80	0.20	0.87	1.05
0.70	0.30	1.05	1.02
0.60	0.40	1.15	1
0.50	0.50	1.19	0.97
0.40	0.60	1.19	0.97
0.30	0.70	1.09	0.95
0.20	0.80	0.93	0.95
0.10	0.90	0.71	0.96
0.021	0.979	0.457	0.98

See Notes, pp. 45 and 176

Bromotoluene and Water. (Bonner, 1910.)

Composition of Homogeneous Mixtures.

Gms. $C_6H_4CH_3Br$.	Gms. H_2O.	Gms. C_3H_7OH.	Sp. Gr. of Mixture.
0.968	0.032	0.252	1.23
0.90	0.10	0.52	1.11
0.80	0.20	0.78	1.03
0.70	0.30	0.96	1.01
0.60	0.40	1.07	0.99
0.50	0.50	1.13	0.97
0.40	0.60	1.13	0.96
0.30	0.70	1.03	0.95
*0.25	0.75	0.97	...
0.20	0.80	0.90	0.94
0.10	0.90	0.72	0.95
0.013	0.987	0.424	0.96

DISTRIBUTION OF PROPYL ALCOHOL BETWEEN WATER AND COTTON-SEED OIL AT 25°.

(Wroth and Reid, 1916.)

Gms. C_3H_7OH per 100 cc.		Ratio.	Gms. C_3H_7OH per 100 cc.:		Ratio.
Oil Layer.	H_2O Layer.		Oil Layer.	H_2O Layer.	
1.447	8.112	5.60	1.516	10.07	6.64
1.475	8.897	6.10	1.576	10.49	6.65
1.503	9.809	6.53	1.694	10.41	6.14

Data for systems composed of normal propyl alcohol, water and various inorganic salts are given by Timmermans, 1907.

EQUILIBRIUM IN THE SYSTEM ISO PROPYL ALCOHOL, BENZENE AND WATER AT 19°.

(Perrakis, 1925.)

The amount of water required to produce clouding in various mixtures of iso propyl alcohol and benzene was determined.

Gms. C_3H_7OH per 100 gms. C_3H_7OH + C_6H_6 Mixture	Gms. H_2O to cause clouding in 100 gms. of Mixture	Gms. C_3H_7OH per 100 gms. C_3H_7OH + C_6H_6 Mixture	Gms. H_2O to cause clouding in 100 gms. of Mixture
13.22	0.8897	33.53	4.7646
19.46	1.6493	34.84	5.3381
24.60	2.3165	36.10	5.8770
28.20	2.9408	37.43	6.4164
30.96	3.5283	43.61	9.2394
32.31	4.1593		

EQUILIBRIUM IN THE SYSTEM NORMAL PROPYL ALCOHOL, ISO AMYL ALCOHOL AND WATER AT 25°.

(Coull and Hope, 1935.)

The binodal curve was determined by titrating 200 cc mixtures of normal propyl and iso amyl alcohol with water to first appearance of turbidity.

Vol. percent composition of the homogeneous mixtures		
Iso Amyl Alcohol	n Propyl Alcohol	Water
93.32	0.0	6.68
89.90	2.30	9.22
86.83	4.57	8.60
81.37	9.04	9.59
71.10	17.78	11.12
60.84	26.08	13.08
50.63	33.76	15.61
45.47	37.21	17.32
40.40	40.40	19.20
35.02	42.81	22.17
30.17	45.26	24.57
25.10	46.59	28.31
19.80	46.21	33.99
13.77	41.32	44.91
8.60	34.40	57.00
4.08	23.98	71.99
2.53	19.49	77.98
2.25	14.66	83.09
2.29	9.77	87.94
2.44	4.88	92.68
3.10	0.0	96.90

The authors also determined the densities and refractive indices of various mixtures of the three liquids. From the latter values a diagram was constructed showing the location of the tie lines connecting the compositions of layers in contact with each other.

EQUILIBRIUM IN THE SYSTEM ISO PROPYL ALCOHOL, BENZENE AND WATER AT 25°.

(Olsen and Washburn, 1935.)

The binodal curve was determined by the titration method. Results are also given for the refractive indices, relative viscosities and densities of the homogeneous mixtures.

Gms. per 100 gms. homogeneous mixture			d. of mixture
C_6H_6	i Propyl alc.	H_2O	
99.93	0.0	0.07	0.8733
87.74	13.20	0.06	0.8594
82.06	17.22	0.72	—
68.63	28.54	2.83	0.8467
57.81	37.95	4.24	0.8392
44.55	46.00	9.46	0.8405
35.30	50.28	14.42	0.8442
29.40	51.00	19.59	0.8516
27.17	51.36	21.47	0.8543
23.63	50.42	25.95	0.8619
17.59	48.16	34.25	0.8771
8.71	41.79	49.50	0.9084
6.25	39.11	54.64	0.9165
2.21	32.51	65.28	0.9386
0.80	25.16	74.04	0.9571
0.15	0.0	99.85	0.9974

In order to locate the tie lines mixtures were prepared which separated into two layers and the alcohol in each of these determined by the refractometer. These results permitted drawing a diagram showing distribution of the alcohol between water and benzene, the composition of the layers in contact with each other.

RECIPROCAL SOLUBILITY OF PROPYL ALCOHOL AND BENZENE.

(Wieth, 1929.)

t°	Wt. % C_6H_6 in sat. sol.	t°	Wt. % C_6H_6 in sat. sol.
-9	33.7	-1.2	59.4
-4.4	45.1	-0.3	64.7
-3.6	48.1	+0.8	71.8
-2.3	53.6		

Freezing-point data for mixtures of Propyl Alcohol and Acetic Acid are given by Pickering, 1893.

METHYLAL $HCH(OCH_3)_2$.

RECIPRODAL SOLUBILITY OF METHYLAL AND WATER. (Bourgom, 1924.)

The methylal was purified by distilling over sodium. It had a b. pt. of 142°.3 at 760 mm.

The determinations were made by the freezing-point method and by the synthetic method.

t° of f. pt.	Gms. $HCH(OCH_3)_2$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $HCH(OCH_3)_2$ per 100 gms. sat. sol	t° of homogeneity.	Gms. $HCH(OCH_3)_2$ per 100 gms. sat. sol.
—1.35	5.26	— 10.78	33.60	148.9	37.23
—2.77	10.11	— 11.0 (tr. pt.)	34.4	154.0	40.16
—3.31	11.79	— 11.0	36.23	159.8	50.46
—3.54	12.66	»	42.98	159.9	50.64
—4.54	15.73	»	54.17	160.2	55.84
—4.98	17.44	»	68.12	160.3	57.34
—5.79	19.15	»	85.58	160.2	58.04
—6.38	20.60	»	95.72	159.5	65.39
—7.54	23.12	— 11 (tr. pt.)	97.5	157.5	72.45
—8.10	25.20	— 12.8	97.53	104.5	86.90
—8.60	25.52	— 15.5	97.9	55.0	91.08
—9.80	29.98	—104.8 (m. pt.)	100.00		

The two liquid layers in contact at 16° were found to have respectively :

Lower layer (aqueous), d_{16} = 0.98427 **and contains** 32.3 gms. $HCH(OCH_3)_2$ per 100 gms.

Upper layer (methylal), d_{16} = 0.87636 » 95.7 » sat. sol.

Freezing-point data are given for mixtures of:

Methylal + Carbon Disulfide (Sapgir, 1929.)
+ Ethylal " "
+ Ethyl Ether (Timmermans, 1934.)

PROPYLAMINE $CH_3.CH_2.CH_2.NH_2$.

The solubility of propylamine in water at 60°, determined by an aspiration method using an indifferent gas, is 191 when expressed in terms of the Bunsen absorption coefficient β (see p. 37) and l_{60} = 233 when expressed in terms of the Ostwald solubility expression. (Doyer, 1890.)

DIMETHYL UREA s, and as $C_3H_8N_2O$.

Freezing-point data for mixtures of dimethyl urea and phenol are given by Kremann, 1910.

ETHYL UREA $NH_2CONHC_2H_5$.

100 gms. abs. Ethyl Alcohol dissolve 79.95 gms. $C_3H_8N_2O$ at 20-25°.
" " Quinoline " 1.13 " " " "
" " + Alcohol " 5.51 " " " "
(Pucher and Dehn, 1921.)

β METHOXY ETHANOL (Methyl Cellosolve) $CH_3OCH_2CH_2OH$.

The critical solution temperature of mixtures of β Methoxy Ethanol and n Heptane is 47.5°. (Cornish, Archibald, Murphy and Evans, 1934.)

These authors also give similar results for mixtures of β Methoxy Ethanol and i Octane.

GLYCEROL $CH_2OH.CHOH.CH_2OH$.

RECIPROCAL SOLUBILITY OF GLYCEROL AND WATER, DETERMINED BY THE FREEZING-POINT METHOD. (Lane, 1925.)

t° of f. pt.	Gms. $C_3H_5(OH)_3$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_3H_5(OH)_3$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_3H_5(OH)_3$ per 100 gms. sat. sol.
— 0.6	5.0	—23.0	50.0	—45.5	67.1
— 1.6	10.0	—28.2	55.0	—44.5	67.3
— 3.1	15.0	—34.7	60.0	—38.9	70.0
— 4.8	20.0	—41.5	64.0	—29.8	75.0
— 7.0	25.0	—42.5	64.7	—20.3	80.0
— 9.5	30.0	—43.0	65.0	—10.9	85.0
—12.2	35.0	—44.5	65.6	— 1.6	90.0
—15.4	40.0	—44.7	66.0	+ 7.7	95.0
—18.8	45.0	—46.5 (Eutec.)	66.7	17.0	100.0

The temperatures given as the freezing-points were those at which crystals appeared and continued to grow. On account of the tendency of glycerol to supercool, seeding was required to obtain true freezing-points of all the more concentrated solutions, beginning at the eutectic point.

Data for this system are also given by Pushin and Glagoleva, 1922, but their results agree with those of Lane only in the region of the higher concentrations of glycerol. They report the eutectic at —31° and 20 mol. per cent (= 57.62 wt. per cent) glycerol, and their other points are evidently incorrect.

RECIPROCAL SOLUBILITY OF GLYCEROL AND PYROCATECHOL.
(Parvatiker and Mc Ewen, 1924.)

t° of miscibility...	183°.	192°.	192.8°.	192.9.	191°.	172.5°.
Wt. % pyrocatechol....	79.37	63.71	48.68	44.42	35.3	20.05

RECIPROCAL SOLUBILITY OF GLYCEROL AND GUAIACOL. (Mc Ewen, 1923.)

This system gives a solubility curve which is a complete circle.

t° of solution No separation between:	Gms. Gualcol per 100 gms. mixture.	t° of solution No separation between:	Gms. Gualcol per 100 gms. mixture.
35° and 80°	28.57	83.0°* and 39.9°	61.35
73.5 » 46.6	31.88	83.0* » 39.9	61.93
80.1 » 42.2	38.82	79.5 » 42.0	68.02
80.4 » 41.8	39.04	72.9 » 47.0	73.03
82.6 » 40.7*	46.18	67.0 » 51.5	74.72
83.4* » 39.8*	54.56	66.0 » 52.5	75.22
83.5* » 39.5	59.87	35.0 » 90.0	77.40

* Indicates critical opalescence.

RECIPROCAL SOLUBILITY OF GLYCEROL AND SALICYLALDEHYDE. (Mc Ewen, 1923.)

t° of solution.	Gms. Salicylaldehyde per 100 gms mixture.	t° of solution.	Gms. Salicylaldehyde per 100 gms. mixture.
91.5	5.36	176.6	52.22
148.5	18.30	176.5	58.67
165.5	26.54	170.5	77.02
175.5	41.82	143.5	91.38
176.5	48.32	106.5	95.60

RECIPROCAL SOLUBILITY OF GLYCEROL AND : (Parvatiker and Mc Ewen, 1924.)

o Toluidine.		*m* Toluidine.			
t° of miscibility.	Gms. *o* $C_6H_4CH_3.NH_2$ per 100 gms. mixture.	t° of miscibility.	Gms. *m* $C_6H_4CH_3.NH_2$ per 100 gms. mixture.	t° of miscibility.	Gms. *m* $C_6H_4CH_3.NH_2$ per 100 gms. mixture.
100	92.2	89	83.23	33.4	83.62
130	86.14	102	79.23	7.8	66.04
150	73.42	113.5	71.58	7.0	62.86
154	63.28	119.4	64.30	6.7	48.80
154.4	52.53	120.5	58.68	8.2	40.99
154	46.59	120.2	53.10	9.2	31.40
153	40.97	119.5	45.68	14.2	21.68
150	32.04	117.5	36.87	16.8	18.72
137	20.96	88.5	18.71	23.0	13.99
99.2	12.42	upper half of circle		lower half of circle	

CRITICAL SOLUTION TEMPERATURES OF MIXTURES OF GLYCEROL AND OTHER SOLVENTS.

(Lecat, 1930.)

System	Critical Solution Temp.	Wt. Percent Glycerol in mixture
Glycerol + Ethyl phenyl acetate	81	7.0
" + Ethyl salicylate	> 226	10.0
" + Bornyl acetate	200	9.0
" + i Butyl benzoate	230	14.0
" + n " "	242	17.0
" + Eugenol	166	14.0
" + Methyl Salicylate	170	7.5
" + o Nitro toluene	193	8.0
" + p " "	220	17.0

100 gms. liquid Carbon Dioxide dissolve less than 0.05 gm. glycerol, Quinn, 1928.

Freezing-point data are given by Puschin and Dezelic, 1932, for mixtures of Glycerol and Oleic, Palmitic and Stearic Acids.

TRI METHYL AMINE $(CH_3)_3N$.

Freezing-point data for mixtures of tri methyl amine and water are given by Pickering, 1893.

SOLUBILITY OF TRIMETHYL AMINE IN VARIOUS SOLVENTS AT 25°.

(v. Halban, 1913.)

The measurements were made according to the dynamic method in the form developed by R. Abegg and his collaborators (Gaus, 1900; Abegg and Riesenfeld, 1902). The calculations of the partial pressures of the trimethylamine were made according to the Abegg and Riesenfeld method.

E = calc. partial pressure of $(CH_3)_3N$ above a 1 normal solution, based on Henry's Law.

λ = solubility, *i.e.*, the quotient of the concentration in the solution and in the gas phase: $\lambda = \frac{\text{mols. } (CH_3)_3N \text{ per liter} \times RT \times 760}{\text{partial pressure of } (CH_3)_3N \text{ in mm. Hg}}$, $RT \times 760 = 18{,}590$.

Solvent.	E.	λ.	Solvent.	E.	λ.	Solvent.	E.	λ.
Methyl Alc.	26.1	711	Acetophenone	321	57.9	Ethyl Acetate	220	84.5
Ethyl "	39.5	471	Ether	349	53.3	Ethyl Benzoate	244	76.2
Propyl "	39.4	472	Acetonitrile	292	63.7	Chloroform	31.1	598
Amyl "	48.3	385	Nitromethane	329	56.5	α Bromnaphthalene	409	47
Benzyl "	14.2	1308	*o* Nitrotoluene	340	54.7	Hexane	248	75
Acetone "	243	76.7	Nitrobenzene	350	53.1	Benzene	172	109

Two determinations are also given for triethyl amine:

λ_{25} in hexane = 2160. λ_{25} in nitromethane = 400.

DISTRIBUTION OF TRIMETHYL AMINE AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $(CH_3)_3N$ per liter of H_2O. layer (C_1).	Millimols. $(CH_3)_3N$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.30	0.70	2.33
0.60	1.50	2.50
1.05	2.90	2.62
4.85	14.95	3.08

Water and Ether.

Millimols. $(CH_3)_3N$ per liter of H_2O layer (C_1).	Millimols. $(CH_3)_3N$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.800	1.2125	0.660
1.1625	1.775	0.655
1.775	2.65	0.67
3.00	4.45	0.675
6.30	8.90	0.707

Water and Xylene.

Millimols. $(CH_3)_3N$ per liter of H_2O layer (C_1).	Millimols. $(CH_3)_3N$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
2.13	1.00	0.47
2.775	1.225	0.442
6.97	3.03	0.435
14.22	5.78	0.407

DISTRIBUTION OF TRI METHYL AMINE BETWEEN WATER AND TOLUENE.

(Moore and Winmill, 1912.)

t°	Gm. Equiv. $(CH_3)_3N$ per liter of aq. layer	Dist. Coef.
18	0.0688	3.297
"	0.0791	3.290
25	0.0677	2.291
"	0.0641	2.297
37.35	0.1182	1.815
"	0.1248	1.820

Similar data for the distribution of tri methyl amine between water and Toluene at 25° and at other temperatures are given by Hantzsch and Sebalt, 1899, and Hantzsch and Vagt, 1901.

TRI METHYL AMINE

DISTRIBUTION OF TRI METHYL AMINE AT [illegible] BETWEEN

([illegible])

Water and Benzene

Gm. Mols. $(CH_3)_3N$ per liter H_2O layer(1)	C_6H_6 layer(2)	K
0.1485	0.0701	0.472
0.2722	0.1278	0.470
0.5299	0.2474	0.467
0.6392	0.3052	0.477
0.7876	0.3771	0.477

Water and Toluene

Gm. Mols. $(CH_3)_3N$ per liter H_2O layer(1)	layer(2)	K
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
0.2654	[illegible]	[illegible]
0.3570	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Water and m Xylol

Gm. Mols. $(CH_3)_3N$ per liter H_2O layer(1)	m $C_6H_4(CH_3)_2$(2)	K
0.1352	0.0546	0.404
0.2503	0.0909	0.363
0.3667	0.1331	0.354
0.4879	0.1727	0.354

Water and Ethyl Benzene

Gm. Mols. $(CH_3)_3N$ per liter H_2O layer(1)	layer(2)	K
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

The authors also give a series of determinations of the [illegible] of trimethyl amine between aqueous solutions of [illegible] salts and benzene at 25°. The results in general show that [illegible] aqueous layer in presence of the salts, thus corresponding to a salting out effect. Chlorides have the greatest effect, bromides [illegible] and iodides least.

TRI METHYL AMINE CHLOROPLATINATE [illegible]

SOLUBILITY OF TRI METHYL AMINE CHLOROPLATINATE IN AQUEOUS [illegible]

([illegible])

Concentration of Aqueous Alcohol	[illegible]
60°	[illegible]
70°	[illegible]

Di **METHYL AMINE** Acid Phthalate.

Tri **METHYL AMINE** Acid Phthalate.

DISTRIBUTION OF EACH SEPARATELY AT 25° BETWEEN ACETONE AND GLYCEROL.
(Smith, 1921, 1922.)

NOTE. —" The acid phthalate salts were made by mixing standardized solutions of phthalic acid, on the one hand, and the desired amine on the other, in the proportion of two to one. It was assumed that the remaining titratable hydrogen of the phthalic acid represents one molecule of the amine acid salt. "

Results for Dimethyl Amine Acid Phthalate.

Millimols. acid Phthalate per liter of Acetone layer (A).	Millimols. acid Phthalate per liter of Glycerol layer (G).	$\frac{A}{G}$.
0.6250	3.725	0.168
0.8125	5.4875	0.148
1.00	7.80	0.128
1.30	10.875	0.119
1.70	14.75	0.115

Results for Trimethyl Amine Acid Phthalate.

Millimols. acid Phthalate per liter of Acetone layer (A).	Millimols. acid Phthalate per liter of Glycerol layer (G).	$\frac{A}{G}$.
0.70	4.20	0.167
0.90	5.65	0.159
1.50	10.35	0.145
1.95	13.55	0.144

PROPYL AMINE $C_3H_7.NH_2$.

DISTRIBUTION OF PROPYL AMINE BETWEEN WATER AND XYLENE AT 25°.
(Smith. 1921, 1922.)

Millimols. $C_3H_7.NH_2$ per liter of H_2O layer (C_1).	Millimols. $C_3H_7.NH_2$ per liter of Xylene layer (C_2).	$\frac{C_2}{C_1}$.
2.45	0.60	0.245
4.80	1.30	0.270
7.75	2.25	0.290

SULFONIUM PERCHLORATES

SOLUBILITY IN WATER.
(Hofmann, Höbold and Quoos, 1911–12.)

Name.			Formula.	t°.	Per 100 Gms. H_2O. Gm. Mols.	= Gms.
Trimethyl	Sulfine	Perchlorate	$(CH_3)_3SClO_4$	16.5	0.0784	13.84
Ethyl dimethyl	"	"	$C_2H_5(CH_3)_2SClO_4$	15.9	0.1191	22.31
Propyl "	"	"	$C_3H_7(CH_3)_2SClO_4$	15	0.0590	12.04
n Butyl "	"	"	$C_4H_9(CH_3)_2SClO_4$	15	0.0607	13.24
Ethylene *dis*methyl	"	"	$C_2H_4(C_2H_6SClO_4)_2$	18	0.0423	14.86
Vinyl dimethyl	"	"	$C_2H_3.S(CH_3)_2.ClO_4$	18	0.0731	13.75
Trimethylene *dis*methyl "		"	$C_3H_6{:}(C_2H_6SClO_4)_2$	18	0.0402	14.68

INDOL (Tetraiodopyrrol) C_4HI_4NH.

SOLUBILITY OF INDOL IN SEVERAL SOLVENTS.
(U.S.P. VIII; Vulpius, 1893.)

Solvent	t°	Gms. C_4HI_4NH per 100 gms. solvent
Water	25	0.0204
Alcohol	25	11.1
Ethyl Ether	25	66.6
Chloroform	25	0.95

MALEIC ANHYDRIDE $C_4H_2O_3$.

100 cc. xylene dissolve 16.32 gms. maleic anhydride at 29°.7.
100 cc. coal tar heavy solvent dissolve 9.04 gms. maleic anhydride at 29°.7.
(Weiss and Downs, 1923.)

MALEIC DIAMIDE $C_4H_2O_2(NH_2)$.

100 cc. H_2O dissolve 0.248 gm. maleic diamide at 50°. (Viseur, 1926.)

Freezing-point data for mixtures of maleic anhydride and succinic anhydride are given by Grimm, Gunther and Titus, 1931.

ALLOXANE $\underbrace{\text{NHCONHCOCOCO}}$.

100 cc H_2O dissolve about 0.08 gm. alloxane
10 cc cold sat. aq. solution of $Mg(ClO_4)_2$ dissolve about 0.3 gm. alloxane. (Duclaux and Durand-Gasselin, 1938.)

DICYANO ETHANE $C_2H_4(CN)_2$.

Freezing-point data for mixtures 1.1.2.2 dicyano ethane and each of the following compounds are given by Timmermans and Mme. Vesselovsky, 1931: Carbon tetrachloride, ethane tetra ethyl carboxylate, ethane tetra methyl carboxylate, ethyl succinate, methyl succinate 1.2 dichloro ethane and tetra chloroethane.

SUCCINIC NITRILE (Ethylene Cyanide) $CNCH_2CH_2CN$.

The solubility of succinic nitrile in water and also in aqueous sodium chloride solutions at various temperatures has been determined by Schreinemakers (1897), and the results presented in terms of mols. of nitrile per 100 mols. of nitrile + H_2O. The following calculations of these results to gram quantities was made by Rothmund. (Landolt and Börnstein's, "Tabellen" 1906.)

t°.	Gms. $CNCH_2CH_2CN$ per 100 Gms.		t°.	Gms. $CNCH_2CH_2CN$ per 100 Gms.	
	Aq. Layer.	Nitrile Layer.		Aq. Layer.	Nitrile Layer.
18.5	10.2	92	53.5	33.2	66.4
20	11	91.5	55	40.3	62.8
39	...	85.2	55.4 crit. temp.	51	
45	22	...			

Very complete data for the system succinic acid nitrile, ethyl alcohol and water, determined by the synthetic sealed-tube method, are given by Schreinemakers (1898c). Results for the system succinic acid nitrile, cane sugar and water are given by Timmermans (1907).

Data for the system ethyl ether, succinic acid nitrile and water are given by Schreinemakers, 1898.

DISTRIBUTION OF ETHYLENE CYANIDE BETWEEN WATER AND CHLOROFORM.

(Hantzsch and Vagt, 1901.)

t°.	Gm. Mols. $C_2H_4(CN)_2$ per Liter.		Ratio, $\frac{c_1}{c_2}$.
	Aq. Layer, c_1.	$CHCl_3$ Layer, c_2.	
0	0.0786	0.0464	1.69
10	0.0787	0.0463	1.70
20	0.0791	0.0459	1.72

Additional data for the influence of KOH, KCl and HCl on the above distribution are also given.

BARBITURIC ACID NHCONHCOCH$_2$CO.

Freezing-point data are given by Hammick and Hanson, 1933, for mixtures of barbituric acid and antipyrine and for barbituric acid and sarcosine anhydride.

SUCCINCHLORIMIDE [CH$_2$CO]$_2$NCl.

SOLUBILITY OF SUCCINCHLORIMIDE IN SEVERAL SOLVENTS AT 20°.

((Wood, 1930.)

The recrystallized sample of m. pt. 146-7° was stirred 30 minutes with each solvent, the solution filtered and titrated with 0.1 n sodium thiosulfate.

Solvent	Gms. $C_4H_4ClO_2N$ per 100 gms. sat. sol.	Solvent	Gms. $C_4H_4ClO_2N$ per 100 gms. sat. sol.
Carbon Tetrachloride	0.09	Water	1.25
Eucalyptol	0.16	Benzene	1.70
n Amyl alcohol	0.22	Methanol	1.73
Glycerol	0.33	Chloroform	3.77
Xylol	0.76	Glacial acetic acid	4.81
Ethanol (95%)	0.98	s Dichloro ethane	5.41
Toluene	1.10	s Tetra chloro ethane	6.63
		Acetone	9.71

THIOPHENE C_4H_4S.

Freezing-point data for mixtures of thiophene and benzene are given by Tsakalotos and Guye, 1910

FUMARIC ACID COOH.CH:CHCOOH.
MALEIC ACID COOH.CH:CHCOOH.

SOLUBILITY OF EACH SEPARATELY IN WATER.

(Lange and Sinks, 1930.)

Determinations were made at approximately 5° intervals between 0° and 80° and curves plotted from the results. The following equations for the grams of acid per 100 grams sat. solution were calculated from the curves. Fumaric Acid, log C = 0.645t- 0.6362 and Maleic Acid at 0° to 40° C = 0.645 t + 28.2 and from 40° to 80° C = 0.492 t + 34.5. Using the above equations the following values have been calculated.

t°	Gms. per 100 gms. sat. sol.		t°	Gms. per 100 gms. sat. sol.	
	Fumaric acid	Maleic acid		Fumaric acid	Maleic acid
0	0.231	28.2	40	1.077	54.1
10	0.330	34.6	50	1.584	59.1
20	0.499	41.1	60	2.328	64.0
25	0.605(0.706)	44.3(52.09)	70	3.422	68.9
30	0.734	47.5	80	5.028	73.9

The authors also give results for the densities and refractive indices of aqueous solutions of these acids.

The results in parentheses in the above table are by Reyer, 1923, and are in terms of gms. per 100 cc of saturated solution.

SOLUBILITY OF FUMARIC AND OF MALEIC ACID EACH DETERMINED SEPARATELY, IN SEVERAL SOLVENTS.

(Weiss and Downs, 1923.)

Solvent.	t°.	Gms. per 100 gms. solvent Fumaric acid.	 Maleic acid.
Water	25	0.70	78.8
»	40	1.07	112.5
»	60	2.4	148.7
»	100	9.8	392.6 (97°.5)
95 % Ethyl alcohol	29.7	5.75	69.9
Ethyl Ether	25	0.72	8.19
Chloroform	25	0.02	0.011
Carbon Tetrachloride	25	0.027	0.002
Benzene	25	0.003	0.024
Acetone	29.7	1.72	35.77
Xylene	29.7	0.027	0.0085
Coal tar (heavy solvent)	29.7	0.0343	0.0085
Acetone	20	1.29	25.01 (Viseur, 1926.)
Acetylene dichloride (trans) (b. pt. 48°.3).	40	0.002	0.076 (Lebrun, 1925)
» « (cis) (» 60°.2).	40	0.002	0.049 »
Crotonic Nitrile (b. pt. 107°.7–108°.2)	50	0.076 (30°)	5.80 »
» » (» 121°.8–122°.2)	50	0.034	4.58 »

Data for the solubility of fumaric acid in acetone solutions of maleic acid at 20° and vice versa, and for the solubility of fumaric and maleic acids in acetone solutions of succinic acid at 20° and vice versa are given by Viseur, 1926.

(1) These results by Viseur are in terms of gms. per 100 cc of acetone.

DISTRIBUTION OF MALEIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ethyl Ether.

Millimols. COOH.CH:CH.COOH per liter of H_2O layer (C_1).	 $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.56	0.215	0.138
2.50	0.35	0.140
4.85	0.75	0.153
7.25	1.025	0.141
11.45	1.90	0.166

Acetone and Glycerol.

Millimols. COOH.CH:CH.COOH per liter of Acetone layer (A).	 Glycerol layer (G).	$\frac{A}{G}$.
0.4375	1.925	0.454
0.95	1.50	0.380
1.75	3.285	0.454
3.50	7.40	0.473
6.85	13.05	0.525

DISTRIBUTION OF FUMARIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether.

Millimols. $(CH)_2(COOH)_2$ per liter. H_2O layer (C_1).	 $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.01875	0.4625	0.454
1.5125	0.8375	0.554
2.60	1.70	0.654
4.80	3.50	0.729
8.85	6.75	0.763

Acetone and Glycerol.

Millimols. $(CH)_2(COOH)_2$ per liter. Acetone layer (A).	 Glycerol layer (G).	$\frac{A}{G}$.
0.730	0.6350	0.870
1.3375	1.1875	0.888
2.225	2.125	0.954
5.275	5.175	0.981

Data for the distribution of maleic acid between ether and water at 25° are given by Chandler, 1908.

SOLUBILITY OF MALEIC ACID IN SEVERAL SOLVENTS.

(Timofeiew, 1894.)

Alcohol.	t°.	Gms. $(CHCOOH)_2$ per 100 Gms. Sat. Sol.	Alcohol.	t°.	Gms. $(CHCOOH)_2$ per 100 Gms. Sat. Sol.
Methyl Alcohol	22.5	41	Propyl Alcohol	0	20
Ethyl Alcohol	0	30.2	"	22.5	24.2

SOLUBILITY OF MALEIC AND OF FUMARIC ACIDS, EACH SEPARATELY IN SEVERAL STEREOISOMERIC SOLVENTS.

(Lebrun, 1930.)

Solvent	Results for Maleic Acid		Results for Fumaric Acid	
	t°	Gms. acid per 100 gms. solvent	t°	Gms. acid per 100 gms. solvent
cis Dichloro acetylene	40	0.049	40	$<$ 0.002
Trans " "	40	0.076	40	$<$ 0.002
Crotonic nitrile	50	4.58	50	0.034

Data for the Solubility of Maleic Acid in Acetone in presence of Fumaric Acid and vice versa as well as for the solubility of these two acids in presence of succinic acid and vice versa at 20° are given by Viseur, 1926.

Freezing-point data for mixtures of maleic acid and *l* mandelic acid are given by Centnerszwer, 1899.

Freezing-point data for various binary mixtures composed of fumaric acid, maleic acid, succinic acid, methyl and ethyl fumarates, maleates and succinates, fumaride, succinamide and maleic diamide are given by Viseur, 1926.

Results for mixtures of Maleic and Fumaric Acid Menthyl esters are given by Wassermann, 1932.

Sodium **FUMARATES** $NaH(CHCOO)_2$ and $Na_2(CHCOO)_2$.
Sodium **MALEATES** $NaH(CHCOO)_2$ and $Na_2(CHCOO)_2$.

SOLUBILITY OF EACH IN AQUEOUS ALCOHOL.

(McDermott, 1940.)

Compound	Solvent	t°	Gms. Compound per 100 cc sat. solution
NaH Maleate	Aq. 41.5 Vol. % C_2H_5OH	23-5	2.01
" "	" 95 " " "	"	0.284
Na_2 "	" 73.9 " " "	"	1.325
NaH Fumarate	" 58.3 " " "	"	1.41
Na_2 "	" 52.0 " " "	"	1.25

DICHLORO SUCCINIC ACID $C_2H_2Cl_2(COOH)_2$.

SOLUBILITY OF DICHLORO SUCCINIC ACIDS IN WATER AND OTHER SOLVENTS AT 25°.

(Holmberg, 1921.)

Compound.	Solvent.	Gms. cmpd. dissolved per liter of sat. sol.
Meso Dichloro Succinic acid (m. pt. 217–18°)	$CH_3COOH+C_6H_6$*	3.17
Acid salt of. » » » with *i* Phenylethylamine	H_2O	81.4
» » » » » » » *d* »	»	76.4
» » » » » » » *l* »	»	76.1
Racemic » » » (m. pt. 174–5°)	$CH_3COOH+C_6H_6$	11.03
Acid salt of » » » with *i* Phenylethylamine	H_2O	18.67
Dextro » » » (m. pt. 166–7°)	$CH_3COOH+C_6H_6$	22.6
Acid salt of » » » with *d* Phenylethylamine	H_2O	21.8
» » » » » » » *l* »	»	75.4
Laevo » » » (m. pt. 166–7°)	$CH_3COOH+C_6H_6$	22.5
Acid salt of » » » with *d* Phenylethylamine	H_2O	75.8
» » » » » » » *l* »	»	21.8

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* The mixture consisted of 10 volumes of CH COOH diluted to 100 volumes with C H

ALLYL CYANIDE $CH_2:CHCH_2CN$.

Freezing-point data for mixtures of allyl cyanide and aniline are given by Lafortune, 1923.

CROTONIC ACID NITRILE $CH_3CH:CHCN$.

Freezing-point data for mixtures of Crotonic Acid nitrile and aniline are given by Lafortune, 1923.

ALLYL iso SULFOCYANIDE $CH_2:CHCH_2NCS$.

Freezing-point data are given by Joukovsky, 1934, for mixtures of allyl iso sulfocyanide with benzene, with nitrobenzene, and with formic acid. The author also gives results for the total and partial vapor pressures at 20.5° of allyl iso sulfocyanide and ethyl ether, methyl alcohol and carbon disulfide.

Freezing-point data for mixtures of Allyl iso sulfocyanide (Allyl mustard oil) and aniline are given by Kurnakov and Kviot, 1913; and Kurnakov and Solover, 1916.

SUCCINIMIDE $\begin{matrix}CH_2CO\\CH_2CO\end{matrix}>NH.H_2O$.

SOLUBILITY OF SUCCINIMIDE HYDRATE IN WATER AND IN ETHYL ALCOHOL.
(Speyers, 1902)

In Water.				In Ethyl Alcohol.			
t°.	Wt. of 1 cc. of sat. sol.	Mols. per 100 mols. sol.	Gms. per 100 gms. H_2O.	t°.	Wt. of 1 cc. of sat. sol.	Mols per 100 mols. sol.	Gms. per 100 gms. C_2H_5OH.
0...	1.025	1.58	10.4	0...	0.815	0.88	2.26
10...	1.035	2.4	17.5	10...	0.809	1.35	3.4
20...	1.052	4.0	30.0	20...	0.806	2.0	5.2
25...	1.067	5.9	44.0	25...	0.805	2.5	6.6
30...	1.086	8.0	60.0	30...	0.804	3.1	8.4
40...	1.120	12.8	95.0	40...	0.809	4.9	13.4
50...	1.145	17.8	135.0	50...	0.816	7.8	21.0
60...	1.167	22.6	185.0	60...	0.835	12.3	36.0
70...	1.189	27.5	245.0	70...	0.873	–	–

100 cc sat. aq. $Mg(ClO_4)_2$ solution dissolve about 4.0 gms. succinimide at about 10°. (Duclaux and Durand-Gasselin, 1938.)

Freezing-point data are given for mixture of succinimide and:

Hydroquinone (1)
α Naphthol (1)
β " (1)
o Nitro phenol (1)
m " (1)
p " (1)

1.2.4 Dinitro phenol (1)
1.4 Dioxy naphthalene (1)
1.6 " " (1)
2.3 " " (2)
2.6 " " (1)
Pyrocatechol (1)

Picric acid (1)
Pyrogallol (1)
Resorcinol (1)
Succinic anhydride (3)

(1) Kremann and Dietrich, 1923; Kremann, Hemmelmayr, 1922; (3) Grimm, Günther and Titus, 1931.

BUTYLCHLORALHYDRATE $CH_3CHCl.CCl_2.CH(OH)_2$.

100 gms. H_2O dissolve 2.7 gms. butylchloralhydrate at 15.5°
(Greenish and Smith, 1903.)
" " " 2.3 " " at 15°–20°.
(Squire and Caines, 1905.)
" glycerol " 100 " " at 15°–20°.
(Greenish and Smith, 1903.)

The partition coefficient of butylchloralhydrate between olive oil and water is

BUTYLCHLORAL $CH_3CHCl.CCl_2CHO$.

The distribution coefficient of butylchloral between oil and water is given as 1.6. (Meyer, 1907.)

TRI CHLORO β HYDROXY BUTYRIC ACIDS $CCl_3CH(OH)CH_2COOH$.

Freezing-point data for mixtures of the optical isomerides of Tri chloro β Hydroxy Butyric Acid are given by Ross. 1936.

Brom**SUCCINIC ACID** $CHBr(CH_2)(COOH)_2$ (m. pt. 159°).

SOLUBILITY IN ALCOHOLS AT 22°.
(Timofeiew, 1894.)

Alcohol.	Gms. $CHBr(CH_2)(COOH)_2$ per 100 Gms. Sat. Solution.	Gms. $CHBr(CH_2)(COOH)_2$ per 100 Gms. Alcohol.
Methyl Alcohol	56.5	129.7
Ethyl Alcohol	45.5	83.6
Propyl Alcohol	33.1	49.4

Data for the distribution of monobromsuccinic acid between water and ether at 25° and for dibromsuccinic acid between water and ether at 25° are given by Chandler (1908).

DISTRIBUTION OF BROM SUCCINIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether.

Millimols. $CHBrCH_2(COOH)_2$ per liter H_2O layer (C_1).	Millimols. $CHBrCH_2(COOH)_2$ per liter $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.63125	0.4500	0.712
1.3625	1.1625	0.853
2.00	1.925	0.963
3.50	3.85	1.10
6.70	8.90	1.35

Water and Glycerol.

Millimols. $CHBrCH_2(COOH)_2$ per liter Acetone layer (A).	Millimols. $CHBrCH_2(COOH)_2$ per liter Glycerol layer (G).	$\frac{A}{G}$.
1.625	1.281	1.27
2.375	1.725	1.34
5.575	3.925	1.42
11.575	7.675	1.51

Water and Xylene.

Millimols. $CHBrCH_2(COOH)_2$ per liter of		
H_2O layer........	25.90	61.70
Xylene layer......	0.555	1.85

Data for the melting-points of mixtures of the following pairs of optical antipodes are given by Centnerszwer (1899).

d + *l* Chlorsuccinic Acid.
d + *i* Chlorsuccinic Acid.
d Chlorsuccinic Acid + *l* Bromsuccinic Acid.
i Chlorsuccinic Acid + *l* Bromsuccinic Acid.
d + *l* Benzylaminosuccinic Acid.
d + *l* Aminosuccinic Acid.

Freezing-point data for mixtures of d and l bromo and chloro succinic acids are given by Timmermans, 1929.

Chloro **SUCCINIC ACIDS** l and d $CHCl(CH_2)(COOH)_2$.

SOLUBILITY OF CHLOROSUCCINIC ACID IN WATER.
(Timmermans and Heuse, 1931.)

t°	Gms. $C_4H_5ClO_4$ per 100 gms. H_2O	Solid Phase	t°	Gms. $C_4H_5ClO_4$ per 100 gms. H_2O	Solid Phase
-0.58	4.18	Ice	-2.32*	21.46	Ice
-1.10	8.62	"	+10	16.98	$C_4H_5ClO_4$ d
-1.38	11.0	" + $C_4H_5ClO_4$	+20	24.44	" 1
-1.92	16.9*	Ice			

* Unstable.

The authors also give results for the freezing-points of the ternary system ChloroSuccinic Acid + Aspartic Acid + Water.

Freezing-point results for the ternary system Chloro Succinic Acid + Phenyl Glycolic Acid + Water are given by Timmermans and Motiuk, 1932.

100 gms. Ethyl Ether dissolve 13.96 gms. d $C_4H_5ClO_4$ at 20°.
" " " " " 13.90 " l " " "
(Timmermans and Dumont, 1931.)

Freezing-point data are given for mixtures of Chlorosuccinic Acid and: Asparigine by Timmermans and Vesselovsky, 1932, Results for mixtures of Chlorosuccinic Acid and each of the following compounds:

d and l Malic Acids, Tartaric Acids and Meso Tartaric Acids are given by Timmermans and Heuse, 1931.

Results for mixtures of methyl chlorosuccinate + methyl tartrate are given by Timmermans and Vesselovsky, 1932.

TRI CHLORO BUTYRIC ACID $C_4H_5Cl_3O_2$.

DISTRIBUTION OF TRICHLORO BUTYRIC ACID BETWEEN WATER AND BENZENE AT 18°.

(Drucker, 1904.)

Gm. Mols. $C_4H_5Cl_3O_2$ per liter		
H_2O layer(1)	C_6H_6 layer (2)	$\frac{1}{2}$
0.01710	0.002344	7.29
0.03402	0.00836	4.07
0.07863	0.04211	1.865
0.1468	0.1732	0.847

β CHLORO CROTONIC ACID $CH_3CCl:HCCOOH$.
β CHLORO ISO CROTONIC ACID $CH_3CCl:COOHCH$

SOLUBILITY OF β CHLORO CROTONIC ACID AND OF β CHLORO ISO CROTONIC ACID, EACH SEPARATELY, IN SEVERAL STEREOISOMERIC SOLVENTS.

(Lebrun, 1930.)

	Results for β Chloro Crotonic Acid		Results for β Chloro Iso Crotonic Acid	
Solvent	t°	Gms. acid per 100 gms. solvent	t°	Gms. acid per 100 gms. solvent
Cis Dichloro Acetylene	0	5.75	0	32.20
" " "	0	—	39	3.11
Trans " "	0	2.36	0	37.29
" " "		—	39	1.64
Cis β Ethyl Chloro iso Crotonate	20	8.93	20	58.1
Cis 2. Bromo butene	0	1.46	0	16.96
Trans 2. " "	0	1.15	0	17.30

Freezing-point data for mixtures of β chloro crotonic acid and β chloro iso crotonic acid are given by Skaw and Saxton, 1928, 1933.

Results for mixtures of chloro crotonic acid and dimethyl pyrone are given by Kendall, 1914, and for mixtures of chloro tonic acid and sulfuric acid are given by Kendall and Carpenter, 1914.

ALLYL MUSTARD OIL (Iso thiocyanic acid allyl ester) $CH_2:CHCH_2NCS$.

Results for equilibrium in the ternary and quarternary systems composed of Allyl mustard oil, Piperidine, Dimethyl aniline and Water at 20° are given by Oust-Katchkintzev and Mertzline, 1936.

SOLUBILITY OF ALLYL ISOTHIOCYANIC ESTER IN SULFUR BY SYNTHETIC METHOD.

(Alexejew, 1886.)

t°.	Gms. Mustard Oil per 100 Gms.	
	Sulfur Layer.	Mustard Oil Layer.
90	10	72
100	12	67
110	15	62
120	23	51
124 (crit. temp.)	35	

Freezing-point data for allyl isothiocyanate + aniline are given by Kurnakov and Solovev (1916). Results for methyl isothiocyanate + phenanthrene and methyl isothiocyanate + naphthalene are given by Kurnakov and Efrenov (1912).

Freezing-point data are given for the system Allyl mustard oil, Nitrobenzene and p Dibrom benzene by Schischokin, 1930.

FUMARAMIDE $CONH_2.CH:CH.CONH_2$.

100 cc. H_2O dissolve 0.146 gm. fumaramide at 50°. (Viseur, 1926.)

CROTONIC ACID α $CH_3CH:CHCOOH$ (solid).
ISO CROTONIC ACID β $CH_3CH:COOHCH$ (liquid).

SOLUBILITY OF CROTONIC ACID AND OF ISO CROTONIC ACID, EACH SEPARATELY, IN SEVERAL STEREOISOMERIC SOLVENTS.

(Lebrun, 1925; 1930.)

Solvent	t°	Gms. Crotonic Acid per 100 gms. solvent	t°	Gms. Iso Crotonic Acid per 100 gms. solvent
Cis acetylene dichloride	0	20.83	0	100+
Trans " "	0	17.12	0	100+
Cis Bromobutene	40	8.62	40	100+
Trans "	0	7.88	0	100+

DISTRIBUTION OF α CROTONIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Chloroform.

Millimols. per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
2.35	0.75	0.319
3.55	1.30	0.366
5.10	2.125	0.417
7.15	3.40	0.475

Water and Ether.

Millimols. per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.54	1.70	3.15
0.85	2.73	3.21
1.24	3.92	3.16
1.68	5.48	3.26
3.52	11.6	3.30

Water and Xylene.

Millimols. per liter		
H_2O layer (C_1).	$C_6H(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
4.75	0.55	0.115
6.3	0.80	0.127
13.9	2.50	0.180

CROTONIC ACID $CH_3CH:CHCOOH$.

DISTRIBUTION OF CROTONIC ACID AT 25° BETWEEN:

(Smith and Wente, 1929.)

Water and Chloroform		Water and Benzene		Water and Toluene	
Gm. Mols. $C_4H_6O_2$ per liter		Gm. Mols. $C_4H_6O_2$ per liter		Gm. Mols. $C_4H_6O_2$ per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	C_6H_6 layer	H_2O layer	$C_6H_5CH_3$ layer
0.00902	0.00466	0.00969	0.00183	0.0195	0.00422
0.01239	0.00743	0.01874	0.00485	0.0323	0.00977
0.01725	0.01258	0.03100	0.01105	0.0474	0.01922
0.02308	0.02068	0.06215	0.03745	0.0652	0.03440
0.02793	0.02794	0.0937	0.0804	0.0955	0.07460
0.03432	0.04015	0.1182	0.1256	0.1261	0.11770

Freezing-point data are given for mixtures of:

α Crotonic acid	+ β Crotonic acid	(Morell and Hanson, 1904.)
" "	+ Dimethyl pyrone	(Kendall, 1914.)
" "	+ Sulfuric acid	(Kendall and Carpenter, 1914.)
" "	+ Chlor acetic acids	(Kendall, 1914.)

ACETIC ANHYDRIDE $(CH_3CO)_2O$

RECIPROCAL SOLUBILITY OF ACETIC ANHYDRIDE AND EACH OF THREE OTHER LIQUIDS.

(Jones and Betts, 1928.)

The determinations were made by the synthetic, sealed tube, method.

Results for Acetic Anhydride + :

Carbon Disulfide		Cyclohexane		Petroleum (b.pt. 170-80°)	
t°	Gms. $(CH_3CO)_2O$ per 100 gms. homogeneous mixture	t°	Gms. $(CH_3CO)_2O$ per 100 gms. homogeneous mixture	t°	Gms. $(CH_3CO)_2O$ per 100 gms. homogeneous mixture
0.7	5.27	2.269 tr.pt.	—	27.6	7.14
16.5	9.66	20.4	7.20	38.5	9.46
26.7	18.27	33.5	10.40	63.5	14.95
27.2	19.18	36.2	12.09	76.1	22.59
29.7	32.10	43.1	16.90	80.0	26.90
29.83	35.36	48.3	24.32	82.0	30.83
29.83 C.S.T.	36.17	50.3	27.97	83.5	35.00
29.85	36.39	52.25	39.03	85.1	42.67
29.80	36.93	52.40	43.01	85.50 C.S.T.	52.11
29.80	38.01	52.42	45.35	85.52	53.50
29.65	41.10	52.45 C.S.T.	47.33	85.25	60.67
29.65	42.85	52.37	52.25	84.0	67.87
29.5	44.2	52.00	58.83	82.55	72.08
28.3	52.04	51.40	62.77	80.27	76.73
27.9	53.22	48.30	70.16	77.35	79.85
25.7	58.57	43.50	76.03	71.00	84.91
19.1	67.60	29.00	84.71	40.0	94.10
13.45	72.18	11.00	89.83	16.5	96.8
4.0	77.98				

ACETIC ANHYDRIDE

Freezing-point data are given for mixtures of Acetic Anhydride and:

Acetamide (1)(3)	o Nitro benzaldehyde (5)
Acetic acid (2)(6)	m " " (5)
Benzamide (1)(3)	p " " (5)
Benzaldehyde (5)	Piperonal (4)
	Piperonylidene di acetate (4)

(1) Baily, 1925; (2) Pickering, 1893; (3) Kremann, Mauermann and Ostwald, 1922; (4) Jorissen and Van der Beek, 1928; (5) Van der Beek, 1928; (6) Astuki and Ishii, 1931.

ALLANTOIN $C_4H_6N_4O_3$.

SOLUBILITY IN WATER.

(Titherly, 1912.)

The author obtained results varying from 0.7 to 0.77 gms. allantoin per 100 gms. H_2O at 25°. The variations were considered to be due to slow decomposition of the compound.

10 cc H_2O dissolve about 0.04 gm. allantoin
10 cc cold sat. aqueous $Mg(ClO_4)_2$ solution dissolve about 0.8 gm. allantoin. (Duclaux and Durand-Gasselin, 1938.)

DIMETHYL OXALATE $(COOCH_3)_2$.

SOLUBILITY OF DIMETHYL OXALATE IN WATER.

(Kendall and Harrison, 1928.)

The determinations were made by the synthetic, sealed tube, method.

t^0	Mol. percent $(COOCH_3)_2$ in sat. sol.	Solid Phase	t^0	Mol. percent $(COOCH_3)_2$ in sat. sol.	Solid Phase
0.1	0.541	$(COOCH_3)_2$ (solid)	49.2	6.07	$(COOCH_3)_2$ (solid)
11.1	1.242	"	51.0	6.46	"
19.5	1.853	"	53.0	6.91	"
27.1	2.68	"	75.0	8.61	$(COOCH_3)_2$(liquid)
31.9	3.36	"	79.3	8.89	"
44.4	5.36	"	96.1	10.2	"

The authors also give the following results for the freezing-points of mixtures of dimethyl oxalate and water.

t^0	Mol. percent $(COOCH_3)_2$ in mixture	t^0	Mol. percent $(COOCH_3)_2$ in mixture	t^0	Mol. percent $(COOCH_3)_2$ in mixture
−0.028	0.024	−0.240	0.205	−0.432	0.362
−0.073	0.060	−0.330	0.280	−0.490	0.414
−0.095	0.081	−0.351	0.295	−0.592	0.508

Di **METHYL OXALATE** $C_2O_4(CH_3)_2$.

FREEZING-POINTS OF MIXTURES OF DIMETHYL OXALATE AND WATER.

(Skrabal, 1917.)

t° of f. pt.	Gms. $C_2O_4(CH_3)_2$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_2O_4(CH_3)_2$ per 100 gms. sat. sol.	t° of f. pt	Gms. $C_2O_4(CH_3)_2$ per 100 gms. sat. sol.
− 0.5(Eutec.)	4.0	36.0	10.7	48.0	19.2
+ 1.5	4.1	38.0	12.5	48.2	29.8
9 5	5.0	41.5	13.0	48.0	64.4
21.5	6.6	44.5	15.8	48.0	93.3*
37.0	9.1	48.0	17.7*	50.5	97.7
				53.5 m. pt.	100.0

* Between 17.7 and 93.3 Wt. % $C_2O_4(CH_3)_2$ two liquid phases exist.

100 gms. H_2O	dissolve	6.18 gms. $(CH_3)_2C_2O_4$	at 20–25°.	(Dehn, 1917.)
" pyridine	"	4.8 "	" "	"
" aq. 50% pyridine	"	93.1 "	" "	"
" 95 % formic acid	"	22.58 "	" at 20.2°	(Aschan, 1913.)

The critical solution temperature of a mixture of di methyl oxalate and camphene is 62.6° and there is 42.0 percent of dimethyl oxalate present. (Lecat, 1930.)

Results for mixtures of dimethyl oxalate and acetic acid and for mixtures of dimethyl oxalate and chloro acetic acids are given by Kendall and Booge, 1936.

Freezing-point lowering data for mixtures of dimethyl oxalate and the following compounds are given by Kremann, Zechner and Drâzel, 1924 : Hydroquinol, α and β naphthol, phenol, *o*, *m* and *p* nitrophenol, 1.2.4 dinitrophenol, picric acid, pyrocatechol, pyrogallol, resorcinol, *p* toluidine.

SUCCINIC ACID $(CH_2)_2(COOH)_2$.

SOLUBILITY IN WATER.

(Miczynski, 1886; van der Stadt, 1902; Lamouroux, 1899; for other concordant results, see Bourgoin, 1874; Henry, 1884.)

t°.	Gms. $(CH_2)_2(COOH)_2$ per 100 Gms. H_2O.	Gms. $(CH_2)_2(COOH)_2$ per 100 cc. Solution.	Gms. Succinic Anhydride $(CH_2)_2COCOO$ per 100 Gms. H_2O.	Mol. Per cent. H_2O.	Mol. Per cent. $(CH_2)_2COCOO$.
0	2.80	2.78 (L.)	2.34	99.58	0.42
10	4.51	4	3.80	99.32	0.68
20	6.89	5.8	5.77	98.97	1.03
25	8.06	7	6.74	98.80	1.20
30	10.58	8.5	8.79	98.44	1.56
40	16.21	12.5	13.42	97.64	2.36
50	24.42	18	19.95	96.53	3.47
60	35.83	24.5	28.77	95.07	4.93
70	51.07	...	40.11	93.26	6.74
80	70.79	...	54.08	91.12	8.88
89.4	95.45	...	70.62	88.71	11.29
104.8	146.3	...	101.2	84.57	15.43
115.1	188.5	...	126.8	81.4	18.6
134.2	335.4	...	187.8	74.72	25.28
159.5	748.2	...	295.2	65.27	34.73
180.6	1839	...	408.5	57.6	42.4
182.8	∞	...	542.3	50	50
174.4	...	...	808.5	40.7	59.3
153.3	...	...	2239	19.86	80.14
128	...	...	8865.	5.80	94.11

The following very careful determinations of the solubility of succinic acid in water are given by Marshall and Bain (1910).

t°.	0°.	12.5°.	25°.	37.5°.	50°.	62.5°.	75°.
Gms. $(CH_2)_2$ $(COOH)_2$ per 100 gms. H_2O	2.75	4.92	8.35	14	23.83	39.35	60.37

100 gms. H_2O dissolve 6.75 gms. $(CH_2)_2COOH)_2$ at 20° and 10.5 gms. at 30°. (Wright, 1927.)

A saturated solution of succinic acid in water contains 0.01460 mol. fraction of $(CH_2)_2(COOH)_2$ at 28°. (Desai and Patel, 1935.)

SUCCINIC ACID $(CH_2)_2(COOH)_2$.

SOLUBILITY OF SUCCINIC ACID IN WATER AND IN ETHYL ETHER.

(Forbes and Coolidge, 1919.)

Solvent.	t°.	$d\frac{t°}{4}$ of sat. sol.	Gms. $(CH_2)_2(COOH)_2$ per 100 gms. sat. sol.	Solvent.	t°.	$d\frac{t°}{4}$ of sat. sol.	Gms. $(CH_2)_2(COOH)$ per 100 gms. sat. sol.
Water.........	15	1.012	5.09	Ether.........	15	0.719	0.353
	20	1.016	6.30		20	0.714	0.420
	25	1.021	7.67		25	0.710	0.487
Water sat. with ether........	15	0.999	5.68	Ether sat. with water.......	15	0.730	1.289
	20	1.005	7.10		20	0.726	1.475
	25	1.010	8.76		25	0.722	1.689

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF ACETIC ACID AND OF FORMIC ACID AT 25°.

(Knox and Richards, 1919.)

In Aq. CH_3COOH.

Equiv. Normality		Equiv. Normality	
CH_3COOH.	$(CH_2)_2(COOH)_2$.	CH_3COOH.	$(CH_2)_2(COOH)_2$.
0.000	1.352	6.655	1.639
0.078	1.384	8.661	1.519
0.448	1.415	10.340	1.357
0.916	1.452	12.400	1.097
2.828	1.592	14.640	0.797
4.536	1.643	16.850	0.514

In Aq. $HCOOH$.

Equiv. Normality		Equiv. Normality	
$HCOOH$.	$(CH_2)_2(COOH)_2$.	$HCOOH$.	$(CH_2)_2(COOH)_2$.
0.090	1.369	11.29	1.228
0.446	1.397	15.29	0.944
0.930	1.408	17.67	0.796
3.730	1.501	19.16	0.715
5.547	1.531	20.53	0.667
7.500	1.449	22.93	0.604

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID, NITRIC ACID AND OF SULFURIC ACID AT 25°.

(Knox and Richards, 1919.)

In Aq. Hydrochloric Acid.

Equiv. Normality	
HCl.	$(CH_2)_2(COOH)_2$.
0.00	1.352
2.751	0.681
5.964	0.402
7.335	0.353
8.950	0.333
9.732	0.328
10.400	0.337
11.080	0.378

In Aq. Nitric Acid.

Equiv. Normality	
HNO_3.	$(CH_2)_2(COOH)_2$.
1.299	1.134
3.034	0.941
5.236	0.724
6.616	0.652
9.710	0.528
11.110	0.518
13.510	0.561
15.430	0.731

In Aq. Sulfuric Acid.

Equiv. Normality	
H_2SO_4.	$(CH_2)_2(COOH)_2$.
1.981	0.908
3.816	0.683
4.926	0.563
8.122	0.388
10.220	0.340
13.81	0.30
17.05	0.30
20.28	0.39

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF SALTS AT SEVERAL TEMPERATURES. (Linderstrom-Lang, 1924.)

Composition of Aq. Solvent.		Gm. mols. $(CH_2)_2(COOH)_2$ dissolved per liter at		
Salt used.	Gm. equiv. per liter.	11°.85.	18°.0.	23°.75.
None....	$=H_2O$	0.3854	0.4974	0.6344
Li Cl ...	0.335	–	0.4417	–
» ...	0.669	0.3062	0.3950	0.5037
» ...	1.338	0.2435	0.3151	0.4046
» ...	2.676	0.1558	0.2018	0.2590
» ...	4.013	0.1036	0.1348	0.1739
Na Cl.	0.1	–	0.4889	–
» ...	0.4	0.3584	0.4611	0.5853
» ...	0.8	0.3330	0.4262	0.5406
» ...	1.6	0.2853	0.3602	0.4597
» ...	2.4	–	0.3091	–
» ...	3.2	0.2082	0.2625	0.3305
» ...	4.0	–	0.2246	–
K Cl....	0.35	–	0.4913	–
»	0.70	0.3824	0.4851	0.6112
»	1.4	0.3771	0.4713	0.5909
»	2.1	0.3693	0.4564	0.5708
»	2.8	0.3593	0.4413	0.5459
»	3.5	–	0.4262	–

Composition of Aq. Solvent.		Gm. mols. $(CH_2)_2(COOH)_2$ dissolved per liter at 17°.85.
Salt used.	Gm. equiv. per liter.	
None....	$=H_2O$	0.4920
Rb Cl...	0.6	0.4955
» ...	1.2	0.4980
» ...	2.4	0.4955
Cs Cl ...	0.578	0.5085
» ...	0.867	0 5169
» ...	1.733	0.5355
K Br....	0.6	0.4938
»	1.2	0.4899
»	2.4	0.4777
Na I	0.6	0.4715
»	1.2	0.4502
»	2.4	0.4101
KI......	0.6	0.5132
»	1.2	0.5300
»	2.4	0.5495

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF SALTS AND OF ACIDS AT 25°.

(Herz, 1910b, 1911.)

In Aq. HBr.

Gms. per Liter.	
HBr.	$C_4H_6O_4$.
0	81.21
79.3	57.38
274.4	32.83

In Aq. HCl.

Gms. per Liter.	
HCl.	$C_4H_6O_4$.
18.45	66.25
45.6	50.78
87.9	35.42
166.6	27.75

In Aq. KBr.

Gms. per Liter.	
KBr.	$C_4H_6O_4$.
0	81.21
65.45	75.58
260.5	69.68
502.1	62.59

In Aq. KCl.

Gms. per Liter.	
KCl.	$C_4H_6O_4$.
28.34	75.58
77.56	74.39
150.7	69.68
267	61.41

In Aq. KI.

Gms. per Liter.	
KI.	$C_4H_6O_4$.
0	81.21
46.48	79.12
102.9	77.93

In Aq. LiCl.

Gms. per Liter.	
LiCl.	$C_4H_6O_4$.
0	81.21
7.63	70.86
23.32	62.59
57.66	47.24
117	29.51
176.4	20.07
231.5	14.17

In Aq. NaCl.

Gms. per Liter.		Solid Phase.
NaCl.	$C_4H_6O_4$.	
18.7	74.39	$C_4H_6O_4$
32.73	69.68	"
64.3	61.41	"
132.1	49.55	"
289.4	27.16	"
315.1	22.44	NaCl
318	4.72	"

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF PHOSPHORUS ACID AT 25°

(Redfield and King, 1936.)

Normality of aq. H_3PO_3	Normality of dissolved $C_4H_6O_4$
0.0	1.347
9.79	0.90
16.61	0.69
18.60	0.71
25.55	0.75
34.20	1.34
35.97	1.51

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF PHOSPHORIC ACID AT 25°.

(Walton and Kepfer, 1930.)

Normality of aq. H_3PO_4	Normality of dissolved $C_4H_6O_4$
0.0	1.347
7.38	0.78
14.31	0.48
19.69	0.50
25.38	0.30
31.05	0.28
37.79	0.38
38.64	0.28
40.95	0.36
43.96	0.49

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF POTASSIUM SUCCINATE AND VICE VERSA AT SEVERAL TEMPERATURES.

(Marshall and Cameron. 1907.)

t°.	Gms. per 100 Gms. Sat. Sol. $H_2C_4H_4O_4$.	$K_2C_4H_4O_4$.	Solid Phase.
0	2.71	0	$H_2C_4H_4O_4$
0	7.26	8.09	“ $+KH_3(C_4H_4O_4)_2$
0	7.86	7.66	“ “
0	8.24	9.95	$KH_3(C_4H_4O_4)_2$
0	8.11	12.77	“
0	7.87	15.47	“ $+KHC_4H_4O_4.2H_2O$
0	0	40.2	$K_2C_4H_4O_4.3H_2O$
14	1.468	41.3	$K_2C_4H_4O_4+KHC_4H_4O_4$ $+KHC_4H_4O_4.2H_2O$
15.9	1.7	34.36	$KHC_4H_4O_4.2H_2O+KHC_4H_4O_4$
20	6.39	0	$H_2C_4H_4O_4$
20	7.48	1.85	“
20	14.63	11.64	“
20	15.03	13.32	“ $+KH_3(C_4H_4O_4)_2$
20	13.32	18.46	$KH_3(C_4H_4O_4)_2$
20	12.74	22.45	“ $+KHC_4H_4O_4$
20	11.7	22.91	$KHC_4H_4O_4$
20	1.71	42.1	“
20	1.05	47.3	“ $+K_2C_4H_4O_4.3H_2O$
20	0.985	48.1	$K_2C_4H_4O_4.3H_2O$
20	0.909	48.75	“
20	0.159	54.3	“
20	0	56.6	“
25	7.88	0	$H_2C_4H_4O_4$
25	9.965	3.17	“
25	12.77	8.4	“
25	17.6	14.15	“
25	18.1	14.3	“ $+KH_3(C_4H_4O_4)_2$
25	15.36	18.48	$KH_3(C_4H_4O_4)_2$
25	13.7	23.6	“ $+KHC_4H_4O_4$
25	13.06	23.81	$KHC_4H_4O_4$
25	11.98	24.43	“
25	9.97	25	“
25	6.61	28.6	“
25	2.6	38.2	“
25	2.11	40.6	“
25	1.03	48.7	“ $+K_2C_4H_4O_4.3H_2O$
25	0.13	56.15	$K_2C_4H_4O_4.3H_2O$
25	0	58.05	“
40	12.9	0	$H_2C_4H_4O_4$
40	25.5	16.83	“ $+KH_3(C_4H_4O_4)_2$
40	19	25.48	$KH_3(C_4H_4O_4)_2+KHC_4H_4O_4$
40	15.83	26.56	$KHC_4H_4O_4$
40	0	62.10	$K_2C_4H_4O_4.3H_2O$

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF:

(Doosaj and Bhagwat, 1933.)

Sodium Chloride at 25°				Sodium Salicylate at 14.3°	
Gms. per liter		Gms. per liter		Gms. per liter	
NaCl	$C_4H_6O_4$	NaCl	$C_4H_6O_4$	$C_6H_4(OH)COONa$	$C_4H_6O_4$
0.0	70.03	313.28	22.74	0.0	50.23
17.70	74.85	316.07	10.00	11.58	59.00
35.40	68.55	319.01	4.51	22.11	63.84
44.25	66.51	321.82	3.62	40.53	70.98
118.00	52.25	327.87	3.00	81.06	82.94
177.00	42.27	333.97	2.01	121.60	93.71
221.25	36.03	347.06	1.04	162.13	97.79
295.00	26.52	354.00	0.52	243.20	86.80

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS AND IN PURE ETHYL ALCOHOL.

(Wright, 1927.)

Solvent	t°	Gms. $C_4H_6O_4$ per 100 gms. solvent
Aq. 50 wt. % C_2H_5OH	20	13.7
" " " "	30	20.9
Pure "	20	10.05
" "	30	11.9

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF DIOXANE AT 25°.

(Herz and Lorentz, 1929.)

cc Dioxane per 100 cc aq. solvent	Gm. Equiv. $C_4H_6O_4$ per liter sat. sol.	cc Dioxane per 100 cc aq. solvent	Gm. Equiv. $C_4H_6O_4$ per liter sat. sol.
10	0.79	75	1.76
33	1.24	80	1.66
50	1.42	100	1.36
66	1.66		

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS ACETONE AT 20°.

(Herz and Knoch, 1904.)

cc. Acetone per 100 cc. Solution.	$C_4H_6O_4$ per 100 cc. Solution.		cc. Acetone per 100 cc. Solution.	$C_4H_6O_4$ per 100 cc. Solution.	
	Millimols.	Gms.		Millimols.	Gms.
0	107.8	6.363	60	275.7	16.27
10	127.4	7.519	70	278.5	16.44
20	155.8	9.194	80	265.3	15.66
30	186.7	11.02	90	201.9	11.91
40	225.4	13.30	100	51.5	3.04
50	254.3	15.01			

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS GLYCEROL SOLUTIONS AT 25°.

(Herz and Knoch, 1905.)

Wt. % Glycerol in Solvent.	$C_4H_6O_4$ per 100 cc. Solution.		Sp. Gr. of Solutions.	Wt. % Glycerol in Solvent.	$C_4H_6O_4$ per 100 cc. Solution.		Sp. Gr. of Solutions.
	Millimols.	Gms.			Millimols.	Gms.	
0	133.4	7.874	1.0213	40.95	105.8	6.244	1.1120
7.15	128.2	7.566	1.0407	48.70	99.9	5.896	1.1298
20.44	118.3	6.982	1.0644	69.20	88.5	5.223	1.1804

DISTRIBUTION OF SUCCINIC ACID BETWEEN WATER AND ETHER AT 15°, 20° AND 25.5°.

(Pinnow, 1915.)

Results at 15°.			Results at 20°.			Results at 25.5°.		
Gm. Mols. per Liter.			Gm. Mols. per Liter.			Gm. Mols. per Liter.		
Aqueous Layer (c).	Ether Layer (c').	$\frac{c}{c'}$.	Aqueous Layer (c).	Ether Layer (c').	$\frac{c}{c'}$.	Aqueous Layer (c).	Ether Layer (c').	$\frac{c}{c'}$.
0.474	0.0783	6.05	0.644	0.096	6.71	0.3293	0.0438	7.52
0.2585	0.0415	6.23	0.312	0.046	6.87	0.1768	0.0235	7.52
0.1175	0.0187	6.28	0.151	0.0218	6.93	0.0894	0.0116	7.71
			0.0405	0.006	6.75			

Very careful determinations of this distribution at 0° and at 25°, in which the ionization of the succinic acid in the two solvents is taken into consideration, are given by Chandler, 1908. Two determinations at 0° and two at 15° are quoted by Kolossovsky, 1911. Earlier data for this system are given by Nernst, "Theoretical Chemistry," 3rd English edition, p. 496.

DISTRIBUTION OF SUCCINIC ACID BETWEEN WATER AND ETHYL ETHER.

(Forbes and Coolidge, 1919.)

Results at 15°.		Results at 20°.		Results at 25°	
Gms. $(CH_2)_2(COOH)_2$ per 100 gms.		Gms. $(CH_2)_2(COOH)_2$ per 100 gms.		Gms. $(CH_2)_2(COOH)_2$ per 100 gms.	
H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.
2.285	0.5025	1.274	0.2525	2.273	0.410
2.689	0.592	2.655	0.528	4.38	0.804
3.475	0.773	3.03	0.605	6.44	1.208
5.22	1.182	3.82	0.768	8.76	1.214
5.68	1.289	5.57	1.137	–	1.689
		7.10	1.475		

Calculations of the undissociated acid in each layer are also given by the authors.

Results at 19°.
(Schilow and Lepin, 1922.)

Gms. $(CH_2)_2(COOH)_2$ per 100 cc.		
H_2O ayer (C_1)	$(C_2H_5)_2O$ ayer (C_2)	$\frac{C_2}{C_1}$.
0.975	0.133	0.1364
1.910	0.266	0.1393
3.940	0.554	0.1406
8.160*	1.154*	0.1411

* Sat. with $(CH_2)_2(COOH)_2$.

Results at 25°.
(Smith, 1921, 1922.)

Millimols. $(CH_2)_2(COOH)_2$ per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.600	0.2880	0.180
2.625	0.4875	0.186
4.3625	0.8625	0.1975
7.95	1.55	0.195
13.80	2.75	0.199

Additional data upon the distribution of succinic acid between water and ether are given by Wosnessensky, 1923, and Perschke, 1926.

DISTRIBUTION OF SUCCINIC ACID BETWEEN :

Water and Amyl Ether at 19°.
(Schilow and Lepin, 1922.)

Gms. $(CH_2)_2(COOH)_2$ per liter of	
H_2O layer.	Amyl ether layer.
1.914	0.0355
2.675	0.0448
4.270	0.0541
4.830	0.0564
6.56	0.0708*

Water and Chloroform at 25°.
(Smith, 1921, 1922.)

Millimols. $(CH_2)_2(COOH)_2$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
13.50	0.15	0.0110
20.50	0.30	0.0146
34.90	0.60	0.0172
48.00	0.95	0.0198

* Solid Phase present.

Acetone and Glycerol at 25°.
(Smith, 1921, 1922.)

Millimols. $(CH_2)_2(COOH)_2$ per liter of		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.7625	1.35	0.565
1.325	1.9625	0.675
1.550	2.675	0.580
2.925	4.725	0.619
3.275	5.70	0.575

100 cc. sat. sol. of succinic acid in acetone contain 3.86 gms. $(CH_2)_2(COOH)_2$ at 20°. (Viseur, 1926.)

100 gms. *p* cymene dissolve 0.02 gms. succinic acid at 25°. (Wheeler, 1920.)

Freezing-point data for mixtures of succinic acid and urea are given by Kremann, Weber and Zechner, 1925.

DISTRIBUTION OF SUCCINIC ACID BETWEEN WATER AND AMYL ALCOHOL AT 20°.

(Herz and Fischer, 1904.)

Millimols $\frac{1}{2}C_4H_6O_4$ per 10 cc.		Gms. $C_4H_6O_4$ per 100 cc.		Millimols $\frac{1}{2}C_4H_6O_4$ per 10 cc.		Gms. $C_4H_6O_4$ per 100 cc.	
Alcohol Layer.	Aq. Layer.	Alcohol Layer.	Aq. Layer.	Alcohol Layer.	Aq. Layer.	Alcohol Layer.	Aq. Layer.
0.1888	0.2684	0.1114	0.1584	3.899	6.0795	2.302	3.588
0.3643	0.5252	0.215	0.310	5.199	8.099	3.069	4.779
0.7077	1.0373	0.418	0.612	6.334	10.170	3.739	6
1.440	2.1266	0.850	1.255	7.119	11.555	4.202	6.821
2.715	4.0495	1.603	2.391				

DISTRIBUTION OF SUCCINIC ACID BETWEEN WATER AND ISO AMYL ALCOHOL AT 25°.

(Kolossowsky, Kulikow and Bekturow, 1935.)

Gm. Mols. $(CH_2)_2(COOH)_2$ per liter		$\frac{1}{2}$	Gm. Mols. $(CH_2)_2(COOH)_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	Alcohol layer(2)		H_2O layer(1)	Alcohol layer(2)	
0.119	0.075	1.59	0.502	0.314	1.60
0.138	0.088	1.59	0.615	0.389	1.58
0.175	0.106	1.65	0.766	0.489	1.57
0.226	0.136	1.64	0.992	0.615	1.61
0.370	0.238	1.57	1.208	0.778	1.63

DISTRIBUTION OF SUCCINIC ACID BETWEEN WATER AND PHENOL.

(Campbell and Campbell, 1937.)

t°	Gms. $(CH_2)_2(COOH)_2$ per 100 gms.		$\frac{2}{1}$	t°	Gms. $(CH_2)_2(COOH)_2$ per 100 gms.		$\frac{2}{1}$
	H_2O layer(1)	C_6H_5OH layer(2)			H_2O layer(1)	C_6H_5OH layer(2)	
2.0	3.95	4.05	1.02	24.5	4.54	4.47	1.00
10.5	3.98	4.15	1.04	29.9	3.87	3.82	0.99
14.5	3.98	4.10	1.03	31.0	4.13	3.95	0.955
19.1	4.10	4.08	1.00	34.2	3.79	3.87	1.02
21.7	4.04	4.05	1.00				

SOLUBILITY OF SUCCINIC ACID IN ALCOHOLS AND IN ETHER.

(Timofeiew, 1891, 1894; at 15°, Bourgoin, 1878.)

Solvent.	Gms. $(CH_2)_2(COOH)_2$ per 100 Gms. Solvent at:			
	−1°.	+15°.	+21.5°.	+39°.
Abs. Methyl Alcohol	10.51	...	19.40	28.7
Abs. Ethyl "	5.06	12.59	9.49	15
90% " "	...	7.51	...	...
Abs. Propyl "	2.11	...	4.79	7.53
Abs. Ether	...	1.265	...	...
Isobutyl Alcohol	...	...	2.73	...

100 gms. 95 per cent formic acid dissolve 2.06 gms. $(CH_2)_2(COOH)_2$ at 18.5°.
(Aschan, 1913.)

SOLUBILITY OF SUCCINIC ACID IN SEVERAL ORGANIC SOLVENTS AT 28°.

(Desai and Patel, 1935.)

Solvent	Mol. fraction $C_4H_6O_4$ in sat. solution	Solvent	Mol. fraction $C_4H_6O_4$ in sat. solution
Acetone	0.02948	Nitrobenzene	0.000128
Carbon Tetrachloride	0.0000118	Chloroform	0.000138
Benzene	0.00002824	Methyl alcohol	0.05620
Toluene	0.0000298	Ethyl alcohol	0.04865
m Xylene	0.0000304	n Propyl alcohol	0.03613
Chlorobenzene	0.0000476	n Butyl alcohol	0.02618

Data for the solubility of Succinic Acid in Acetone in presence of Maleic and of Fumaric Acids and vice versa at 20° are given by Viseur, 1926.

Diagrams showing the solubility of Succinic Acid in various binary mixtures of Water, Acetone, Carbon Tetrachloride, Methyl, Ethyl and Propyl Alcohols at 20° and at 40° are given by Bancroft and Butler, 1932.

Freezing-point data are given for mixtures of Succinic Acid and:

1.2 Dichlor ethane(4)
Di nitro phenol(1)
Fumaric Acid(3)
Hydroquinone(1)
Maleic Acid(3)(5)
α Naphthol(1)
β Naphthol(1)
α Naphthylamine(2)
β " (2)
m Nitro phenol(1)
p " "
Phenol(1)
Pyrocatechol(1)
Pyrogallol(1)
Picric Acid
Resorcinol(1)
1.1.2.2 Tetra chloro ethane(4)
Azo benzene(3)

(1) Kremann, Zechner and Drazil, 1924; (2) Kremann, Weber and Zechner 1925; (3) Kremann and Zechner, 1925; (4) Timmermans and Mme. Vesselovsky 1931; (5) Grimm, Gunther and Titus, 1931.

METHYL MALONIC ACID (Iso Succinic Acid) $CH(CH_3)(COOH)_2$.

100 gms. H_2O dissolve 123.8 gms. $CH(CH_3)(COOH)_2$ at 25°.
" " C_6H_6 " 0.003 gm. " "

(Verkade and Coops, 1930a.)

The critical solution temperature of a mixture of methyl malonate and camphene is 74° and there is 44.6 percent methyl malonate present.

(Lecat, 1930.)

MALIC ACID (inactive) $COOHCH(OH)CH_2COOH$.

SOLUBILITY OF MALIC ACID IN WATER.

(Lange and Sinks, 1930.)

From the determinations at approximately 5° intervals a curve was plotted and from this the equation $C = 0.438t + 47.04$ was derived. The following results were calculated from the authors' equation.

t°	Gms. $C_4H_6O_5$ per 100 gms. sat. sol.	t°	Gms. $C_4H_6O_5$ per 100 gms. sat. sol.
0	47.04	40	64.6
10	51.42	50	68.9 (68.95)
20	55.8	60	73.3 (72.85)
25	58.0 (59.15 at 26°)	70	77.7 (76.85)
30	60.2	80	82.1 (80.65 at 79°)

The authors also give results for the densities and refractive indices of aqueous solutions of malic acid.

The results in parentheses are by Weiss and Downs, 1923.

The solubility of laevo Malic Acid in Water is given by Timmermans and Dumont, 1931, as 26.96 gms. $C_4H_5O_5$ per 100 gms. H_2O at 10° and 36.35 gms. at 20°. The eutectic point is given as at −2.20° with 15.0 gms. *l* malic acid per 100 gms. H_2O.

SOLUBILITY OF MALIC ACID IN AQUEOUS SOLUTIONS OF PHOSPHORIC ACID AT 25°.

(Walton and Kepfer, 1930.)

Normality of Aq. H_3PO_4	Normality of $C_4H_6O_5$ in sat. sol.	Normality of Aq. H_3PO_4	Normality of $C_4H_6O_5$ in sat. sol.
0.0	11.06	23.23	3.02
4.96	8.88	28.94	2.70
15.44	4.74	32.10	2.72
16.76	4.48	35.81	2.82
20.08	3.68	38.15	2.95

SOLUBILITY OF MALIC ACID IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 30°.

(Dittmar, 1930.)

Normality of Aq. H_2SO_4	Normality of $C_4H_6O_5$ in sat. sol.	Normality of Aq. H_2SO_4	Normality of $C_4H_6O_5$ in sat. sol.
0.0	11.21	19.08	3.568
4.212	8.045	23.54	5.005
9.416	5.451	25.26	6.071
14.00	3.568	28.44	7.090

DISTRIBUTION OF MALIC ACID BETWEEN WATER AND ETHER. (Pinnow, 1915.)

Results at 15°.			Results at 25.5°.		
Gm. Mols. Acid per Liter:		Dist. Coeff.	Gm. Mols. Acid per Liter.		Dist. Coeff.
H_2O Layer.	Ether Layer.		H_2O Layer.	Ether Layer.	
0.564	0.0091	62	1.179	0.0172	68.4
0.288	0.0045	64	0.582	0.0082	71
0.151	0.0024	62.9	0.293	0.0040	73
0.967	0.0157	61.6	0.142	0.0020	71

DISTRIBUTION OF MALIC ACID AT 25° BETWEEN ACETONE AND GLYCEROL.

(Smith, 1921, 1922.)

Millimols. $COOH.CH_2.CHOH.COOH$ per liter of Acetone layer (A).	Millimols. $COOH.CH_2.CHOH.COOH$ per liter of Glycerol layer (G).	$\frac{A}{G}$.
0.475	2.60	0.182
0.675	3.75	0.180
1.10	5.50	0.200
2.2875	11.0625	0.207

SOLUBILITY OF *l* MALIC ACID IN SEVERAL SOLVENTS.

100	gms.	methyl alcohol	dissolve	124.8	gms.	malic	acid	at	0°.	(1)
"	"	"	"	167.7	"	"	"	"	19.1°.	(1)
"	"	ethyl "	"	91.4	"	"	"	"	19°.	(1)
"	"	propyl "	"	54	"	"	"	"	19°.	(1)
"	"	dichlorethylene	"	0.009	"	"	"	"	15°.	(2)
"	"	trichlorethylene	"	0.010	"	"	"	"	15°	(2)
"	"	ethyl ether	"	2.96	"	"	"	"	20°.	(3)

(1) Timofeiew, 1894; (2) Wester & Bruins, 1894; (3) Timmermans and Dumont, 1931.

Freezing-point data are given for mixtures of:

d Malic Acid + l Malic acid(1)
" " + d Chloro succinic acid(2)
" " + l " " " (2)
" " + d Tartaric acid(2)(4)
" " + l " " (2)(4)

l Malic Acid + Meso Tartaric acid(2)
" " + d Phenyl glycollic acid(3)
" + l " "
" " + d Tartaric acid + H_2O(4)
" " + l " " "

(1) Timmermans and Mme. Vesselovsky, 1932; (2) Timmermans and Meuse, 1931; (3) Timmermans and Motuik, 1932; (4) Timmermans and Dumont, 1931.

TARTARIC ACIDS $C_2H_2(OH)_2(COOH)_2$. *d*, *l*, and *racemic*

SOLUBILITY OF EACH SEPARATELY IN WATER.

(Leidie, 1882.)

t°.	Grams Tartaric Acid per 100 Gms. H_2O. Dextro and Laevo Acids.	Racemic Ac. Anhydrous.	Racemic Ac. Hydrated.	t°.	Gms. Tartaric Acid per 100 Gms. H_2O. Dextro and Laevo Acids.	Racemic Ac. Anhydrous.	Racemic Ac. Hydrated
0	115.04	8.16	9.23	50	195.0	50.0	59.54
10	125.72	12.32	14.00	60	217.55	64.52	78.33
20	139.44	18.0	20.60	70	243.66	80.56	99.88
25	147.44	21.4	24.61	80	273.33	98.12	124.56
30	156.2	25.2	29.10	90	306.56	117.20	152.74
40	176.0	37.0	43.32	100	343.35	137.80	184.91

100 gms. H_2O dissolve 140.8 gms. tartaric acid at 15°. The Sp. Gr. of the sat. solution is 1.31. (Greenish and Smith, 1902.)

The following results for the solubility at 25° of dextro tartaric acid, racemic tartaric acid and mixtures of the two are given by Findlay and Campbell, 1928.

Acid	Gms. acid per 100 gms. H_2O
Dextrô Tartaric Acid	147.7
Racemic. (d + l) Tartaric Acid	21.5
Dextro + Racemic " "	103.8(d) + 11.8(l)

Later very careful determinations by Dalman, 1937, differing somewhat from the results of Leidie, 1882, correspond to a straight line expressed by the equation C = 51.8573 + 0.2643 t. From this equation the following results were obtained.

t°	Gms. $C_4H_6O_6$ per 100 gms. sat. sol.	Solid Phase	t°	Gms. $C_4H_6O_6$ per 100 gms. sat. sol.	Solid Phase
-16.18 Eutec.	48.18 (1)	Ice + $C_4H_6O_6$	50	65.072	$C_4H_6O_6$
0	51.8573	$C_4H_6O_6$	60	67.715	"
10	54.490	"	70	70.358	"
20	57.143	"	80	73.001	"
25	58.464	"	90	75.644	"
30	59.786	"	100	78.287	"
40	62.429	"			

(1) Timmermans and Dumont, 1931.

TARTARIC ACID $C_2H_2(OH)_2(COOH)_2$.

SOLUBILITY OF TARTARIC ACID IN AQUEOUS SOLUTIONS OF ACETIC ACID, HYDROCHLORIC ACID AND OF SULFURIC ACID AT 25°. (Knox and Richards, 1919.)

Results for Acetic Acid.		Results for Hydrochloric Acid.		Results for Sulfuric Acid.	
Equiv. Normality		Equiv. Normality		Equiv. Normality	
CH_3COOH.	$C_2H_2(OH)_2(COOH)_2$.	HCl.	$C_2H_2(OH)_2(COOH)_2$.	H_2SO_4.	$C_2H_2(OH)_2(COOH)_2$.
0.25	10.09	0.0	10.260	1.798	8.51
0.60	9.875	1.257	8.528	4.043	6.64
1.23	9.515	2.568	7.092	6.807	4.73
2.63	8.717	4.466	5.434	9.895	3.18
4.25	7.718	6.303	4.350	12.54	2.43
6.12	6.548	8.144	3.77	15.46	1.95
8.30	5.151	9.89	3.43	18.10	1.77
10.89	3.505	10.51	3.42	19.85	1.86
14.14	1.594	11.17	3.42	22.17	2.74
16.92	0.344				

SOLUBILITY OF TARTARIC ACID IN AQUEOUS ETHYL ALCOHOL SOLUTIONS AT 25°. (Seidell, 1910.)

Wt. Per cent C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 Gms. Sat. Sol.	Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 Gms. Solvent.	Wt. Per cent C_2H_5OH. in Solvent.	d_{25} of Sat. Sol.	Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 Gms. Sat. Sol.	Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 Gms. Solvent.
0	1.321	57.9	137.5	60	1.142	43.9	78.3
10	1.300	56	127.3	70	1.095	40.2	66.9
20	1.276	54.1	117.9	80	1.040	35.3	54.6
30	1.251	52	108.3	90	0.973	29	40.8
40	1.220	49.6	98.4	95	0.937	25.4	34.1
50	1.184	47	88.6	100	0.905	21.6	27.6

SOLUBILITY OF DEXTRO TARTARIC ACID, RACEMIC TARTARIC ACID AND MIXTURES OF THE TWO IN 93.8 WT. ETHYL ALCOHOL.

(Findlay and Campbell, 1928.)

Solid Phase	Gms. $C_4H_6O_6$ per 100 gms. 93.8 Wt. % C_2H_5OH at: 0°	15°	25°	40°
Dextro acid	25.17	30.65	43.04	61.70
Racemic acid (total d + l)	2.006	3.153	5.01	6.299
Dextro + racemic acid	24.92d 1.091	40.26d 0.21	51.06d 1.041	94.04d 1.581

The authors also give similar results for dextro and racemic Methyl Tartrate, Methyl Diacetyl tartrate, Ethyl Diacetyl tartrate and Methyl Dibenzyl tartrate.

SOLUBILITY OF TARTARIC ACID IN AQUEOUS SOLUTIONS OF SALTS AT 25°.

(Herz and Hiebenthal, 1929.)

In aq. Potassium Chloride

Gm. Equiv. per liter KCl	$C_4H_6O_6$
0.0	10.04
1.0	9.92
1.68	9.92
2.25	9.90
2.70	9.90

In aq. Sodium Chloride

Gm. Equiv. per liter NaCl	$C_4H_6O_6$
0.75	9.94
1.20	9.84
1.52	9.78
1.70	9.78
3.70(1)	9.77

(1) An excess of NaCl was present.

DISTRIBUTION OF TARTARIC ACID BETWEEN WATER AND ETHER.

(Pinnow, 1915.)

Results at 15°.

Gms. Mols. per Liter. H_2O Layer, c.	Ether Layer, c′.	$\frac{c}{c'}$.
1.402	0.0072	197
0.790	0.0037	216
0.446	0.0022	210

Results at 27°.

Gms. Mols. per Liter. H_2O Layer, c.	Ether Layer, c′.	$\frac{c}{c'}$.
1.625	0.0070	233
0.857	0.0033	259
0.427	0.0016	268

DISTRIBUTION OF TARTARIC ACID BETWEEN WATER AND ISO AMYL ALCOHOL AT 25°.

(Kolossowsky, Kulikow and Bekturow, 1936.)

Gm. Mols. $C_4H_6O_6$ per liter H_2O layer(1)	Alcohol layer(2)	$\frac{1}{2}$	Gm. Mols. $C_4H_6O_6$ per liter H_2O layer(1)	Alcohol layer(2)	$\frac{1}{2}$
0.454	0.029	15.66	4.44	0.52	8.54
0.674	0.047	14.34	5.42	0.72	7.53
1.370	0.114	12.02	6.83	0.98	6.97
2.010	0.198	10.15	8.48	1.57	5.40
2.600	0.255	10.20	10.51	2.80	3.75

DISTRIBUTION OF TARTARIC ACID BETWEEN

Water and Ether.

Results at 19°.
(Schilow and Lepin, 1922.)

Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 cc. of H_2O layer (C_1).	Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 cc. of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
16.70	0.0742	0.0044
33.60	0.154	0.0046
66.80	0.367	0.0055
107.4	0.890	0.0083
137.0*	1.600*	0.0117

Results at 25°.
(Smith, 1921, 1922.)

Millimols. $C_2H_2(OH)_2(COOH)_2$ per liter of H_2O layer (C_1).	Millimols. $C_2H_2(OH)_2(COOH)_2$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
8.40	0.625	0.0745
21.62	1.500	0.0694
37.55	2.562	0.0683
98.75	6.062	0.0613

* Excess solid present.

Acetone and Glycerol.

Results at 25°.
(Smith, 1921, 1922.)

Millimols. $C_2H_2(OH)_2(COOH)_2$ per liter of Acetone layer (A).	Millimols. $C_2H_2(OH)_2(COOH)_2$ per liter of Glycerol layer (G)	$\frac{A}{G}$.
0.412	2.75	0.150
0.425	3.07	0.136
0.625	5.77	0.105
0.60	6.00	0.100
1.30	16.75	0.080

100 gms. 86.5 % glycerol ($d = 1.2326$) dissolve 115.5 — 161.7 gms. $C_2H_2(OH)_2(COOH)_2$ at 20°.

100 gms. 98.5 % glycerol ($d = 1.2645$) dissolve 69.5 — 114.7 gms. $C_2H_2(OH)_2(COOH)_2$ at 20°.

Saturation was approached from below and from above. In the latter case esters were formed and the higher results include the acid which had passed into solution in the form of ester. (Holm, 1921, 1922.)

SOLUBILITY OF TARTARIC ACID IN ALCOHOLS.

(Timofeiew, 1894.)

Alcohol.	t°.	Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 Gms. Solvent.	Alcohol.	t°.	Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 Gms. Solvent.
Methyl Alcohol	− 3	67.5	Ethyl Alcohol	+23	28.9
"	+19.2	70.1	"	39	31.8
"	23	73.2	Propyl Alcohol	− 3	8.74
"	39	77.3	"	+19.2	10.85
Ethyl Alcohol	− 3	22.4	"	23	11.85
"	+19.2	27.6	"	39	14.4

SOLUBILITY OF TARTARIC ACID IN SEVERAL SOLVENTS.

Solvent.	Sp. Gr. of Solvent.	d_{25} of Sat. Sol.	t°.	Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 Gms. Solvent.	Authority.
Amyl Alcohol	$d_{20} = 0.817$	0.824	25	3.50	(Seidell, 1910.)
Benzene	$d_{25} = 0.873$	0.875	25	0.0086	"
Carbon Tetrachloride	$d_{25} = 1.587$	1.589	25	0.0189	"
Ether	$d_{22} = 0.711$	0.715	25	0.61	"
"	...	...	15	0.40	(Bourgoin, 1878.)
Dichlorethylene	...	...	15	0.005	(Wester & Bruins, '14.)
Trichlorethylene	...	...	15	0.005	"

100 gms. Ethyl Ether dissolve 0.310 gm. dextro tartaric acid at 20°.
" " " " " 0.313 " laevo " " " "
(Timmermans and Dumont, 1931.)

F.-pt. data are given for mixtures of the *d* and *racemic* modifications of dimethyl ether of tartaric acid, and for mixtures of the *d* and *racemic* modifications of dimethyl ether of diacetyl tartaric acid by Roozeboom (1899). Results for mixtures of the *d* and *i* forms of the diformalic derivative of *racemic* tartaric acid by Ringer (1902). Results for mixtures of *d* tartaric acid and *racemic* acid ester and for *d* diacetyl tartrate and *racemic* acid ester are given by Beck (1904). Data for

Data for the melting-points of mixtures of dextro and laevo tartaric acids are given by Findlay and Campbell, 1928. The authors also give data for the freezing- or melting-points of active and racemic methyl diacetyl tartrates, ethyl diacetyl tartrates, methyl dipropionyl tartrates and methyl dibenzoyl tartrates.

TARTARIC ACID

Freezing-point data are given for various mixtures of:

d, l and racemic Tartaric Acids(2)(3)
" " " " " + malic acids(3)(5)
" " " " " + " " + H_2O(5)
" " " " " + chloro succinic acids(3)(1)(5)
" " " " " + " " " + H_2O(5)
" " " " " + aspartic acid(3)
" " " " " + asparigine + H_2O(3)
" " " " " + iso butyl ester(6)
" " " " " + phenyl glycolic ester(4)
" " " " " + " " " + H_2O(4)

(1) Timmermans and Mme. Vessolovsky, 1931; (2) Timmermans and Mme. Vessolovsky, 1932; (3) Timmermans and Heuse, 1931; (4) Timmermans and Motiuk, 1932; (5) Timmermans and Dumont, 1931; (6) Campbell, 1929.

ERYTHRITOL TETRA NITRATE i (Nitroerythrite) $(CHNO_3CH_2NO_3)_2$.

Freezing-point data for mixtures of Erythritol Tetranitrate and each of the following compounds: Nitromannite, nitro penta erythrite, nitro phenetol, p nitro toluene, 2.4.6 tri nitro toluene and m dinitro benzene are given by Urbanski, 1933, 1934.

BUTYRO NITRILE $CH_3(CH_2)_2CN$.

Freezing-point data are given by Joukovsky, 1934, for mixtures of Butyro nitrile with Acetonitrile, Proprio nitrile, Valeronitrile and with Benzene

BUTYL CHLORALDEHYDE $CH_2Cl(CH_2)_2CHO$.

Freezing-point data for mixtures of Butyl chloraldehyde and Pyramidon are given by Pfeiffer and Seydel, 1928.

BUTYL CHLORAL HYDRATE $CH_3CHClCCl_2CH(OH)_2$.

Freezing-point data for mixtures of Butyl chloral hydrate and Antipyrine are given by Pfeiffer and Seydel, 1929.

ChloroACETIC ACID ESTERS.

SOLUBILITY OF MONOCHLOR, DICHLOR, AND OF TRICHLORACETIC ESTER IN AQUEOUS ALCOHOL AT ROOM TEMPERATURE.

(Bancroft — Phys. Rev. 3, 193, 1895-96, from results of Pfeiffer, Z. physik. chem. 9, 469, '92.)

cc. Ethyl Alcohol in Mixtures.	cc. H_2O added to cause separation of a second phase in mixtures of the given amts. of Alcohol and 3 cc. of:		
	$CH_2ClCOOC_2H_5$.	$CHCl_2COOC_2H_5$	$CCl_3COOC_2H_5$.
3	1.32	0.90	0.65
6	4.01	2.45	1.80
9	7.30	4.33	3.02
12	10.78	6.60	4.50
15	16.16	9.20	6.50
18	22.16	...	...
21	28.74	...	...

METHYL PROPIONATE $C_2H_4COOCH_3$.

100 gms. H_2O dissolve 5 gms. $C_2H_5COOCH_3$ at 22°. (Traube, 1884.)

More recent data for the solubility of methyl propionate in water are given by Herz (1917).

α BROMO n BUTYRIC ACID $CH_3CH_2CHBrCOOH$.

DISTRIBUTION OF α BROMO n BUTYRIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform		Water and Benzene		Water and Toluene	
Gm. Mols. $C_4H_7O_2Br$ per liter		Gm. Mols. $C_4H_7O_2Br$ per liter		Gm. Mols. $C_4H_7O_2Br$ per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	$CHCl_3$ layer	H_2O layer	$CHCl_3$ layer
0.00746	0.00667	0.00786	0.00471	0.00887	0.00377
0.00952	0.00957	0.01010	0.00669	0.01138	0.00541
0.01199	0.01391	0.01153	0.00795	0.01290	0.00658
0.01387	0.01750	0.01307	0.00962	0.01469	0.00800
0.01553	0.02069	0.01547	0.01248	0.01737	0.01058
0.01706	0.02404	0.01744	0.01523	0.01964	0.01303
0.01900	0.02914	0.02134	0.02051	0.02386	0.01799
0.02164	0.03621	0.02838	0.03272	0.03190	0.02920
0.02428	0.04352	0.03778	0.05257	0.04215	0.04820
0.02689	0.05101				

DISTRIBUTION OF α BROMO BUTYRIC ACID BETWEEN WATER AND OLIVE OIL AT 25°.

(Bodansky and Meigs, 1932.)

Gm. Mols. $C_4H_7O_2Br$ per liter		$\frac{1}{2}$
H_2O layer (1)	Oil layer (2)	
0.0456	0.059	0.77
0.088	0.125	0.704

γ Phospho *n* **BUTYRIC ACID** HOOC.CH_2.CH.CH_2PO(OH).

100 gms. sat. solution of γ phospho *n* butyric acid in water contain 41.3 gms. HO OC.CH_2.CH.CH_2.PO (OH) at 0° and 53.3 gms. at 20°. (Nylen, 1926.)

β MALAMINIC ACID $CH_2(OH)COOH:CH_2CONH_2$, $CH_2COO.NH_3.CHCOOH$.

SOLUBILITY IN WATER AT 18°. (Lutz, 1902.)

Compound.	M.-pt.	Gms. per 100 Gms. H_2O.	$(\alpha)_D$ in Water $C=1$, $1=2$.
d β Malaminic Acid	149	7.52	+9.70
l "	149	7.50	−9.33
r "	148	4.02	...

1 and dl ASPARTIC ACIDS $HOOCC_2H_3(NH_2)COOH$.

SOLUBILITY OF 1 AND OF dl ASPARTIC ACID, EACH DETERMINED SEPARATELY, IN WATER.

(Dalton and Schmidt, 1933.)

In the case of the 1 Aspartic Acid 38 determinations were made at 9 temperatures between 0° and 60°. In the case of the dl acid 30 determinations were made at 9 temperatures between 0° and 65°. From the solubility equations obtained from these results the following values for regular intervals of temperature were derived. The values above 65° are less accurate than those below. The density of approximately saturated solutions at 25° was very close to 1.00.

t°	Gms. per 100 gms. H_2O		t°	Gms. per 1000 gms. H_2O	
	1 aspartic acid	dl aspartic acid		1 aspartic acid	dl aspartic acid
0	2.09(2.23)	2.62(3.16)	45	10.07	16.75
5	2.49	3.22	50	11.99(12.54)	20.00(20.98)
10	2.96	4.12	55	14.29	23.75
15	3.53	5.12	60	17.01	28.64
20	4.20	6.33	65	20.27	32.91
25	5.00(5.39)	7.78(8.16)	70	24.14	38.40
30	5.96	9.50	75	28.75(27.14)	44.56(47.94)
35	7.10	11.55	100	68.93(48.8)	85.94(99.4)
40	8.45	13.95			

The above results in parentheses are by Dunn, Ross and Reed, 1933. Those at 100° were calculated.

SOLUBILITY OF dl ASPARTIC ACID IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL.

(Dunn and Ross, 1938.)

t°	Wt. % C_2H_5OH in aqueous solvent	d. of sat. sol.	Gms. $C_4H_7O_4N$ per 100 gms. solvent	t°	Wt. % C_2H_5OH in aqueous solvent	d. of sat. sol.	Gms. $C_4H_7O_4N$ per 100 gms. solvent
0	20.32	0.972	0.0703	45	20.16	0.958	0.680
"	42.52	0.935	0.0267	"	42.59	0.914	0.255
"	66.94	0.886	0.0111	"	67.03	0.856	0.0608
25	20.00	0.963	0.266	"	92.61	0.796	0.0042
"	42.66	0.926	0.0992	65	20.32	0.952	1.53
"	67.03	0.872	0.0317	"	42.52	0.902	0.588

SOLUBILITY OF l ASPARTIC ACID IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°(?).

(McMeekin, Cohn and Weare, 1935.)

Vol. % C_2H_5OH in aqueous solvent	d. of sat. sol.	Gm. Mols. $C_4H_7O_4N$ per liter sat. sol.	Vol. % C_2H_5OH in aqueous solvent	d. of sat. sol.	Gm. Mols. $C_4H_7O_4N$ per liter sat. sol.
0.0	0.9994	0.0375	70.0	0.8826	0.00149
20.0	0.9729	0.0149	80.0	0.8550	0.00070
40.0	0.9457	0.00675	90.0	0.8262	0.00021
50.0	0.9272	0.00441	100.0	0.7851	0.0000116
60.0	0.9064	0.00264			

l ASPARTIC ACID (Aspariginic Acid) Amino Succinic Acid, HOOC.CH$_2$.CH.NH$_2$.COOH.

SOLUBILITY IN WATER AND IN AQUEOUS SOLUTIONS OF SALTS AT 20°.

(Pfeiffer and Würgler, 1916.)

Salt.	Mols. salt per liter.	Gms. $C_4H_7NO_4$ per 100 cc. sat. sol.	Salt.	Mols. salt per liter.	Gms. $C_4H_7NO_4$ per 100 cc. sat. sol.
None (= H_2O)	0.00	0.410	$BaCl_2$	0.500	0.691
LiCl	1.17	0.493	$CaCl_2$	0.429	0.612
KNO_3	1.00	0.633	»	0.528	0.638
KCl	1.00	0.540	»	0.858	0.745
KBr	0.50	0.499	»	1.716	0.998
»	1.00	0.550	$Ca(NO_3)_2$	0.49	0.758
»	2.00	0.638	$SrBr_2$	0.486	0.638
»	4.00	0.742	$SrCl_2$	0.500	0.638
K_2SO_4	0.50	0.686	$Sr(NO_3)_2$	0.204	0.592
NaCl	0.50	0.464	»	0.408	0.751
»	1.00	0.520	»	0.500	0.798
»	2.00	0.541	»	0.816	0.929
»	4.00	0.570	»	1.632	1.346

The following determinations are given for salt solutions made with aqueous 0.1 normal Na OH instead of water.

Salt.	Mols. salt per liter.	Gms. $C_4H_7NO_4$ per 100 cc. sat. sol.	Salt.	Mols. salt per liter.	Gms. $C_4H_7NO_4$ per 100 cc. sat. sol.
None (=0.1*n*NaOH)	0.0	1.669	KBr	2.0	1.762
LiCl	1.97	1.640	KCl	2.0	1.756
NaCl	2.00	1.707	KNO_3	2.0	1.907

Freezing-point data are given for:

Aspartic Acid + Chloro succinic acid + H_2O (Timmermans and Heuse, 1931.)
" " + Tartaric acid (Timmermans and Mme. Vesselovsky, 1932.)

BUTYLENE, pseudo and iso, C_4H_8.

1.0 cc. abs. C_2H_5OH dissolves 49.7 to 52.9 cc. pseudo C_4H_8 at 19° and 760 mm. pressure
1.0 cc. » » » 44.6 to 45.1 cc. iso » » » »

(Spörry, 1922, 1926.)

Y BUTYLENE (Propene, 2- methyl) $CH_2:C(CH_3)CH_3$.

SOLUBILITY OF Y BUTYLENE IN SEVERAL SOLVENTS AT VARIOUS TEMPERATURES AND PRESSURES.

(Kirejew, Kaplan and Romantchouk, 1930.)

Solvent	t°	cc C_4H_8 (reduced to 0° & 760 mm) dissolved by 1 cc solvent at: 50	100	150	200	300	400	600	760 mm Hg Pressure
Kerosene	-21	17.5	36.0	54.5	73.5	—	—	—	—
"	-10	7.5	15.5	25.5	39.0	—	—	—	—
"	0	5.5	11.5	18.0	25.5	42.5	—	—	—
"	+20	3.0	6.0	8.5	11.5	18.0	25.5	44.0	58.5
"	40	1.0	2.0	3.0	4.3	8.0	11.5	19.0	24.0
Xylene	-21	20.0	44.0	74.0	—	—	—	—	—
"	-10	12.0	34.0	38.5	55.0	—	—	—	—
"	0	8.6	17.5	27.5	38.0	65.5	—	—	—
"	+20	3.0	7.0	11.0	14.0	23.0	35.0	58.5	75.0
"	40	2.0	4.5	6.0	9.0	13.5	18.5	30.5	39.0
Cracked benzine	-21	16.0	46.0	61.5	—	—	—	—	—
" "	-10	9.5	21.5	35.0	52.0	—	—	—	—
" "	0	7.5	15.5	24.0	32.5	55.0	—	—	—
" "	+20	2.0	5.0	8.0	11.5	20.0	29.0	48.5	61.0
" "	40	2.0	4.0	6.0	8.0	12.0	16.0	24.0	31.0
Dichloro ethane	0	6.0	12.0	18.0	24.0	50.0	—	—	—
Heavy benzine	0	6.0	12.0	19.0	28.0	38.0 (250)	—	—	—
Light benzine	0	8.0	16.0	24.0	33.0	44.0 (250)	—	—	—

ββ' Dichlor **ETHYL SULFIDE** (« Mustard Gas ») $S(CH_2.CH_2Cl)_2$

SOLUBILITY OF « MUSTARD GAS » IN WATER.

(Boulin and Simon, 1920; Wilson, Fuller and Schur, 1922.)

B and S titrated the acidity of the aqueous solution immediately and after 24 hours and considered the results to show the amount of the compound which dissolved and afterwards decomposed. Approximate determinations in this manner, using cold water, gave 0.48 gm. $S(CH_2.CH_2Cl)_2$ per liter.

The rate of decomposition at temperatures of 20°, 50° and 100° was found to be approximately as 1 : 7.5 : 30. The effect of alkalis and of thiodiglycol on this decomposition was studied.

W, F and S shook « mustard gas » vigorously with water at 25° for 10 seconds and filtered the mixture during the next 20 seconds with the aid of suction. The result of several determinations was 0.0043 gm. mols or 0.684 gm. $S(CH_2.CH_2Cl)_2$ per liter at 25°.

THE MUTUAL SOLUBILITY OF « MUSTARD GAS » AND ETHYL ALCOHOL.

(Thompson, Black and Sohl, 1921.)

The synthetic method was used. The temperatures of complete solution and of clouding of known mixtures were determined.

Results with 92.5 % Alcohol.				Results with Absolute Alcohol.	
t°	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.	t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.	t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.
5.1	21.64	34.4	65.27	5.6	44.83
12.8	26.20	35.2	68.67	7.5	47.45
17.0	30.26	35.8	72.45	9.1	50.39
21.7	33.91	36.7	75.22	10.6	53.73
25.6	38.70	37.6	78.20	11.8	57.52
28.3	42.80	37.9	81.42	12.2	61.91
29.9	46.47	38.6	84.93	13.6	67.00
30.6	49.66	38.5	86.80	14.2	71.75
31.4	52.29	38.4	88.75	14.8	75.76
31.0	54.45	37.8	90.80	15.5	80.25
32.5	56.76	35.7	92.93	15.6	83.12
33.0	59.37	30.9	95.18	15.3	87.13
33.6	62.18	19.9	97.53	14.8	91.04
				14.5	93.13
				13.6	95.31

SOLUBILITY OF « MUSTARD GAS » IN GASOLINE, IN RAIL ROAD LIGHT OIL AND IN KEROSENE.

(Thompson and Odeen, 1920.)

Gasoline + $S(CH_2CH_2Cl)_2$.		R. R. Light Oil + $S(CH_2CH_2Cl)_2$.		Kerosene, + $S(CH_2CH_2Cl)_2$.	
t°	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.	t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture	t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.
4.2	30.08	9.3	21.64	9.5	33.13
4.5	30.14	14.5	24.33	14.2	39.79
9.0	36.46	20.9	29.88	25.0	68.67
9.5	36.51	23.6	38.49	25.6 (crit. t.)	73.80
13.5	46.21	33.0	47.95	25.6	75.21
14.0	46.32	35.0	54.48	25.6	76.67
18.7	53.49	37.0 (crit. t.)	63.80	24.3	81.42
20.4 (crit. t.)	66.02	31.3	86.58	21.9	84.93
18.0	77.53	28.0	88.74	14.3	89.68
7.8	87.17	25.0	90.78	8.9	91.88
7.3	87.34				

MUTUAL SOLUBILITY OF « MUSTARD GAS » AND LIGROIN.

(Thompson and Odeen, 1920.)

The ligroin boiled below 100° and had $d_{24} \doteq 1.6677$.

t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. mixture.	t°	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. mixture.	t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. mixture.
− 7.5	8.7	16.0	43.7	9.6	84.5
− 6.5	11.3	17.5	49.4	9.0	86.4
− 2.5	13.7	18.3	56.8	9.5	88.4
+ 0.2	16.1	19.0 (crit. t.).	61.4	10.0	90.5
2.5	24.2	19.0	66.7	12.0	95.1
6.5	27.8	17.22	76.1	13.0	97.4
10.3	32.5	14.0	80.9	13.0	100.0
14.5	39.3	12.0	82.6		

The authors also give data for the mutual solubility of chlorinated « Mustard Gas » and rail road light oil.

Freezing-point data for mixtures of « Mustard Gas » and sulfur are given by

THIOSINAMINE (Allyl Thio Urea) $CH_2:CHCH_2NHCSNH_2$.

Freezing-point data for mixtures of thiosinamine and antipyrine are given by Mazetti, 1926.

100 cc. H_2O dissolve about 5.9 gms. $NH_2.CS.NH.C_3H_5$ at 15–20°.
100 cc. 90% alcohol dissolve about 50 gms. $NH_2.CS.NH.C_3H_5$ at 15–20°.
(Squire and Caines, 1905.)

BUTYRALDEHYDE n $CH_3(CH_2)_2CHO$.

100 gms. H_2O dissolve 3.6 gm. normal butyraldehyde at 20°. (Vaubel, 1899.)
" " " " 10.0 " iso butyraldehyde " " " "

ETHYL METHYL KETONE $CH_3.CO.C_2H_5$.

SOLUBILITY IN WATER. (Rothmund, 1898.)

By synthetic method, see Note, page 292.

t°.	Gms. Ketone per 100 Gms.		t°.	Gms. Ketone per 100 Gms.	
	Aq. Layer.	Ketone Layer.		Aq. Layer.	Ketone Layer.
−10	34.5	89.7	90	16.1	84.8
+10	26.1	90	110	17.7	80
30	21.9	89.9	130	21.8	71.9
50	17.5	89	140	26	64
70	16.2	85.7	151.8 (crit. temp.)	44.2	

The accuracy of Rothmund's data is questioned by Marshall (1906) and the following new determinations given.

t°.	64.7°.	65.5°.	73.6°.	91.0°.	15°.	73.6°.
Wt. % Ketone in Mixture	18.15	18.08	18	18.08	88.2	85.05

Data for the reciprocal solubility of ethyl methyl ketone and water, containing 1.5% ethyl alcohol, are given by Bruni (1899, 1900). This system is of interest particularly on account of having both an upper and a lower critical point.

Freezing-point data for mixtures of ethylmethyl ketone and water are given by Timmermans (1911) and by Bruni, 1899, 1900.

More recent determinations of the reciprocal solubility of Ethyl methyl ketone, (Butanone) and water are:

t°	Gms. $CH_3COC_2H_5$ per 100 gms. sat. solution in H_2O	Gms. H_2O per 100 gms. sat. solution in $CH_3COC_2H_5$	Authority
20	24.0	10.0	(Jones, 1929.)
25 (approx.)	22.6	9.9	(Park and Hofmann, 1832.)

Approximate determinations of the Solubility of Ethyl Methyl Ketone (Butanone) in aqueous solutions of metal perchlorates show that the volume of butanone dissolved per 10 cc of cold perchlorate solutions increases from about 5 cc to more than 10 cc as the concentrations of perchlorate increases from 0.1 to 0.3 normal. (Duclaux and Durand-

$C_4H_8O_1$

MUTUAL SOLUBILITY OF ETHYL METHYL KETONE AND GLYCEROL

(Mc Ewen, 1923.)

The synthetic method was used The temperatures were determined at which liquid phases separated from mixtures of known composition.

t°.	Wt. per cent $CH_3.CO.C.H_5$.	t°.	Wt. per cent $CH_3.CO.C_2H_5$.	t°.	Wt. per cent $CH_3.CO.C_2H_6$.
37.5	4.0	162.5	36.17	161.5	67.14
116.5	10.21	163.2	41.27	150.0	74.78
128.5	13.21	164.5	53.84	118.5	86.55
155.5	26.75	164.5	60.25	55.5	92.14

Freezing-point data for mixtures of Ethyl Methyl Ketone and Acetone are given by Sapgir, 1929.

DiETHYLENE ETHER $(CH_2OCH_2)_2$.

Freezing-point data are given for mixtures of diethylene ether and water, by Unkovskaja, 1913.

PROPYL FORMATE $HCOOC_3H_7$.

100 cc H_2O dissolve 2.1 gm. $HCOOC_3H_7$ at 22°. (Traube, 1884.)

ETHYL ACETATE $CH_3COOC_2H_5$.

SOLUBILITY OF ETHYL ACETATE IN WATER AND VICE VERSA.

(Merriman, 1913, see also Seidell, 1910.)

Results for Ethyl Acetate in Water.

t°.	$d_{\frac{t^\circ}{4^\circ}}$ of Sat. Sol.	Gms. $CH_3COOC_2H_5$ per 100 Gms. H_2O.
0	1.0034	11.21
5	1.0022	10.38
10	1.0009	9.67
15	0.9995	9.05
20	0.9979	8.53
25	0.9962	8.08
30	0.9943	7.71
40	0.9901	7.10

Results for Water in Ethyl Acetate.

t°	$d_{\frac{t^\circ}{4^\circ}}$ of Sat. Sol.	Gms. H_2O per 100 Gms. $CH_3COOC_2H_5$.
0	0.9280	2.34
10	0.9164	2.68
20	0.9054	3.07
25	0.9002	3.30
30	0.8953	3.52
40	0.8863	4.08
50	...	4.67
60	...	5.29

SOLUBILITY OF ETHYL ACETATE IN WATER. (Glasstone and Pound, 1925.)

Highly purified ethyl acetate was used. A slight excess of it was shaken with water at a temperature below that of the experiment and then placed in a thermostat. The excess of ethyl acetate then separating caused the liquid to become cloudy, but this disappeared in an hour or two. Care was always taken that the excess of ethyl acetate present was not large enough to require a correction for the amount of water dissolved by it. For analysis the saturated solution was weighed. The ethyl acetate was distilled out, hydrolyzed with standard Na OH, and estimated in the usual way.

t°.	Gms. $CH_3COOC_2H_5$. per 100 gms. H_2O.	t°.	Gms. $CH_3COOC_2H_5$ per 100 gms. H_2O.
0	10.40	30	7.06
10	8.96	37	6.65
20	7.85	40	6.50
25	7.39	50	6.04

The following results, in terms of grams $CH_3\,CO\,OC_2\,H_5$ per 100 gms. H_2O, are probably less accurate than the above. At 16°, 12.5 gms. (Linde, 1917, 1926); at 18°, 7.3 gms. (von Euler and Svanberg, 1917, 1926); at 20°, 6.88 gms. (approx. det. only) (Fühner, 1924); at 29°.7, 7.47 gms. (von Euler and Rudberg, 1924).

SOLUBILITY OF ETHYL ACETATE IN WATER AND VICE VERSA.

t°	Gms. $CH_3COOC_2H_5$ per 100 gms. sat. sol. in H_2O	Gms. H_2O per 100 gms. sat. sol. in $CH_3COOC_2H_5$	Authority
0	10	2.26	(Mion, 1931.)
15	8.3 (8.864)	2.82	" "
20	8.53 (8.420)	3.07	(Jones, 1929.)
25 (about)	7.9 (8.030)	3.0	(Park and Hofmann, 1932.)
30	7.1 (7.692)	3.52	(Mion, 1931.)
40	— (7.177)	—	
50	— (6.875)	—	

The results in parentheses are in terms of gms. $CH_3COOC_2H_5$ per 100 gms. H_2O, and are the averages of a large number of determinations made by the synthetic, sealed tube method, by Schlesinger and Kubasowa, 1929.

The following results for the solubility of ethyl acetate in water, in terms of molecular percent are by Kendall and Harrison, 1928.

t°	Mol. Percent $CH_3COOC_2H_5$ in sat. sol.	t°	Mol. Percent $CH_3COOC_2H_5$ in sat. sol.
0	2.08	30	1.42
10	1.79	37	1.34
20	1.58	40	1.31
25	1.48	50	1.21

These authors also give the following results for the freezing point of aqueous solutions of ethyl acetate.

t°	Mol. Percent $CH_3COOC_2H_5$ in solution	t°	Mol. Percent $CH_3COOC_2H_5$ in solution
-0.190	0.181	1.431	1.362
-0.398	0.379	1.797	1.718
-0.594	0.574	2.034	1.945
-1.007	0.963	2.224	2.134

ETHYL ACETATE

SOLUBILITY OF ETHYL ACETATE IN AQUEOUS SOLUTIONS.

(Glasstone and Pound, 1925; Glasstone, Dimond and Jones, 1926: Glasstone, Dimond and Harris, 1926.)

These authors have made a very careful and comprehensive study of the solubility of ethyl acetate in aqueous solutions of various salts and sugars. They give results at 25° and at 50° for aqueous solutions of Li Cl, Li Br, Li I, K Cl, K Br, K I, Na Cl, Na Br, Na I, Rb Cl, Rb Br, Rb I, Cs Cl, Cs Br, Cs I, NH_4 Cl, NH_4 Br, NH_4 I, dextrose, levulose, sucrose and lactose. They also give results at 25° for aqueous solutions of $Na NO_3$, $Pb (NO_3)_2$, $NH_4 NO_3$, $CH_3 CO O NH_4$, $K Cr O_4$, $Ca (NO_3)_2$, $Sn (NO_3)_2$, $Ba (NO_3)_2$, $K NO_3$, $Ba Cl_2$, $Cu Cl_2$, $Ni SO_4$, $K_2 SO_4$, $(CO O NH_4)_2$, $Mg SO_4$, $Na_2 SO_4$, $Cu SO_4$, $Zn SO_4$, $K Fe (CN)_6$, $K_3 Fe (CN)_6$, $K Cl O_3$, K F and various mixtures of these salts. The results are, however, all expressed « in terms of the number of *gram molecules of water* required to dissolve one gram molecule of ethyl acetate in the presence of various molecular quantities of added sugar or salt ». The experiments were made for the purpose of explaining the salting-out effect of various compounds. It was concluded from the results that the hydration of the salt may be one of the factors responsible for the salting-out effect; this effect may, however, be due to some other fundamental property of salt ions or molecules. The salting-out power of a mixture is, in general, equal to the sum of the salting-out powers of the constituents, provided allowance is made for the electrical interaction of the ions. The salting-out effect cannot be utilized for the detection of complex ion formation.

In spite of the undoubted interest of these results as quantitative solubility measurements, their recalculation to the more usual terms of expression would involve a considerable effort. Furthermore, since they are published in one of the most easily accessible journals there appears less need for their reproduction in the present compilation.

SOLUBILITY OF ETHYL ACETATE IN AQUEOUS SOLUTIONS OF :

(von Euler and Rudberg, 1924.)

Lithium Nitrate at 29°.7.

Gm. mols. per liter.	
$Li NO_3$.	$CH_3 COO C_2 H_5$.
0.00	0.791
0.0362	0.787
0.0723	0.784
0.1810	0.764

Potassium Nitrate at 30°.1.

Gm. mols. per liter.	
$K NO_3$.	$CH_3 COO C_2 H_5$.
0.000	0.779
0.100	0.756
0.250	0.734

SOLUBILITY OF ETHYL ACETATE AT 16°-16°.5 IN AQUEOUS SOLUTIONS OF :

(Linde 1917. 1926.)

Sodium Chloride.

Mols. Na Cl. per liter.	Gms $CH_3 COO C_2 H_5$ per 100 cc. solvent.
0.125	11.5 (12.7)
0.25	10.75 (11.6)
0.50	9.9 (10.8)
0.75	9.0 (10.0)
1.00	8.4 (9.2)

Sodium Nitrate.

Mols. $Na NO_3$ per liter.	Gms $CH_3 COO C_2 H_5$ per 100 cc. solvent.
0.00	12.5
0.25	12.0
0.50	11.8 (13.5)
0.75	11.5
1.00	11.4 (13.3)

The results in parentheses show the grams of $CH_3 CO O C_2 H_5$ per 100 cc. of salt solution made with 0.95 normal $C_2 H_5 OH$ instead of water.

100 cc. sat. solution of ethyl acetate in aqueous 1.0 normal aniline nitrate contain 12.5 gms $CH_3 CO O C_2 H_5$ at 18°. (von Euler and Svanberg, 1917, 1926.)

SOLUBILITY IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 28°.

(Euler — Z. physik. Chem. 31, 365, '99; 49, 306, '04.)

Solvent.	Conc. of Salt Solution.		$CH_3COOC_2H_5$ per Liter.		Solvent.	Conc. of Salt Solution.		$CH_3COOC_2H_5$ per Liter.	
	Normality.	Gms. per Liter.	Gram Mols.	Grams.		Normality.	Gms. per Liter.	Gram Mols.	Grams.
Water	0	0	0.825	75.02	NaCl(at 18°)	¼	14.62	0.76	67.0
KNO_3	½	50.59	0.77	67.81	" "	½	29.25	0.67	59.0
"	1	101.19	0.72	63.40	" "	1	58.5	0.51	45.0
"	2	202.38	0.625	55.04	Na_2SO_4	1	71.08	0.465	40.96
KCl	¼	18.4	0.747	65.79	" (at 18°)	½	35.54	0.61	54.0
"	½	36.8	0.685	65.33	" "	1	71.08	0.42	37.0
"	1	73.6	0.575	50.64	$MgSO_4$	¼	16.30	0.733	64.55
"	2	147.2	0.41	36.11	"	½	32.6	0.655	57.68
NaCl	¼	14.62	0.745	65.61	"	1	65.21	0.505	44.47
"	½	29.25	0.677	59.62	$ZnSO_4$	¼	20.18	0.733	64.55
"	1	58.5	0.545	47.99	"	½	40.36	0.653	57.50
"	2	117.0	0.315	27.74	"	1	80.73	0.500	44.03

Additional data for the influence of salts upon the solubility of ethyl acetate in water are given by Lunden ,1913.

SOLUBILITY OF ETHYL ACETATE IN AQUEOUS SALT SOLUTIONS.

(Schlesniger and Kubasowa, 1929.)

The determinations were made by the synthetic, sealed tube method. The results were plotted and average values obtained from the curves.

Composition of aqueous solvent		Gms. $CH_3COOC_2H_5$ dissolved per 100 gms. sat. solution at:						
Salt	Normality	15°	20°	25°	30°	35°	40°	50°
NaCl	0.10	8.672	8.084	7.646	7.302	7.016	6.806	6.457
"	0.25	8.159	7.607	7.171	6.825	6.543	6.297	5.819
"	0.50	7.400	6.872	6.553	6.269	6.017	5.800	5.466
"	1.00	6.002	5.656	5.349	5.083	4.858	4.672	4.422
KBr	0.10	8.926	8.372	7.947	7.573	7.250	6.979	6.589
"	0.25	8.528	8.008	7.557	7.232	6.859	6.612	6.324
"	0.50	7.936	7.437	7.010	6.656	6.373	6.163	5.958
"	1.00	7.071	6.659	6.293	5.972	5.698	5.469	5.151
KI	0.10	8.810	8.444	8.042	7.699	7.377	7.114	6.727
"	0.25	8.778	8.303	7.895	7.531	7.233	6.995	6.695
"	0.50	8.820	8.213	7.817	7.416	7.082	6.816	6.486

SOLUBILITY OF ETHYL ACETATE IN AQUEOUS SOLUTIONS OF SODIUM SALTS OF ORGANIC ACIDS AT 18°.

(Traube, Schöning and Weber, 1927.)

Composition of aqueous solvents		cc $CH_3COOC_2H_5$ per
Salt	Normality	5cc of the aqueous solvent
Sodium butyrate	Almost saturated	0.5
Sodium benzoate	0.0	0.45
" "	saturated	1.3
Sodium salicylate	1.0	1.3
" "	1.5	1.8
" "	saturated	∞

100 gms. aqueous 0.4 normal Sodium Oleate Solution (= 10.8 gm. Na oleate

SOLUBILITY OF ETHYL ACETATE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(Seidell, 1910.)

Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	cc. $CH_3COOC_2H_5$ per 100 cc. Solvent.	Gms. $CH_3COOC_2H_5$ per 100 Gms. Solvent.
0	0.999	10	8.6
5	0.993	10.5	9.5
10	0.986	12	10.9
15	0.974	15	13.3
20	0.960	27	19.6
25	0.945	44	37.0
30	0.931	70	66.7
35	0.918	125	132.5
40	...	∞	∞

A second phase separates from a mixture of 3.0 cc of C_2H_5OH + 3.0 cc of $CH_3COOC_2H_5$ upon the addition of 6.0 cc of H_2O at room temperature.
(Pfeiffer, 1892.)

EQUILIBRIUM IN THE SYSTEM ETHYL ACETATE, FURFURAL AND WATER AT 25°.

(Lloyd, Thompson and Ferguson, 1937.)

The binodal curve was determined by the titration method. Tie lines were located by weighing the two layers separating from a mixture of known composition and analysing one of these for furfural, by the colorimetric method.

Gms. per 100 gms. homogeneous mixture			Gms. per 100 gms. homogeneous mixture		
H_2O	$C_4H_3OCH_3$	$CH_3COOC_2H_5$	H_2O	$C_4H_3OCH_3$	$CH_3COOC_2H_5$
92.44	0.0	7.56	4.9	74.7	10.4
91.7	1.7	6.6	4.6	71.9	23.5
91.2	3.9	4.9	4.8	60.7	34.5
91.5	5.3	3.2	4.4	51.4	44.2
91.1	6.5	2.4	4.1	33.3	62.6
91.3	6.8	1.9	4.2	21.9	73.9
92.0	7.4	0.6	4.3	15.8	79.9
92.3	7.7	0.0	3.4	6.9	89.7
5.3	94.7	0.0	3.5	3.3	93.2
5.1	86.3	8.6	3.24	0.0	94.76

The percentage of furfural in three adjoining layers was found to be:

Layer I	3.8	5.0	6.7
Layer II	31.9	70.5	90.1

FREEZING-POINTS OF MIXTURES OF ETHYL ACETATE AND ETHYL ALCOHOL.

(Sapgir, 1929.)

t°	Gms. $CH_3COOC_2H_5$ per 100 gms. mixture	t°	Gms. $CH_3COOC_2H_5$ per 100 gms. mixture
-83.6	100	- 96.5	41.5
-87	88.6	-110.0	28.5

Freezing-point data are also given for mixtures of Ethyl Acetate and:

Tri chloro Acetic Acid (1)	Carbon Tetrachloride(4)
Aniline (2)	Methyl formate (3)
Carbon Disulfide (3)	Nitrobenzene (5)

(1) Kendall and Booge, 1916; (2) Wroczynski and Guye, 1910; (3) Sapgir, 1929; (4) Wyatt, 1929; (5) Timmermans, 1931.)

METHYL PROPIONATE $C_2H_5COOCH_3$.

RECIPROCAL SOLUBILITY OF METHYL PROPIONATE AND WATER.

(Kendall and Harrison, 1928.)

t^o	Mol. Percent $C_2H_5COOCH_3$ in sat. solution	t^o	Mol. Percent $C_2H_5COOCH_3$ in sat. solution
− 2.1	1.95	20.0	1.47
+ 1.0	1.80	27.1	1.40
11.5	1.58	32.5	1.38
14.9	1.53	42.7	1.33

The authors also give the following freezing points of aqueous solutions of methyl propionate:

t^o	Mol. Percent $C_2H_5COOCH_3$ in solution	t^o	Mol Percent $C_2H_5COOCH_3$ in solution
−0.059	0.065	0.776	0.752
−0.141	0.151	0.896	0.862
−0.318	0.339	0.978	1.035
−0.425	0.451	1.415	1.364
−0.510	0.524	1.828	1.748
		2.037	1.948

n PROPYL FORMATE $HCOOC_3H_7$.

RECIPROCAL SOLUBILITY OF n PROPYL FORMATE AND WATER.

(Kendall and Harrison, 1928.)

t^o	Mol. Percent $HCOOC_3H_7$ in sat. sol.	t^o	Mol. Percent $HCOOC_3H_7$ in sat. sol.
− 1.0	0.760	20.0	0.589
+ 4.0	0.695	30.0	0.569
6.0	0.670	34.0	0.555
12.5	0.620	45.0	0.535

The authors also give the following freezing-points of aqueous solutions of n Propyl Formate.

t^o	Mol. Percent $HCOOC_3H_7$ in solution	t^o	Mol. Percent $HCOOC_3H_7$ in solution
−0.071	0.077	−0.575	0.567
−0.082	0.091	−0.620	0.600
−0.236	0.248	−0.721	0.680

BUTYRIC ACIDS (normal) $CH_3(CH_2)_2COOH$; (iso) $(CH_3)_2CH.COOH$.

SOLUBILITY OF NORMAL BUTYRIC ACID IN WATER, DETERMINED BY THE FREEZING-POINT METHOD. (Faucon, 1909, 1910.)

t° of Congealing.	Gms. Acid per 100 Gms. Mixture.	t° of Congealing.	Gms. Acid per 100 Gms. Mixture.	t° of Congealing.	Gms. Acid per 100 Gms. Mixture
0	0	− 3.57	67.38	−13.40	87.62 Eutec.
−1.08	5.12	− 5.20	75	−12.40	90.08
−2.70	12.75	− 6.80	80	−10	95.92
−2.96	25.32	− 8.61	84	− 8	98.60
−3.07	50.60	−10.25	85.41	− 5.40	99.15
−3.14	59.72	−12.54	86.54	− 3.12	100

Higher values for the temperature of congealing of the above mixtures are given by Ballo (1910). For additional data see also Timmermans (1907) and Tsakalotos (1914). Data for the miscibility of normal butyric acid and water are also given by Faucon. The curve is entirely in the metastable region. The mixtures are either opalescent or completely homogeneous and never form two distinct layers, even with the application of centrifugal force. The results are as follows:

t° of opalescence	−5.2	−4.2	−4	−3.8 crit. t.	−4.5	−7
Gms. acid per 100 gms. mixture	25	30	35	40	50	58.2

SOLUBILITY OF ISOBUTYRIC ACID IN WATER, DETERMINED BY THE FREEZING-POINT METHOD. (Faucon, 1910.)

The congealing temperatures for mixtures containing up to 60 grams isobutyric acid per 100 gms. coincide with the results given in the above table for normal butyric acid and water. For higher concentrations the following results were obtained.

t° of congealing	−3.09	−3.35	−3.61	−12.5	−80
Gms. acid per 100 gms. mixture	70.10	82.08	86.44	97.21	100

MISCIBILITY OF ISOBUTYRIC ACID AND WATER, DETERMINED BY THE "SYNTHETIC METHOD."

(Smirnoff, 1907.)

	Gms. Acid per 100 Gms.:	
t°.	Upper Layer.	Lower Layer.
10.05	69.08	17.82
12	67.1	18.3
14	64.9	19.1
16	62.3	20
18	59.2	21.1
20	55.4	22.8
22	49	25.8
22.5	46	27
23	41	29
23.3 crit. t.	34.7	

Determinations varying more or less from the above are given by Rothmund (1898), Friedlander (1901) and Faucon (1910). The discrepancies are shown by Smirnoff to be due to the effect of variations in purity of the isobutyric acid upon the position of the curve. Smirnoff fractionated the purest obtainable acid and determined the miscibility curve for each fraction. The above results were obtained with fraction 4 of boiling point 154°–155°, twice refractionated.

An extensive series of determinations are given by Smirnoff of the effect of various percentages of different salts upon the temperature of immiscibility of aqueous 16.46% isobutyric acid solution.

A later determination of the reciprocal solubility of iso butyric acid and water at 20°, reported by Jones, 1929, agrees with the above result of Smirnoff, 1907.

Other determinations of the critical solution temperatures of mixtures of normal and of iso butyric acids and water are as follows:

Mixture	c.s.t.	Gms. $C_4H_8O_2$ per 100 gms. sat. sol.	Authority
Normal acid + H_2O	-1.1	26	Howard and Patterson, 1926.
" " + "	-4.1	—	Timmermans & Hennaut-Roland, 1932.
" " + "	-1.6	33	Patterson, 1938.
iso " + "	+17.7	30	Howard and Patterson, 1926.
" " + "	26.2	—	Timmermans and Delcourt, 1934.
" " + "	21.9	32	Patterson, 1938.

Results showing that the critical solution temperatures of normal and of iso butyric acids and water are raised respectively 23.6° and 19.5° by replacement of ordinary with heavy water (Deuterium Oxide) are given by Patterson, 1938. Timmermans and Poppe, 1935a, report an elevation of 23.45° in the case of normal butyric acid and heavy instead of ordinary water. A method for estimating various percentages of deuterium oxide in ordinary water, based upon the degree of elevation of the critical solution temperatures of normal and of iso butyric acids, is proposed by Patterson, 1938.

Results showing the elevation of the critical solution temperature of iso butyric acid and water caused by the presence of hydrochloric acid and of various salts and their mixtures are given by Carter and Megson, 1927.

THE MUTUAL SOLUBILITY OF ISO BUTYRIC ACID AND WATER AT HIGH PRESSURES.

(Timmermans, 1922.)

The following determinations of the critical temperature of solution at high pressures are given.

The constants of the iso butyric acid were, b. pt. = 154°.35, f. pt. —4°.7, $d_4^{0} = 0.96819$.

Pressure in kilograms.	Critical temp. of solution.	Pressure in kilograms.	Critical temp. of solution.
1	26.4	300	9.40
50	23 76	475	0.0
100	21.14	525	—2.6
170	17.34	(ord. pressure)	—3.0 (cryst. pt. of triphase system)

DISTRIBUTION OF NORMAL BUTYRIC ACID BETWEEN:

Water and Chloroform at 25°. (Smith, 1921-1922.)

Millimols. $CH_3(CH_2)_2COOH$ per liter of H₂O layer (C_1).	Millimols. $CH_3(CH_2)_2COOH$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.040	0.488	0.470
1.169	0.574	0.491
1.402	0.710	0.506
1.680	0.866	0.516
2.290	1.252	0.546
3 930	2.190	0.557

Water and Ethyl Ether

at 25°. (Smith, 1921-1922.)

Millimols. $CH_3(CH_2)_2COOH$ per liter in H_2O layer (C_1).	Millimols. $CH_3(CH_2)_2COOH$ per liter in $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.335	1.40	4.18
0.59	2.65	4.50
1.60	5.02	4.73
1.80	9.20	5.12
2.64	14.04	5.32

at 21°. (Behrens, 1926.)

Concentration in H_2O layer (C_1).	Concentration in $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.01214	0.0744	6.13
0.0181	0.1136	6 28
0.0228	0.1469(12°)	6.44
0.0264	0.1707	6.46
0.0407	0.2763	6.79

DISTRIBUTION OF NORMAL BUTYRIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Xylene.

Millimols. $CH_3(CH_2)_2COOH$ per liter of

H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
4.500	0.700	0.156
6.475	1.025	0.158
8.20	1.30	0.159

Acetone and Glycerol.

Millimols. $CH_3(CH_2)_2COOH$ per liter of

Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.
0.275	3.45	12.5
0.50	6.4375	12.8
1.15	14.60	12.7
2.10	26.65	18.7

DISTRIBUTION OF BUTYRIC ACID AT 25° BETWEEN WATER AND COTTON SEED OIL.

(Gordon and Reid, 1922.)

Gms. Butyric Acid per 100 gms.	
H_2O layer.	Oil layer.
2.7	1.11
5.0	2.85
9.2	6.96

Gms. Butyric Acid per 100 gms.	
H_2O layer.	Oil layer.
14.0	10.45
30.5	20.8
41.3	22.8

DISTRIBUTION OF ISO BUTYRIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Benzene.

Millimols. $(CH_3)_2CHCOOH$ per liter of

H_2O layer (C_1).	C_6H_6 layer (C_2).	$\frac{C_2}{C_1}$.
2.415	0.410	0.170
3.75	0.7125	0.190
9.60	2.20	0.230
18.90	5.0	0.264

Water and Carbon Tetrachloride.

Millimols. $(CH_3)_2CHCOOH$ per liter of

H_2O layer (C_1).	CCl_4 layer (C_2).	$\frac{C_2}{C_1}$.
4.775	0.305	0.0639
7.10	0.595	0.0838
9.25	1.05	0.1135
13.80	1.725	0.125
17.50	2.70	0.154

Water and Chloroform.

Millimols. $(CH_3)_2CHCOOH$ per liter of

H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.025	0.350	0.342
2.100	0.750	0.357
3.190	1.275	0.400
5.450	2.350	0.431

NOTE. In the series of papers by Smith, 1921-1922, the results for the distribution of butyric acids are given under « *n* butyric acid » and « *sec.* butyric acid. » In the absence of any description or constants of either of the compounds it is assumed that *Iso* butyric acid was employed in all cases referred to under « *sec.* butyric acid ».

DISTRIBUTION OF ISO BUTYRIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Ethyl Ether.

Millimols. $(CH_3)_2CHCOOH$ per liter of

H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.29375	0.85625	2.92
0.500	1.6125	3.22
0.975	3.225	3.30
1.625	5.575	3.43
2.6	8.4	3.23

Acetone and Glycerol.

Millimols. $(CH_3)_2CHCOOH$ per liter of

Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.
0.350	3.40	9.72
0.375	3.375	9.00
0.625	6.825	9.90
0.65	6.80	10.45
1.30	11.85	9.14
2.20	20.20	9.20

DISTRIBUTION OF ISO BUTYRIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Toluene.

Millimols. $(CH_3)_2CHCOOH$ per liter of

H_2O layer (C_1).	$C_6H_5CH_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.975	0.2025	0.1025
3.60	0.50	0.139
8.90	1.65	0.185
15.70	5.50	0.350

Water and Xylene.

Millimols. $(CH_3)_2CHCOOH$ per liter of

H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
3.65	0.574	0.157
9.575	1.625	0.17
18.35	3.50	0.19

Distribution of Normal Butyric Acid at 25° Between Water and:

(Smith and White, 1929.)

Chloroform		Benzene		Toluene	
Gm. Mols. $C_4H_8O_2$ per liter		Gm. Mols. $C_4H_8O_2$ per liter		Gm. Mols. $C_4H_8O_2$ per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	C_6H_6 layer	H_2O layer	$C_6H_5CH_3$ layer
0.00178	0.000924	0.0044	0.0011	0.00457	0.000813
0.00367	0.00213	0.00735	0.00208	0.00781	0.00162
0.00572	0.00348	0.01565	0.00560	0.01651	0.00474
0.01435	0.01258	0.02403	0.01078	0.02541	0.00940
0.02200	0.02500	0.03921	0.02340	0.04143	0.02117
0.03555	0.05505	0.06380	0.05410	0.06775	0.05115
0.05898	0.1269	0.1171	0.1597	0.1249	0.1519
0.09665	0.2982	0.1661	0.3039	0.1794	0.2906
0.1260	0.4710	0.2163	0.4897	0.2341	0.4719

Distribution of Iso Butyric Acid at 25° Between Water and:

(Smith and White, 1929.)

Chloroform		Benzene		Toluene	
Gm. Mols. $C_4H_8O_2$ per liter		Gm. Mols. $C_4H_8O_2$ per liter		Gm. Mols. $C_4H_8O_2$ per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	C_6H_6 layer	H_2O layer	$C_6H_5CH_3$ layer
0.00333	0.00198	0.00774	0.00213	0.00818	0.00173
0.00608	0.00426	0.00995	0.00302	0.01744	0.00539
0.01111	0.00959	0.0164	0.00639	0.02278	0.00850
0.01838	0.02042	0.0215	0.00978	0.03880	0.02082
0.02623	0.03680	0.0364	0.0232	0.05308	0.03662
0.04101	0.07969	0.0493	0.0404	0.09440	0.1088
0.06315	0.1721	0.0877	0.1156	0.09440	0.1088
0.09380	0.3541	0.1470	0.3130	0.1609	0.3001
0.11280	0.4952	0.1906	0.5014	0.2072	0.4848

Distribution of Butyric Acid between Water and Benzene at 13°–15°

(Georgievics, 1913.)

Gms. Butyric Acid Used.	Gms. Acid Found per 150 cc. Benzene Layer.	Gms. Acid Found per 25 cc. H_2O Layer.
2.0044	1.7643	0.2401
2.9968	2.6965	0.3003
3.5028	3.1740	0.3288
4.0088	3.6544	0.3544
4.5342	4.1521	0.3821

The distribution ratio of normal butyric acid between water and benzene at room temperature was found by King and Narracott (1909), to be 1 to 0.7585, and for isobutyric acid, the ratio was 1 to 0.810.

One determination of the distribution of butyric acid between sat. aqueous $CaCl_2$ solution and kerosene gave 7.2 gms. acid per 100 gms. aqueous layer and 92.8 gms. per 100 gms. kerosene layer at ord. temp. (Crowell, 1918.)

Distribution of Normal Butyric Acid Between Water and Benzene at 20°.

(Angelescu and Dutchievici, 1932.)

Gms. $C_4H_8O_2$ per 100 cc		$\frac{1}{2}$	Gms. $C_4H_8O_2$ per 100 cc		$\frac{1}{2}$
H_2O layer(1)	C_6H_6 layer(2)		H_2O layer(1)	C_6H_6 layer(2)	

DISTRIBUTION OF NORMAL BUTYRIC ACID AT 25° BETWEEN WATER AND BENZENE.

(Brown and Bury, 1923.)

Normality of $CH_3(CH_2)_2COOH$ in		Normality of $CH_3(CH_2)_2COOH$ in		Normality of $CH_3(CH_2)_2COOH$ in	
H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.
0.0421	0.0234	0.1617	0.257	0.423	1.116
0.0635	0.0525	0.1844	0.320	0.702	2.344
0.1045	0.1213	0.245	0.522	0.938	2.819
0.1363	0.1941	0.281	0.657	1.369	4.015

DISTRIBUTION OF NORMAL BUTYRIC ACID BETWEEN WATER AND BENZENE.

(Bektourov, 1939a.)

Results at 0°			Results at 25°			Results at 60°		
Gm. Mols. $C_4H_8O_2$ per liter		$\frac{1}{2}$	Gm. Mols. $C_4H_8O_2$ per liter		$\frac{1}{2}$	Gm. Mols. $C_4H_8O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	C_6H_6 layer(2)		H_2O layer(1)	C_6H_6 layer(2)		H_2O layer(1)	C_6H_6 layer(2)	
0.0227	0.00757	2.99	0.0245	0.0156	1.57	0.0379	0.0279	1.360
0.0445	0.0227	1.96	0.0557	0.0390	1.43	0.0769	0.0936	0.835
0.0776	0.0587	1.32	0.0656	0.0545	1.20	0.1003	0.1449	0.692
0.1060	0.1041	1.02	0.1104	0.1412	0.782	0.1758	0.3567	0.493
0.1516	0.2181	0.727	0.1561	0.2899	0.539	0.2451	0.6686	0.367
0.2933	0.6624	0.443	0.2602	0.6913	0.376	0.3791	1.3826	0.274
0.4022	1.2870	0.313	0.3902	1.3937	0.280	0.4906	2.1185	0.232
0.5798	2.3749	0.244	0.5129	2.1631	0.237	0.6021	2.8098	0.214
0.7470	3.6460	0.208	0.7136	3.7018	0.193	0.7916	4.1143	0.192
0.9366	4.8614	0.193	1.0592	6.2440	0.170	1.0035	5.5750	0.198
1.1707	6.7346	0.174	1.1261	6.6454	0.169	1.3116	6.4447	0.204

Similar results for normal butyric acid are also given for 40°.

DISTRIBUTION OF ISO BUTYRIC ACID BETWEEN WATER AND BENZENE.

(Bektourow, 1939a.)

Results at 0°			Results at 60°		
Gm. Mols. $C_4H_8O_2$ per liter		$\frac{1}{2}$	Gm. Mols. $C_4H_8O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	C_6H_6 layer(2)		H_2O layer(1)	C_6H_6 layer(2)	
0.2948	0.9380	0.314	0.0290	0.0268	1.084
0.3015	1.0921	0.276	0.0670	0.0938	0.714
0.4422	2.1306	0.208	0.0938	0.1675	0.560
0.5494	2.8140	0.195	0.1407	0.2881	0.488
0.6030	3.5376	0.170	0.2814	1.0988	0.256
0.7370	4.5560	0.162	0.5762	3.2026	0.180
1.0720	6.6464	0.161	0.7504	4.5962	0.163
1.3400	7.3700	0.182	0.9916	5.7754	0.172

BUTYRIC ACID

DISTRIBUTION OF NORMAL BUTYRIC ACID AT 25° BETWEEN WATER AND:

(Kolossowsky, Kulikow and Bekturow, 1934; 1935.)

Carbon Tetrachloride			Nitro Benzene			Amyl Alcohol		
Gm. Mol. $C_4H_8O_2$ per liter			Gm. Mol. $C_4H_8O_2$ per liter			Gm. Mol. $C_4H_8O_2$ per liter		
H_2O layer(1)	CCl_4 layer(2)	$\frac{1}{2}$	H_2O layer(1)	$C_6H_5NO_2$ layer(2)	$\frac{1}{2}$	H_2O layer(1)	i $C_5H_{11}OH$ layer (2)	$\frac{1}{2}$
0.0152	0.0027	5.70	0.010	0.004	2.5	0.0023	0.0233	0.100
0.0328	0.0096	3.40	0.020	0.010	2.0	0.0046	0.0459	0.100
0.1285	0.0727	1.77	0.054	0.033	1.60	0.0060	0.0589	0.102
0.2040	0.1797	1.14	0.163	0.163	1.00	0.0242	0.2385	0.101
0.3071	0.6520	0.471	0.276	0.452	0.61	0.0405	0.410	0.099
0.8858	4.4528	0.199	0.477	1.104	0.433	0.0907	0.867	0.105
1.2365	6.9694	0.177	0.703	2.360	0.297	0.182	1.562	0.117
1.6471	8.5095	0.194	0.897	3.790	0.236	0.314	2.529	0.124
1.9839	7.6831	0.258	1.029	5.197	0.197	0.584	4.066	0.144
2.4474	6.7618	0.362	1.255	6.654	0.188	1.227	6.138	0.200

DISTRIBUTION OF ISO BUTYRIC ACID AT 25° BETWEEN WATER AND:

(Kolossowsky Kulikow and Bekturow 1934; 1935.)

Carbon Tetrachloride			Nitro Benzene		
Gm. Mols. $C_4H_8O_2$ per liter			Gm. Mol. $C_4H_8O_2$ per liter		
H_2O layer(1)	CCl_4 layer(2)	$\frac{1}{2}$	H_2O layer(1)	$C_6H_5NO_2$ layer(2)	$\frac{1}{2}$
0.01425	0.00302	4.712	0.0748	0.0561	1.33
0.03048	0.01146	2.660	0.1122	0.1029	1.09
0.08922	0.04909	1.818	0.2526	0.3555	0.711
0.1675	0.1698	0.986	0.402	0.917	0.438
0.3048	0.8561	0.356	0.608	1.946	0.321
0.6456	3.2122	0.201	0.720	2.676	0.261
0.9521	5.8062	0.164	0.851	4.266	0.199
1.2888	7.9640	0.162	0.954	5.089	0.187
1.9827(1)	8.6235	0.230			
2.1339(1)	8.0745	0.264			

(1) In these cases the H_2O layer was the lower.

DISTRIBUTION OF ISO BUTYRIC ACID AT 25° BETWEEN WATER AND:

(Kolossowsky Kulikow and Bekturow 1934; 1935.)

Normal Amyl Alcohol			Iso Amyl Alcohol		
Gm. Mol. $C_4H_8O_2$ per liter			Gm. Mol. $C_4H_8O_2$ per liter		
H_2O layer(1)	n $C_5H_{11}OH$ layer(2)	$\frac{1}{2}$	H_2O layer(1)	i $C_5H_{11}OH$ layer(2)	$\frac{1}{2}$
0.00287	0.0262	0.109	0.0748	0.5610	0.133
0.00917	0.0898	0.102	0.1216	0.9729	0.125
0.0209	0.218	0.096	0.1590	1.3100	0.121
0.0945	0.856	0.110	0.2432	1.8900	0.129
0.265	2.110	0.126	0.3461	2.5260	0.137
0.582	3.948	0.147	0.5800	3.6858	0.157
0.907	5.388	0.168	0.7671	4.4156	0.174
1.492	6.273	0.238			

BUTYRIC ACID

DISTRIBUTION OF BUTYRIC ACID AT 25° BETWEEN WATER AND SEVERAL ORGANIC SOLVENTS.

(Archibald, 1932.)

Organic solvent	Gm. Mols. $C_4H_8O_2$ per liter		$\frac{2}{1}$
	H_2O layer(1)	Organic layer(2)	
Ethyl methyl ketone	0.03278	0.16644	5.077
" " "	0.12288	0.61599	5.013
n Butyl alcohol	0.02109	0.18761	8.896
" " "	0.05766	0.50350	8.732
sec " "	0.03125	0.15963	5.108
" " "	0.09123	0.49896	5.470
n Amyl alcohol	0.01552	0.17338	11.171
" " "	0.04667	0.51912	11.123
ter " "	0.01601	0.16697	10.367
" " "	0.05232	0.53505	10.226
Iso propyl ether	—	—	2.90
Ethyl ether	—	—	4.60

DISTRIBUTION OF BUTYRIC ACID AT 25° BETWEEN WATER AND ISO BUTYL ALCOHOL.

(Kolossowski, Kulikow & Bektourow, 1935; Kolossowski, Bektourow and Kulikow, 1936.)

Gm. Mols. $C_4H_8O_2$ per liter		$\frac{1}{2}$	Gm. Mols. $C_4H_8O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	i C_4H_9OH layer(2)		H_2O layer(1)	i C_4H_9OH layer(2)	
0.0032	0.024	0.133	0.214	1.506	0.142
0.0071	0.059	0.120	0.314	2.100	0.150
0.0154	0.142	0.108	0.498	3.072	0.162
0.0259	0.243	0.107	0.640	3.724	0.172
0.0889	0.735	0.121	0.877	4.768	0.184
0.1125	0.887	0.128			

DISTRIBUTION OF BUTYRIC ACID AT 25° BETWEEN WATER AND TOLUENE.

(Kolossowsky and Ponomarev, 1934, 1934a.)

Gm. Equiv. $C_4H_8O_2$ per liter		$\frac{1}{2}$	Gm. Equiv. $C_4H_8O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	$C_6H_5CH_3$ layer(2)		H_2O layer(1)	$C_6H_5CH_3$ layer(2)	
0.0108	0.0018	6.00	0.1324	0.1676	0.790
0.0161	0.0039	4.10	0.1612	0.2888	0.675
0.0231	0.0069	3.32	0.1857	0.3143	0.591
0.0354	0.0146	2.42	0.2913	0.7087	0.411
0.0463	0.0237	1.955	0.613	2.387	0.257
0.0611	0.0389	1.57	0.881	4.119	0.214
0.0826	0.0674	1.225	1.186	5.814	0.204
0.1170	0.1330	0.88	1.406	6.894	0.204

BUTYRIC ACID

DISTRIBUTION OF BUTYRIC ACID AT 25° BETWEEN WATER AND ORTHO NITRO TOLUENE.

(Kolossowsky and Kulikow, 1934.)

Gm. Mols. $C_4H_8O_2$ per liter		$\frac{1}{2}$	Gm. Mols. $C_4H_8O_2$ per liter		$\frac{1}{2}$
H_2O layer (1)	$C_6H_4CH_3NO_2$ layer (2)		H_2O layer (1)	$C_6H_4CH_3NO_2$ layer (2)	
0.0350	0.0164	2.13	0.564	1.448	0.383
0.0567	0.0350	1.62	0.754	2.482	0.304
0.1028	0.0801	1.28	0.878	3.381	0.260
0.1541	0.1513	1.02	1.044	4.852	0.215
0.239	0.319	0.749	1.223	6.418	0.191
0.407	0.780	0.523	1.289	6.540	0.197

DISTRIBUTION OF NORMAL BUTYRIC ACID AND OF ISO BUTYRIC ACID BETWEEN WATER AND PETROLEUM ETHER AT ROOM TEMPERATURE.

(Grossfield and Miermeister, 1932.)

Results for Normal Butyric Acid

cc 0.1 n NaOH per 25 cc		$\frac{1}{2}$
H_2O layer (1)	Pet Ether layer (2)	
0.44	0.041	10.7
0.97	0.058	16.6
1.21	0.063	19.2
3.64	0.188	16.7
8.69	0.988	8.8
19.3	4.46	4.33
47.5	26.3	1.81
72.3	57.7	1.25
117.0	143.0	0.82

Results for Iso Butyric Acid

cc 0.1 n NaOH per 25 cc		$\frac{1}{2}$
H_2O layer (1)	Pet. Ether layer (2)	
0.822	0.088	9.3
1.459	0.126	11.6
5.287	0.663	7.98
13.09	3.31	3.96
36.27	23.48	1.55
70.40	91.60	0.77

DISTRIBUTION OF BUTYRIC ACID AND OF ISO BUTYRIC ACID BETWEEN WATER AND OLIVE OIL.

(Bodansky, 1928; Bodansky and Meigs, 1932.)

Results for Butyric Acid

t°	Gm. Mols. $C_4H_8O_2$ per liter	
	H_2O layer	Oil layer
25	0.0125	0.0198
"	0.0308	0.0488
"	0.0610	0.1010
"	0.120	0.2020
37.5	0.0126	0.0206
"	0.0306	0.0496
"	0.0600	0.1000
"	0.1190	0.201

Results for Iso Butyric Acid

t°	Gm. Mols. $C_4H_8O_2$ per liter	
	H_2O layer	Oil layer
25	0.0310	0.0490
"	0.0620	0.1020
"	0.1180	0.2030
37.5	0.030	0.050
"	0.061	0.102
"	0.118	0.204

TRI BUTYRIN $C_3H_5(C_3H_7COO)_3$.

Results for the reciprocal solubility of tri butyrin and benzene are given by Loskit, 1928.

DISTRIBUTION OF NORMAL BUTYRIC ACID BETWEEN METHYL ALCOHOL AND i OCTANE AT 0°

(Smith and Norton, 1932.)

i Octane = 2.2.4, Tri methyl Pentane

Gm. Mols. $C_4H_8O_2$ per liter i Octane layer(1)	Gm. Mols. $C_4H_8O_2$ per liter CH_3OH layer(2)	$\frac{1}{2}$
0.00691	0.08120	0.0840
0.01898	0.20633	0.0916

DISTRIBUTION OF NORMAL BUTYRIC ACID BETWEEN i OCTANE AND β METHOXY ETHANOL.

(Henriques, 1933.)

t°	Gm. Mol. $C_4H_8O_2$ per liter i Octane layer(1)	Gm. Mol. $C_4H_8O_2$ per liter Ethanol layer (2)	$\frac{1}{2}$	t°	Gm. Mol. $C_4H_8O_2$ per liter i Octane layer(1)	Gm. Mol. $C_4H_8O_2$ per liter Ethanol layer (2)	$\frac{1}{2}$
-19.5	0.0019	0.0822	0.023	0	0.0049	0.104	0.047
"	0.0058	0.2154	0.027	"	0.0099	0.1962	0.050
"	0.0104	0.4103	0.025	"	0.0124	0.2470	0.050
0	0.0034	0.0777	0.044	"	0.0164	0.3022	0.054
"	0.0040	0.0799	0.050	"	0.0211	0.3827	0.055

DATA FOR THE FOLLOWING TERNARY SYSTEMS CONTAINING NORMAL BUTYRIC ACID ARE GIVEN BY TIMMERMANS, 1907.

Normal Butyric acid + Water + Azobenzene.
" " " " + Barium nitrate.
" " " " + Benzophenone.
" " " " + Camphor.
" " " " + Cane sugar.
" " " " + Mannite.
" " " " + Naphthalene.
" " " " + Potassium sulfate.
" " " " + Sodium chloride.

Freezing-point data are given for mixtures of *n* butyric acid and formamide by English and Turner (1915), and for mixtures of trichlorobutyric acid and dimethyl pyrone by Kendall (1914).

Freezing-point lowering data for mixtures of butyric acid and *o* phenylene diamine are given by Kremann, Weber and Zechner, 1925.

Results for mixtures of Iso Butyric acid and Propionic acid and for Iso Butyric acid and Iso Valeric acid are given by Timmermans, 1934.

Oxy**BUTYRIC ACIDS** α and β $CH_3.CH_2.CH(OH)COOH$.

DISTRIBUTION OF α AND OF β OXY BUTYRIC ACIDS AT 25° BETWEEN WATER AND ETHYL ETHER. (Smith, 1921-1922.)

Results for α Oxy Butyric Acid.

Millimols. α $CH_3.CH_2.CH(OH)COOH$ per liter of H_2O layer (C_1).	Millimols. α $CH_3.CH_2.CH(OH)COOH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.7625	1.0875	0.617
2.875	1.875	0.652
4.1375	2.7125	0.656

Results for β Oxy Butyric Acid.

Millimols. β $CH_3.CH_2.CH(OH)COOH$ per liter of H_2O layer (C_1)	Millimols. β $CH_3.CH_2.CH(OH)COOH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$
1.075	0.375	0.349
1.725	0.600	0.348
3.05	1.075	0.352

DISTRIBUTION OF α OXY BUTYRIC ACID AT 20° BETWEEN WATER AND:

(Dietzel and Schmitt, 1932.)

Ethyl Ether

Gm. Mol. $C_4H_8O_2$ per liter	
H_2O layer	Ether layer
0.232	0.0733
0.412	0.1442
0.592	0.2221
0.817	0.3151
1.177	0.4639

Amyl Alcohol

Gm. Mol. $C_4H_8O_2$ per liter	
H_2O layer	Alcohol layer
0.218	0.2325
0.398	0.4419
0.638	0.7211
0.878	1.0003
1.178	1.3493

DIOXANE, p (1,4) $OCH_2CH_2OCH_2CH_2$.

FREEZING-POINTS OF MIXTURES OF DIOXANE AND WATER.

Results of Gillis
and Delaunois, 1934

t°	Gms. $C_4H_8O_2$ per 100 gms. sat. sol.	Solid Phase
- 1.79	9.382	Ice
- 7.55	25.73	"
-11.2	34.37	"
-13.72	40.81	"
-14.05	43.22	"
-14.82 Eutec.	—	" p$C_4H_8O_2$
- 9.28	50.86	p $C_4H_8O_2$
- 4.35	61.15	"
- 2.51	66.47	"
+ 1.95	80.04	"
3.42	87.35	"
3.87	89.44	"
4.07	90.23	"
4.71	91.87	"
5.27	94.07	"
5.80	95.45	"
7.81	96.97	"
11.6	100.00	"

Results of Hovorka,
Schaefer and Dreisbach, 1936

t°	Mol. fraction $C_4H_8O_2$ in sat. sol.	Solid Phase
-10.1	0.0855	Ice
-10.8	0.0905	"
-11.6	0.1011	"
-12.7	0.1140	"
-14.9 Eutec.	0.1515	" + p $C_4H_8O_2$
-11.1	0.1830	p $C_4H_8O_2$
- 3.6	0.2500	"
- 0.7	0.3219	"
+ 1.0	0.4007	"
1.5	0.4285	"
2.8	0.5202	"
3.7	0.6074	"
3.9	0.6351	"
5.0	0.7296	"
5.4	0.7633	"
7.5	0.8760	"
8.7	0.9208	"
11.78	1.000	"

The curve of Gillis & Delaunois shows a peculiar trend in the region of high dioxane content which was not found by Hovorka, Schaefer and Dreisbach. Results for the boiling points, densities and refractive indices of aqueous dioxane mixtures are given by Gillis and Delaunois. Results for the densities, refractive indices, surface tensions, vapor pressures and partial molar volumes of mixtures of water and dioxane are given by Hovorka, Schaefer and Dreisbach.

Freezing-point data are given for:

p Dioxane	+ Butanol	(Getman, 1937.)
	+ Di Iodo Ethane	(Rheinboldt and Luyken, 1932.)
	+ Di Iodo Ethylene	" " "

DIMETHYL GLYOXIME $CH_3C(:NOH)C(:NOH)CH_3$.

Freezing-points of mixtures of dimethyl glyoxime and antipyrine, of methyl glyoxime and antipyrine and of methyl ethyl glyoxime and antipyrine are given by Semeria and Bocca, 1926.

SUCCINAMIDE $(CH_2)_2(CONH_2)_2$.

100 cc. H_2O dissolve 1.836 gm. succinamide at 50°. (Viseur, 1926.)

Freezing-point data for mixtures of succinamide and Fumaride and of succinamide and malemanide are given by Viseur, 1926.

MALAMIDE (Malic amide) l $C_2H_3(OH)(CONH_2)_2$.

FREEZING-POINTS OF MIXTURES OF LAEVO MALAMIDE AND WATER.

(Timmermans and Mme. Vesselovsky, 1932.)

t°	Gms. $C_4H_8O_3N_2$ per 100 gms. H_2O	t°	Gms. $C_4H_8O_3N_2$ per 100 gms. H_2O
-0.75	5.0	-2.45	20.0*
-1.35	10.0	-3.55	30.0*
-2.0	15.0	-4.20	40.0*

* Metastable region. The eutectic point is at -2.30°.

These authors also give data for the freezing-points of mixtures of d and l malamide and of mixtures of malamides and tartaric amides.

GLYCYLGLYCINE

$NH\langle\begin{smallmatrix}CO.CH_2NH_2\\CH_2COOH\end{smallmatrix}$

Solvent.	t°.	Gms. $C_4H_8O_3N_2$ per 100 cc. sat. sol.	Authority.
Water.......	18.5	19.09	(von Euler and Rudberg, 1924, 1925.
....	21.0	19.81	(Pfeiffer and Angern, 1924.)
Aq. 0.1*n* NaCl	18.5	10.57	(von Euler and Rudberg, 1924, 1925.)

SOLUBILITY OF GLYCYL GLYCINE IN AQUEOUS ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1935.)

Vol. Percent C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mol. $C_4H_8O_3N_2$ per liter sat. solution	Vol. Percent C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mol. $C_4H_8O_3N_2$ per liter sat. solution
0.0	1.0779	1.512	80.0	0.8554	0.00374
20.0	1.0019	0.531	90.0	0.8250	0.000493
40.0	0.9541	0.152	100.0	0.7851	0.0000222
60.0	0.9082	0.0362			

ASPARAGINE $C_4H_8N_2O_3.H_2O$.

SOLUBILITY β-l-ASPARAGINE, $C_4H_8N_2O_3.H_2O$, AND OF β-l-ASPARAGINIC ACID, $C_4H_7NO_4$, IN WATER.

(Bresler — Z. physik. Chem. 47, 613, '04.)

β-l-Asparagine.				β-l-Asparaginic Acid.			
t°.	Gms. $C_4H_8N_2O_3.H_2O$ per 100 g. H_2O.	t°.	Gms. $C_4H_8N_2O_3.H_2O$ per 100 g. H_2O.	t°.	Gms. $C_4H_7NO_4$ per 100 g. H_2O.	t°.	Gms. $C_4H_7NO_4$ per 100 g. H_2O.
0.7	0.9546	55.5	10.650	0.2	0.2674	51.0	1.2746
7.9	1.4260	71.7	19.838	9.5	0.4042	63.5	1.8147
17.5	2.1400	87.0	36.564	16.4	0.5176	70.0	2.3500
28.0	3.1710	98.0	52.475	31.5	0.7514	80.5	3.2106
41.4	5.6500			40.0	0.9258	97.4	5.3746

100 gms. H_2O dissolve 2.4 gms. asparagine at 20°–25°. (Dehn, 1917.)
100 gms. pyridine dissolve 0.03 gm. asparagine at 20°–25°. "
100 gms. 50% aq. pyridine dissolve 0.15 gm. asparagine at 20°–25°. "
100 gms. trichlorethylene dissolve 0.018 gm. asparagine at 15°. (Wester & Bruins, 1914.)

Data for the solubility of asparaginic acid in aqueous salt solutions are given by Würgler (1914).

100 cc. sat. solution of Asparigine in Water contain 1.12 gm. $C_4H_8N_2O_3$ at 21-22° (Pfeiffer and Angern, 1924.)
100 gms abs Alcohol dissolve 0.02 gm. Asparigine at 20–25° (Pucher and Dehn, 1921)
» Quinoline » 0.11 » » » » »
» equi. mol. mixture of Alcohol and Quinoline dissolve 0.18 gm. Asparigine at 20–25° (Pucher and Dehn, 1921.)

SOLUBILITY OF l ASPARAGINE IN WATER.

(Dalton and Schmidt, 1935.)

The results of 26 determinations at nine temperatures between 0° and 65° were used for calculating the solubility equation and from this the following values for 5° intervals were obtained. The results above 70° are probably less accurate than those at lower temperatures. Density determinations at 25° for solutions less than saturated are also given.

t°	Gms. $C_4H_8O_3N_2 \cdot H_2O$ per 100 gms. H_2O	t°	Gms. $C_4H_8O_3N_2 \cdot H_2O$ per 100 gms. H_2O	t°	Gms. $C_4H_8O_3N_2 \cdot H_2O$ per 100 gms. H_2O
0	0.849	30	3.779	60	13.68
5	1.105	35	4.750	65	16.62
10	1.429	40	5.937	70	20.06
15	1.838	45	7.377	75	24.09
20	2.351	50	9.118	100	55.17
25	2.989	55	11.20		

FREEZING-POINTS OF AQUEOUS SOLUTIONS OF l ASPARAGINE.

(Timmermans and Heuse 1931.)

t°	Gms. $C_4H_8O_3N_2$ per 100 gms. H_2O	t°	Gms. $C_4H_8O_3N_2$ per 100 gms. H_2O
-0.09	0.45	-0.16 Eutec.	0.82
-0.12	0.63	-0.17	0.90
-0.15	0.75	-0.23	1.40

SOLUBILITY OF l ASPARAGINE IN AQUEOUS ETHYL ALCOHOL AT 25°.

(McMeekins Cohn and Weare 1936.)

Vol. Percent C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mol. $C_4H_8O_3N_2$ per liter sat. sol.
0.0	1.0072	0.186 (24.57 gms.)
20.0	0.9761	0.075
40.0	0.9473	0.0306
60.0	0.9068	0.0105
100.0	0.7852	0.000023

Freezing-point data are given for:

l Asparagine + l dichloro succinic acid (Timmermans, Van Lancken and Jaffe, 1939.)
" + d " " " " "
" + d Tartaric acid + H_2O (Timmermans and Heuse, 1941.)
" + phenyl glycolic acid (Timmermans and Motiuk, 1942.)

METHYL HYDANTOIC ACID $NH_2CONHCH(CH_3)COOH$.

SOLUBILITY OF METHYL HYDANTOIC ACID IN AQUEOUS ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1936.)

Vol. Percent C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mol. $C_4H_8O_3N_2$ per liter sat. sol.	Vol. Percent C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mol. $C_4H_8O_3N_2$ per liter sat. sol.
0.0	1.0045	0.193	60.0	0.9160	0.223
20.0	0.9795	0.187	80.0	0.8649	0.173
40.0	0.9541	0.212	100.0	0.7877	0.044

β ALANINE HYDANTOIC ACID $C_4H_8O_3N_2$.

SOLUBILITY OF β ALANINE HYDANTOIC ACID IN WATER AND IN ETHYL ALCOHOL.

(McMeekin, Cohn and Weare, 1936.)

Solvent	t°	d. of sat. sol.	Gm. Mol. $C_4H_8O_3N_2$ per liter sat. sol.
Water	25	1.00287	0.158
Ethyl alcohol	25	0.78692	0.017

Ethyl, Methyl, etc. **ALLOPHANATES** $NH_2.CO.NH.COOC_2H_5$.

SOLUBILITIES IN ETHYLALCOHOL AND IN ETHER. (Béhal, 1919.)

As a method of isolation and identification, an extensive series of alcohols were converted into the corresponding allophanates by the action upon them of cyanic acid. This gas was prepared by the depolymerization of cyanuric acid at about 300° in a very slow current of CO_2, and when passed into the cooled alcohol gave rise to the general reaction, $2\ O.C.NH + C_2H_5OH = NH_2.CO.NH.COOC_2H_5$, which proceeded rapidly with evolution of heat and brisk solidification of the mixture. In each case the product, after cooling, was washed with ether, to remove unchanged alcohol and urethan, which is simultaneously formed in greater or less amount. The allophanates were then each purified by dissolving in warm alcohol, benzene or acetone and crystallizing by cooling. They were all crystalline and only slightly soluble in alcohol and ether. The author does not describe the procedure followed in determining the solubilities which he reports. In a private communication he states that « 10 cc. of each of the saturated solutions were evaporated to dryness and the residue weighed after standing in a desiccator containing sulfuric acid ». The figures in parentheses show the melting-points of the allophanates.

Allophanate of : (Primary alcohols).	t°.	Gms. Allophanate per 10 cc. of		Allophanate of : (Primary alcohols)	t°.	Gms. Allophanate per 10 cc. of	
		Alcohol.	Ether.			Alcohol.	Ether.
Ethyl (190°).....	20	0.455	0.080	Heptyl (160°).....	17	0.350*	0.120
Methyl (212°)...	17	0.140	0.030	Octyl (157°)......	17	0.220*	0.140
Propyl (175°.5) .	17	0.750	0.139	Nonyl (158°)	17–13	0.120*	0.091
n Butyl (150°)..	18	1.230	0.246	Decyl (159°)......	17	0.054*	0.058
Iso Butyl (180°.5)	15	0.947	0.302	Undecyl (155°) ...	13	0.105*	0.117
Iso Amyl (150°).	13	1.411*	0.698	Dodecyl (159°.5)..	17	0.015*	0.025
Hexyl (165°)...	17	0.480*	0.120	Allyl (165°).......	18	0.855	0.212
Iso Hexyl (190°)	14	0.471*	0.220*	Undecylenyl (143°)	17	0.642	0.181

* Absolute alcohol or ether was used in these cases.

SOLUBILITIES OF ALLOPHANATES IN ETHYLALCOHOL AND IN ETHER (*Con.*).

Allophanates of Secondary and Tertiary alcohols.	°	t°.	Gms. Allophanate per 10 cc. of	
			Alcohol.	Ether.
Propanol.2	(180)...	16	0.815*	0.521*
Me Et Carbinol	(159.5).	18	0.748	0.571
Me Pr »	(154)...	18	0.535	0.531
Di Et »	(179.5).	18	0.996	0.457
Me Bu »	(175)...	17	0.970	0.300
Et iso Pr »	(179)...	19	1.361*	0.485
Me iso Bu »	(161)...	16.5	0.288	0.198
Di Pr »	(206)...	16.5	0.410	0.191
Octyl »	(155)...	14	0.304*	0.069
Di iso Bu »	(156)...	16.5	1.158	1.064
Tri Me »	(190)...	15	0.723*	0.299
Amyl »	(152)...	16	1.125*	0.289
Hexyl (1)	(128)...	16	2.400*	0.965
Heptyl (2)	(132)...	14	0.920*	0.446
Octyl (3)	(149)...	16	1.144*	0.531*
Nonyl (4)	(145)...	16	1.340*	0.891*
Di Me (5)	(113.5).	14	0.642*	0.793*

* In absolute alcohol or ether.

Allophanates of Aryl alcohols, Cyclic alcohols, and Phenols.	°	t°	Gms. Allophanate per 10 cc. of	
			Alcohol.	Ether.
Benzyl	(121)...	17	0.220	0.050
Phenylethyl	(186)...	17	0.080	0.033
» propyl	(165)...	16.5	0.157	0.089
Me Saligenine	(180)...	17	0.106	0.064
Anisyl	(180.2).	17	0.070	0.016
Et Vanillyl	(173)...	17	0.039	0.014
Piperonyl	(176.5).	16.5	0.066	0.023
Phenyl ethyl (Sec.)	(181.5).	19	0.680	0.016
Cyclo (6)	(148)...	17	0.238	0.070
Cinnamyl	(185)...	17	0.810	0.050
Cyclo pentanyl	(179.5).	17	0.978	0.322
» hexanyl	(179)...	20	0.834	0.347
Menthyl	(213)...	18	0.140	0.067
Carvon (7)	(192.3).	17	0.238	0.026
Menthyl (tery)	(187)...	17	0.180	0.070
Iso pulegyl	(219)...	17	0.263	0.222
Phenyl	(180)...	19	0.381	0.036
o cresyl	(185)...	18	0.474	0.063
p »	(194)...	18	0.279	0.093

(1) Methyl-2-pentanol-5; (2) Dimethyl-2.4-Pentanol-2; (3) Ethyl-3-Hexanol-3; (4) Methyl-2-Ethyl-4 Hexanol-4; (5) Dimethylnonylcarbinol; (6) Cyclohexylbutanyl; (7) Carvon menthyl.

TARTRAMIDE d $(CHOH.CONH_2)_2$.

FREEZING-POINTS OF MIXTURES OF DEXTRO TARTRAMIDE AND WATER.

(Timmermans and Mme. Vesselovsky, 1932.)

t°		Gms. $C_4H_8O_4N_2$ per 100 gms. H_2O
-0.40		3.0
-0.75		6.0
-0.80	Eutectic	—
-1.00		9.0
-1.30		12.0

Freezing-point data are also given for mixtures of d and l Tartramide and for mixtures of tartramide and malamide.

BUTYL BROMIDE, CHLORIDE, IODIDE etc.

APPROXIMATE SOLUBILITY OF EACH IN WATER.

(Fuhner, 1924.)

Componnd.	Formula.		t°.	Gms. compd per 100 gms sat. sol.
Butyl bromide.....	$CH_3(CH_2)_2CH_2Br$	(1.23)	16	0.058
Iso Butyl bromide.....	$(CH_3)_2CH.CH_2Br$	(1.21)	18	0.051
Butyl chloride.....	$CH_3(CH_2)_2CH_2Cl$	(0.86)	12.5	0.066
Iso Butyl chloride.....	$(CH_3)_2CH.CH_2Cl$	(0.86)	12.5	0.092
Butyl iodide.......	$CH_3(CH_2)_2CH_2I$	(1.54)	17.5	0.021
Iso Butyl urethan.....	$(CH_3)_2CH.CH_2NHCO_2.C_2H_5$		15.5	2.00

The figures in parentheses are the approximate specific gravities of the compounds.

100 gms. H_2O dissolve 0.608 gm. C_4H_9Br at 30°. (Gross and Saylor, 1931.)

Freezing-point data are given by Timmermans, 1934, for the following mixtures.

n Butyl Bromide + Ethyl Bromide
" " + iso Butyl "
iso " " + CS_2
" " " + Ethyl Bromide
" " " + n Propyl "

iso Butyl Bromide + ter Butyl Chloride
" " " + Methylene "
" " " + Ethylidene "
n " Chloride + ter Butyl "

dl α AMINO n BUTYRIC ACID $CH_3CH_2CH(NH_2)COOH$.

dl α AMINO iso BUTYRIC ACID $(CH_3)_2C(NH_2)COOH$.

SOLUBILITY OF EACH SEPARATELY IN AQUEOUS ETHYL ALCOHOL SOLUTIONS AT 25°.

(Cohn, McMeekin, Edsall and Weare, 1934.)

Vol. Percent C_2H_5OH in Aq. Solvent	Results for α Amino n Butyric Acid		Results for α Amino Iso Butyric Acid	
	d. of sat. sol.	Gm. Mols. $C_4H_9O_2$ per liter sat. sol.	d. of sat. sol.	Gm. Mols. $C_4H_9O_2$ per liter sat. sol.
0.0	1.0456	1.800(= 185.6 gms.)	1.0312	1.330(= 137.2 gms.
5.0	1.0370	1.634	—	—
10.0	1.0264	1.464	—	—
15.0	1.0166	1.287	—	—
20.0	1.0043	1.082	0.9947	0.775
40.0	0.9629	0.570	0.9577	0.401
60.0	0.9147	0.260	0.9111	0.177
80.0	0.8586	0.0668	0.8578	0.0467
100.0	0.7851	0.0026	—	—

DISTRIBUTION OF α AMINO n BUTYRIC ACID BETWEEN WATER AND BUTYL ALCOHOL AT 25°.

(England, Albert, Jr., and Cohn, 1935.)

Gm. Mols. $C_4H_9O_2$ per liter		$\frac{2}{1}$
H_2O layer(1)	Butyl alc. layer(2)	
0.396	0.0166	0.0420
0.577	0.0228	0.0394
1.094	0.0386	0.0352
1.614*	0.0513*	0.0318

*Saturated with respect to Amino n Butyric Acid.

METHYL URETHAN $CH_3.NHCOOC_2H_5$.

100 gms. H_2O dissolve 222.6 gms. $C_4H_9NO_2$ at 15.5°. (Fühner, 1924.)

BUTANE C_4H_{10}.

SOLUBILITY IN WATER AT t° AND 760 MM.

t°.	0°.	4°.	10°.	15°.	20°.
Vol. C_4H_{10} per 100 vols. H_2O	3.147	2.77	2.355	2.147	2.065

The upper critical solution temperature of Butane in Sulfur Dioxide is -4.7° and the mixture contains 72 Wt. % SO_2. (Seyer and Todd, 1931; Leslie, 1934.)

BUTYL ALCOHOL *normal* $CH_3.(CH_2)_2CH_2OH$.

SOLUBILITY IN WATER, DETERMINED BY THE SYNTHETIC METHOD. (Fühner, 1924.)

t°.	Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.	t°.	Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.	t°.	Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.
0	10.45	40	6.55	80	7.00
10	9.00	50	6.35	90	7.80
20	7.90	60	6.35	100	9.05
30	7.10	70	6.55	110	10.90

The original results were plotted and the above table constructed from the curve.

$C_4H_{10}O_1$

MUTUAL SOLUBILITY OF NORMAL BUTYL ALCOHOL AND WATER.

(Hill and Malisoff, 1926.)

Highly purified butyl alcohol was employed. The determinations were made in the two-bulbed solubility flasks previously described.

(*J. Am. Chem. Soc.*, 45, 1143, 1923.)

	Butyl Alcohol Phase.			Water Phase.	
t°.	Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.	Density of sat. sol.		Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.	Density of sat. sol.
5	80.38	0.8598		9.55	0.9883
10	80.33	0.8562		8.91	0.9877
15	80.14	0.8533		8.21	0.9881
20	79.93	0.8484		7.81	0.9873
25	79.73	0.8450		7.45	0.9865
30	79.38	0.8424		7.38	0.9851
35	78.94	0.8397		6.83	0.9843
40	78.59	0.8365		6.60	0.9831
50	77.58	0.8307		6.56	0.9799
60	76.38	0.8251		6.52	0.9766
70	74.79	0.8190		6.73	0.9731
80	73.53	0.8139	t°	6.89	0.9695
92	69.24		96.79	8.74	
106.1	63.88		113.5	11.74	
122.3	49.85		116.9	14.56	
124.3	42.02		123.4	19.74	
125.15	32.82		124.81	27.36	
			125.10	33.83	
			125.15	40.33	

The quadruple point is at −2°.95. The consolute solution contains 32.5 gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. solution at the critical solution temperature 125°.15. These values as given by Droullon, 1925, are respectively 38.0 gms. and 129°.5. As given by Brun (1925) they are respectively 32.0 gms. and 125°.

MUTUAL SOLUBILITY OF NORMAL BUTYL ALCOHOL AND WATER.

(Jones, 1929.)

The synthetic method was used. It was found that ordinary soda glass could not be used for accurate determinations. Well steamed Pyrex glass gave results identical with those obtained in quartz glass tubes in the neighborhood of the critical solution temperature.

t°	Gms. C_4H_9OH per 100 gms. sat. sol.	t°	Gms. C_4H_9OH per 100 gms. sat. sol.	t°	Gms. C_4H_9OH per 100 gms. sat. sol.
-18.01	12.74(1)	122.45	27.51	124.05	41.90
- 3.11	9.79(1)	124.74	27.88	123.75	44.01
+19.3	6.47(1)	124.74	28.36	122.60	48.01
40.0	6.03(1)	124.73	30.19	115.00	59.80
65.0	6.03	124.75(C.S.T.)	32.9	106.05	61.44
81.0	6.47	124.75	32.85	78.50	76.47
107.72	9.79	124.72	33.79	29.92	79.51
117.49	12.72	124.66	38.05	13.0	80.40
120.30	15.15			5.0	80.82

(1) = the lower miscibility temperature in mixtures which have both a lower and an upper miscibility temperature.

The above results when plotted yield a curve from which the following values for regular intervals of temperature were taken.

t°	Gms. C_4H_9OH per 100 gms.		t°	Gms. C_4H_9OH per 100 gms.	
	H_2O rich phase	C_4H_9OH rich phase		H_2O rich phase	C_4H_9OH rich phase
-15	12.0	81.0	90	7.8	69.8(3)
0	9.1	80.6	100	8.2	66.4
+20	6.4	80.2	105	9.8	64.3(3)
25	7.31	79.69(1)	110	10.2	61.5
25	7.45	79.5((2)	115	11.7	57.8
40	6.0	78.6	120	14.7	52.5
60	6.0	76.2	123	19.0	46.8
75	6.8	73.7 (3)	124.75	32.4	32.4
80	6.4	72.7			

(1) Butler, Thomson and Maclennen, 1933; (2) Stockhardt and Hull, 1931; (3) Mueller, Rigsley and Ferguson, 1931.

The following additional determinations of the mutual solubility of n Butyl alcohol and Water are given by Butler Thomson & Maclennen, 1933.

t°	Gms. C_4H_9OH per 100 gms. sat. sol.	t°	Gms. C_4H_9OH per 100 gms. sat. sol.	t°	Gms. C_4H_9OH per 100 gms. sat. sol.
22.6	7.497	28.06	7.090	27.45	79.50
24.85	7.318	29.18	7.016	23.40	79.73
26.40	7.202	30.83	7.928	18.45	80.01

BUTYL ALCOHOL

100 gms. aq. 0.2 n NaOH dissolve 59.0 gms. n C_4H_9OH at 20°. (Smith, 1932.)

Results showing the effect of Glycine and of α Amino Butyric Acid upon the solubility of Butyl Alcohol in water are given by England and Cohn, 1935.

Equilibrium in the System Normal Butyl Alcohol Benzene and Water at 19°.

(Perrakis, 1925.)

The amount of water required to produce clouding in various mixtures of benzene and butyl alcohol was determined by a titration method.

Wt. % C_4H_9OH in mixture	Gms. H_2O to cause clouding in 100 gms. mixture	Wt. % C_4H_9OH in mixture	Gms. H_2O to cause clouding in 100 gms. mixture
15.75	0.8553	34.92	3.9640
21.02	1.4898	36.78	4.4925
26.68	2.2610	38.54	4.9916
30.26	2.8315	42.28	5.8673
32.84	3.4035	56.16	9.3456

BUTYL ALCOHOL *iso* $(CH_3)_2CH.CH_2OH$.

MUTUAL SOLUBILITY OF ISO BUTYL ALCOHOL AND WATER. (Michels, 1922.)

Commercial iso butyl alcohol was fractionated into 10 portions and only those which distilled at a constant temperature were used for the solubility determinations. The density was 0.8197. The determinations were made by the sealed tube method. The numerous determinations of the author were plotted and the following values obtained from the curve.

	Gms. $(CH_3)_2CH.CH_2OH$ per 100 gms.	
t°.	H_2O rich layer.	Iso Butyl Alcohol rich layer.
−10	13.4	86.2
0	11.5	85.4
+10	9.8	84.4
20	8.5	83.6
30	7.5	82.7
40	7.0	81.6
50	6.6	80.4
60	6.4	79.0
70	6.6	77.2
80	7.2	75.2

	Gms. $(CH_3)_2CH.CH_2OH$ per 100 gms.	
t°.	H_2O rich layer.	Iso Butyl Alcohol rich layer
90	8.1	73.2
100	9.3	70.2
110	11.2	66.7
120	14.0	61.5
125	16.5	57.5
130	21.0	51.5
131	23.0	49.0
132	26.0	45.0
132.8 (crit. t.)	37.0	

A small scale diagram, without numerical data, is given for the above system by Brun, 1925. The critical solution temperature is stated to be 123.5° and the corresponding concentration, 37.5 gms. iso butyl alcohol per 100 gms. sat. solution. This author also gives two diagrams and several determinations of tie lines for the system iso butyl alcohol, ethyl alcohol and water.

BUTYL ALCOHOL (Secondary) $CH_3.CHOH.CH_2CH_3$.

THE MUTUAL SOLUBILITY OF SECONDARY BUTYL ALCOHOL AND WATER AT HIGH PRESSURES. (Timmermans, 1922.)

The following data for the critical temperature of solution at high pressures are given.

The constants of the secondary butyl alcohol were: b. pt. = 99.5°, $d_{\frac{0}{4}}$ = 0.82263.

Pressure in kilograms.	Critical temp of solution.	Pressure in kilograms.	Critical temp of solution.
1	The triphase system crystallizes at −8°.45	800	58.6
100	+5.3	830	Homogeneous at all temps.
200	17.8	800	74.4
300	24.8	700	81.4
400	30.8	600	85.4
500	36.7	120	105.7
600	42.7	1	113.8
700	49.6		

Secondary **BUTYL ALCOHOL** $CH_3.CHOH.CH_2CH_3$.
Iso **BUTYL ALCOHOL** $(CH_3)_2CH.CH_2OH$.

SOLUBILITY OF BUTYL ALCOHOLS IN WATER, "SYNTHETIC METHOD."
(see Note, p. 292)
(Alexejew, 1886.)

	Secondary Butyl Alcohol and Water. Gms. Secondary Butyl Alcohol per 100 Gms.		Iso Butyl Alcohol and Water. Gms. Iso Butyl Alcohol per 100 Gms.	
t°.	Aqueous Layer.	Alcoholic Layer.	Aqueous Layer.	Alcoholic Layer.
−20	27	66	...	...
−10	28	60	...	...
0	27.5	56	13	85
10	26.0	57	...	...
20	22.5	60	9	84
30	18	63.5	...	...
40	16	65.5	7.5	83
60	13	67	7	82
80	15	63	7	77.5
100	20	52	8	72
107 crit. temp.	33		...	...
120			16	62
130			28	50
133 crit. temp.			49	

Additional determinations of the reciprocal solubility of secondary butyl alcohol and water are given by Dolgolenko (1908). This investigator prepared three fractions of 98°–98.6°, 98.6°–99° and 99°–99.5° boiling point respectively, and determined the curve for each fraction and water by the "synthetic method." The first fraction gave a closed curve having both a lower and an upper critical solution temperature, while the other fractions gave curves with only an upper critical solution temperature, and in other respects in fair agreement with the results of Alexejew as shown in the above table. The explanation of this difference in the case of the first fraction, is supposed to be that this fraction contained a larger proportion of tertiary butyl alcohol than the others, due to the lower boiling point of this isomer. Since the tertiary alcohol is entirely miscible with secondary alcohol and water its presence would restrict the boundaries of inhomogeneity and, therefore, tend to favor a closed curve for the system.

SOLUBILITIES, DETERMINED BY THE FREEZING-POINT METHOD ARE GIVEN FOR THE FOLLOWING MIXTURES CONTAINING BUTYL ALCOHOLS.

Isobutyl alcohol + Water	(Dreyer, 1913.)
" " + Liquid CO_2	(Büchner, 1905–06.)
Normal butyl alcohol + Water	(Dreyer, 1913.)
" " " + Liquid CO_2	(Büchner, 1905–06.)
Secondary butyl alcohol + Water	(Dreyer, 1913; Timmermans, 1907, 1910, 1911.)
" " " + " + Hydroquinine	(Timmermans, 1907.)
Tertiary butyl alcohol + Water	(Dreyer, 1913.)

100 gms. sat. solution of sec. Butyl Alcohol in Water contain 20 gms. $CH_3CHOHCH_2CH_3$ at 20°.

100 gms. sat. solution of Water in sec. Butyl Alcohol contain 37 gms. H_2O at 20°. (Jones, 1929.)

SOLUBILITY OF ISO BUTYL ALCOHOL IN WATER.

(Jänecke, 1933.)

The determinations were made by the synthetic, sealed tube, method.

t°	Gms. $(CH_3)_2CH.CH_2OH$ per 100 gms. sat. sol.	t°	Gms. $(CH_3)_2CH.CH_2OH$ per 100 gms. sat. sol.
28.2	8.0	130.5	20.7
90.4	8.0	133	26.7
107.9	10.6	132.6	49.1
126.7	16.3	126.4	57.8
127.7	17.5	38.6	81.7

Results are also given for the ternary system Iso Butyl Alcohol, Methyl Alcohol and Water. These will be found under Methyl Alcohol.

SOLUBILITY OF ISO BUTYL ALCOHOL IN AQUEOUS SOLUTIONS OF SODIUM BENZOATE AT ABOUT 18°.

(Traube, Schoning and Weber, 1927.)

Normality of Aq. C_6H_5COONa Solution	cc Iso Butyl Alcohol per 6.0 cc sat. solution
0.0	0.6
0.5	0.55
0.75	1.05
0.83	1.55
1.0	∞

DISTRIBUTION OF ISOBUTYL ALCOHOL BETWEEN WATER AND COTTON SEED OIL AT 25°.

(Wroth and Reid, 1916.)

Gms. C_4H_9OH per 100 cc. Oil Layer.	Gms. C_4H_9OH per 100 cc. H_2O Layer.	Ratio.	Gms. C_4H_9OH per 100 cc. Oil Layer.	Gms. C_4H_9OH per 100 cc. H_2O Layer.	Ratio
1.168	2.043	1.74	1.375	2.301	1.67
1.276	2.250	1.76	1.405	2.429	1.72
1.288	2.135	1.65	1.495	2.450	1.64

The partition coefficient of tertiary butyl alcohol $(CH_3)_2C(OH)CH_3$, between olive oil and water is given as 0.176 at ord. temp. (Baum, 1899.)

Tertiary BUTYL ALCOHOL (Tri Methyl Carbinol) $(CH_3)_3COH$.

Freezing-point data for mixtures of Tri methyl Carbinol and Water are given by Paterno and Mieli, 1907.

Freezing-point data are given for mixtures of trimethyl carbinol and the following compounds:

Hydroquinone (1)
α and β Naphthol (1)
α and β Naphthylamine (1)
o and m Phenylene diamine (1)
Pyrogallol (1)
p Dioxane (2)
Pyrocatechol (1)
Resorcinol (1)
p Toluidine (1)
o, m and p Nitrophenol (3)
1, 2, 4 Dinitro phenol (3)
Naphthalene (3)
Phenol (4)
Thymol (4)
Bromo Toluene (4)

(1) Kremann and Wlk, 1919; (2) Getman, 1937; (3) Kremann, Mauermann, Müller II, and Rösler, 1922-23.; (4) Paterno and Ampola, 1897.

METHYL n PROPYL ETHER $CH_3OC_3H_7$.
METHYL Iso PROPYL ETHER $CH_3OCH_3CHCH_3$.

SOLUBILITY OF METHYL NORMAL PROPYL ETHER AND OF METHYL ISO PROPYL ETHER, EACH SEPARATELY, IN WATER.

(Bennett and Philip, 1928.)

t°	Gms. n $C_4H_{10}O$ per 100 gms. sat. sol. in water	Gms. iso $C_4H_{10}O$ per 100 gms. sat. sol. in water
0	5.6	—
10	3.8	9.7
15	3.4	8.6
20	3.2	7.4
25	3.05	6.5

ETHYL ETHER $(C_2H_5)_2O$.

RECIPROCAL SOLUBILITY OF ETHER AND WATER.

(Klobbie — Z. physik. Chem. **24**, 619, '97; Schuncke — *Ibid.* **14**, 334, '94; St. Tolloczko — *Ibid.* **20**, 407, 96.)

t°.	Solubility of Ether in Water. Lower Layer — Aqueous. Gms. $(C_2H_5)_2O$ per 100 Gms. Water.	Gms. $(C_2H_5)_2O$ per 100 Gms. Solution.	Solubility of Water in Ether. Upper Layer — Ethereal. Gms. H_2O per 100 Gms. Ether.	Gms. H_2O per 100 Gms. Solution.
0	13.12	11.6	1.01	1.0
5	11.4	10.2	1.06	1.05
10	9.5	8.7	1.12	1.12 (2.6, S.)
15	8.2	7.6	1.16	1.15
20	6.95	6.5	1.20	1.20 (2.65, S.)
25	6.05	5.7	1.26	1.26
30	5.4	5.1	1.33	1.32
*40	4.7	4.5	1.52	1.50
*50	4.3	4.1	1.73	1.7
*60	3.8	3.7	1.83	1.8
*70	3.3	3.2	2.04	2.0
*80	2.9	2.8	2.25	2.2

* Indicates determinations made by Synthetic Method, for which

100 cc. H_2O dissolve 8.11 cc. ether at 22°; vol. of solution, 107.145 cc., Sp. Gr. 0.9853.

100 cc. ether dissolve 2.93 cc. H_2O at 22°; vol. of solution, 103.282 cc.; Sp. Gr. 0.7164. (Herz, 1898.)

More recent determinations of the solubility of ethyl ether in water, agreeing closely with the above data, are given by Osaka, 1910.

Data for the temp.-pressure diagram of ether-water are given by Scheffer, 1912a.

RECIPROCAL SOLUBILITY OF ETHER AND WATER.

(Hill, 1923; Kablukov and Malischeva, 1925.)

A new method for the determination of the reciprocal solubility of liquids was employed by these authors. It depends upon the simple application of the phase rule to the volumes obtained by mixing the two liquids in two different ratios by weight, in two separate experiments at the same temperature. The apparatus consists of flasks with two bulbs of 100 cc. and 300 cc. respectively, having the stem between the bulbs and above the upper bulb, very accurately graduated and calibrated. The method of calculation employed eliminates the correction for change of volume on mixing and enables the solubilities to be calculated directly from the volumetric readings. The flasks were rotated 1/2 hour in a thermostat and allowed to stand 1/2 hour before reading the volume changes.

	The Solubility of Ether in Water.			The Solubility of Water in Ether.		
		Gms. Ether per 100 gms. Water layer.			Gms. Water per 100 gms. Ether layer	
t°.	Density of Water layer.	Hill.	K and M.	Density of Ether layer.	Hill	K and M
− 3.83....	−	12.752	− (12.2)	−	0.978	
0.0....	−	11.668	− (10.3)	−	1.078	− (1.0)
10.0....	0.98219	9.040	9.01 (8.3)	0.72998	1.164	1.30
15.0....	0.98405	7.913	7.87 (7.0)	0.72404	1.240	1.35 (1.1)
20.0....	0.98478	6.896	6.88 (6.5)	0.71835	1.264	1.45 (1.3)
25.0....	0.98508	6.027	6.04 (5.6)	0.71309	1.348	1.58
30.0....	0.98505	5.340	5.34 (4.5)	0.70763	1.409	1.77

Determinations by other methods are as follows :

15.0....	0.985(1)	7.83(1)	8.43(2)	0.722(1)	1.04(1)
18.0....	−	7.88(3)	7.80(4)		
20.0....	0.986(1)	6.89(1)	−	0.718(1)	1.10(1)
25.0....	0.987(1)	6.00(1)	6.05(2)	0.714(1)	1.19(1)

(1) Forbes and Coolidge, 1919; (2) Thorne, 1921; (3) Per 100 cc. H_2O, Linde, 1917, 1928; (4) Per 100 cc. H_2O, von Euler and Svanberg, 1917, 1917 *a*, 1926. The results in parentheses are by Boulin and Sanfourche, 1919.

Later determinations by Bennett and Philip, 1928, using the same method as Hill but reducing the quantities of liquid gave results in very close agreement with those of Hill.

One determination at 20° by Jones, 1929, gave 6.95 gms. $(C_2H_5)_2O$ per 100 gms. aqueous layer and 1.2 gms. H_2O per 100 gms. ether layer.

Determinations of the effect of a third substance (CdI_2, ZnI_2 and $UO_2(NO_3)_2$) upon the mutual solubility of ethyl ether and water are given by Guempel, 1929.

FREEZING-POINTS OF MIXTURES OF ETHYL ETHER AND WATER.

(Lalande, 1934a.)

The authors results are given in the form of a curve from which the following values were read.

t°	Gms. $(C_2H_5)_2O$ per 100 gms. mixture	Solid Phase	t°	Gms. $(C_2H_5)_2O$ per 100 gms. mixture	Solid Phase
-1.0	3.8	Ice	-3.0	10.7	Ice
-1.5	5.6	"	-3.5	12.2	"
-2.0	7.4	"	-3.78tr.pt.	12.8	" + 2 liquid layers
-2.5	9.2	"			

SOLUBILITY OF ETHER IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID.

(Schuncke — Z. physik. Chem. 14, 334, '94; in 38.52% HCl, Draper — Chem. News, 35, 87, '77.)

	In 38.52 % HCl.	In 31.61 % HCl.			In 20 % HCl.		
t°.	cc. Ether per 100 cc. Solvent.	cc. Ether per 100 cc. Solvent.	Gms. per 1 Gram H_2O. HCl.	Gms. per 1 Gram H_2O. $(C_2H_5)_2O$.	cc. Ether per 100 cc. Solvent.	Gms. per 1 g. H_2O. HCl.	Gms. per 1 g. H_2O. $(C_2H_5)_2O$.
−6	181	149	0.4622	1.387	67.2	0.253	0.5637
0	177.5	142	0.4622	1.308	58.3	0.253	0.4863
+6	172.5	131.5	0.4622	1.2075	51.1	0.253	0.4231
15	163	121.7 (14°)	0.4622	1.1075	40.5	0.253	0.3299
20	158	111.9 (20.8°)	0.4622	1.0005	33.1	0.253	0.2688
26	135	104.2	0.4622	0.9360	27.5	0.253	0.2221

	In 12.58 % HCl.			In 3.65 % HCl.		
t°.	cc. Ether per 100 cc. Solvent.	Gms. per 1 Gram H_2O. HCl.	Gms. per 1 Gram H_2O. $(C_2H_5)_2O$.	cc. Ether per 100 cc. Solvent.	Gms. per 1 Gram H_2O. HCl.	Gms. per 1 Gram H_2O. $(C_2H_5)_2O$.
−6	26.45	0.144	0.2106	19.23	0.0308	0.1454
0	22.19	0.144	0.1748	...	...	...
+6	19.18	0.144	0.1503	14.31	0.0308	0.1070
15	15.61	0.144	0.1210	11.83	0.0308	0.0868
20	13.76	0.144	0.1059	10.52	0.0308	0.0769
26	12.70	0.144	0.0970	9.24	0.0308	0.0673

The above data are recalculated and discussed by Jüttner, 1901.

THE BINODAL CURVE OF THE SYSTEM ETHYL ETHER PHOSPHORIC ACID AND WATER AT 0°.

(Ousti - Katchincev and Klebnikov, 1939.)

Gms. per 100 gms. sat. sol. H_3PO_4	Gms. per 100 gms. sat. sol. $(C_2H_5)_2O$	Gms. per 100 gms. sat. sol. H_2O	Gms. per 100 gms. sat. sol. H_3PO_4	Gms. per 100 gms. sat. sol. $(C_2H_5)_2O$	Gms. per 100 gms. sat. sol. H_2O
0.0	11.7	88.3	40.1	27.8	32.1
14.1	9.4	76.5	33.3	47.0	19.7
24.4	10.1	64.5	23.3	70.0	6.7
36.3	16.4	47.3	9.4	85.0	5.6
39.2	19.6	41.2			

Data for locating three tie lines are also given.

Freezing-point data for mixtures of $(C_2H_5)_2O + H_3PO_4$ are given by Rabinowitsch and Jakubsohn, 1923.

Freezing-point data for the systems $(C_2H_5)_2O.HBr + H_2O$ and $(C_2H_5)_2O.HBr + C_2H_5OH$ are given by Maass and Russel, 1919.

Solubility of Ethyl Ether in Aqueous Solutions of Acids.

(Marie and LeJeune, 1929.)

t°	Acid	Gm. Mols. Acid per liter of solution	Gms. $(C_2H_5)_2O$ per 10 cc acid solution	t°	Acid	Gm. Mols. Acid per liter of solution	Gms. $(C_2H_5)_2O$ per 10 cc acid solution
18	$HClO_4$	1.78	3.54	25	HCl	5.65	2.4
"	"	3.05	11.0	"	"	7.50	5.1
"	"	4.07	21.2	"	"	10.45	9.6
"	"	5.10	35.8	18	H_2SO_4	5.92	1.9
"	"	7.82	56.5	"	"	6.50	3.0
"	"	9.50	47.5	"	"	8.15	6.75
25	"	2.50	4.25	"	"	8.75	8.60
"	"	3.55	11.8	"	"	9.05	10.0
"	"	3.98	16.5	25	"	6.22	2.0
"	"	4.70	25.2	"	"	6.80	3.2
"	"	5.20	31.25	"	"	8.15	6.4
"	"	5.60	37.7	"	"	9.25	9.35
"	"	5.96	44.2	18	H_3PO_4	7.0	3.1
"	"	7.36	47.0	"	"	8.58	7.3
"	"	10.25	44.2	"	"	10.10	12.6
18	HCl	5.40	2.24	25	"	7.75	2.3
"	"	6.90	4.84	"	"	8.60	5.55
"	"	10.0	9.55	"	"	10.3	10.60

The Binodal Curve of the System Ethyl Ether Sulfuric Acid and Water.

(Ousti-Katchincev and Klebnikov, 1930.

Results at -10		Results at 0		Results at 20°	
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
H_2SO_4	$(C_2H_5)_2O$	H_2SO_4	$(C_2H_5)_2O$	H_2SO_4	$(C_2H_5)_2O$
0.0	14.3	0.0	11.7	0.0	7.4
14.2	8.1	7.5	7.4	6.3	5.1
19.6	8.8	16.3	5.2	14.2	4.7
27.4	14.9	21.2	6.1	20.6	5.3
31.7	24.0	33.3	14.9	34.4	7.3
32.5	34.9	35.0	32.4	37.8	11.5
33.2	38.0	31.0	49.1	43.4	21.8
27.3	64.2	26.1	68.3	44.0	35.3
18.5	76.2	9.2	90.2	38.2	59.0
				18.4	78.3

Data for locating three tie lines at 0° are also given.

Solubility of Ethyl Ether in Aq. Sulfuric Acid at 0°.

(Kremann, 1910a.)

Gms. per 100 Gms. Homogeneous Mixture.			Gms. per 100 Gms. Homogeneous Mixture.		
$(C_2H_5)_2O$.	H_2O.	H_2SO_4.	$(C_2H_5)_2O$.	H_2O.	H_2SO_4.
24.2	34.5	41.3	16.1	42.7	41.2
24.8	35.4	39.8	6.1	78	15.9
43.9	15.7	40.4	53.8	8.5	37.7
34	26.1	39.9			

Data for the system ethyl ether, ethyl alcohol, water, sulfuric acid at 0° are also given.

Data showing the influence of Cadmium Iodide upon the mutual solubility of Ethyl Ether and Water are given by Guempel, 1929. This author also gives complete data for the system Ethyl Ether + H_2O + CdI_2. Similar data are also given for the systems Ethyl Ether + H_2O + ZnI_2 and for Ethyl Ether + H_2O + $UO_2(NO_3)_2$.

Data for the solubility of ethyl ether in carbon dioxide at high pressures are given by Sander (1911-12). The determinations were made by using quite small amounts of ether and observing the pressure at which a drop of liquid just appeared or disappeared in a mixture of known weight per cent composition. The results give the "gas curve" for constant temperature and when plotted in connection with the "liquid curve" (see Vol. I p. 234), give the complete pressure – concentration diagram.

Freezing-point lowering data for mixtures of ethyl ether and hydrochloric acid are given by Maass and McIntosh (1913).

Solubility of Ether in Aqueous Salt, Etc., Solutions at 18°.

(Euler, 1904.)

Aq. Solution of:	Gm. per Liter Added Salt.	Gms. $(C_2H_5)_2O$ per 100 cc. Solvent.	Aq. Solution of:	Gms. per Liter Added Salt.	Gms. $(C_2H_5)_2O$ per 100 cc. Solvent.
Water	0	7.8	Na_2SO_4	59.54	3.7
KNO_3	101.19	5.4	Mannite	91.06	6.7
KCl	73.6	4.7	H_2SO_4	49	6.6
LiCl	42.48	5.2	"	122.5	5.65
NaCl	58.5	4.5	"	245.	4.55

Solubility of Ethyl Ether in Aq. Salt Solutions at 28°.

(Thorin, 1915.)

Solvent.	Gms. $(C_2H_5)_2O$ per 100 cc. Solvent.	Solvent.	Gms. $(C_2H_5)_2O$ per 100 cc. Solvent.	Solvent.	Gms. $(C_2H_5)_2O$ per 100 cc. Solvent.
Water	5.85	0.5 *n* Na_3PO_4	4.17	0.5 *n* Na Succinate	4.68
0.5 *n* NaI	5.70	0.5 *n* Na_3AsO_4	4.20	0.5 *n* Na Citrate	4.19
0.5 *n* NaBr	4.68	0.5 *n* $Hg(CN)_2$	5.71	0.5 *n* Na Acetate	4.15
0.5 *n* NaCl	4.48	0.5 *n* NH_4NO_3	5.37	0.5 *n* Na Tartrate	4.12
0.5 *n* NaF	4.15	0.5 *n* $FeCl_3$	5.09	0.5 *n* Na Phthalate	5.88
0.5 *n* Na_2SO_4	4.30	0.5 *n* $Na_2Cr_2O_7$	4.84	0.5 *n* Na Cinnamate	6.29
0.5 *n* Na_2CrO_4	4.22	0.5 *n* $FeSO_4$	4.33	0.5 *n* Na Benzoate	5.99
0.5 *n* Na_2MoO_4	4.39	0.5 *n* $Al_2(SO_4)_3$	3.95	0.5 *n* Na Salicylate	6.44
0.5 *n* Na_2WO_4	4.12	0.5 *n* Am. Oxalate	4.74	0.5 *n* Na Benzene Sulfonate	6.05

Solubility of Ethyl Ether in 0.91 Per Cent (Physiological Normal Saline) Aqueous NaCl Solution.

(Bennett, 1912.)

Determinations made by freezing-point method. Ether of d_{15} = 0.720 used

t°.	Gms. $(C_2H_5)_2O$ per 100 Gms. Aq. NaCl.	cc. $(C_2H_5)_2O$ (at 15°) per 100 cc. Aq. NaCl.
0	13.08	18.27
5	11.15	15.58
10	9.45	13.20
15	8.10	11.31
20	6.87	9.60
25	5.96	8.33
30	5.30	7.40

Purified ether prepared from methylated spirit gave slightly higher results.

SOLUBILITY OF ETHER IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE. (Thorne, 1921.)

The solutions were saturated by constant shaking for 3 1/2 to 4 hours.

The ether was determined by passing a current of dry air through a weighed amount of the saturated solution and calculating from the observed loss in weight.

Results at 15°.				Results at 25°.	
Gms. per 100 gms. sat. sol.		Gms per 100 gms. sat. sol.		Gms per 100 gms sat sol	
Na Cl.	$(C_2H_5)_2O$.	Na Cl.	$C_2H_5)_2O$.	Na Cl	$(C_2H_5)_2O$
0.0	8.43	8.75	3.20	0.0	6.04
0.91	8.10	11.08	2.32	0.91	5.96
1.033	7.73	14.16	1.55	2.847	4.78
2.30	6.67	16.24	1.11	5.970	3.41
3.307	5.81	21.58	0.577	7.810	2.57
5.881	4.37	23.18	0.454	11.08	1.88
7.108	3.91	26.52	0.309	15.79	0.979
				21.18	0.464
				24.90	0.309

The following results at 18° were obtained by Linde, 1917, 1926.

Gm-mols. Na Cl per liter...	0.0.	0.1.	0.2.	0.3.	0.4.	0.5.	0.6.	0.8.	1.0.
Gms $(C_2H_5)_2O$ per 100 cc. solvent...	7.88	7.66	7.20	6.84	6.48	6.12	5.78	5.19	4.62

von Euler and Svanberg, 1917, 1917 *a*, 1926, found 4.5 gms. $(C_2H_5)_2O$ per 100 cc. of aq. 1.0 normal Na Cl at 18°.

SOLUBILITY OF ETHER IN AQUEOUS SOLUTIONS AT 18°. (Linde, 1917, 1926.)

The determinations were made by rotating together in a sealed flask at 18°, 50 cc. of the solvent and such volumes of ether, that, after the period of rotation, not more than 0.5 cc. remained undissolved. The weight of dissolved ether was found by multiplying the volume by the $d_{18} = 0.716$.

Aqueous solvent.	Gms. $(C_2H_5)_2O$ per 100 cc. solvent.	Aqueous solvent.	Gms. $(C_2H_5)_2O$ per 100 cc. solvent.
0.1 *n* CH_3COONa	7.22	0.5 *n* Na_2SO_4	5.52
0.2 »	6.70	0.375 » + 0.125 *n* H_2SO_4	5.98
0.3 »	6.14	0.333 » + 0.166 »	6.16
0.4 »	5.58	0.3125 » + 0.1875 »	6.30
0.5 »	5.14	0.28125 » + 0.21875 »	6.45
0.6 »	4.73	0.2 » + 0.25 »	6.51
0.7 »	4.33	0.1875 » + 0.3125 »	6.81
0.8 »	4.06	0.125 » + 0.375 »	7.04
1.0 »	3.44	0.0625 » + 0.4375 »	7.26
0.1 *n* Sodium picrate	8.16	0.000 » + 0.5 »	7.56
0.5 » phenolate	5.59	0.5 »	5.50
0.5 » lactate	6.30	0.425 » + 0.075 *n* NaOH	5.53
0.25 » maleate	7.21	0.375 » + 0.125 »	5.55
0.75 *n* NaCl + 0.25 *n* CH_3COONa	4.37	0.25 » + 0.25 »	5.50
0.5 » + 0.5 »	4.00	0.125 » + 0.375 »	5.55
0.25 » + 0.75 »	3.65	0.00 » + 0.500 »	5.56

von Euler and Svanberg, 1917, 1917 *a*, 1926, found 3.7 gms. $(C_2H_5)_2O$ per 100 cc. of 1.0 *n* Na_2SO_4 at 18° and 3.7 gms. $(C_2H_5)_2O$ per 100 cc. of 1.0 *n* CH_3COONa at 18°.

Data for the reciprocal solubility of ether and water at 15°, 20° and 25°, in solutions respectively saturated with succinic acid, are given by Forbes and Coolidge, 1919.

Data for the solubility of mixtures of ethyl ether and kerosene and of ethyl ether and xylene in 92 wt. per cent ethyl alcohol at 20° are given by Ormandy and Craven, 1921

FREEZING-POINTS OF MIXTURES OF BENZENE AND ETHYL ETHER.
(Yamamura, 1926.)

t° of freezing.	Mol. per cent C_6H_6 in mixture.	t° of freezing.	Mol. per cent C_6H_6 in mixture.	t° of freezing.	Mol. per cent C_6H_6 in mixture.
5.1	100.0	−33.0	50.4	−94.0	12.3
1.7	94.9	−36.9	45.0	−105.0	9.6
0.4	93.0	−43.4	40.4	−106.0	8.7
−4.3	85.1	−48.0	35.9	−115.5	7.6
−4.8	84.0	−52.5	30.3	−118.5	7.3
−11.2	74.9	−61.3	25.5	−126.5	5.2
−14.9	69.4	−71.7	19.7	−126.5	5.1
−18.6	64.9	−74.5	18.0	−125.0	2.9
−22.6	60.5	−79.0	17.7	−124.5	2.4
−27.0	55.1	−88.5	14.9	−123.5	0.0 = unstable form of $(C_2H_5)_2O$

Results for the total and partial vapor pressures at 20.5° in mixtures of ethyl ether and each of the following compounds: acetonitrile, nitro methane, allyl iso sulfocyanate and tri ethyl amine, are given by Joukovsky, 1934.

Freezing-point data are given for mixtures of Ethyl Ether and each of the following compounds:

Acetic Acid	(Pickering, 1893.)
Trichloro Acetic Acid	(Tsakalotos and Guye, 1910)
Nitro Benzene	" "
Carbon Disulfide	(Saphir, 1929.)
Methyl Alcohol	" "
Acetone	" (Waddell, 1899.)
Iso Pentane	"
Ethyl Alcohol	"
" "	(Lalande, 1933.)

Formamide	(Joukovsky, 1934.)
Carbon Tetra Chloride	(Wyatt, 1929.)
Chloroform	" "
Aniline	(Timmermans, 1930.)
Ethylol	" 1934.
Methylol	" "
Ethylene Chloride	(Huettig, 1935.)
Ethyl Iodide	(Wroczynsky and Guye, 1910.)

ERYTHRITOL $(CH_2OH.CHOH)_2$.

SOLUBILITY OF ERYTHRITOL IN WATER DETERMINED BY THE FREEZING-POINT METHOD.
(Pushin and Glagoleva, 1922.)

t° of cryst.	Mol. per cent $(CH_2OH.CHOH)_2$.	Solid Phase.	t° of cryst.	Mol. per cent $(CH_2OH.CHOH)_2$.	Solid Phase.
−1.1..	0.9	Ice	65.0..	26.1	$(CH_2OH.CHOH)_2$
−2.4..	2.0	"	70.5..	29.0	"
−3.1..	2.5	"	76.2..	33.3	"
−4.4..	3.0	" + $(CH_2OH.CHOH)_2$	82.0..	39.8	"
−1.0..	4.8	$(CH_2OH.CHOH)_2$	87.8..	42.4	"
−14.0..	7.0	"	97.5..	56.4	"
22.8..	9.0	"	102.5..	65.7	"
27.4..	11.1	"	106.5..	75.2	"
36.5..	13.4	"	110.2..	80.0	"
40.4..	14.4	"	114.0..	92.4	"
54.6..	17.5	"	116.6..	100.0	"

100 gms. H_2O dissolve 61.5 gms. erythritol at 20–25°. (Dehn, 1917.)
100 gms. aq. 50% pyridine dissolve 8.47 gms. erythritol at 20–25°. "
100 gms. pyridine dissolve 2.50 + gms. erythritol at 20–25. (Dehn, 1917; Holty, 1905.)

Freezing-point data are given by Puschin and Dezelic, 1932, for mixtures of Erythritol and each of the following compounds: Antimony tri bromide, Mono chloro acetic acid, Tri chloro acetic acid, Benzoic acid, Cinnamic acid, Elaidinic acid, Mannite, Oleic acid, Palmitic acid, Phenol, 2.4.6 Tri nitro Phenol, o and p Phenylene di amine, Resorcinol, Stearic acid, Urea, and Urethan.

DI ETHYL AMINE $NH(C_2H_5)_2$.

SOLUBILITY OF DI ETHYL AMINE IN WATER, DETERMINED BY THE SYNTHETIC METHOD.

(Lattey, 1905.)

t°	Gms. $NH(C_2H_5)_2$ per 100 gms.		t°	Gms. $NH(C_2H_5)_2$ per 100 gms.	
	H_2O layer	Amine layer		H_2O layer	Amine layer
155	21.7	59.0	145	28.0	49.0
150	23.6	55.5	144	31.0	45.0
148	24.8	53.5	143.5(Crit. t.)	37.4	
146	26.3	51.0			

The solubility of Di Ethyl Amine in Water at 60°, calculated from the vapor pressures, determined by an aspiration method, as given by Doyer, 1890, as 89 in terms of the Ostwald Solubility Expression and 73 in terms of the Bunsen Absorption Coefficient at a vapor pressure of 233 mm Hg.

Freezing-point data for mixtures of Di ethyl amine and Water are given by Guthrie, 1884, and Pickering, 1893.

DIETHYL AMINE Hydrobromide, Hydrochloride and Hydroiodide.

SOLUBILITY OF EACH SEPARATELY IN WATER AND IN CHLOROFORM AT 25°.

(Peddle and Turner, 1913.)

Compound	Formula	Gms. Compound per 100 gms. H_2O	Gms. Compound per 100 gms. $CHCl_3$
Diethyl Amine Hydrobromide	$(C_2H_5)_2NH.HBr$	311.6	46.66
" " Hydrochloride	$(C_2H_5)_2NH.HCl$	231.7	29.45
" " Hydroiodide	$(C_2H_5)_2NH.HI$	377.2	71.56

DISTRIBUTION OF DIETHYL AMINE AT 25° BETWEEN (Smith, 1931 1932)

Water and Amyl Alcohol.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$CH_3(CH_2)_3CH_2OH$ layer (C_2).	$\frac{C_2}{C_1}$.
0.65	1.625	2.52
1.05	2.9625	2.82
1.675	5.450	3.26
2.875	10.625	3.70
4.95	20.00	4.04

Water and n Butyl Alcohol.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1)	$CH_3(CH_2)_2CH_2OH$ layer (C_2)	$\frac{C_2}{C_1}$
0.275	0.575	2.09
0.675	1.540	2.30
1.35	3.175	2.35
2.50	6.8	2.72

Water and Isobutyl Alcohol.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1)	$(CH_3)_2CHCH_2OH$ layer (C_2)	$\frac{C_2}{C_1}$
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

DISTRIBUTION OF DIETHYL AMINE AT 25° BETWEEN (Smith, 1931 1932)

Water and Xylene.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$
1.44	0.55	0.38
2.72	1.28	0.47
4.075	1.925	0.472
6.45	3.55	[illegible]

Acetone and Glycerol.

Millimols. $(C_2H_5)_2NH$ per liter		
Acetone layer	Glycerol layer	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Distribution of Diethyl Amine at 25° Between.

(Smith, 1921-1922,)

Water and *sec.* Octyl Alcohol.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CH_3(CH_2)_5CHOH.CH_3$ layer (C_2).	
0.475	0.50	1.05
1.05	1.20	1.14
1.75	2.01	1.16
2.10	2.50	1.19

Water and *n* Butyl Bromide.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CH_3(CH_2)_3Br$ layer (C_2).	
1.10	0.725	0.660
2.10	1.3375	0.637
3.475	2.20	0.633
6.60	4.00	0.606

Water and *n* Butyl Ether

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$(C_4H_9)_2O$ layer (C_2).	
0.925	0.625	0.676
2.1625	1.375	0.632
4.05	2.45	0.605
7.75	4.55	0.587

Water and Benzene.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	C_6H_6 layer (C_2).	
2.1375	1.2375	0.578
3.875	2.475	0.638
6.575	4.35	0.662
11.95	9.05	0.756
22.30	18.30	0.822

Water and Brombenzene.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	C_6H_5Br layer (C_2).	
1.100	0.625	0.568
1.4625	0.8875	0.607
2.1875	1.1375	0.520
3.40	1.70	0.50
3.825	2.075	0.542
7.15	4.05	0.567

Water and *o* Dichlorbenzene.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	*o* $C_6H_4Cl_2$ layer (C_2).	
1.475	0.95	0.643
1.55	1.075	0.693
3.175	2.325	0.732
5.50	3.30	0.60
11.70	7.15	0.61

Water and 1.3.4 Trichlorbenzene.

Millimols $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	1.3.4. $C_6H_3Cl_3$ layer (C_2).	
1.4875	0.4125	0.287
3.325	1.125	0.346
4.95	1.925	0.403
9.45	4.05	0.43

Water and Carbon Tetrachloride.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	CCl_4 layer (C_2).	
1.425	0.850	0.597
6.525	1.9375	0.700
5.075	4.00	0.788
7.80	7.00	0.897

Water and Chloroform.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	
0.300	0.600	2.00
0.800	2.000	2.50
1.625	5.025	3.09
4.350	17.95	4.13

Water and Ethyl Ether.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	
0.6125	0.4375	0.714
1.100	0.7375	0.671
1.650	1.075	0.652
2.875	2.025	0.704
7.90	6.30	0.798

Water and Iso Amyl Phenyl Ether.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$C_5H_{11}.O.C_6H_5$ layer (C_2).	
1.85	0.815	0.440
3.30	1.35	0.410
5.775	2.55	0.442
9.50	3.90	0.411

Water and Ethylene Chloride.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CH_2Cl.CH_2Cl$ layer (C_2).	
0.95	0.835	0.880
1.875	1.05	0.886
2.15	1.925	0.886
4.475	4.075	0.910

Water and Paraffine oil.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Paraffine oil layer (C_2).	
1.475	0.300	0.204
3.20	0.575	0.180
3.35	0.650	0.194
5.25	1.025	0.192
8.70	1.40	0.161
8.80	1.50	0.170
16.10	3.00	0.186

Water and Petroleum (b. pt. 145-155°) = Nonane.

Millimols. $(C_2H_5)_2NH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Petroleum layer (C_2).	
2.7125	0.850	0.313
4.175	1.275	0.305
0.442	1.30	0.289
4.825	1.425	0.295
7:25	2.05	0.283
11.35	3.25	0.287

C_4H_{11}

DISTRIBUTION OF DIETHYL AMINE AT 25° BETWEEN:

(Herz and Stanner, 1927.)

Water and Benzene

Gm. Mols. $(C_2H_5)_2NH$ per liter H_2O layer(1)	Gm. Mols. $(C_2H_5)_2NH$ per liter C_6H_6 layer(2)	$\frac{2}{1}$
0.0726	0.0653	0.899
0.1387	0.1326	0.956
0.1979	0.1877	0.948
0.2652	0.2501	0.943

Water and Toluene

Gm. Mols. $(C_2H_5)_2NH$ per liter H_2O layer(1)	Gm. Mols. $(C_2H_5)_2NH$ per liter $C_6H_5CH_3$ layer(2)	$\frac{2}{1}$
0.0979	0.0734	0.750
0.1787	0.1469	0.822
0.3427	0.2733	0.798
0.6181	0.5357	0.867

Water and Ethyl Benzene

Gm. Mols. $(C_2H_5)_2NH$ per liter H_2O layer(1)	Gm. Mols. $(C_2H_5)_2NH$ per liter $C_6H_5C_2H_5$ layer(2)	$\frac{2}{1}$
0.1180	0.0787	0.667
0.1311	0.0851	0.650
0.2295	0.1574	0.686

DISTRIBUTION OF DIETHYL AMINE BETWEEN WATER AND TOLUENE.

(Moore and Winmill, 1912.)

t°	Gm. Equiv. $(C_2H_5)_2NH$ per liter H_2O layer	Dist. Coef.	t°	Gm. Equiv. $(C_2H_5)_2NH$ per liter H_2O layer	Dist. Coef.
18	0.0484	2.14	25	0.0416	1.59
"	0.0503	2.14	32.35	0.1200	1.091
25	0.0483	1.59	"	0.1104	1.095

DISTRIBUTION OF DIETHYL AMINE AT 25° BETWEEN METHYL ALCOHOL AND VASELINE.

(Kozakewitch, 1936.)

Gm. Mols. $(C_2H_5)_2NH$ per 1000 gms.: CH_3OH layer(1)	Gm. Mols. $(C_2H_5)_2NH$ per 1000 gms.: Vaseline layer(2)	$\frac{1}{2}$
0.253	0.0115	22.0
0.273	0.0103	26.5
0.527	0.0182	29.1
0.806	0.0296	27.2

Several determinations are also given showing the effect of additions of lithium chloride upon the above distribution.

BUTYL AMINE (Normal) $CH_3(CH_2)_2CH_2NH_2$.

DISTRIBUTION OF NORMAL BUTYL AMINE AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Ethyl Ether.

Millimols. $CH_3(CH_2)_2CH_2NH_2$ per liter of H_2O layer (C_1).	Millimols. $CH_3(CH_2)_2CH_2NH_2$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.85	0.76	0.895
1.35	1.23	0.912
2.15	2.20	1.02
3.20	3.52	1.10

Water and Xylene.

Millimols. $CH_3(CH_2)_2CH_2NH_2$ per liter of H_2O layer (C_1).	Millimols. $CH_3(CH_2)_2CH_2NH_2$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.671	0.328	0.490
1.28	0.718	0.560
2.40	1.50	0.625
5.60	4.40	0.785

DISTRIBUTION AT 25° OF : (Smith, 1921-1922.)

Iso Butyl amine $(CH_3)_2CH.CH_2NH_2$, Between Water and Xylene.

Millimols. $(CH_3)_2CH.CH_2NH_2$ per liter of H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.625	0.362	0.58
1.775	0.975	0.55
3.575	2.075	0.58

Di *iso* Butyl Amine Acid Phthalate*, Between Acetone and Glycerol.

Millimols. Acid Phthalate per liter of Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.
1.90	1.10	0.580
3.95	2.10	0.530
5.85	3.10	0.530
7.60	3.80	0.500
9.65	4.45	0.462

IsoBUTYLAMINE HYDROCHLORIDE $(CH_3)_2CHCH_2NH_2.HCl$.

100 gms. H_2O dissolve 238.9 gms. of the salt at 25°. (Peddle and Turner, 1913.)
100 gms. $CHCl_3$ dissolve 11.56 gms. of the salt at 25°. (Peddle and Turner, 1913.)

TETRA METHYL AMMONIUM PHOSPHOR HEXA FLUORIDE $(CH_3)_4N.PF_6$.

One liter of saturated solution in water contains 1.68 gm. $(CH_3)_4N.PF_6$ at 21°. (Lange and Mueller, 1930.)

FURFURAL $C_4H_3O.CHO$.

RECIPROCAL SOLUBILITY OF FURFURAL AND WATER.

(Mains, 1922; Evans and Aylesworth, 1926.)

The determinations of Mains were made by shaking together furfural and water at nearly constant temperature for 100 times. After separation, the two layers were analyzed by measurement of their densities and comparing with a concentration-density chart. The determinations of Evans and Aylesworth were made by the sealed tube synthetic method and precautions were taken to secure the highest accuracy.

Results of Mains.

t°.	Gms. $C_4H_3O.CHO$ per 100 gms. Water rich layer.	Furfural rich layer.
10	7.9	96.1
20	8.3	95.2
30	8.8	94.2
40	9.5	93.3
50	10.4	92.4
60	11.7	91.4
70	13.2	90.3
80	14.8	88.7
90	16.6	86.7
97.9 b. t.	18.4	84.1

Results of Evans and Aylesworth.

t°.	Gms. $C_4H_3O.CHO$ per 100 gms. Water rich layer.	Furfural rich layer.
50	9.2	92.2
60	10.5	90.9
70	12.2	89.1
80	14.1	87.2
90	16.5	84.9
100	19.6	81.8
110	25.0	76.5
120	40.5	61.0
120.9 crit. t.	50.7	

SOLUBILITY OF FURFURAL IN WATER.

(Rothmund, 1898.)

The determinations were made by synthetic method, see Note, page 292

t°.	Gms. C_4H_3OCHO per 100 Gms. Aq. Layer.	Furfurol Layer.	t°.	Gms. C_4H_3OCHO per 100 Gms. Aq. Layer.	Furfurol Layer.
40	8.2	93.7	100	18.9	83.5
50	8.6	93	110	24	78.5
60	9.2	92	115	28	74.6
70	10.8	90.7	120	34.4	68.1
80	13	89	122.7 (crit. t.)	51	
90	15.5	86.6			

100 gms. Aq. 0.4 n sodium oleate solution (= 10.8 gm. Na oleate per

EQUILIBRIUM IN THE SYSTEM FURFURAL, ISO AMYL ACETATE AND WATER AT 25°

(Lloyd, Thompson and Ferguson, [illegible].)

The determinations of the binodal curve were made by the titration method. To mixtures of weighed amounts of two of the components, the third was added from a weight buret equipped with a long fine delivery tip. Tie lines were obtained from weights of the two phases separating from a mixtures of known composition or from these weights and the furfural content of the furfural rich phase.

Gms. per 100 gms. homogeneous mixture			Gms. per 100 gms. homogeneous mixture		
C_4H_3OCHO	$i\ CH_3COOC_5H_{11}$	H_2O	C_4H_3OCHO	$i\ CH_3COOC_5H_{11}$	H_2O
0.0	0.2	98.8	[illegible]	[illegible]	2.6
1.8	0.5	97.7	[illegible]	[illegible]	2.9
3.8	0.4	95.8	[illegible]	[illegible]	2.8
5.8	1.2	93.0	[illegible]	[illegible]	2.2
7.3	1.9	90.8	[illegible]	[illegible]	2.1
7.7	0.0	92.3	[illegible]	[illegible]	1.8
94.7	0.0	5.3	[illegible]	[illegible]	1.6
88.8	0.0	4.6	[illegible]	[illegible]	1.1
78.4		3.6	[illegible]	[illegible]	1.2

The percentage of furfural in adjoining layers fixing tie lines were:

Layer I	2.0	16.0
Layer II	4.2	46.0

Similar results for systems containing furfural will be found under Acetone and Ethyl Acetate.

URIC ACID $C_5H_4N_4O_3$.

SOLUBILITY IN WATER.

(Blarez and Denigès, 1887; at 15° Magnier, 1875.)

t°.	Gms. $C_5H_4N_4O_3$ per 100 Gms. H_2O.	t°.	Gms. $C_5H_4N_4O_3$ per 100 Gms. H_2O.	t°.	Gms. $C_5H_4N_4O_3$ per 100 Gms. H_2O.
0	0.002	30	0.0088	70	0.0405
10	0.0037	40	0.0122	80	0.0490
15	0.0053	50	0.0170	90	0.0498
20	0.006	60	0.0230	100	0.0625

One liter of very carefully purified CO_2 free water dissolves 0.0253 gm. uric acid at 18°. Constant agitation and temperature were employed. With finely divided uric acid, saturation was reached after one hour. The amount dissolved was determined by the difference in weight between the amount of sample taken and that remaining undissolved. (His Jr. and Paul, 1900.)

One liter of pure CO_2 free water dissolves 0.0649 gm. uric acid at 37°. The amount dissolved was determined by difference and only 20-25 minutes agitation allowed for saturation. It is stated that on long contact with water, the uric acid breaks down and the solubility and conductivity increase directly with time. (Gudzent, 1909.)

One liter of water dissolves 0.0645 gm. uric acid at 37°. (Bechhold and Ziegler, 1910.)

One liter of serum dissolves 0.9 gm. uric acid at 37°.

SOLUBILITY OF URIC ACID IN AQUEOUS SOLUTIONS OF ACID AT 18°.

(His, Jr. and Paul, 1900.)

Acid.	Concentration of Aq. Acid. Normality.	Concentration of Aq. Acid. Per cent.	Gms. Uric Acid per 1000 cc. Sat Sol.
Hydrochloric	1	3.65	0.0236
"	3.75	13.69	0.0263
"	6.24	22.77	0.0375
Sulfuric	1	4.9	0.0227
	3.2	15.67	0.0205
	6.4	31.34	0.0183

Additional data for the solubility of uric acid in aqueous sulfuric acid are given by Tafel (1901). A saturated solution of crystallized uric acid in 80 wt. per cent aqueous H_2SO_4 was prepared by warming to about 120° and allowing to stand. Portions of the clear solution were diluted with increasing amounts of water and the mixtures allowed to stand many days in closed flasks which were frequently shaken. The precipitated uric acid was then filtered off and weighed and the amount remaining in solution calculated by difference. The following results were obtained.

Wt. % of aq. H_2SO_4	72.5	70.5	68	66.5	62.5	59.5
Gms. uric acid per 100 gms. aq. H_2SO_4	6.45	3.85	1.60	0.64	0.35	0.312

INFLUENCE OF HYDROGEN ION CONCENTRATION UPON THE SOLUBILITY OF URIC ACID.

(Jung, 1922, 1923.)

An excess of uric acid was shaken for two hours with buffer mixtures of determined p_H values and the solution either filtered immediately or after 1 or 2 days. The dissolved uric acid was usually determined with Folin's uric acid reagent (phosphotungstic acid) and the standard solution of Benedict. The following results were obtained at the temperatures shown in parentheses with uric acid as the starting material and the indicated buffer mixtures. The calculated results were obtained with the aid of the Michaelis formula derived on the basis of the mass action law.

p_H of solvent.	Gms. Uric Acid dissolved per liter in Buffer mixtures A (22°).	KNa (22°).	B (22°).	A (15°-18°).	Na (15°-18°).	K (15°-18°).	Calculated gms. Uric Acid per liter.
3.24	0.0271	–					0.0236
5.0	0.0333					–	0.0271
5.4	0.0450	–					0.0324
5.6	0.0455			0.046	0.035	0.032	0.0376
5.8	0.063	0.110		0.064	0.042	–	0.0465
6.0	0.142	0.062		0.130	0.058	0.056	0.0589
6.2	0.217	0.097		0.290	0.080	0.080	0.0795
6.4	–	0.166			0.120	0.112	0.1123
6.6		0.217			0.170	0.180	0.1640
6.8		0.357	0.370		0.270	0.220	0.2465
7.0		0.500			0.430	0.357	0.360
7.2		0.816			0.54	0.600	0.583
7.4		1.10	–		0.97	0.877	0.911
7.6		1.48	1.54		1.20	(1.00)	1.43
7.8		(1.74)	2.08		(1.33)	(1.19)	2.25
8.0		(2.22)	3.44		(1.39)	(1.19)	3.56
8.2		(2.50)	(3.77)				5.62
8.7			(5.26)				

Buffer Mixture A 0.1 *n* CH_3COONa + 0.1 *n* CH_3COOH (p_H = 3.24 – 6.20).
" " KNa 0.067 mol. KH_2PO_4 + 0.067 mol. Na_2HPO_4.
" " B 0.1 mol. Borax + 0.2 mol. Boric Acid (p_H = 6.77 – 9.24).
" " Na 0.067 mol. NaH_2PO_4 + 0.067 mol. Na_2HPO_4 (p_H = 5.6 – 8.2).
" " K 0.067 mol. KH_2PO_4 + 0.067 mol. K_2HPO_4.

Results are also given for determinations made at 37° and with sodium urate as the starting material. The influence of the anion present and of the time of shaking and of standing was also studied. Similar curves were obtained in all cases and they show that the greatest effect upon the solubility of uric acid, resulting

THE SOLUBILITY OF URIC ACID IN BUFFER SOLUTIONS AT 37°.

(Harpuder and Erbsen, 1924.)

Buffer mixtures were prepared with primary and secondary sodium phosphate, sodium acetate and acetic acid, and sodium lactate and lactic acid. Each was diluted to 100 cc. with distilled or conductivity water. An excess of a weighed amount of the purest uric acid was added to each solution and the mixture shaken in a thermostat one-fourth of an hour and then allowed to stand one hour. The undissolved uric acid was filtered out and weighed, and that dissolved calculated by difference. A direct determination of the uric acid in the saturated solution was also made by titration with sulfuric acid and potassium permanganate. The average of the two determinations was taken as the solubility in each buffer mixture. A determination of the p_H of each saturated solution was made with the gas chain.

Per 100 cc. Buffer mixture. Cc. 0.1 n CH_3COONa.	 Cc. 0.1 n CH_3COOH.	p_H of sat. sol.	Gms. Uric Acid per liter sat. sol.
10	0.0	6.16	0.260
10	0.3	6.00	0.214
10	0.6	5.62	0.198
10	1.2	5.42	0.175
10	2.4	5.23	0.147
10	4.8	5.06	0.129

Per 100 cc. Buffer mixture. Cc. 0.1 n CH_3COONa.	 Cc. 0.1 n CH_3COOH.	p_H of sat. sol.	Gms. Uric Acid per liter sat. sol.
10	9.6	[illegible]	[illegible]
10	19.2	[illegible]	0.110
10	38.4	[illegible]	[illegible]
10	[illegible]	[illegible]	0.068
100 cc. 1.0 n CH_3COOH		[illegible]	[illegible]

Per 100 cc. Buffer mixture. Cc. 0.33 mol. NaH_2PO_4.	 Cc. 0.33 mol. Na_2HPO_4.	p_H of sat. sol.	Gms. Uric Acid per liter sat. sol.
1.8	3.6	6.78	1.171
3.0	3.0	6.61	0.780
4.5	2.25	6.47	0.510
6.0	1.5	6.21	0.361
7.2	0.9	5.97	0.249
7.99	0.5	5.71	0.184
8.47	0.26	5.52	0.153
9.00	0.0	4.61	0.097

Per 100 cc. Buffer mixture. Cc. 0.1 n Na lactate	 Cc. 0.1 n Lactic acid	p_H of sat. sol.	Gms. Uric Acid per liter sat. sol.
10	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]
100 cc. [illegible]		[illegible]	[illegible]
100 cc. [illegible]		[illegible]	[illegible]

The curves obtained by plotting the above results show that the solubility of uric acid in acetate and lactate buffer mixtures differs from that in phosphate buffers. Additional evidence on this point, and on the marked tendency of uric acid to form supersaturated solutions, was desired. Further determinations were therefore, made by Harpuder, 1924, using a method designed to show more clearly the effect of the anion (at higher concentrations) upon the solubility of uric acid.

An amount of dried uric acid, which was chosen to yield an equal excess in all cases, was dissolved by warming, in a portion of the alkaline part of the buffer mixture. The remaining portions were then added in amounts such that the concentration of Na^+ remained constant, and the mixture was diluted to 40 cc. The amount of added uric acid was controlled by a colorimetric determination made with phosphotungstic acid and sodium cyanide. The mixture was shaken one-fourth of an hour at 37° and then allowed to stand at this temperature for 16 hours. It was then filtered and the uric acid again determined colorimetrically in one portion of the filtrate and the p_H measured in another by means of the gas chain.

The p_H corresponding to the beginning of precipitation of uric acid or urate was considered to be a more satisfactory indication of the solubility influence than the amount of uric acid dissolved. The results of such measurements, made under conditions so chosen that all factors remained constant except the concentration of the anion, showed that the precipitation of uric acid from :

Phosphate buffer mixture begins at p_H = about 6.8
Acetate » » » » » = » 4.9
Lactate » » » » » = » 4.2

On the basis of many experiments and calculations it was concluded that the failure of the excess of mono urate to precipitate from its supersaturated solution depends upon the simultaneous presence of undissociated uric acid and *diurate*, and accordingly is possible first at a definite p_H upwards of > 6.7 to 6.8. The failure of uric acid complexes to precipitate from acetic acid and lactic acid mixtures is caused by supersaturation of undissociated uric acid due to the buffer acid. Non electrolytes and colloids may favorably influence the holding of uric acid complexes in solution.

By constant agitation at 14°.0 ± 0°.5 for more than 24 hours Biltz and Herrmann, 1923, found that 1000 cc. water dissolve 0.0223 gm. uric acid when equilibrium was approached from below, and 0.0295 gm. when equilibrium was approached from above.

SOLUBILITY OF URIC ACID AT ABOUT 18° IN AQUEOUS SOLUTIONS OF:

(Lang and Lang. 1927.)

Sodium Bicarbonate

Normality of aq. $NaHCO_3$	Gms. $C_5H_4O_3N_4$ per 100 cc sat. sol.	Normality of aq. $NaHCO_3$	Gms. $C_5H_4O_3N_4$ per 100 cc sat. sol.
0.0074	0.013	0.0066	0.058
0.0011	0.017	0.010	0.078
0.00185	0.025	0.011	0.080
0.0022	0.028	0.0125	0.082
0.0025	0.033	0.0166	0.103
0.0033	0.038	0.02	0.114
0.0037	0.040	0.025	0.124
0.005	0.044	0.033	0.150
0.00555	0.052	0.05	0.193
0.00625	0.056	0.10	0.284

Sodium Carbonate

Normality of aq. Na_2CO_3	Gms. $C_5H_4O_3N_4$ per 100 cc sat. sol.	Normality of aq. Na_2CO_3	Gms. $C_5H_4O_3N_4$ per 100 cc sat. sol.
0.00074	0.014	0.0066	0.077
0.00123	0.021	0.01	0.107
0.00185	0.029	0.0111	0.122
0.0022	0.031	0.0125	0.133
0.0025	0.036	0.0166	0.169
0.0037	0.051	0.020	0.198
0.005	0.062	0.025	0.235
0.0055	0.070	0.033	0.306
0.00625	0.077	0.05	0.420

Sodium Carbonate + Carbon Dioxide

Normality of aq. $NaHCO_3$	Gms. dissolved CO_2	Gms. Total CO_2	Gms. $C_5H_4O_3N_4$ per 100 cc sat. sol.
0.0025	0.00275	0.0085	0.022
0.005	0.0055	0.0136	0.031
0.010	0.011	0.0224	0.0437
0.020	0.022	0.0362	0.0541
0.0025	0.019	0.0228	0.0140
0.005	0.038	0.0423	0.0159
0.010	0.072	0.0816	0.0176
0.020	0.154	0.1593	0.0202

100 gms. Abs. Alcohol dissolve 0.68 gm uric acid at 20-25°. (Fucher and Dehn, 1921.)
» Quinoline » 1.13 » " " " " "
» equi mol. mixture of alcohol and quinoline dissolve 0.61 gm. uric acid at 20-25°.

An approximate determination of the solubility of uric acid in alcohol by extraction in a Soxhlet apparatus, gave 0.00008 gms. per 100 cc. A similar determination with ether as solvent, gave negative results. (Gortner, 1914.)

100 gms. 95% formic acid dissolve 0.04 gm. uric acid at 20°. (Aslan, 1915.)
" pyridine dissolve 0.21 gm. uric acid at 20-25°. (Dehn, 1917.)
" aq. 50% pyridine dissolve 0.75 gms. uric acid at 20-25°. "

Methyl **URIC ACIDS.**

SOLUBILITY OF ORDINARY URIC ACID AND OF SEVERAL METHYL URIC ACIDS IN WATER AT THE BOILING POINT.

(Biltz and Heyn, 1917.)

About 400 cc. of water containing several grams of the given uric acid were boiled under a reflux condenser for 2 hours. The saturated solution was analyzed by evaporating a weighed sample in a platinum dish and weighing the residue after drying one-fourth of an hour at 110°.

Compound.	Gms. compound per 1000 cc. H_2O.	Compound.	Gms. compound per 1000 cc. H_2O.
Uric acid...........	0.800	3 Methyl Uric acid	[illegible]
9-Methyl Uric acid...	0.546	3.7 Di methyl Uric acid	1.118
δ » » » ...	1.588	90% δ + 10% 9 Methyl Uric acid	[illegible]
ζ » » » ...	2.105	70% δ + 30% 9 " " "	[illegible]

THIOPHENE Mono**CARBONIC ACIDS** α, β and a C_4H_3SCOOH.

The solubility of the three isomers is given by Voerman (1907) as 0.57 gm. of the α acid per 100 cc. sat. solution at 21°; 0.445 gm. of the β acid at 18°, and 0.75 gm. of the a acid at 17°. The solvent is not stated. Data for the solidification points of mixtures of the α and β acid are also given.

PYRIDINE CH < (CH.CH)$_2$ > N.

SOLUBILITY IN WATER, DETERMINED BY THE FREEZING-POINT METHOD.

(Average curve from results of Pickering (1893) and Baud (1909).)

t°. of Solidification.	Gms. C_5H_5N per 100 Gms. Mixture.	Solid Phase.	t° of Solidification.	Gms. C_5H_5N per 100 Gms. Mixture.	Solid Phase.	t° of Solidification.	Gms. C_5H_5N per 100 Gms. Mixture.	Solid Phase.
0	0	Ice	−10	58.5	Ice	−60	84	Ice
−1	7.5	"	−12.5	62	"	−65 Eutec.	85	" + C_5H_5N
−2	17	"	−15	64.5	"	−60	87	C_5H_5N
−3	28	"	−20	68	"	−55	89	"
−4	37.5	"	−25	71	"	−50	92	"
−5	43.5	"	−30	73.5	"	−45	95	"
−6	48	"	−40	78	"	−40	97	"
−8	54	"	−50	81.5	"	−38 m. pt.	100	"

Timmermans (1912) is reported to have made determinations on the above systems but the original paper could not be located.

Baud also gives data for the densities of pyridine + water mixtures.

The following more recent determinations are by Ewert, 1937.

t°	Mol. Percent C_5H_5N in Mixture	t°	Mol. Percent C_5H_5N in Mixture
- 2.9(- 4.0)	10.0	-69.2(-64.1)	60.0
- 9.0(- 8.0)	20.0	-61.9(-57.3)	70.0
-21.7(-17.4)	30.0	-76.0(-66.0)Eutec.	—
-36.4(-28.4)Eutec.	—	-54.7(-51.3)	80.0
-40.2(-32.2)	40.0	-47.9(-45.8)	90.0
-55.0(-47.5)	50.0		

The temperatures in parentheses are quoted by Ewert from the unpublished results of S. Frederic and R. Rayet.

EQUILIBRIUM IN THE SYSTEM PYRIDINE, PHENOL AND WATER.

(Mertzline, 1936.)

The temperature of homogeneity and composition of mixtures containing:

	5 Wt. % C_5H_5N	
t°	Wt. % H_2O	Wt. % C_6H_5OH
80.5	93.0	2.0
94.3	92.2	3.0
112.6	90.0	5.0
128.4	85.0	10.0
130.1	75.0	20.0
122.6	65.6	29.4
113.6*	56.4	38.6
103.0	44.9	50.1
85.2	33.7	61.3
59.8	25.0	70.0

	10 Wt. % C_5H_5N	
t°	Wt. % H_2O	Wt. % C_6H_5OH
52.2	89.0	1.0
87.0	88.0	2.0
108.4	86.5	3.5
123.2	84.0	6.0
140.6	75.0	15.0
133.5*	57.6	32.4
119.3	40.0	50.0
103.6	30.7	59.3
69.5	20.1	69.9

	20 Wt. % C_5H_5N	
t°	Wt. % H_2O	Wt. % C_6H_5OH
80.5	77.5	2.5
109.4	75.0	5.0
131.2	69.9	10.1
142.4*	60.0	20.0
143.0	48.6	31.4
138.4	40.1	39.9
125.5	28.5	51.6
97.2	18.0	62.0
73.6	13.3	66.7

	30 Wt. % C_5H_5N	
t°	Wt. % H_2O	Wt. % C_6H_5OH
75.6	65.0	5.0
117.1*	59.6	10.4
135.5	50.2	19.8
140.0	40.1	29.9
136.5	31.8	38.2
117.8	20.1	49.9
89.4	13.0	57.0

	40 Wt. % C_5H_5N	
t°	Wt. % H_2O	Wt. % C_6H_5OH
51.0	53.0	7.0
89.3*	49.7	10.2
105.5	47.0	13.0
123.7	40.0	20.0
127.0	30.1	29.9
117.1	20.0	40.0
96.8	15.0	45.0
65.7	10.2	49.8

	50 Wt. % C_5H_5N	
t°	Wt. % H_2O	Wt. % C_6H_5OH
69.7	36.0	14.0
92.1*	30.0	30.0
90.2	20.0	30.0
71.8	15.0	35.0

* Critical opalescence

Composition of the mixtures near the upper critical point.

t°	Gms. per 100 gms. mixture		
	H_2O	C_5H_5N	C_6H_5OH
143.5	63.4	15.8	20.8
143.5	58.4	18.3	23.3
143.8	56.5	18.5	25.0

EQUILIBRIUM IN THE SYSTEM PYRIDINE, ANILINE AND WATER.

(Ousti-Katchkintzev and Mertzaline, 1930.)

Results at 0°

Gms. per 100 gms. homogeneous mixture		
H_2O	C_5H_5N	$C_6H_5NH_2$
—	—	—
69.3	23.1	7.6
52.2	32.0	15.8
46.3	35.3	18.4
40.4	37.7	21.9
24.0	39.6	36.4
18.5	37.2	44.3
9.3	17.2	73.5

Results at 50°

Gms. per 100 gms. homogeneous mixture		
H_2O	C_5H_5N	$C_6H_5NH_2$
80.1	7.9	12.0
—	—	—
51.5	33.0	15.5
—	—	—
40.9	37.7	21.4
—	—	—
19.9	36.6	43.5

The authors also give results for the quaternary systems Pyridine, Pyperidine, Aniline and Water at 0°, 20°, and 50° and for Pyridine, Piperidine, Acetic Acid and Water at 0°.

DISTRIBUTION OF PYRIDINE AT 25° BETWEEN:

(Smith, 1921, 1922.)

Water and Chloroform.

Millimols. C_5H_5N per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$
0.225	1.225	5.4
0.30	2.2	7.3
0.55	5.10	9.3
1.45	16.25	11.2

Water and Xylene

Millimols C_5H_5N per liter of		
H_2O layer C_1	Xylene layer C_2	$\frac{C_2}{C_1}$.
1.00	1.90	1.90
2.05	3.80	1.85
4.80	9.50	1.98
9.75	19.00	1.95

DISTRIBUTION OF PYRIDINE BETWEEN WATER AND BENZENE AT 25°

(Woodman and Corbet, 1925.)

Measured volumes of benzene, water and pyridine were placed in stoppered graduated cylinders. The mixtures were maintained at 25° for 6 hours and vigorously shaken periodically. The volume of the two layers was noted and known volumes of each weighed and the pyridine in them determined by titration with normal acid, using methyl orange as indicator. The volume of benzene was measured.

Benzene layer.			Water Layer.		
Density.	Wt. % Pyridine.	Wt. % C_6H_6.	Density.	Wt. % Pyridine.	Wt. % C_6H_6.
0.874	3.28	94.51	0.994	1.17	0.0
0.882	9.75	87.46	0.995	3.55	0.0
0.983	18.35	79.49	0.998	7.64	trace
0.903	26.99	71.31	0.997	11.46	0.15
0.909	31.42	66.46	0.997	22.78	0.25
0.911	34.32	64.48	0.996	32.13	0.44
0.915	36.85	59.35	0.997	41.47	2.18
0.918	39.45	56.43	0.990	48.82	3.99
0.914	39.27	55.72	0.991	49.82	4.28

DISTRIBUTION OF PYRIDINE BETWEEN WATER AND BENZENE.

At Room Temperature.
(v. Georgievics, 1915.)

Gms. C_5H_5N per 25 cc. H_2O Layer.	Gms. C_5H_5N per 75 cc. C_6H_6 Layer.
0.0617	0.4733
0.0958	0.7631
0.1549	1.2249
0.2432	2.0096
0.3297	2.6553
0.723	5.4159
1.147	9.878

At 25°.
(Hantzsch and Sebaldt, 1899.)

	Mols. C_5H_5N per Liter.		Ratio.
	Aq. Layer.	C_6H_6 Layer.	
	0.00148	0.00436	0.339
	0.00076	0.00226	0.339
	0.00038	0.00110	0.345
	0.000208	0.000546	0.381
	0.000112	0.000274	0.413
(at 5.5°)	0.000456	0.000928	0.491
(at 50°)	0.000314	0.001088	0.289

DISTRIBUTION OF PYRIDINE BETWEEN WATER AND TOLUENE.

(Hantzsch and Vagt, 1901.)

At 25°.

Mols. C_5H_5N per Liter.		Ratio.
Aq. Layer.	$C_6H_5CH_3$ Layer.	
0.0517	0.1129	0.458
0.0261	0.0559	0.466
0.0132	0.0275	0.481
0.0067	0.0137	0.496
0.0033	0.0066	0.551
0.0019	0.0034	0.629
0.0011	0.0017	0.647
0.0007	0.0010	0.696

At Various Temperatures.

t°.	Mols. C_5H_5N per Liter.		Ratio.
	Aq. Layer.	$C_6H_5CH_3$ Layer.	
0	0.0168	0.0201	0.840
10	0.0135	0.0215	0.627
20	0.0111	0.0228	0.529
30	0.0108	0.0234	0.461
40	0.0101	0.0245	0.411
50	0.0096	0.0252	0.380
70	0.0085	0.0263	0.324
90	0.0082	0.0266	0.307

Data for systems composed of pyridine, water and various inorganic salts are given by Timmermans, 1907.

RECIPROCAL SOLUBILITY, DETERMINED BY FREEZING-POINT METHOD, OF MIXTURES OF:

Benzene and Phenol.
(Hatcher and Skirrow, 1917.)

t° of Melting.	Gms. C_6H_6 per 100 Gms. Mixture.	Solid Phase.
39.4	0	C_6H_5OH
30	11.8	"
20	25	"
10	38.2	"
0	51.5	"
− 5.4 Eutec.	58.4	" + C_6H_6
− 2.5	67.5	C_6H_6
0	78.3	"
+ 2.5	89	"
5.1	100	"

Benzene and Pyridine.
(Hatcher and Skirrow, 1917.)

t° of Melting.	Gms. C_6H_6 per 100 Gms. Mixture.	Solid Phase.
−39.4	0	C_5H_5N
−45	10	"
−50	17	"
−55	23.3	"
−58 Eutec.	26	" + C_6H_6
−50	31	C_6H_6
−40	37.7	"
−30	46	"
−20	57	"
−10	71.5	"
0	90.5	"

Additional data on the system Benzene + Phenol are given by Dahms, 1895; Paterno and Ampola, 1897; Tsakalotos and Guye, 1910, and Rozsa, 1911. Additional data on the system Benzene + Pyridine are given by Pickering, 1893.

The critical solution temperature of mixtures of Pyridine and n Heptane is -22.8°.

The critical solution temperature of mixtures of Pyridine and i Octane (2.2.4-Tri methyl pentane) is -15.0°. (Cornish, Archibald, Murphy and Evans, 1934.)

The critical solution temperature of mixtures of pyridine and sulfur is at 161° and the mixture contains 30 percent C_5H_5N. (Hammick and Holt, 1926, 1927.)

Freezing-point data are given for mixtures of:

Pyridine	+ Acetic Acid	(Puschin and Rikovsky, 1932a.)
"	+ Chloro Benzene	(Burnham and Madgin, 1936.)
"	+ p Chloro Phenol	" " "
"	+ Guaicol	(Puschin and Vaic, 1926.)
"	+ Methyl Iodide	(Wroczinski and Guye, 1910.)
"	+ Naphthalene	(Hatcher and Skirrow, 1917.)

Results for mixtures of Pyridine and Benzoic acid are given by Baskov, 1914.

Results for mixtures of pyridine and each of the following compounds: phenol, chloro phenol, o, m and p cresol and naphthalene are given by Bramley, 1916 and Hatcher and Skirrow, 1917.

PYRIDINAMINO SUCCINIC ACIDS.

100 gms. H_2O dissolve 1.67 gms. of the *d* compound, 1.64 gms of the *l* compound and 1.68 gms. of the *dl* compound at 18°. (Lutz, 1910.)

PYRIDINE Phosphor Hexa Fluoride $C_5H_5N.HPF_6$.

One liter sat. solution of Pyridine Phosphor Hexa fluoride in Water contain 0.18 gm. $C_5H_5N.HPF_6$ at 19°. (Lange and Müller, 1930.)

TRI METHYLENE CYANIDE (Glutaronitrile) $CN.CH_2.CH_2.CH_2CN$.

RECIPROCAL SOLUBILITY OF TRIMETHYLENE CYANIDE AND WATER.
(Serwy, 1933.)

t°	Gms. H_2O per 100 gms. Mixture	t°	Gms. H_2O per 100 gms. Mixture	t°	Gms. H_2O per 100 gms. Mixture
-1.2tr.pt.	—	68.1	41.99	68.1	58.05
+5.6	6.0	68.2	44.96	66.7	64.92
34.85	11.6	68.25	49.26	65.5	67.92
55.3	20.7	68.3*	51.17	63.6	71.17
64.3	30.0	68.3	53.25	56.0	78.29
67.5	38.12	68.2	55.21	21.7	89.5

* Critical opalescence.

GALLIC ALDEHYDE $3.4.5.(OH)_3C_6H_2CHO.H_2O$.

100 gms. H_2O dissolve 0.1 gm. aldehyde at 0° and 5.8 gms. at 50°.

METHYL BARBITURIC ACID NHCONHCOCH(CH_3) CO

Freezing-point data for mixtures of n Methyl barbituric acid with Antipyrine and with Pyramidon are given by Hammick and Hanson, 1933.

MESACONIC ACID (Methyl fumaric acid) $C_3H_4(COOH)_2$.

SOLUBILITY OF MESACONIC ACID IN SEVERAL SOLVENTS. (Lebrun, 1925.)

Solvent.	t°.	Gms. $C_3H_4(COOH)_2$ per 100 gms. solvent.
Acetylene dichloride, cis. b. pt. 60°.2	40	0.006
» » trans. b. pt. 48°.3 ..	40	0.046
Crotonic nitrile, b. pt. 107.7-108.2	30	1.049
» » » 121.8-122.2	30	0.72

CITRACONIC ACID (Methyl Maleic Acid) $CH_3C.(COOH) : HC.COOH$.

SOLUBILITY OF CITRACONIC ACID IN SEVERAL SOLVENTS. (Lebrun, 1925.)

Solvent.	t°	Gms. $C_5H_6O_4$ per 100 gms. solvent.
Crotonic nitrile (b pt. 107°.7-108°.2)	30	30.52
» (b. pt. 121°.8-122°.2)	30	25.93
Dichlor acetylene (cis) (b. pt. 60°.2)	40	0.69
» (trans) (b. pt. 48°.3)	40	0.047

ITACONIC ACID $CH_2:C(COOH)CH_2COOH$.

Data for the distribution of itaconic acid between water and ether at 25° are given by Chandler, 1908.

ASPARTIC ACID HYDANTOIN $C_5H_6O_4N$.

SOLUBILITY IN WATER AND IN ETHYL ALCOHOL AT 25°.
(McMeekin, Cohn and Weare, 1935.)

Solvent	d. of sat. sol.	Gm. Mol. $C_5H_6O_4N$ per liter
H_2O	1.0016	0.0705
C_2H_5OH	0.7878	0.0141

METHYL TRICHLORO β HYDROXY BUTYRATE $CCl_3CHOHCH_2COOCH_3$.

Freezing-point data for mixtures of the isomerides of methyl tri chloro β Hydroxy Butyrate are given by Ross, 1936.

DI ACETYL METHYL d TARTRATE $(CHOCOCH_3CO_2CH_3)_2$.

Freezing-point data for mixtures of the d and r compound are given by Findlay and Campbell, 1928.

ACETYLACETONE CH_3COCH_2COCH.

SOLUBILITY IN WATER.

(Rothmund — Z. phys. Ch. 26, 475, '98.)

t°.	Gms. $CH_3COCH_2COCH_3$ per 100 Gms. H_2O Layer.	Acetyl Acetone Layer.
30	15.46	95.02
40	17.58	93.68
50	20.22	91.90
60	23.23	89.41
70	27.10	85.77
80	33.92	78.82
87.7 (crit. temp.)	56.8	

NOTE. — Weighed amounts of water and acetyl acetone were placed in small glass tubes, which were then sealed and slowly heated until the contained mixtures became homogeneous. The temperature was then allowed to fall very gradually and the point noted at which cloudiness appeared. This point was accurately established for each tube by repeated trials. The curve plotted from these determinations shows two percentage amounts of acetyl acetone which cause cloudiness at each temperature below the critical point. Of these two points, for each temperature, one represents the aqueous layer, *i.e.*, the solubility of acetyl acetone in water; and the other represents the acetyl acetone layer, *i.e.*, the solubility of water in acetyl acetone. This method is known as the 'Synthetic Method," and yields results in harmony with those obtained by the analytical method, *i.e.*, by analyzing each layer after complete separation occurs.

100 gms. sat. sol. of Acetyl acetone in ordinary water (H_2O) contain 17.05 gms. $C_5H_8O_2$ at 19.5°.
100 gms. sat. sol. of Acetyl acetone in heavy water (D_2O) contain 10.6 gms. $C_5H_8O_2$ at 19.5°. (Nachod, 1938.)

α AMINO n BUTYRIC HYDANTOIN $C_5H_8O_2N_2$.

SOLUBILITY IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1935.)

Vol. % C_2H_5OH in Aq. Solvent	d. of sat. sol.	Gm. Mols. $C_5H_8O_2N$ per liter sat. sol.	Vol. % C_2H_5OH in Aq. Solvent	d. of sat. sol.	Gm. Mols. $C_5H_8O_2N$ per liter sat. sol.
0.0(= H_2O)	1.0223	0.863	80	0.9713	2.408
20	1.0118	1.233	90	0.9222	1.971
40	1.0092	2.053	100	0.8969	0.988
60	1.0008	2.725			

LEVULINIC ACID (β acetyl propionic Acid.) $CH_3COCH_2CH_2COOH$.

DISTRIBUTION OF LEVULINIC ACID BETWEEN WATER AND ETHER AT 25°.

(Smith, 1921, 1922.)

Millimols per liter. Aq. layer (C_1).	Millimols per liter. $(C_2H_5)_2O$ layer C_2.	$\frac{C_2}{C_1}$.	Millimols per liter Aq. layer (C_1).	Millimols per liter $(C_2H_5)_2O$ layer C_2	$\frac{C_2}{C_1}$
1.725	0.500	0.2900	10.10	2.65	0.2625
2.57	0.725	0.2820	14.65	3.75	0.2575
5.15	1.40	0.2725			

DISTRIBUTION OF LEVULINIC ACID AT 25° BETWEEN :
(Smith, 1921, 1922.)

Water and Chloroform.

Millimols per liter. H_2O layer (C_1).	Millimols per liter. $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
12.80	0.75	0.0586
18.55	1.35	0.0728
24.5	2.00	0.0817

Water and Xylene

Millimols per liter. H_2O layer (C_1).	Millimols per liter. $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
26.0	0.50	0.0192
35.0	0.80	0.0228
51.7	1.40	0.0271

GLUTARIC ACID (Pyrotartaric) $(CH_2)_3(COOH)_2$.

SOLUBILITY IN WATER. (Lamouroux, 1899)

t°.	0°.	15°.	20°.	35°.	50°.	65°.
Gms. $(CH_2)_3(COOH)_2$ per 100 cc. solution	42.9	58.7	63.9	79.7	95.7	111.8

100 gms. 95% formic acid dissolve 55.62 gms. glutaric acid at 18.6°. (Aschan, 1913.)

Data for the distribution of glutaric acid between water and ether at 25° are given by Chandler, 1908.

F. pt. data for glutaric acid + sulfuric acid. (Kendall and Carpenter, 1914.)

100 gms. benzene dissolve 0.0163 gm. $(CH_2)_3(COOH)_2$ at 25°. (Verkade and Coops, 1930.)

GLUTARIC ACID (Pyrotartaric Acid) $CH_2(CH_2COOH)_2$.

DISTRIBUTION OF GLUTARIC ACID AT 25° BETWEEN :
(Smith. 1921-1922.)

Water and Chloroform.

Millimols. per liter. H_2O layer (C_1).	Millimols. per liter. $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
17.9	0.375	0.0210
24.7	0.570	0.0231
33.1	0.905	0.0273

Water and Ether.

Millimols. per liter. H_2O layer (C_1).	Millimols. per liter. $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.70625	0.1875	0.268
1.300	0.34375	0.264
3.0875	0.9125	0.296
6.40	1.875	0.292
11.90	3.65	0.306

Acetone and Glycerol.

Millimols. per liter. Acetone layer (A).	Millimols. per liter. Glycerol layer (G).	$\frac{A}{G}$.
0.775	0.875	0.885
1.350	1.55	0.870
2.575	2.950	0.874
2.60	3.025	0.860
8.15	9.65	0.845

DI METHYL MALONIC ACID $C(CH_3)_2(COOH)_2$.

DISTRIBUTION OF DIMETHYL MALONIC ACID AT 25° BETWEEN WATER AND:
(Kolossowsky and Pomomarev, 1934; Kolossowsky, Kulikow and Bekturow, 1935.)

Ethyl Ether. Gm. Mols. $C(CH_3)_2(COOH)_2$ per liter H_2O layer(1)	Ethyl Ether. Gm. Mols. $C(CH_3)_2(COOH)_2$ per liter Ether layer(2)	Ethyl Ether. $\frac{1}{2}$	Amyl Alcohol. Gm. Mols. $C(CH_3)_2(COOH)_2$ per liter H_2O layer(1)	Amyl Alcohol. Gm. Mols. $C(CH_3)_2(COOH)_2$ per liter Alcohol layer(2)	Amyl Alcohol. $\frac{1}{2}$
0.00404	0.00387	1.044	0.0043	0.0141	0.305
0.00789	0.00831	0.950	0.0082	0.0353	0.232
0.02617	0.03385	0.773	0.0171	0.0781	0.219
0.0800	0.1233	0.649	0.0349	0.1688	0.207
0.1317	0.2120	0.621	0.0688	0.3302	0.208
0.2677	0.4396	0.551	0.1142	0.5161	0.221
0.4125	0.8544	0.483	0.2510	1.0208	0.246
0.5920	1.3978	0.424	0.5433	1.8227	0.298
0.8401	2.0975	0.401	0.6884	2.1285	0.323
1.1152	2.8877	0.386	0.8694	2.3385	0.372
1.6800	3.9403	0.426	1.3118	3.0803	0.426
2.3130	4.5236	0.511	1.8033	3.5647	0.506
3.4247	5.2234	0.656	2.8852	4.3594	0.622

ETHYL MALONIC ACID $CH(C_2H_5)(COOH)_2$.

100 gms. H_2O dissolve 170.9 gms. $CH(C_2H_5)(COOH)_2$ at 25°.
" " Ethyl Ether dissolved 0.015 gm. $CH(C_2H_5)(COOH)_2$ at 25°.
(Verkade and Coops, 1930a.)

Pyro**TARTARIC ACID** (Methyl Succinic Acid) $CH_3.CH(COOH).CH_2(COOH)$.
100 gms. H_2O dissolve 51 gms. $CH_3CH(COOH).CH_2COOH$ at 19.5°.
(Timofeiew, 1894.)

SOLUBILITY OF PYRO TARTARIC ACID IN ALCOHOLS.
(Timofeiew, 1894.)

Alcohol.	t°.	Gms. Acid per 100 Gms. Solvent.	Alcohol.	t°.	Gms. Acid per 100 Gms. Solvent.
Methyl Alcohol	−18.5	53	Ethyl Alcohol	19.5	72.4
"	+19	109.8	Propyl Alcohol	19	44.0
"	+19.5	112.5	"	19.5	47.1
Ethyl Alcohol	+19	70.8			

100 gms. 95% formic acid dissolve 17.8 gms. pyrotartaric acid at 18.5°.
(Aschan, 1913.)

TETRANITRO PENTA ERYTHRITOL $C(CH(NO_2)OH)_4(?)$.

SOLUBILITY OF TETRANITRO PENTAERYTHRITOL IN SEVERAL SOLVENTS.
(Urbanski and Kwiatkowski, 1933a.)

t°	Gms. $C(CH(NO_2)OH)_4$ per 100 gms.					
	CH_3OH	C_2H_5OH	$(C_2H_5)_2O$	$(CH_3)_2CO$	C_6H_6	$C_6H_5CH_3$
0	0.190	0.070	0.200	14.37	0.150	0.150
10	0.235	0.085	0.225	16.43	—	0.170
20	0.455	0.195	0.250	20.26	0.400	0.230
30	0.710	0.275	0.340	24.95	0.450	0.430
40	1.160	0.415	0.450(34.7°)	30.56	1.160	0.620
50	1.840	0.705	—	36.16	2.010	1.100
60	2.600	1.205	—	42.68(62.0°)	3.150	2.490
70	3.235(65.1°)	2.225	—	—	5.400	4.290
80	—	3.795(78.4°)	—	—	7.900(80.2°)	5.850
90	—	—	—	—	—	9.120
100	—	—	—	—	—	15.920
113	—	—	—	—	—	30.960

Freezing-point data are given by Urbanski, 1933, 1934, for mixtures of Nitro Penta Erythritol and each of the following compounds: Diphenyl amine, diethyl diphenyl urea, dimethyl diphenyl urea, m dinitro benzene, 1.2.4 dinitro toluene, 1.2.4 Chloro dinitro benzene 1.3.5 dinitro anisole, nitro erythrite, naphthalene, p nitro anisole, nitro mannite, α nitro naphthalene, p nitro toluene, 1.3.5 trinitro benzene, 2.4.6 trinitro toluene, trinitro phenyl, methyl nitramine, (tetryl)

VALERONITRILE $CH_3(CH_2)_3CN$.

α BROMO VALERIC ACID $CH_3(CH_2)_2CHBrCOOH$.
α BROMO ISO VALERIC ACID $(CH_3)_2CHCHBrCOOH$.

DISTRIBUTION OF α BROMO n VALERIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Benzene

Gm. Mols. $C_5H_9O_2Br$ per liter	
H_2O layer	C_6H_6 layer
0.00475	0.01042
0.00601	0.01496
0.00718	0.02012
0.00783	0.02357
0.00879	0.02862
0.01071	0.04119
0.01285	0.05625

Water and Toluene

Gm. Mols. $C_5H_9O_2Br$ per liter	
H_2O layer	$C_6H_5CH_3$ layer
0.00470	0.00790
0.00605	0.01146
0.00758	0.01731
0.00882	0.02258
0.00980	0.02760
0.01195	0.03995
0.01430	0.05480

DISTRIBUTION OF α BROMO VALERIC ACID AND OF α BROMO ISO VALERIC ACID BETWEEN WATER AND OLIVE OIL AT 25°.

(Bodansky and Meigs, 1932.)

Results for:

α Bromo Valeric Acid

t°	Gm. Mols. $C_5H_9O_2Br$ per liter		$\frac{1}{2}$
	H_2O layer(1)	Oil layer(2)	
25	0.0048	0.017	0.283
"	0.0103	0.042	0.245
"	0.0200	0.086	0.233
37.5	0.0045	0.017	0.265
"	0.0102	0.042	0.243
"	0.0190	0.085	0.223

α Bromo Iso Valeric Acid

t°	Gm. Mols. $C_5H_9O_2Br$ per liter		$\frac{1}{2}$
	H_2O layer(1)	Oil Layer(2)	
25	0.0032	0.0060	0.532
"	0.0053	0.0140	0.379
"	0.0130	0.0400	0.325
"	0.0222	0.0840	0.265
37.5	0.0063	0.0140	0.45
"	0.0120	0.0390	0.308
"	0.0222	0.0830	0.268

HYDROXY PROLINE $C_4H_7N(OH)COOH$.

100 cc 99-100% Acetic Acid dissolves 1.67 gm. $C_5H_9O_3N$ at 18°.
100 cc pure Butyric Acid " 0.006 " " " "

(v. Przylecki and Kasprzyk-Czaykowska, 1938.)

FORMYL α AMINO BUTYRIC ACID $CH_3CH_2CH(NHCHO)COOH$.

SOLUBILITY IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1936.)

Vol. % C_2H_5OH in Aq. Solvent	d. of sat. sol.	Gm. Mols. $C_5H_9O_3N$ per liter sat. sol.
0.0(= H_2O)	1.0043	0.256
20	0.9816	0.313
40	0.9600	0.475
60	0.9297	0.666
80	0.8812	0.691
90	0.8492	0.586
100	0.8018	0.355

One liter sat. sol. in Methanol contain 0.646 gm. mol. $C_5H_9O_3N$ at 25° and d. of sat. sol. = 0.8222.

GLUTAMIC ACID d $COOH(CH_2)_2CH(NH_2)COOH$.

SOLUBILITY OF d GLUTAMIC ACID IN WATER.

(Dalton and Schmidt, 1933.)

The following values were derived from a solubility equation based upon 35 very careful determinations made at 9 temperatures between 0° and 60°. The density of a 0.9399 percent aqueous d glutamic acid solution is 1.00068 at 25°.

t°	Gms. $C_5H_9O_4N$ per 100 gms. H_2O	t°	Gms. $C_5H_9O_4N$ per 100 gms. H_2O	t°	Gms. $C_5H_9O_4N$ per 100 gms. H_2O
0	0.341(0.345)	30	1.040	60	3.169
5	0.411	35	1.252	65	3.810
10	0.495	40	1.508	70	4.594
15	0.596	45	1.816	75	5.542(5.34)
20	0.717	50	2.186(2.228)	100	14.00
25	0.864(0.8852)	55	2.632		

The results in parentheses are by Dunn, Ross and Reed, 1933.

One very careful determination at 25° by Pertzoff, 1933, gave 0.87 gms. $C_5H_7O_4N$ per 100 cc sat. solution.

One liter of water saturated with d Glutamic acid at 25° contains 0.0585 gm. mol. $C_5H_9O_4N$ and the density = 1.0002. (McMeekin, Cohn and Weare, 1935.)

SOLUBILITY OF GLUTAMIC ACID IN WATER AND IN AQUEOUS SALT SOLUTIONS.

Solvent.	t°.	Gms. $C_3H_5(NH_2)(COOH)_2$ per 100 cc sat. sol.	Authority.
Water........................	20	0.669	(Pfeiffer and Würgler, 1916.)
»	21	0.658	(Pfeiffer and Angern, 1924.)
Aq. 2.01 *n* Li Cl solution....	20	0.707	(Pfeiffer and Würgler, 1916.)
» 2.00 *n* K Cl »	20	0.878	»
» 2.00 *n* KNO_3 »	20	1.205	»

GLUTAMIC ACID dl $COOH(CH_2)_2CH(NH_2)COOH$.

SOLUBILITY OF dl GLUTAMIC ACID IN WATER.

(Dalton and Schmidt, 1933.)

The following values were derived from a solubility equation based upon 24 very careful determinations made at 9 temperatures between 0° and 65°. The density of a 2.111 percent aqueous solution is 1.00529.

t°	Gms. $C_5H_9O_4N$ per 100 gms. H_2O	t°	Gms. $C_5H_9O_4N$ per 100 gms. H_2O	t°	Gms. $C_5H_9O_4N$ per 100 gms. H_2O
0	0.855(0.831)	30	2.447	60	7.006
5	1.018	35	2.916	65	8.450
10	1.213	40	3.475	70	9.950
15	1.446	45	4.141	75	11.86 (19.9
20	1.722	50	4.934(8.165)	100	28.49
25	2.054(2.643)	55	5.880		

SOLUBILITY OF d GLUTAMIC ACID IN AQUEOUS ETHYL ALCOHOL.

(Dunn and Ross, 1938.)

t°	Wt. % C_2H_5OH in aqueous solvent	d. of sat. sol.	Gms. $C_5H_9O_4N$ per 100 gms. solvent	t°	Wt. % C_2H_5OH in aqueous solvent	d. of sat. sol.	Gms. $C_5H_9O_4N$ per 100 gms. solvent
0.0	20.16	0.971	0.0855	25	100	0.783	0.0025
"	42.59	0.934	0.0371	45	20	0.960	0.811
"	67.03	0.882	0.0163	45.3	42.59	0.912	0.378
25.0	20.00	0.964	0.292	44.9	67.11	0.854	0.0885
"	42.66	0.925	0.131	45.2	92.61	0.794	0.0127
"	67.11	0.867	0.037	44.9	100.0	0.770	0.0056
"	92.61	0.807	0.0044				

10 cc. of a cold aqueous sat. solution of $Mg(ClO_4)_2$ dissolve 1.25 gm. d Glutamic Acid. (Duclaux and Durand-Gasselin, 1938.)

SOLUBILITY OF d GLUTAMIC IN SEVERAL SOLVENTS AT 25°.

(Pertzoff, 1933.)

Solvent	Gm. $C_5H_9O_4N$ per 100cc sat. sol.	Gm. Mols. $C_5H_9O_4N$ per 1000 gms. solvent
Methyl Alcohol	0.0058	0.00048
Ethyl Alcohol	0.0054	0.00046
Acetone	0.0006	0.0000025

GLUTAMIC ACID HYDROCHLORIDE $C_3H_6NH_2(COOH)_2.HCl$.

SOLUBILITY IN WATER. (Stoltzenberg, 1912.)

(The following results were taken from the diagram given by the author.)

t°.	Gms. Glutamic Acid. HCl per 100 cc. Sat. Sol.	t°.	Gms. Glutamic Acid. HCl per 100 cc. Sat. Sol.
0	31.5	60	57
10	34.5	70	62
20	38	80	67.5
30	42.5	90	74
40	47	100	81
50	52	20	1.4 (sol. sat. with HCl)

DIGLYCINE HYDANTOIC ACID $C_5H_9O_4N_3$.

SOLUBILITY OF DIGLYCINE HYDANTOIC ACID IN AQUEOUS ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1936.)

Solvent	d. of sat. sol.	Gm. Mols. $C_5H_9O_4N_3$ per liter
Water	1.0050	0.126
80% C_2H_5OH	0.85695	0.0220
90% "	0.82564	0.00851
100% "	0.7857	0.00115

AMYLENE (1-Pentene?) C_5H_{10}.

5.0 cc of an aqueous sat. solution of sodium salicylate dissolve 0.05 cc of Amylene at about 18°. (Traube, Schöning and Weber, 1927.)

CRITICAL TEMPERATURE OF VAPORIZATION OF MIXTURES OF AMYLENE AND LIQUID CARBON DIOXIDE.

(Büchner, 1905-06.)

The determinations were made by the synthetic method.

t° (Crit.)	31	103	201
Gms. C_5H_{10} per 100 gms. mixture	0	48	100

AMYLENE (Trimethylethylene) $(CH_3)_2C:CHCH_3$.

RECIPROCAL SOLUBILITY IN ANILINE; DETERMINATIONS BY SYNTHETIC METHOD.

(Konowalow, 1903.)

t°.	Gms. Aniline per 100 Gms. Amylene Layer.	Gms. Aniline per 100 Gms. Aniline Layer.	t°.	Gms. Aniline per 100 Gms. Amylene Layer.	Gms. Aniline per 100 Gms. Aniline Layer.
0	19.5	81.5	10	28	73
2	19.7	80.5	12	34	68
4	20.5	79.5	13	38.5	64.7
6	21.7	78	14	45	59
8	24.2	75.8	14.5 (crit. temp.)	51.0	

METHYL n PROPYL KETONE (2-Pentanone) $CH_3CO(CH_2)_2CH_3$.

100 gms. sat. sol. of Methyl Propyl Ketone in Water contain 6.0 gms. $(CH_3)(C_3H_7)CO$ at approximately 25°.
100 gms. sat. sol. of Water in Methyl Propyl Ketone contain 1.6 gms H_2O at approximately 25°. (Park and Hofman, 1932.)

SOLUBILITY OF METHYL n PROPYL KETONE AND OF METHYL ISO PROPYL KETONE, EACH SEPARATELY, IN WATER.

(Gross, Rintelen and Saylor, 1939.)

t°	Gm. Mols. normal $C_5H_{10}O$ per 100 gms. H_2O	Gms. Iso $C_5H_{10}O$ per 100 gms. H_2O
10	0.887	0.813
30	0.630	0.608
50	0.515	0.594

DIETHYL KETONE (Propione) $(C_2H_5)_2CO$.

SOLUBILITY IN WATER. (Rothmund, 1898.)

The determinations were made by Synthetic Method, see p. 291. The critical temperature could not be reached and high accuracy is not claimed for the results.

t°.	Gms. Diethyl Ketone per 100 Gms. Aq. Layer.	Gms. Diethyl Ketone per 100 Gms. Ketone Layer.	t°.	Gms. Diethyl Ketone per 100 Gms. Aq. Layer.	Gms. Diethyl Ketone per 100 Gms. Ketone Layer.
20	4.60	...	100	3.68	93.10
40	3.43	97.42	120	4.05	90.18
60	3.08	96.18	140	4.70	87.01

SOLUBILITY OF DIETHYL KETONE IN WATER.

(Gross, Saylor and Gorman, 1933; Gross, Rintelen and Saylor, 1939.)

t°	Gm. Mols. $C_5H_{10}O$ per 1000 gms. H_2O	Gms. $C_5H_{10}O$ per 100 gms. H_2O
10	0.781	6.73
30	0.576	4.96
50	0.456	3.93

Results for the partial vapor pressures at 30° of Diethyl ketone in aqueous solution less than saturated are given by Saylor, Stuckey and Gross, 1938.

RECIPROCAL SOLUBILITIES OF SEVERAL PENTANOLS AND WATER.

(Ginnings, Herring and Coltrane, 1939.)

Alcohol	Formula	t°	Gms. alcohol per 100 gms. sat. sol. in H_2O	Gms. H_2O per 100 gms. sat. sol. in alcohol
3 Penten - 2 ol	$C_5H_{10}O$	20	9.46	12.29
" "	"	25	8.92	12.35
" "	"	30	8.48	12.43
4 Penten - 3 ol	$C_5H_{10}O$	20	8.72	12.88
" "	"	25	8.20	13.12
" "	"	30	7.74	13.22
4 Penten - 1 ol	$C_5H_{10}O$	20	5.89	13.17
" "	"	25	5.70	13.43
" "	"	30	5.56	13.81

RECIPROCAL SOLUBILITIES OF SEVERAL CYCLIC ETHERS AND WATER.

(Bennett and Philip, 1928.)

The authors used a modification of the method of Hill, 1923, in which the size of the vessels were greatly reduced and a globule of Hg was introduced to hasten the mixing of the phases.

Cyclic Ether	Formula	t°	Gms. Ether per 100 gms. sat. sol. in H_2O	Gms. H_2O per 100 gms. sat. sol. in ether
Penta methylene oxide	$C_5H_{10}O$	0	13.40	1.63
" " "	"	10	10.70	2.08
" " "	"	15	9.64	2.27
" " "	"	20	8.76	2.70
" " "	"	25	8.02	3.14
α Methyl tetra methylene oxide	$C_5H_{10}O$	0	22.10	9.54
" " " "	"	10	18.20	7.72
" " " "	"	15	16.52	7.05
" " " "	"	20	15.05	6.65
" " " "	"	25	13.87	6.08
β Methylene tetra methylene oxide	$C_5H_{10}O$	0	14.6	—
" " " "	"	10	11.25	—
" " " "	"	15	10.2	—
" " " "	"	20	9.5	—
" " " "	"	25	8.8	—

$C_5H_{10}O_2$

BUTYL FORMATE $HCOOC_4H_9$.

SOLUBILITY OF BUTYL FORMATE IN AQUEOUS ETHYL ALCOHOL MIXTURES.

(Pfeiffer, 1892; Bancroft, 1895.)

Composition of Homogeneous Mixture		
cc. $HCOOC_4H_9$	cc. C_2H_5OH	cc H_2O
3.0	3.0	3.45
3.0	6.0	8.83
3.0	9.0	14.75
3.0	12.0	21.45
3.0	15.0	29.64
3.0	18.0	39.0
3.0	21.0	51.8
3.0	24.0	∞

100 gms. H_2O dissolve 1.0 gm. Iso butyl formate at 22°. (Traube, 1884.)

PROPYL ACETATE $CH_3COOC_3H_7$.

100 cc H_2O dissolve 1.91 gms. $CH_3COOC_3H_7$ at 20°. (Fuhner, 1924.)
100 cc H_2O dissolve 1.7 gm. $CH_3COOC_3H_7$ at 22°. (Traube, 1884.)
100 cc H_2O dissolve 3.19 gms. Iso Propyl Acetate at 20°. (Fuhner, 1924.)

EQUILIBRIUM IN THE SYSTEM PROPYL ACETATE, ETHYL ALCOHOL AND WATER AT ROOM TEMPERATURE.

(Pfeiffer, 1892; Bancroft, 1895.)

Composition of Homogeneous Mixtures		
cc $CH_3COOC_3H_7$	cc C_2H_5OH	cc H_2O
3.0	3.0	4.5
3.0	6.0	10.38
3.0	9.0	17.80
3.0	12.0	26.00
3.0	15.0	35.64
3.0	18.0	47.50
3.0	21.0	68.91
3.0	24.0	∞

ETHYL PROPIONATE $C_2H_5COOC_2H_5$.

SOLUBILITY IN WATER AND IN AQUEOUS ETHYL ALCOHOL MIXTURES.

(Pfeiffer, 1892; Bancroft, 1895.)

cc. Alcohol in Mixture.	cc. H_2O to cause Separation of a Second Phase in Mixtures of the Given Amounts of Alcohol and 3 cc. Portions of Ethyl Propionate.
3	2.13
6	6.87
9	11.15
12	19.17
15	27.12
18	36.84
21	50.42
24	∞

100 grams H_2O dissolve 1.7 grams ethyl propionate at 22° (Traube, 1884.)

Freezing-point data for mixtures of ethyl propionate and ethyl formate are given by Timmermans, 1914.

METHYL BUTYRATE $C_3H_7COOCH_3$.

100 gms. H_2O dissolve [illegible] gm. $C_3H_7COOCH_3$ at 22°. (Traube, 1884.)

VALERIC ACID *n* $CH_3(CH_2)_3COOH$ (*n* Propyl Acetic Acid).

When valeric acid is shaken with water at 16°, two layers are formed.
100 gms. of the aqueous layer contain 3.4 gms. $CH_3(CH_2)_3COOH$.
100 gms. of the acid layer contain 90.4 gms. $CH_3(CH_2)_3COOH$.
(Lieben and Rossi, 1871.)

DISTRIBUTION OF VALERIC ACID BETWEEN BENZENE AND 95.8% SULFURIC ACID.

(Gurwitsch, 1914.)

The mixtures were made at 0° and brought to equilibrium by shaking for 5 minutes at 18°, and allowing to stand over night.

Gms. Valeric Acid per 100 Gms.		Gms. Valeric Acid per 100 Gms.	
Benzene Layer.	H_2SO_4 Layer.	Benzene Layer.	H_2SO_4 Layer.
7.60	46.4	1	36.7
4.78	44.8	0.58	35.2
3.64	43.5	0.29	32.7
2.61	41.4	0.20	30.7
1.62	39.5	0.04	26.1
1.48	38.1	0.007	23.8

The coefficient of distribution of isovaleric acid between benzene and water at room temperature is, conc. in C_6H_6 ÷ conc. in H_2O = 2.744. (King and Narracott 1909.)

VALERIC ACID *n* $CH_3(CH_2)_3COOH$.

DISTRIBUTION OF VALERIC ACID BETWEEN :

Water and Benzene at 22°.
(Brown and Bury, 1923.)

Normality of $CH_3(CH_2)_3COOH$ in		Normality of $CH_3(CH_2)_3COOH$ in	
H_2O layer.	C_6H_6 layer	H_2O layer.	C_6H_6 layer.
0.1357	1.848	0.0383	0.191
0.1149	1.400	0.0235	0.0793
0.0919	0.929	0.0178	0.0481
0.0610	0.445	0.0136	0.0292
0.0479	0.289		

Water and Chloroform at 25°.
(Smith, 1921, 1922.)

Millimols. $CH_3(CH_2)_3COOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	
0.890	0.70	1.80
0.650	1.35	2.08
0.910	2.00	2.20
1.825	4.625	2.53

DISTRIBUTION OF VALERIC ACID BETWEEN WATER AND ETHYL ETHER.

Results at 22°.
(Behrens, 1926.)

Concentration in		$\frac{C_2}{C_1}$.	Concentration in		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).		H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	
0.00315	0.0675	21.4	0.01015	0.2358	23.2
0.00413	0.0907	21.9	0.0161	0.4025	25.1
0.00507	0.1145	22.6	0.0164	0.4155	25.3
0.00671	0.1528	22.8			

Results at 25°.
(Smith, 1921, 1922.)

Millimols. per liter in		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	
0.0775	1.0225	13.20
0.1125	1.4575	12.92
0.1700	2.2000	12.95
0.3000	4.3000	14.32
0.3900	5.6700	15.52

DISTRIBUTION OF VALERIC ACID AT 25° BETWEEN WATER AND XYLENE.

(Smith, 1921, 1922.)

Millimols. $CH_3(CH_2)_3COOH$ per liter.		$\frac{C_2}{C_1}$.	Millimols. $CH_3(CH_2)_3COOH$ per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).		H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	
0.6625	0.3125	0.472	2.30	1.70	0.74
1.150	0.625	0.543	5.00	5.00	1.00
1.500	0.925	0.616	8.40	11.6	1.38
2.175	1.575	0.725			

$C_5H_{10}O_2$

DISTRIBUTION OF NORMAL VALERIC ACID AT 25° BETWEEN WATER AND:

([illegible] and [illegible], 19[illegible].)

Chloroform		Benzene		Toluene	
Gm. Mols. $C_5H_{10}O_2$ per liter		Gm. Mols. $C_5H_{10}O_2$ per liter		Gm. Mols. $C_5H_{10}O_2$ per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	C_6H_6 layer	H_2O layer	$C_6H_5CH_3$ layer
0.00228	0.00694	0.00150	0.00144	0.00112	0.000979
0.00321	0.01055	0.00284	0.00705	0.00195	0.00168
0.00437	0.01724	0.00655	0.01247	0.00491	0.00668
0.00602	0.02818	0.01041	0.02679	0.00711	0.01192
0.00770	0.04200	0.01440	0.04649	0.01546	0.04543
0.00917	0.05411	0.01981	0.08254	0.02150	0.08075
0.01040	0.06900	0.02661	0.14079	0.02889	0.1185

DISTRIBUTION OF VALERIC ACID AT 25° BETWEEN WATER AND SEVERAL ORGANIC SOLVENTS.

(Archibald, 1932.)

Organic Solvent	Formula	Gm. Mols. $C_5H_{10}O_2$ per liter		k
		H_2O layer	Organic layer	
Methyl Ethyl Ketone	$CH_3COC_2H_5$	0.01153	0.12216	10.211
ter. Amyl Alcohol	$C_5H_{11}OH$	0.01497	0.11074	37.011
Sec. Butyl Alcohol	C_4H_9OH	0.02744	0.11115	11.156
n " "	C_4H_9OH	0.03171	0.11550	31.012
n Amyl "	$C_5H_{11}OH$	0.00884	0.11288	15.41
Ethyl Ether	$C_2H_5OC_2H_5$			17.5

DISTRIBUTION OF VALERIC ACID AT ROOM TEMPERATURE BETWEEN WATER AND PETROLEUM ETHER

([illegible] and [illegible], 192[illegible].)

[illegible] per [illegible]		k
H_2O layer	Pet. Ether layer	
0.58	[illegible]	[illegible]
1.22	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
11.70	[illegible]	[illegible]

DISTRIBUTION OF NORMAL VALERIC ACID AND OF ISO VALERIC ACID BETWEEN WATER AND [illegible] AT 25°

([illegible] and [illegible], 19[illegible]; [illegible], 19[illegible].)

Normal Valeric Acid				Iso Valeric Acid			
t°	Gm. Mols. $C_5H_{10}O_2$ per liter		k	t°	Gm. Mols. $C_5H_{10}O_2$ per liter		k
	H_2O layer	[illegible] layer			H_2O layer	[illegible] layer	
25°	[illegible]	[illegible]	[illegible]	25°	[illegible]	[illegible]	0.474
	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	0.522
	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	0.465
	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	0.481

Iso VALERIC ACID $(CH_3)_2.CH.CH_2COOH$.

SOLUBILITY OF ISO VALERIC ACID IN AQUEOUS SOLUTIONS OF PHOSPHORIC ACID AT 25°.

(Walton and Kepfer, 1930.)

Normality of aq. H_3PO_4	Normality of dissolved $C_5H_{10}O_2$	Normality of aq. H_3PO_4	Normality of dissolved $C_5H_{10}O_2$	Normality of aq. H_3PO_4	Normality of dissolved $C_5H_{10}O_2$
0.0	0.467	19.43	0.15	35.72	0.15
7.67	0.26	28.39	0.10	39.15	0.21
13.84	0.18	32.16	0.11	42.82	0.39

DISTRIBUTION OF ISO VALERIC ACID BETWEEN

Water and Chloroform

at 25°. (Smith, 1921, 1922.)

Millimols. per liter in		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.239	1.162	0.94
1.585	1.65	1.04
2.45	2.90	1.182
3.35	4.55	1.36

Water and Ethyl Ether

at 16-17°. (Behrens, 1926.)

Concentration in		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C}{C_1}$.
0.0051	0.0993	19.5
0.0078	0.1533	19.7
0.0125	0.257	20.5

at 25°. (Smith, 1921, 1922.

Millimols. per liter in		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.2500	1.875	7.50
0.4437	3.275	7.70
0.5750	4.500	7.82
0.8875	7.087	7.98
1.325	11.00	8.32

DISTRIBUTION OF ISO VALERIC ACID AT 25° BETWEEN: (Smith, 1921, 1922.)

Water and Xylene.

Millimols. per liter in		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
1.875	0.600	0.320
2.35	0.875	0.372
3.85	1.55	0.403
4.275	1.925	0.450
5.30	2.60	0.490
6.15	3.15	0.512

Acetone and Glycerol.

Millimols. per liter in		
Acetone layer (A).	Glycerol layer (G)	$\frac{A}{G}$.
4.75	0.1125	42.3
5.15	0.1375	37.4
10.30	0.300	34.4
23.00	0.500	46.0

·ISO VALERIC ACID

DISTRIBUTION OF ISO VALERIC ACID AT 25° BETWEEN WATER AND;

(Smith and White, 1929.)

Chloroform		Benzene		Toluene	
Gm. Mols. iso $C_5H_{10}O_2$ per liter		Gm. Mols. iso $C_5H_{10}O_2$ per liter		Gm. Mols. iso $C_5H_{10}O_2$ per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	C_6H_6 layer	H_2O layer	$C_6H_5CH_3$ layer
0.00147	0.00247	0.00510	0.00526	0.00555	0.00492
0.00276	0.00627	0.00641	0.00747	0.00699	0.00688
0.00403	0.01059	0.00808	0.01082	0.00874	0.01016
0.00596	0.01964	0.01214	0.02154	0.01086	0.01482
0.00771	0.02769	0.01404	0.02771	0.01307	0.02061
0.00989	0.04231	0.01644	0.03229	0.01777	0.03494
0.01213	0.06188	0.01915	0.04805	0.02100	0.04620
0.01538	0.09142	0.02231	0.06254	0.02418	0.06067

DISTRIBUTION OF ISO VALERIC ACID BETWEEN WATER AND BENZENE AT SEVERAL TEMPERATURES.

(Bektourow, 1930a.)

Results at 0°			Results at 25°			Results at 60°		
Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$	Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$	Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	C_6H_6 layer(2)		H_2O layer(1)	C_6H_6 layer(2)		H_2O layer(1)	C_6H_6 layer(2)	
0.0104	0.0132	0.788	0.0120	0.0212	0.566	0.0144	0.0288	0.500
0.0170	0.0322	0.528	0.0245	0.0754	0.321	0.0211	0.0483	0.437
0.0293	0.0889	0.337	0.0401	0.1895	0.212	0.0446	0.2561	0.174
0.0587	0.3217	0.182	0.0669	0.4794	0.140	0.0647	0.4681	0.138
0.1072	1.0031	0.107	0.0818	0.7136	0.115	0.1041	1.0704	0.087
0.1419	1.5614	0.091	0.1078	1.1707	0.092	0.1226	1.2151	0.101
0.1672	1.8955	0.0883	0.1226	1.5387	0.0797	0.1561	2.1071	0.0745
0.2007	2.8321	0.0709	0.1784	2.6081	0.0661	0.1782	2.5756	0.0692
0.2453	3.8244	0.8641	0.2341	3.9136	0.0598	0.2006	3.0997	0.0647
0.3456	5.5750	0.0622	0.2787	5.3641	0.0520	0.3285	5.7181	0.0574
0.4460	7.0802	0.0630	0.3010	5.7534	0.0523	0.4460	6.8684	0.0649
0.5575	8.3625	0.0667	0.4125	7.2252	0.0571	0.4681	7.2921	0.0642

Similar results are also given for 40°.

DISTRIBUTION OF ISO VALERIC ACID AT 25° BETWEEN WATER AND:

(Kolossowsky, Kulikow & Bekturow, 1934, 1936.)

Chloroform			Carbon Tetra Chloride		
Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$	Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	$CHCl_3$ layer(2)		H_2O layer(1)	CCl_4 layer(2)	
0.0023	0.0044	0.523	0.00250	0.00122	2.05
0.0039	0.0100	0.390	0.00499	0.00454	1.10
0.0059	0.0190	0.310	0.00898	0.01104	0.813
0.0120	0.060	0.200	0.0140	0.0273	0.513
0.024	0.236	0.102	0.0297	0.1076	0.276
0.050	0.795	0.063	0.0549	0.350	0.156
0.105	2.306	0.045	0.117	1.395	0.084
0.150	3.805	0.039	0.204	3.288	0.062
0.202	5.040	0.041	0.347	6.199	0.056
0.247	5.425	0.0455	0.412	6.986	0.059(1)
			0.428	7.100	0.060(1)

(1) In these cases the aqueous phase is the lower.

ISO VALERIC ACID

DISTRIBUTION OF ISO VALERIC ACID AT 25° BETWEEN WATER AND:

(Kolossowsky, Kulikow & Bekturow, 1934; 1935; Kolossowsky, Bekturow & Kulikow, 1935.)

Iso Butyl Alcohol

Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	iso C_4H_9OH layer(2)	
0.0016	0.020	0.080
0.0040	0.052	0.077
0.0197	0.415	0.047
0.0309	0.712	0.043
0.0513	1.008	0.051
0.1008	1.399	0.072
0.166	2.130	0.078
0.213	3.012	0.071
0.273	3.866	0.071
0.308	4.554	0.068
0.379	6.037	0.063

Iso Amyl Alcohol

Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	iso $C_5H_{11}OH$ layer(2)	
0.0010	0.0100	0.100
0.0015	0.0260	0.057
0.0032	0.0700	0.046
0.0082	0.208	0.038
0.020	0.530	0.038
0.045	1.104	0.041
0.079	1.820	0.043
0.125	2.611	0.048
0.219	4.205	0.052
0.301	5.436	0.055
0.039	7.320	0.060

Nitro Benzene

Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	$C_6H_5NO_2$ layer(2)	
0.0078	0.0109	0.716
0.0156	0.0285	0.547
0.0281	0.0628	0.447
0.0431	0.1260	0.342
0.0929	0.3830	0.243
0.183	1.466	0.125
0.243	2.764	0.088
0.314	4.895	0.064
0.398	6.921	0.057
0.452	7.759	0.058

Xylene

Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	$C_6H_4(CH_3)_2$ layer(2)	
0.0080	0.0082	0.975
0.0158	0.0263	0.600
0.028	0.070	0.400
0.049	0.200	0.245
0.094	0.693	0.137
0.167	2.338	0.071
0.238	4.431	0.054
0.332	5.775	0.057
0.376	6.465	0.058
0.452	7.759	0.058

Ethyl Bromide

Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	C_2H_5Br layer(2)	
0.0276	0.0540	0.51
0.0351	0.1130	0.31
0.0879	0.6193	0.14
0.1004	1.2738	0.079
0.1242	1.8637	0.067
0.1801	3.1501	0.057
0.2071	3.5140	0.059
0.2887	5.7667	0.050

Ortho Nitro Toluene

Gm. Mols. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	o $C_6H_4(NO_2)CH_3$ layer(2)	
0.0156	0.0225	0.693
0.0241	0.0418	0.577
0.0827	0.3038	0.272
0.1253	0.668	0.188
0.226	2.130	0.106
0.316	4.545	0.0695
0.413	6.621	0.0597(1)
0.488	8.026	0.0608(1)

(1) In these cases the aqueous layer is the lower.

ISO VALERIC ACID

DISTRIBUTION OF ISO VALERIC ACID AT 25° BETWEEN WATER AND TOLUENE

(Kolossowski and Ponomarewa, 1934, 1934a.)

Gm. Equiv. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$	Gm. Equiv. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	$C_6H_5CH_3$ layer(2)		H_2O layer(1)	$C_6H_5CH_3$ layer(2)	
0.0040	0.0030	1.330	0.097	0.903	0.107
0.00543	0.00458	1.186	0.124	1.376	0.090
0.00825	0.01173	0.705	0.145	1.855	0.078
0.01644	0.03356	0.490	0.164	2.336	0.070
0.02663	0.07337	0.363	0.183	2.817	0.065
0.0481	0.2519	0.191	0.205	4.735	0.056
0.0641	0.4359	0.147	0.352	6.648	0.053
0.0778	0.6222	0.125	0.493	8.507	0.058

DISTRIBUTION OF ISO VALERIC ACID AT ROOM TEMPERATURE BETWEEN WATER AND PETROLEUM ETHER.

(Grossfeld and Miermeister, 1931.)

cc 0.1 n NaOH per 25 cc		$\frac{1}{2}$
H_2O layer(1)	Pet. Ether layer(2)	
1.00	0.14	7.14
5.80	4.30	1.35
9.50	12.85	0.74
15.00	32.10	0.47
20.70	60.45	0.34

DISTRIBUTION OF ISO VALERIC ACID AT 25° BETWEEN GLYCEROL AND:

(Kolossowski, and Kulikow, 1935a.)

Chloroform			Nitro Benzene			Toluene		
Gm. Mol. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$	Gm. Mol. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$	Gm. Mol. iso $C_5H_{10}O_2$ per liter		$\frac{1}{2}$
$C_3H_5(OH)_3$ layer(1)	$CHCl_3$ layer(2)		$C_3H_5(OH)_3$ layer(1)	$C_6H_5NO_2$ layer(2)		$C_3H_5(OH)_3$ layer(1)	$C_6H_5CH_3$ layer(2)	
0.0091	0.0206	0.442	0.0153	0.0108	1.42	0.0301	0.0398	0.756
0.0171	0.0440	0.389	0.0261	0.0245	1.065	0.0424	0.1157	0.366
0.0372	0.1412	0.263	0.0725	0.1036	0.702	0.0782	0.2884	0.271
0.0612	0.3178	0.193	0.2014	0.4732	0.426	0.1138	0.4849	0.235
0.1201	0.8357	0.145	0.3013	0.9216	0.327	0.2119	1.2076	0.175
0.2060	1.7243	0.119	0.5061	2.1010	0.241	0.3496	2.6636	0.131
0.3531	3.0249	0.117	0.7533	3.8194	0.197	0.6627	5.1317	0.129
0.5061	4.1195	0.123(1)	0.8945	4.3784	0.204	0.9569	6.4500	0.148
0.9063	5.5613	0.163(1)	1.5183	5.6908	0.267	1.3300	7.0032	0.190

(1) The glycerine layer is the lower.

Freezing-point data are given by Timmermans, 1934 for:

Normal valeric acid + Iso valeric acid
" " " + Propionic acid
Iso " " + " "
" " " + Iso Butyric acid

d GLUTAMINE $C_3H_5(NH_2)(CONH_2)COOH$.

SOLUBILITY IN WATER AND IN ETHYL ALCOHOL.

(McMeekin, Cohn and Weare, 1936.)

Solvent	d. of sat. sol.	Gm. Mols. $C_5H_{10}O_3N$ per liter
Water	1.0124	0.291
Ethyl alcohol	0.7851	0.0000315

Mono-, Di-, and Tri **ACETIN** $C_3H_5(OH)_2(OC_2H_3O)$, $C_3H_5(OH)(OC_2H_3O)_2$, and $C_3H_5(OC_2H_3O)_3$.

The partition coefficients of these three compounds between olive oil and water are given by Baum (1899) and Meyer (1901, 1909), as 0.06, 0.23, and 0.3 respectively.

BROMO PENTANE $C_5H_{11}Br$.

Freezing-point data for mixtures of 2- Bromo and 3- Bromo Pentane are are given by Lauer and Stodola, 1934.

PIPERIDINE $CH_2<(CH_2.CH_2)_2>NH$.

FREEZING-POINTS OF MIXTURES OF PIPERIDINE AND WATER.

(Ewert, 1937.)

t°		Mol. Percent $C_5H_{11}N$ in mixture	Solid Phase	t°		Mol. Percent $C_5H_{11}N$ in mixture	Solid Phase
-4.6		8.4	Ice	-13.3		57.8	$2\ C_5H_{11}N.H_2O$
-22.8		26.9	"	-12	m.pt.(1)	66.0	"
-31.9	Eutec.	33.0	" + $2C_5H_{11}N.H_2O$	-13.6		78.4	"
-27.3		35.8	$2\ C_5H_{11}N.H_2O$	-16.4	tr.pt.	82	" → $C_5H_{11}N$
-19.2		47.9	"	-13.2		86.1	$C_5H_{11}N$
-15.3		53.5	"	-10.0		100.0	"

(1) with decomposition.

EQUILIBRIUM IN THE SYSTEM PIPERIDINE, ANILINE AND WATER.

(Ousti-Katchkintzev and Mertzline, 1936.)

Results at 0°			Results at 50°		
Gms. per 100 gms. homogeneous mixture			Gms. per 100 gms. homogeneous mixture		
$C_5H_{11}N$	$C_6H_5NH_2$	H_2O	$C_5H_{11}N$	$C_6H_5NH_2$	H_2O
12.2	4.6	83.2	8.0	4.8	87.2
16.5	8.7	74.8	17.8	11.2	71.0
22.7	18.2	59.1	23.5	18.0	58.5
24.7	23.7	51.6	25.9	23.3	50.8
26.4	30.2	43.4	28.1	29.5	42.4
26.8	36.9	36.3	28.8	35.8	35.4
			16.5	68.1	15.4

The authors also give results for the quarternary systems Piperidine, Pyridine, Aniline and Water at 0°, 20° and 50° and for Piperidine,

PIPERIDINE

EQUILIBRIUM IN THE SYSTEM PIPERIDINE, PHENOL AND WATER.

(Mertslin, 1937.)

t° of clouding lower	t° of clouding upper	Gms. per 100 gms. homogeneous mixture $C_5H_{11}N$	H_2O	C_6H_5OH	t° of clouding lower	t° of clouding upper	Gms. per 100 gms. homogeneous mixture $C_5H_{11}N$	H_2O	C_6H_5OH
—	135	10	49.6	40.4	—	161.5	40	15	45
—	157	10	71.3	18.7	—	159.5	30	56.6	13.4
—	115.6	10	35.1	54.9	—	126.4	30	19.9	50.1
—	72.8	10	20.7	69.3	47.4	161.5	30	50.1	19.9
69	124.6	10	85.4	4.6	69.4	155.4	30	54.8	15.2
26.4	146.8	10	83.0	7.0	88.6	165.5	30	58.0	12.0
—	155.0	10	80.0	10.0	—	50	30	9.0	61.0
34.5	—	10	14.0	76.0	51.7	147.9	40	30.0	30.0
—	45	20	11.0	69.0	92.8	142.9	40	42.0	18.0
—	109.4	20	20	60.0	45.6	111.8	40	18.0	42.0
—	146.8	20	34.8	45.2	41.2	116.1	40	43.0	17.0
58.5	156.6	20	70.0	10.0	50.2	98.0	40	16.0	44.0

The system possesses an upper ternary critical solution point.

DISTRIBUTION OF PIPERIDINE AT 25° BETWEEN (Smith, 1931, 1932.)

Water and Chloroform.

Millimols. $C_5H_{11}N$ per liter H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$
0.400	0.800	2.00
0.643	1.556	2.42
1.200	3.625	3.02
1.725	6.225	3.61

Water and Ether.

Millimols. $C_5H_{11}N$ per liter H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_1}{C_2}$
1.10	1.675	0.657
2.80	4.80	0.583
4.85	6.70	0.724
8.60	11.40	0.754
14.10	17.85	0.790

Water and Xylene.

Millimols. $C_5H_{11}N$ per liter H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$
1.25	0.45	0.360
1.85	0.75	0.406
2.85	1.30	0.456
3.25	1.725	0.53
7.00	4.00	0.57

Acetone and Glycerol.

Millimols. $C_5H_{11}N$ per liter Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$	Millimols. $C_5H_{11}N$ per liter Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$
0.225	1.3125	0.144	4.0	9.93	0.403
0.725	2.85	0.254	4.925	12.00	0.41
0.85	3.25	0.262	7.8	17.35	0.45
1.875	5.45	0.344	10.6	24.4	0.434
2.375	6.775	0.350	16.0	33.3	0.48

DISTRIBUTION OF PIPERIDINE BETWEEN WATER AND BENZENE AT ORD. TEMP.

(Georgievics, 1915.)

Gms. Piperidine per: 25 cc. H_2O Layer.	75 cc. C_6H_6 Layer.	Gms. Piperidine per: 25 cc. H_2O Layer.	75 cc. C_6H_6 Layer.
0.1573	0.4127	0.841	2.319
0.256	0.674	1.200	3.589
0.409	1.088	1.712	4.789
0.674	1.746		

Freezing-point data are given for the following mixtures.

Piperidine + Acetic Acid (Puschin and Rikovsky, 1932a.)
" + o Cresol (Puschin and

PIPERIDINE HYDROCHLORIDE $CH_2<(CH_2.CH_2)_2>NH.HCl$.

SOLUBILITY IN SEVERAL SOLVENTS. (Freundlich and Richards, 1912.)

Solvent.	t°.	Mols. Piperidine HCl per Liter.
Water	0	4.87
"	25	5.19
Tetrachlor Ethane (sat. with H_2O)	0	0.13
" " "	25	0.29
Nitrobenzene "	25	0.00543
Benzene "	25	0.00102

Methyl**PIPERIDINES** 2-, 3-, 4-, *n* Methyl, etc.

Data for the reciprocal solubility of 2-methylpiperidine and water, 3-methylpiperidine and water, 4-methylpiperidine and water, nitrosopiperidine and water and for *n*-methylpiperidine and water, determined by the synthetic (sealed tube) method of Alexejeff, are given by Flaschner and MacEwan (1908) and by Flaschner (1909) and (1908). Similar data for *n*-ethylpiperidine and water and for *n*-propylpiperidine and water are given by Flaschner (1908).

VALERAMIDES

DISTRIBUTION OF VALERAMIDES BETWEEN WATER AND OLIVE OIL AT 15°.
(Harrass, 1903.)

Amide.	Formula.	Gms. Cmpd. per per 100 cc.		Ratio $\frac{Conc._{oil}}{Conc._{H_2O}}$.
		Water Layer.	Olive Oil Layer.	
Valeramide	$CH_3(CH_2)_3CONH_2$	0.769	0.241	0.313
Valerethylamide	$CH_3(CH_2)_3CONH(C_2H_5)$	1.029	0.261	0.254
Valerdiethylamide	$CH_3(CH_2)_3CON(C_2H_5)_2$	0.231	1.339	5.797
Valerdimethylamide	$CH_3(CH_2)_3CON(CH_3)_2$	0.011	0.379	0.416
Lactdiethylamide	$CH_3CHOHCON(C_2H_5)_2$	1.256	0.194	0.154

α AMINO VALERIC ACID $CH_3CH_2CH_2CH(NH_2)COOH$.

DISTRIBUTION OF α AMINO VALERIC ACID BETWEEN WATER AND NORMAL BUTYRIC ACID AT 25°.
(England, Albert, and Cohn, 1936.)

Gm. Mols. $C_5H_{11}O_2N$ per liter		$\frac{2}{1}$
H_2O layer(1)	Butyl alcohol layer(2)	
0.022	0.0023	0.105
0.128	0.0153	0.120
0.270	0.302	0.112

BETAINE (Trimethyl glycocoll) $C_5H_{11}O_2N.H_2O$.

SOLUBILITY OF ANHYDROUS BETAINE IN WATER AND ALCOHOLS.
(Stoltzenberg, 1914.)
(Figures read from the author's curves.)

t°.	Gms. $C_5H_{11}O_2N$ per 100 Gms.			t°.	Gms. $C_5H_{11}O_2N$ per 100 Gms.		
	H_2O.	CH_3OH.	C_2H_5OH.		H_2O.	CH_3OH.	C_2H_5OH.
−10	134	38	5	50	197	70	16
0	140	43	6	60	215	75	18.5
+10	147	49	7	70	236	80	22
20	157	54	8.5	80	259	..	25
30	168	60	11	90	286	..	...
40	182	65	13	100	328		

BETAINE SALTS.

Solubility of Each, Separately, in Water.

(Stoltzenberg, 1914.)

t°.	Grams per 100 Grams H_2O.						
	$C_5H_{11}O_2N.HCl.$	$C_5H_{11}O_2N.HBr.$	$C_5H_{11}O_2N.HI.$	$C_5H_{11}O_2N.H_2SO_4.H_2O.$	$C_5H_{11}O_2N.H_3PO_4.$	$C_5H_{11}O_2N.HMnO_4.$	$C_5H_{11}O_2N.HAuCl_4.$
−10	38	28	35	67	35	1.5	1.3
0	44	39	66	86	45	1.75	1.5
+10	52	52	98	107	58	2.5	2
20	60	65	130	132	73	5	3
30	70	79	162	164	91	9	4.5
40	81	94	198	203	112	16	6
50	93	110	231	250	135	30	8
60	106	127	269	306	160	(55°) 48	11.5
70	120	144	304	...	190	...	15
80	135	162	(75°) 321	...	223	...	18
90	151	183	...	...	...	...	23
100	169	206	...	...	...	...	...

Data are also given by Stoltzenberg for the following basic salts of betaine $(C_5H_{11}O_2N)_2HCl.H_2O$, $(C_5H_{11}O_2N)_2.HBr$, $(C_5H_{11}O_2N)_2HI$, $(C_5H_{11}O_2N)_2H_2SO_4$ and $(C_5H_{11}O_2N)_2HAuCl_4.H_2O$.

dl VALINE $(CH_3)_2CHCH(NH_2)COOH$.

Solubility of dl Valine in Water.

(Dalton and Schmidt, 1933.)

The following values were derived from a solubility equation based upon 52 very careful determinations made at 15 temperatures between 0° and 80°. Density determinations upon dilute aqueous valine solutions are also given. The d_{25} of a 7.4 percent solution is 1.01387.

t^0	Gms. $C_5H_{11}O_2N$ per 100 gms. H_2O	t^0	Gms. $C_5H_{11}O_2N$ per 100 gms. H_2O	t^0	Gms. $C_5H_{11}O_2N$ per 100 gms. H_2O
0	5.96(7.011)	30	7.42	60	10.28
5	6.13	35	7.77	65	10.97
10	6.33	40	8.17	70	11.74
15	6.56	45	8.61	75	12.61(13.31)
20	6.81	50	9.11(9.424)	100	18.81(20.0)
25	7.09(7.441)	55	9.67		

The results in parentheses are by Dunn, Ross and Read, 1933.

Solubility of dl Valine in Aqueous Solutions of Ethyl Alcohol.

(Dunn and Ross, 1938.)

t^0	Wt. % C_2H_5OH in aq. solvent	d. of sat. sol.	Gms. $C_5H_{11}O_2N$ per 100 gms. solvent	t^0	Wt. % C_2H_5OH in aq. solvent	d. of sat. sol.	Gms. $C_5H_{11}O_2N$ per 100 gms. solvent
0	20.32	0.975	2.10	45	20.00	0.966	5.10
"	42.52	0.942	0.769	"	42.66	0.918	2.74
"	66.94	0.881	0.269	"	67.11	0.857	0.999
"	92.61	0.819	0.0277	"	92.61	0.795	0.0979
"	100.0	0.797	0.0136	65	20.0	0.962	7.44
25	20.62	0.971	3.30	"	42.52	0.905	4.49

SOLUBILITY OF dl VALINE AND OF d VALINE, EACH SEPARATELY, IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(Cohn, McMeekin, Edsall and Weare, 1934.)

Results for dl Valine			Results for d Valine		
Vol. % C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mol. $C_5H_{11}O_2N$ per liter sat. sol.	Vol. % C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mol. $C_5H_{11}O_2N$ per liter sat. sol.
0.0 = H_2O	1.0120	0.571 (= 66.9 gm.)	0.0 = H_2O	1.0148	0.7061 (=82.63 gm.)
20.0	0.9814	0.318	20.0	0.9853	0.409
40.0	0.9512	0.167	20.0	0.9528	0.231
60.0	0.9092	0.086	60.0	0.9100	0.123
80	0.8575	0.028	80	0.8565	0.0373
90	0.8256	0.00922			
100	0.7851	0.00128			

DISTRIBUTION OF VALINE BETWEEN WATER AND NORMAL BUTYL ALCOHOL AT 25°.

(England, Albert and Cohn, 1934.)

Gm. Mols. $C_5H_{11}O_2N$ per liter		$\frac{2}{1}$
H_2O layer(1)	Butyl alc. layer(2)	
0.054	0.0038	0.0722
0.268	0.0193	0.0722
0.271	0.0206	0.0762

100 cc Butyric Acid dissolve 0.056 gm. Valine at 18°.
(v. Przylecki and Kasprzyk-Czaykowska, 1938.)

METHIONINE dl $CH_3SCH_2CH_2CH(NH_2)COOH$.

SOLUBILITY OF METHIONINE IN WATER.

(Dalton and Schmidt, 1935.)

The following results were calculated from a solubility equation based upon 36 very careful determinations made at 9 temperatures between 0° and 62°. The densities of several solutions are given. The density of a 3.337 percent solution at 25° is 1.00678.

t°	Gms. $C_5H_{11}O_2NS$ per 100 gms. H_2O	t°	Gms. $C_5H_{11}O_2NS$ per 100 gms. H_2O	t°	Gms. $C_5H_{11}O_2NS$ per 100 gms. H_2O
0	1.818	30	3.812	60	7.545
5	2.064	35	4.290	65	8.478
10	2.340	40	4.824	70	9.452
15	2.650	45	5.415	75	10.52
20	2.995	50	6.070	100	17.60
25	3.381	55	6.795		

100 cc Acetic Acid dissolve 1.75 gms. Methionine at 18°.
(V. Przylechi and Kasprzyk-Czaykowska, 1938.)

ETHYL URETHAN $C_2H_5NH.COOC_2H_5$.

100 gms. H O dissolve 72.31 gms. C H O N at 15.5°. (Fühner, 1924.)

PENTANE $CH_3(CH_2)_3CH_3$.

100 cc. sat. sol. of pentane in water contain 0.06 cc. $CH_3(CH_2)_3CH_3$ at 16°

(Fuhner, 1924.)

Data for the solubility of pentane in liquid carbon dioxide, determined by the synthetic method, are given by Büchner (1906).

Iso**PENTANE** $(CH_3)_2CH.CH_2CH_3$.

RECIPROCAL SOLUBILITY OF ISOPENTANE AND PHENOL. (Campetti and Del Grosso, 1913.)

t°.	Gms. Phenol per 100 Gms.	
	Isopentane Rich Layer.	Phenol Rich Layer.
20	4.5	87
30	7	83.5
40	11.5	80
50	18	75.5
60	29.5	68
65	40	58
66 crit. temp.	50	

F.-pt. data for mixtures of hexachloro-α-keto γ-*R*-pentene, C_5Cl_6O, + penta chloromonobromo α-keto γ-*R* pentene, C_5Cl_5BrO, are given by Küster (1890, 1891).

The critical solution temperature of mixtures of pentane and Sulfur Dioxide is at 2.0° and there is approximately 75 Mol. percent SO_2 present, (Leslie, 1934.)

The critical solution temperature of mixtures of iso pentane and *o* nitro toluene is 8.65°. That of mixtures of iso pentane and *m* nitro toluene is 7.05°. (Hennant-Roland, 1933.)

HYDROCARBONS.

In connection with the use of liquid sulfur dioxide for the fractionation of mixtures of hydrocarbons, many determinations have been made of the solubility of aromatics, paraffines, olefins and naphthenes in this solvent. A general review of the subject and many new experiments are given by Moore, Morrell and Egloff, 1918. The methods are, however, more in the nature of fractional extraction processes than equilibria studies. Mixtures of various proportions of liquid sulfur dioxide and oil were shaken together, usually at — 18° or — 10°, and, after separation of the two layers, each was freed of SO_2 and its density and refractive index determined. It was found in general that the paraffines (pentane, hexane, octane, nonane and decane) are completely insoluble and the aromatics and olefins (benzene, toluene, xylene, mesitylene, hexylene, and caprylene) completely soluble in liquid sulfur dioxide. Naphthalene and cyclohexane varied in solubility depending upon the ratio of SO_2 used. Data for a great variety of synthetic mixtures of hydrocarbons are given and it was found that within certain limiting concentrations: (a) Aromatics may be separated from paraffins or naphthenes, (b) Olefins may be separated from paraffins or naphthenes, (c) Aromatics and olefins together may be separated from paraffins or naphthenes, (d) Naphthenes may be separated from paraffins. The particular advantage of the method is that the separated unsaturated and aromatic oils may be recovéred and their identity proven by further physical tests.

Freezing-point data are given for mixtures of:

Pentane + Iso pentane (Ormandy & Craven, 1921; Saphir, 1929.)
" + Methyl cyclohexane (Timmermans, 1934.)
Iso pentane + CS_2 (Saphir, 1929.)
" + Acetone " "
" + Ethyl Ether " "
" + Ethyl bromide " "
" + Hexane (Timmermans, 1934.)
" + Nitro benzene (" 1910, 1911.)

AMYL ALCOHOL $C_5H_{11}OH$.

SOLUBILITY OF AMYL ALCOHOL IN WATER AT 22°.

(Herz — Ber. 31, 2671, '98.)

100 cc. water dissolve 3.284 cc. amyl alcohol. Sp. Gr. of solution = 0.9949, Volume = 102.99 cc.

100 cc. amyl alcohol dissolve 2.214 cc. water. Sp. Gr. of solution = 0.8248, Volume = 101.28 cc.

Sp. Gr. of H_2O at 22° = 0.9980; Sp. Gr. of amyl alcohol at 22° = 0.8133.

100 gms. sat. solution of normal amyl alcohol in water contain 2.208 gm. $C_5H_{11}OH$ at 25°. (Butler, Thomson and Maclennen, 1933.)

100 gms. H_2O dissolve 5.2 gm. Amyl Alcohol at 20°. (Smith, 1932.)

SOLUBILITY OF AMYL ALCOHOL IN WATER AND IN AQUEOUS SOLUTIONS OF ETHYL AND METHYL ALCOHOLS.

(Fontein, 1910.)

	In Water.			In Aq. Ethyl Alcohol.*			In Aq. Methyl Alcohol.†	
	Gms. $C_5H_{11}OH$ per 100 Gms.			Gms. $C_5H_{11}OH$ per 100 Gms.			Gms. $C_5H_{11}OH$ per 100 Gms.	
t°.	H_2O Layer.	$C_5H_{11}OH$ Layer.	t°.	$C_2H_5OH + H_2O$ Layer.	$C_5H_{11}OH$ Layer.	t°.	$CH_3OH + H_2O$ Layer.	$C_5H_{11}OH$ Layer.
0.5	4	...	4.5	16.2	...	3.6	11	...
15.5	2.6	90.7	20	20.8	...	20	19.3	...
20	2.6	90.6	40	26.7	...	38.4	...	78.4
40	2.1	89.5	60	33	...	40	31.2	78
60	2	88	67.8	...	24.4	50	37.1	74.8
80	2.5	86	70	36.5	73.7	60	43.3	71.6
100	3	83.8	80	40.8	70.1	70	52.7	65
120	3.8	80.8	90	47	64	72	(crit. temp.)	
140	5	76.4	94.2	(crit. temp.)				
160	7.3	70						
170	9.3	65.1						
180	13.5	57.3						
187.5	(crit. temp.)							

* Of 33.55 per cent C_2H_5OH. † Of 33 per cent CH_3OH.

The "synthetic method" was used for the preceding determinations. Fermentation amyl alcohol of b. pt. 131°-131.4° and $d_{15.5}$ = 0.814 was employed. It contained 16% of optically active amyl alcohol. Many other series of determinations were made with solvents containing other percentages of ethyl and methyl alcohol. Also, other series were made for the above-named ternary systems at constant temperatures from which binodal curves were obtained. The author uses a very ingenious indirect method for determining the composition of the conjugated solutions. Data are also given for the distribution of ethyl alcohol between water and amyl alcohol.

SOLUBILITY OF AMYL ALCOHOL IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL.

(Pfeiffer, 1892; Bancroft, 1895-96.)

Mixture of $C_5H_{11}OH$ c.c.	Mixture of C_2H_5OH c.c.	c.c. H_2O added to * Mixture at 9.1°	c.c. H_2O added to * Mixture at 19.2°.	Mixture of $C_5H_{11}OH$ c.c.	Mixture of C_2H_5OH c.c.	c.c. H_2O Added to * Mixture at 13.3°.	c.c. H_2O Added to * Mixture at 17.4°.
3	3	3.21	3.5	3	3	3.36	3.47
3	6	10.35	10.80	6	3	2.20	2.25
3	9	18.34	19.10	9	3	2.10	2.15
3	12	27.47	29.15	12	3	2.10	2.10
3	15	41.25	43.15	15	3	2.10	2.10

* Just enough water was added to produce cloudiness.

NOTE. — The effect of various amounts of a large number of salts upon the temperature (39.8°) at which a mixture of 20 cc. of amyl alcohol + 20 cc. of ethyl alcohol + 32.9 cc. of water becomes homogeneous has been investigated by Pfeiffer (Z. phys. Ch. 9, 444, '92). The results are no doubt of interest from a solubility standpoint, but their recalculation to terms suitable for presentation in the present compilation has not been attempted.

IsoAMYL ALCOHOL $(CH_3)_2CH.(CH_2)_2OH$.

RECIPROCAL SOLUBILITY OF ISOAMYL ALCOHOL AND WATER.

(Kablukov and Malischeva, 1925.)

A volumetric method, apparently identical with that described by Hill, 1923, was used. The method of calculation eliminates the correction for change of volume on mixing and permits direct estimation from the volumetric results.

Solubility of Isoamyl Alcohol in Water.

t°.	d of H_2O layer.	Gms. Alcohol per 100 gms. H_2O layer. K and M.	Gms. Alcohol per 100 gms. H_2O layer. Fontein, 1923.
15..	0.9929	3.04	2.72
20..	0.9924	2.82	–
25..	0.9914	2.67	–
30..	0.9904	2.56	2.31 (29°)

Solubility of Water in Isoamyl Alcohol.

t°.	d of Alcohol layer.	Gms. H_2O per 100 gms. Alcohol layer K and M.	Gms. H_2O per 100 gms. Alcohol layer Fontein, 1923.
15..	0.8306	9.33	9.31 (15°.5)
20..	0.8275	9.60	
25..	0.8242	9.87	
30..	0.8209	10.15	10.18 (34°).

The determinations quoted from Fontein were made by the « turbidity point » method. A small scale diagram, without numerical results, is given for the above system by Brun, 1925.

SOLUBILITIES OF ISOAMYL COMPOUNDS IN WATER. (Fühner, 1924.)

Compound.	Formula.	d of cmpd.	t°.	Gms. Cmpd. per 100 gms. sat. sol.
Isoamyl alcohol.....	$(CH_3)_2CH.(CH_2)_2OH$	0.81	18	2.75
Isoamyl bromide....	$(CH_3)_2CH.(CH_2)_2Br$	1.17	16.5	0.02
Isoamyl urethan.....		–	15.5	0.48

MUTUAL SOLUBILITY OF ISOAMYL ALCOHOL AND GLYCEROL. (Mc Ewen, 1923.)

t°.	Gms. Alcohol per 100 gms. sat. sol.	t°.	Gms. Alcohol per 100 gms. sat. sol.	t°.	Gms. Alcohol per 100 gms. sat. sol.
21.5.....	5.05	73.7.....	27.62	54.41.....	69.3
58.0.....	10.35	74.2*....	31.90	61.4......	62.4
66.5.....	13.97	74.1*....	36.79	36.8......	76.21
71.5.....	19.20	73.0.....	46.16	12.5......	84.26

* Temperature of critical opalescence.

SOLUBILITY OF ISO AMYL ALCOHOL IN AQUEOUS SOLUTIONS OF SEVERAL SODIUM SALTS OF ORGANIC ACIDS AT ABOUT 18°.

(Traube, Schöning and Weber, 1927.)

Composition of aqueous solvent	cc $\frac{1}{2}$ $C_5H_{11}OH$ per 5 cc aq. solvent	Composition of aqueous solvent	cc $\frac{1}{2}$ $C_5H_{11}OH$ per 5 cc aq. solvent
Water alone	0.15	1.75n Na Salicylate	17.4
0.5 n Na benzoate	0.12	2.00" " "	∞
1.0 " " "	0.10	Sat. Na naphthionate	0.15
1.25" " "	0.17	1.0 n Na p oxybenzoate	0.15
1.5 " " "	0.63	2.0 " " "	0.45
1.75" " "	2.85	2.0 " Na butyrate	0.075
1.875 " "	5.00	¼ sat. " "	0.08
2.0 " " "	∞	½ " " "	1.6
0.5 " " benzene sulfonate	0.15	2/3" " "	∞
1.0 " " " "	0.15	2.0 n Na tartrate	0.05
1.5 " " " "	0.2	sat. " "	0.02
2.0 " " " "	0.525	1.0 n Na succinate	0.12
sat. " " "	0.9	2.0 n Na citrate	0.07
1.0 " " hippurate	0.2	sat. " "	0.03
1.5 " " "	0.05	2.0 n " acetate	0.07
1.75" " "	3.0	¼ sat. aniline hydrochlorid	0.1
2.0 " " "	∞	½ " " "	0.25
0.5 " " salicylate	0.6	sat. " "	∞
1.0 " " "	1.2	sat. ammonium nitrate	0.1
1.25" " "	2.5	" casium nitrate	0.1(1)
1.50" " "	5.6		

(1) Normal amyl alcohol.

Results are also given for the increase in solubility of iso amyl alcohol by sodium cinnamate and vice versa at 25°.

100 gms. aqueous 0.2 normal sodium oleate solution dissolve 58 gms. $C_5H_{11}OH$ at 20°. (Smith, 1932.)

DISTRIBUTION OF ISOAMYL ALCOHOL BETWEEN WATER AND COTTON SEED OIL AT 25°.

(Wroth and Reid, 1916.)

Gms. $C_5H_{11}OH$ per 100 c.c.		Ratio.
Oil Layer.	H_2O Layer.	
1.947	0.9153	0.470
2.195	1.1156	0.508
2.273	1.1050	0.486
2.372	0.9995	0.421

AMYLENE HYDRATE $(CH_3)_2C(OH)CH_2.CH_3$.

The distribution coefficient of amylene hydrate between olive oil and water at ord. temp. is 1. (Baum, 1899.)

RECIPROCAL SOLUBILITY OF EIGHT ISOMERIC CARBINOLS AND WATER, EACH DETERMINED SEPERATELY.

(Ginnings and Baum, 1937.)

Isomeric $C_5H_{12}O$ Carbinol	Formula	t°	Gms. Carbinol per 100 gms.	
			H_2O phase	Carbinol phase
n Butyl (= 1 Pentanol)	$CH_3(CH_2)_3CH_2OH$	20	2.36(0.8317)	92.52(0.9939)
"	"	25	2.19(0.8287)	92.54(0.9930)
"	"	30	2.03(0.8253)	92.35(0.9919)
iso Butyl (= iso amyl alcohol)	$(CH_3)_2CHCH_2CH_2OH$	20	2.85(0.8286)	90.53(0.9941)
"	"	25	2.67(0.8257)	90.39(0.9932)
"	"	30	2.53(0.8188)	90.24(0.9921)
sec Butyl (= 1 Butanol 2-Methyl)	$CH_3CH_2CH(CH_3)CH_2OH$	20	3.18 (0.8311)	91.05(0.9943)
"	"	25	2.97 (0.8288)	90.81(0.9930)
"	"	30	2.83 (0.8239)	90.74(0.9928)
ter Butyl (= 1 Propanol 2.2 dimethyl)	$(CH_3)_3CCH_2OH$	20	3.74(0.8243)	91.77(0.9936)
"	"	25	3.50(0.8216)	91.64(0.9930)
"	"	30	3.28(0.8178)	91.46(0.9925)
Methyl n Propyl (= 2 Pentanol)	$CH_3CH_2CH_2CHOHCH_3$	20	4.86(0.8317)	88.30(0.9914)
"	"	25	4.46(0.8280)	88.21(0.9909)
"	"	30	4.13(0.8243)	88.10(0.9898)
Di ethyl (= 3 Pentanol)	$CH_3CH_2CHOHCH_2CH_3$	20	5.61(0.8368)	91.81(0.9920)
"	"	25	5.15(0.8330)	91.68(0.9914)
"	"	30	4.75(0.8294)	91.42(0.9903)
Methyl iso propyl (= 2 Butanol 3-methyl)	$(CH_3)_2CHCHOHCH_3$	20	6.07(0.8390)	88.12(0.9909)
"	"	25	5.55(0.8352)	88.07(0.9902)
"	"	30	5.10(0.8348)	87.95(0.9879)
Dimethyl ethyl (= 2 Butanol 2 methyl	$CH_3CH_2C(CH_3)OHCH_3$	20	12.15(0.8662)	75.74(0.9837)
"	"	25	11.00(0.8552)	76.53(0.9829)
"	"	30	10.10(0.8498)	77.31(0.9828)

The figures in parentheses are the densities of the respective phases at 25/4°.

RECIPROCAL SOLUBILITY OF SIX ISOMERIC ETHERS AND WATER, EACH DETERMINED SEPARATELY.

(Bennett and Philip, 1928.)

The method of Hill, 1923, was modified by greatly reducing the volumes of liquid and adding a globule of mercury to the small sealed tube to hasten the mixing and attainment of equilibrium.

A = Wt. % of Ether in Aqueous Phase
B = Wt. % of H_2O in Ether Phase at:

Isomeric $C_5H_{12}O$ Ether		0°	10°	15°	20°	25°
Methyl n-Butyl	A	2.51	1.51	1.18	1.00	0.89
	B	0.50	0.45	0.57	0.71	0.91
Methyl iso-Butyl	A	2.53	1.79	1.51	1.24	1.10
	B	0.92	1.30	1.54	1.78	2.02
Methyl sec.-Butyl	A	3.24	2.33	2.05	1.79	1.60
	B	0.80	1.22	1.48	1.69	1.95
Methyl tert.-Butyl	A	9.12	7.30	6.55	5.83	5.16
	B	1.17	1.84	2.20	2.54	2.95
Ethyl n-Propyl	A	3.66	2.24	2.32	2.03	1.87
	B	0.69	0.76	0.88	1.01	1.13
Ethyl iso Propyl	A	5.89	3.99	3.35	2.82	2.40
	B	0.26	0.22	0.30	0.41	0.52

ETHYLAL (Diethoxy Methane) $CH_2(OC_2H_5)_2$.

Freezing-point data are given for mixtures of:

Ethylal and Methylal	(Saphir, 1929.)
" " Ethyl Ether	(Timmermans, 1934.)

DIMETHYL SULFON DIMETHYL METHANE etc.

DISTRIBUTION BETWEEN WATER AND OLIVE OIL AT ROOM TEMP.

(Baum, 1899; Meyer, 1909.)

Compound.	Formula.	Gms. Cmpd. per 100 cc. H_2O Layer (w).	Gms. Cmpd. per 100 cc. Oil Layer (o).	Ratio $\frac{(o)}{(w)}$.
Dimethyl Sulfon Dimethyl Methane	$(CH_3)_2C(SO_2.CH_3)_2$	0.6072	0.0622	0.103
Diethyl Sulfon Methane	$CH_2(SO_2C_2H_5)_2$	0.610	0.092	0.151
Sulfonal	$(CH_3)_2C(SO_2C_2H_5)_2$	0.070	0.0686	0.979
Trional	$(CH_3)(C_2H_5)C(SO_2.C_2H_5)_2$	0.0404	0.1646	4.074
Tetronal	$(C_2H_5)_2C(SO_2.C_2H_5)_2$	0.0462	0.1446	3.756

AMYL AMINE $C_5H_{11}.NH_2$.

The freezing-point curve for mixtures of amyl amine and water is given by Pickering (1893).

AMYL AMINES $n\,CH_3(CH_2)_4.NH_2$ and Iso $(CH_3)_2CH.CH_2CH_2NH_2$.

DISTRIBUTION OF EACH BETWEEN WATER AND XYLENE AT 25°. (Smith, 1921-1922.)

Results for *n* Amylamine. Millimols. $CH_3(CH_2)_4.NH_2$ per liter of H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.	Results for Isoamylamine. Millimols. $(CH_3)_2CH.(CH_2)_2NH_2$ per liter of H_2O layer (C_1).	Xylene. layer (C_2).	$\frac{C_2}{C_1}$.
0.755	1.15	1.52	0.525	0.650	1.24
1.335	2.67	2.00	0.55	0.700	1.28
1.875	4.275	2.28	0.75	1.073	1.43

DISTRIBUTION OF : (Smith, 1921-1922.)

n Amyl Amine between Water and Chloroform at 25°.

Millimols. $CH_3(CH_2)_4.NH_2$ per liter of		$\frac{C_2}{C_1}$.
Water layer (C_1).	$CHCl_3$ layer (C_2).	
0.1168	0.6832	5.86
0.150	1.20	8.0
0.1735	1.70	9.8
0.200	2.30	11.5

Isoamyl Amine between Water and Ether at 25°.

Millimols. $(CH_3)_2CH(CH_2)_2.NH_2$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Ether layer (C_2).	
0.2375	0.3875	1.63
0.3750	0.6500	1.73
0.4875	1.0125	2.08
0.8375	1.8375	2.19

DISTRIBUTION OF DIISO AMYL AMINE ACID PHTHALATE BETWEEN ACETONE AND GLYCEROL AT 25°.

(Smith, 1921-1922.) (See Note. p. 213.)

Millimols. Di isoamylamine Acid Phthalate per liter of		$\frac{(A)}{(G)}$.
Glycerol layer (G).	Acetone layer (A).	
1.9375	1.750	0.905
3.075	2.725	0.886
4.875	3.625	0.744
6.30	4.80	0.762
7.85	6.15	0.783

Iso **AMYLAMINE HYDROCHLORIDE** $C_5H_{11}.NH_2.HCl$ (iso).

100 gms. H_2O dissolve 192.2 gms. of the salt at 25°. (Peddle and Turner, 1913.)
100 gms. $CHCl_3$ dissolve 5.1 gms. of the salt at 25°.

Data for the distribution of ε-chloramyl amine between water and tetrachlorethane at 0°, water and nitrobenzene at 25° and water and benzene at 25° are given by Freundlich and Richards (1912).

CHOLINE PERCHLORATE and its Nitric Ether.

100 gms. H_2O dissolve about 290 gms. $(CH_3)_3N(ClO_4)CH_2CH_2.OH$ at 15°.
100 gms. H_2O dissolve 0.62 gm. $(CH_3)_3N(ClO_4)CH_2.CH_2.ONO_2$ at 15°.
100 gms. H_2O dissolve 0.82 gm. " at 20°.
(Hofmann and Hobold, 1911.)

NEURINE PERCHLORATE $CH_2.CH.N(CH_3)_3OH\ HClO_4$.

100 gms. H_2O dissolve 4.89 gms. of the salt at 14.5°. (Hofmann & Hobold, 1911.)

HEXA BROMO BENZENE CBr_6.

100 cc of 96% Ethyl Alcohol dissolve 0.0068 gm. CBr_6 at 20°.
100 cc of Methyl Alcohol (d = 07975) dissolve 0.076 gm. CBr_6 at 20°.

HEXA CHLORO BENZENE CCl_6.

100 gms. para cymene dissolve 2.93 gms. Hexachloro Benzene at 23°.5, 16.77 gms. at 100° and 106.95 gms. at 176°. (Wheeler, 1920.)

Freezing-point data for mixtures of α and β Hexachloro Benzene are given by Nagornow, 1911.

TRI CHLORO TRI NITRO BENZENE $C_6Cl_3(NO_2)_2$.

RECIPROCAL SOLUBILITY OF TRICHLORO TRINITRO BENZENE AND HEXAMETHYL BENZENE.

(Hammick and Hellican, 1938.)

The determinations were made by the synthetic method.

t°	Mol. fraction $C_6(CH_3)_6$	Solid Phase	t°	Mol. fraction $C_6CH_3)_6$	Solid Phase
187.0	0.0	$C_6Cl_3(NO_2)_3$	141.5	0.54	$2C_6Cl_3(NO_2)_3C_6(CH_3)_6$
183.2	0.08	"	140.0	0.59	"
175.0	0.19	"	137.5	0.65	"
159.5	0.41	"	138.1	0.69	$C_6(CH_3)_6$
155.0	0.46	"	146.5	0.79	"
146.9	0.52	"	154.5	0.89	"
			165.0	1.00	"

RECIPROCAL SOLUBILITY OF TRICHLORO TRINITRO BENZENE AND NAPHTHALENE.

(Hammick and Hellicar, 1938.)

t°	Mol. fraction $C_{10}H_8$	Solid Phase	t°	Mol. fraction $C_{10}H_8$	Solid Phase
187.0	0.0	$C_6Cl_3(NO_2)_3$	129.8	0.52	$2C_6Cl_3(NO_2)_3.C_{10}H_8$
183.0	0.07	"	130.0	0.55	"
171.2	0.20	"	127.2	0.59	"
158.3	0.31	"	108.9	0.71	"
149.8	0.37	"	89.0	0.80	"
135.0	0.48	" + $2C_6Cl_3(NO_2)_3C_{10}H_8$	74.3	0.90	$C_{10}H_8$
134.2	0.51	$2C_6Cl_3(NO_2)_3.C_{10}H_8$	80.0	1.00	"

TETRA CHLORO BENZENE $C_6H_2Cl_4$.

Freezing-point data for mixtures of tetrachloro benzene with ethylene chloride and with p dichloro benzene are given by Timmermans, 1934.

TRI BROMO NITROSO BENZENE $C_6H_2Br_3NO$.

Freezing-point data for mixtures of tribromo nitroso benzene and nitroso mesitylene are given by Hammick, Edwards, Illingworth and Snell, 1933.

2.6 Dibrom **QUINONE** Chlor**IMIDE** $O:C_6H_2Br_2:NCl$.

1000 cc. sat. solution of 2.6 dibrom quinone chlorimide in water contain 0.0002 gm. mol. or 0.06 gm. $O:C_6H_2Br_2:NCl$ at 20°. (Gibbs, 1927.)

2.6 Dibrom **QUINONE OXIME** $O:C_6H_2Br:NOH$.

1000 cc. sat. solution of 2.6 dibrom quinone oxime in water contain 0.00085 gm. mol. or 0.2388 gm. $O:C_6H_2Br_2:NOH$ at 20°. (Gibbs, 1927 *a*.)

TRICHLORO PHENOL $OHC_6H_2(2.4.6)Cl_3$.

Freezing-point data are given for:

Tri chloro phenol	Di phenylamine (Giua and Cherchi, 1919.)
" " "	Styphnic acid (Jänecke and Rahlfs, 1932.)

PICRYL CHLORIDE $C_6H_2(2)Cl(1.3.5)(NO_2)_3$.

Freezing-point data are given for mixtures of Picryl Chloride and:

- Acenaphthene (1)(6)
- Anthracene (1)(6)
- Acenaphthylene (6)
- Benzene (3)
- Diphenyl butadien (4)
- Fluorene (1)(6)
- Fluor anthene (5)
- Naphthalene (1)(2)(6)
- Picric acid (1)(6)
- Phenanthrene (6)
- Pyrene (5)
- Retene (1)(6)
- Tri nitro phenol (2)
- Tri nitro toluene (2)

(1) Jefremow, 1918; (2) Grim, Gunther and Titus, 1931; (3) Hammick, Hill and Howard, 1932; (4) Kuhn and Wagner-Jouregg, 1921; (5) Shinomiya, 1940; (6) Efremov, 1918.

Results for mixtures of **Picryl Sulfide** and Tolite are given by Roche and Thomas, 1923.

CHLORO TRI NITRO BENZENE $C_6H_2(1)Cl(2.4.6.)(NO_2)_3$.

SOLUBILITY OF 1 CHLORO 2.4.6 TRINITRO BENZENE IN WATER.
(Desvergnes, 1925, 1931.)

t^0	Gms. $C_6H_2Cl(NO_2)_3$ per 100 gms. H_2O
15	0.0178
50	0.053
100	0.346

SOLUBILITY OF 1 CHLORO 2.4.6 TRINITRO BENZENE IN ORGANIC SOLVENTS.
(Desvergnes, 1925.)

Solvent	Gms. $C_6H_2Cl(NO_2)_3$ per 100 gms. solvent at		Solvent	Gms. $C_6H_2Cl(NO_2)_3$ per 100 gms. solvent at	
	17^0	50^0		17^0	50^0
$CH_3COOC_2H_5$	91.52	238.35	$CHCl_3$	12.36	233.42
$(CH_3)_2CO$	212.00	546.43	C_5H_5N	120.79	173.38(1)
CH_3OH	10.24	34.80	CCl_4	0.56	2.45
96% C_2H_5OH	2.70	10.85	$C_6H_5CH_3$	89.44	321.05
100% "	4.85	15.06	$(C_2H_5)_2O$	7.23	10.64(31°)
C_6H_6	36.69	428.08	CS_2	0.50	0.95(30.5°)

(1) The compound 2 $C_6H_2(NO_2)_3OH.5C_5H_5N$ is formed.

Results are also given for the freezing-points of mixtures of Chloro tri nitro benzene and Chloro 2.4 Di nitro benzene

DICHLORO DINITRO BENZENES $C_6H_2Cl_2(NO_2)_2$.

Freezing-point data are given for:

1.3 Dichloro, 4.6 Dinitro Benzene + 1,3 Dichloro, 2.4 Dinitro Benzene. (Dann, 1929.)

1.4 Dichloro 2.5 Dinitro Benzene + 2.6 Dinitro Benzene

TETRA NITRO BENZENE $C_6H_2(NO_2)_4$.

Freezing-point data for mixtures of Tetra nitro Benzene and each of the following compounds: Acenaphthene, Anthracene, Fluorene, Phenanthrene, Pyrene, α and β Nitro Naphthalene, β Naphthyl Acetate and β Methyl Naphthoate are given by Shimoniya, 1940.

TRI BROMO BENZENE $C_6H_3Br_3$.

100 gms. H_2O dissolve 0.004 gm. $C_6H_3Br_3$ at 20-25°.
" " Pyridine dissolve 24.3 gm. $C_6H_3Br_3$ at 20-25°.
" " Aq. 50% Pyridine dissolve 2.01 gm. $C_6H_3Br_3$ at 20-25°.
(Dehn, 1917.)

TRI CHLORO BENZENE $C_6H_3Cl_3$.

Freezing-point data for mixtures of 1.2.3, 1.2.4 and 1.3.5 tri chloro benzenes are given by Vander Linden, 1911, 1912.

s Tribromo**PHENOL** $C_6H_2Br_3OH$.

Data for the solubility of mixtures of symmetrical tribromophenol and symmetrical trichlorophenol in diluted methyl alcohol at 25° are given by Küster and Würfel (1904–05). The results are presented in terms which are not clearly explained.

SOLUBILITY OF MIXTURES OF *s* TRIBROMO PHENOL AND *s* TRICHLORO PHENOL IN METHYL ALCOHOL AT 25°.

(Thiel, 1903; from Würfel, 1896.)

Molecular per cent $C_6H_2.OH.Br_3$		*n* Solubility of		Total.
In Solid.	In Solution.	$C_6H_2.OH.Cl_3$.	$C_6H_2.OH.Br_3$.	
0	0	0.204	0	0.204
4.49	3.59	0.194	0.007	0.201
10.13	7.58	0.191	0.016	0.206
16.28	12.15	0.172	0.024	0.196
62.44	13.07	0.204	0.031	0.235
69.88	15.86	0.150	0.028	0.178
81.76	19.01	0.096	0.023	0.118
84.66	24.05	0.069	0.022	0.091
87.53	32.46	0.043	0.021	0.063
93.62	47.87	0.021	0.019	0.040
100.0	100.0	0.0	0.019	0.019

Freezing-point data are given for mixtures of:

s Tribromo phenol + s Trichloro phenol (Küster and Würfel, 1904-5.)
" " + s Trinitro benzene (Sudborough and Beard, 1911.)
" " + Acetyl tribromo phenol (Boeseken, 1912.)
" " + Tetra methyl phthalan (Bennett and Wain, 1936.)
s Trichloro " + " " " " " "
" " + Nitro benzene (Hrynakowski and Szmyt, 1938a.)
" " + Diphenyl amine (Giua and Cherchi, 1919.)

DICHLORO NITRO BENZENE $C_6H_3Cl_2(NO_2)$.

Freezing-point data for mixtures of 1.2.4 Dichloro nitro benzene and Naphthylamine are given by Giua, Marcellino and Curti, 1920.)

CHLORO IODO NITRO BENZENES $C_6H_3ClI(NO_2)$.

Binary freezing-point curves for mixtures of the iso meric chloro iodo nitrobenzenes are given by Wallagh and Wibaut, 1936.

BROMO DINITRO BENZENE $BrC_6H_3(2.4)(NO_2)_2$.

Freezing-point data are given for mixtures of Bromodinitro benzene and:

Azoxy benzene	(Giua and Guastalla, 1925.)
Cinnamylidene acetophenone	(Giua, 1925.)
s Diethyl diphenyl urea	(Giua and Guastalla, 1925.)

CHLORO DINITRO BENZENES 1.2.4-$C_6H_3Cl(NO_2)_2$.

SOLUBILITY OF 1 CHLORO 2.4 - DINITRO BENZENE IN WATER AND IN ORGANIC SOLVENTS.

(Desvergnes, 1925, 1931a.)

Solvent	Gms. $C_6H_3ClNO_2$ per 100 gms. solvent at: 16°	50°	Solvent	Gms. $C_6H_3ClNO_2$ per 100 gms. solvent at: 16°	50°
H_2O	0.0008(15°)	0.041	C_6H_6	158.43	159.64(31°)
"	—	0.159(100°)	$CHCl_3$	102.76	210.01(42°)
$CH_3COOC_2H_5$	119.42	257.51	$(C_2H_5)_2O$	23.52	128.17(30.5°)
$(CH_3)_2CO$	267.90	531.90(30°)	C_5H_5N	26.33	20.85(1)
96% C_2H_5OH	4.73	15.48(34°)	CS_2	4.21	28.87(31°)
100% "	8.25	18.89(32.5°)	CCl_4	3.85	76.99(31°)
CH_3OH	11.23	32.37(32°)	$C_6H_5CH_3$	139.89	282.55(31.5°)

(1) With formation of 2.4 dinitro phenyl pyridinium chloride.

Freezing-point data are given for:

1.2.4 Chloro Dinitro Benzene	2.6 Dinitrobenzene	(Macleod, Pfund and Kilpatrick, 1922.)
" " " "	+ Benzantial doxime	(Brady and Truszkowski, 1924.)
" " " "	+ o Hydroxy "	" " "
" " " "	+ o Methoxy "	" " "
" " " "	+ p " "	" " "
" " " "	+ " " benzsynal doxime"	"
" " " "	+ p Amino acetophenone	(Giua, Marcellino and Curti, 1920.)
" " " "	+ Naphthylamine	(Giua and Marcellino, 1920.)
" " " "	+ o & m Nitro aniline	"
" " " "	+ Nitromannite	(Urbanski, 1933.)
" " " "	+ Nitro penta erythrite	"

TRINITRO BENZENE 1.3.5 $C_6H_3(NO_2)_3$.

SOLUBILITY OF 1.3.5 TRINITRO BENZENE IN WATER AND IN ORGANIC SOLVENTS.

(Desvergnes, 1926, 1931.)

Solvent	Gms. $C_6H_3(NO_2)_3$ per 100 gms. solvent at 17°	50°	Solvent	Gms. $C_6H_3(NO_2)_3$ per 100 gms. solvent at 17°	50°
H_2O	0.0278(15°)	0.102	C_6H_6	6.18	25.70
"	—	0.498(100°)	$CHCl_3$	6.24	18.42
$CH_3COOC_2H_5$	29.83	52.40	$(C_2H_5)_2O$	1.70	2.72(32.5°)
$(CH_3)_2CO$	59.11	160.67	C_5H_5N	112.61	194.23
96% C_2H_5OH	1.39	3.52	CS_2	0.24	0.44(33°)
100% "	2.09	4.57	CCl_4	0.24	0.69
CH_3OH	3.76	7.62	$C_6H_5CH_3$	11.82	76.31

Solubilities of Di-Nitro **BENZENES** and of Tri-Nitro **BENZENES** in Several Solvents.

(de Bruyn — Rec. trav. chim. 13, 116, 150, '94.)

Solvent.	t°.	Grams per 100 Grams Solvent. (*o*)$C_6H_4.(NO_2)_2$.	(*m*)$C_6H_4.(NO_2)_2$.	(*p*)$C_6H_4.(NO_2)_2$.	(*s*)$C_6H_3.(NO_2)_3$.	(*as*)$C_6H_3(NO_2)_3$.
Methyl Alcohol	20.5	3.30	6.75	0.69	4.9 (16°)	16.2 (15.5°)
Ethyl Alcohol	20.5	1.9	3.5	0.4	1.9 (16°)	5.45 (15.5°)
Propyl Alcohol	20.5	1.09	2.4	0.298	...	...
Carbon Bi-Sulphide	17.6	0.236	1.35	0.148	0.25	...
Chloroform	17.6	27.1	32.4	1.82	6.1	...
Benzene	18.2	5.66	39.45	2.56	6.2 (16°)	...
Ether	17.5	...	...	...	1.5	...
Ethyl Acetate	18.2	12.96	36.27	3.56	...	...
Toluene	16.2	3.62	30.66	2.36	...	...
Carbon Tetra Chloride	16.2	0.143	1.18	0.12	...	...
Water	(ord.)	0.014	0.0525	0.008	...	...

Symmetrical Tri-Nitro **BENZENE**.

SOLUBILITY IN AQUEOUS ALCOHOL AT 25°.

(Holleman and Antusch — Rec. trav. chim. 13, 296, '94.)

Vol. % Alcohol.	G. $C_6H_3(NO_2)_3(s)$ per 100 g. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	G. $C_6H_3(NO_2)_3(s)$ per 100 g. Solvent.	Sp. Gr. of Solutions.
100	2.34	0.7957	80	0.57	0.8582
95	1.57	0.8131	75	0.47	0.8708
90	1.12	0.8288	70	0.37	0.8808
85	0.79	0.8436	60	0.23	0.9064

See remarks under α Acetnaphthalide, p. 705

100 gms. 93 vol. % ethyl alcohol dissolve 2.1 gms. of *o* $C_6H_4(NO_2)_2$, 3.1 gms. *m* $C_6H_4(NO_2)_2$ and 0.33 gm. *p* $C_6H_4(NO_2)_2$ at 25°. (Holleman and de Bruyn, 1900.)

100 gms. of each of the following solvents dissolve the indicated gms. of 1.2.4 trinitrobenzene at 15.5°: C_6H_6, 140.8 gms.; $CHCl_3$, 12.87 gms.; CH_3OH, 12.08 gms.; $(C_2H_5)_2O$, 7.13 gms.; C_2H_5OH, 5.42 gms; CS_2, 0.4 gm. (de Bruyn, 1890.)

Data for the solubility of *m* dinitrobenzene in a solution of nitrobenzene in hexane are given by Timmermans (1907).

Freezing-point data are given for mixtures of Trinitro Benzene and each of the following compounds:

Acenaphthene(1)
Anthracene(4)
Aniline(2)
" o bromo(17)
Benzene(10)
Carbazole(1)
Coumarine(8)
m Dinitro benzene(18)
Dimethyl pyrone(8)
γγ Dipyridyl(6)
Diphenyl(19)
Fluorenone(3)(8)
Fluorene(3)

Fluoranthene(5)
Iodo diphenyl(20)
β Methyl naphthoate(5)
Naphthalene(2)
β Naphthyl acetate(5)
α and β Naphthylamine (12)(13)(14)
m Nitraniline(6)(7)
p " (6)(7)
Nitrobenzene(18)
Nitro mannite(21)
α Nitro naphthalene(5)
β " " (5)

Nitro penta erythritol(21)
o,m and p Phenylene diamine(1
Phenyl ether(8)
Pyrene(5)
Quinol(8)
Styphnic acid(16)
Tribrom phenol(8)
Trinitro phenyl methyl nitramine(22)
Triphenyl carbinole(11)
Urea(9)
Xanthone(8)
Phenanthrene(23)

(1) Kremann and Strzelba, 1921; (2) Kremann, 1904; (3) Kremann, 1911; (4) Kremann and Müller II, 1921; (5) Shinomiya, 1940; (6) Smith and Watts, 1910; (7) Sudborough and Beard, 1910; (8) Sudborough and Beard, 1911; (9) Van Dorp, Limburg and Nobel, 1937; (10) Hammick, Hills and Howard, 1932; (11) Kremann, Kohl and Müller II, 1921; (12) Kremann and Grasser, 1916; (13) Rheinboldt and Kircheisen, 1926 (14) Rheinboldt, Henning and Kircheisen, 1925; (15) Kremann and Mauermann, 1923; (16) Efremov, 1919a; (17) Hertel, 1924; (18) Hammick, Andrew and Hampson, 1923; (19) Briegleb and Schachowskoy, 1932; (20) Pfeiffer, Schuntz and Inoue, 1929; (21) Urbanski, 1933; (22) Jefremow and Bogojawlenski, 1926.
(23) Kremann, et. al., 1908.

PICRIC ACID $C_6H_2.OH.(NO_2)_3$ 1.2.4.6.

SOLUBILITY IN WATER.

(Dolinski — Ber. 38, 1836, '05; Findlay — J. Ch. Soc. 81, 1219, '02.)

t°.	Gms. $C_6H_3N_3O_7$ per 100 Grams		
	Solution.	Water.	
0	0.67 (D.)	0.68 (D.)	1.05 (F.)
10	.80	0.81	1.10
20	1.10	1.11	1.22
30	1.38	1.40	1.55
40	1.75	1.78	1.98
50	2.15	2.19	2.53

t°.	Gms. $C_6H_3N_3O_7$ per 100 Grams		
	Solution.	Water.	
60	2.77 (D.)	2.81 (D.)	3.17 (F.)
70	3.35	3.47	3.89
80	4.22	4.41	4.66
90	5.44	5.72	5.49
100	6.75	7.24	6.33

Dolinski does not refer to the previous determinations of Findlay.

100 gms. H_2O dissolve 1.525 gms. $C_6H_2.OH.(NO_2)_3$ at 30° and 1.868 gms. at 40°. (Karplus, 1907.)

100 gms. H_2O dissolve 1.45 gms. $C_6H_2.OH.(NO_2)_3$ at 20°. (Sisley, 1902.)

100 gms H_2O containing 5 gms. H_2SO_4 per liter, dissolve 0.61 gm. $C_6H_2OH(NO_2)_3$ at 20°. (Sisley, 1902.)

SOLUBILITY OF 1.2.4.6 TRINITRO PHENOL (PICRIC ACID) IN WATER.

(Desvergnes, 1927.)

t°	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. H_2O	t°	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. H_2O
9	0.979	82	4.691
50	2.328	100	7.600

In addition to the above, the following determinations at 20° and 25° have been made.

t°	Gm. Mol. $C_6H_2OH(NO_3)_2$ per liter	Authority	t°	Gm. Mol. $C_6H_2OH(NO_3)_2$ per liter	Authority
20	0.0515	(Brönsted, 1912.)	25	0.0552	(Flatt and Jorday, 1933.)
"	0.0530	(Marchand, 1909.)	"	0.0568	(v. Halban and Kortschak, (1938.)
"	0.0535	(Erday-Gruz, 1928.)	"	0.0570	(Duff and Bills, 1931.)
"	0.0568	(v. Halban and Kortschak, 1938.)	"	0.0575	(Schreiner, 1924.)
25	0.0487	(Sala and Kurano, 1933.)	"	0.0578	(Knox and Richards, 1918.)
"	0.0533	(Levin, 1906.)	"	0.0581	(Jorissen and Rutter, 1905.)
"	0.0533	(Drucker, 1929.)	"		

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.

(Stepanow, 1910.)

(The solutions were saturated by constant agitation at constant temperature. The picric acid in the saturated solutions was determined by evaporation and weighing. The solubility passes through a minimum.)

Mols. HCl per Liter.	$C_6H_2.OH.(NO_2)_3$ per Liter.		Mols. HCl per Liter.	$C_6H_2.OH.(NO_2)_3$ per Liter.	
	Mols.	Gms.		Mols.	Gms.
0.25	0.0116	2.66	3.67	0.0068	1.55
0.50	0.0079	1.80	4.40	0.0082	1.87
0.75	0.0062	1.42	5.14	0.0098	2.26
1	0.0054	1.24	5.51	0.0105	2.41
1.47	0.0050	1.14	5.87	0.0115	2.65
2.20	0.0051	1.15	6.24	0.0123	2.82
2.94	0.0057	1.31	6.61	0.0125	2.86

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF SEVERAL SALTS AT 25°.

(Schreiner, 1924.)

Saturation was secured by constant rotation.

Results for aqueous solutions of :

Barium chloride.		Magnesium sulfate.				Sodium chloride.	
Gm. mols. per liter		Gm. mols. per liter		Gm. mols. per liter		Gm. mols. per liter	
$BaCl_2$.	$OH.C_6H_2(NO_2)_3$.	$MgSO_4$.	$OH.C_6H_2(NO_2)_3$.	$MgSO$.	$OH.C_6H_2(NO_2)_3$.	$NaCl$.	$OH.C_6H_2(NO_2)_3$.
0.00	0.0575	0.00	0.0575	0.13	0.0830	0.01	0.0584
0.01	0.0599	0.01	0.0626	0.15	0.0859	0.03	0.0602
0.03	0.0618	0.03	0.0680	0.17	0.0888	0.05	0.0614
0.05	0.0683	0.05	0.0720	0.20	0.0916	0.07	0.0624
0.07	0.0691	0.07	0.0752	0.35	0.1052	0.10	0.0633
0.10	0.0720	0.10	0.0796	0.50	0.1159	0.30	0.0659

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF NITRIC ACID AT 25°.

(Knox and Richards, 1919.)

Equiv. Normalities		Equiv. Normalities		Equiv. Normalities	
HNO_3.	$OH.C_6H_2(NO_2)_3$.	HNO_3.	$OH.C_6H_2(NO_2)_3$.	HNO_3.	$OH.C_6H_2(NO_2)_3$.
0.00	0.0578	4.161	0.0237	10.47	0.1006
1.022	0.0108	6.280	0.0405	12.47	0.1763

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF ACIDS AT 25°.

(Drucker, 1929.)

In aqueous HCl		In aqueous HNO_3		In aqueous H_2SO_4	
Gm. Equiv. per liter		Gm. Equiv. per liter		Gm. Equiv. per liter	
HCl	$C_6H_2OH(NO_2)_3$	HNO_3	$C_6H_2OH(NO_2)_3$	H_2SO_4	$C_6H_2OH(NO_2)_3$
0.01425	0.0457	0.00635	0.05095	0.00577	0.05023
0.02664	0.0409	0.02564	0.04281	0.02197	0.04530
0.04594	0.03596	0.05166	0.03493	0.03758	0.03934
0.1159	0.02223	0.0872	0.02604	0.1022	0.02740

SOLUBILITY OF PICRIC ACID IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 25°.

(Levin — Z. physik. Ch. 55, 520, '06.)

One liter of aqueous solution contains 0.05328 gram mols. = 12.20 grams $C_6H_2.OH(NO_2)_3$ at 25°.

Gm. Mols. Salt per Liter.	Gram Mols. Picric Acid per Liter in Aq. Solutions of:					
	NaCl.	$NaNO_3$.	Na_2SO_4.	LiCl.	Li_2SO_4.	NH_4Cl.
0.01	0.05524	0.05529	0.05604	0.05480	0.05661	0.05487
0.02	0.05559		0.05872	0.05558	0.06053	0.05540
0.05	0.05729		0.06632	0.05703	0.06691	0.05771
0.07	0.05862		0.07093	0.05878	0.07013	0.05865
0.10	0.05902		0.07670	0.06132	0.07437	...
0.50	0.0790		...	...	0.123	...
1.00	0.1180		...	...	0.149	...

Gm. Mols. Salt per Liter.	Grams Picric Acid per Liter in Aq. Solutions of:					
	NaCl.	$NaNO_3$.	Na_2SO_4.	LiCl.	Li_2SO_4.	NH_4Cl.
0.01	12.66	12.67	12.83	12.55	12.97	12.57
0.02	12.74		13.45	12.74	13.87	12.69
0.05	13.12		15.19	13.06	15.33	13.22
0.07	13.43		16.25	13.47	16.06	13.44
0.10	13.52		17.57	14.05	17.04	...
0.50	18.09		...	...	28.18	...
1.00	26.98		...	...	34.14	...

Solubility in Aq. Cane Sugar.

Gm. Mols. Sugar per Liter.	Picric Ac. per Liter Solution.		Sp. Gr. Solution.
	Gm. Mols.	Gms.	
0.10	0.05202	11.92	1.0122
0.25	0.04978	11.40	1.0319
0.50	0.0482	11.04	1.0654
1.00	0.0443	10.15	1.1294

Solubility in Aq. Grape Sugar.

Gm. Mols. Grape Sugar per Liter.	Picric Acid per Liter Sol.	
	G. Mols.	Gms.
0.10	0.0530	12.14
0.25	0.0521	11.93
0.50	0.0509	11.66
1.00	0.0474	10.86

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AT 25°.

(Kozakewitch and Mikhalkow, 1934.)

Gm. Mols. NaCl per liter aq. solvent	Gm. Mols. $C_6H_2OH(NO_2)_3$ per liter sat. sol.
0.30	0.0659
0.40	0.0734
0.60	0.0437
0.80	

PICRIC ACID

Solubility of Picric Acid in Aqueous Acid and Salt Solutions at 20°.

(v. Halban and Kortschak, 1938.)

The picric acid was determined by titration with barium hydroxide solution using phenolphthaline as indicator.

Conc. of aq. solvent in gm. equiv. per liter	Gm. Mol. $C_6H_2OH(NO_2)_3$ per liter sat. sol.	Conc. of aq. solvent in gm. equiv. per liter	Gm. Mol. $C_6H_2OH(NO_2)_3$ per liter sat. sol.
0.0000 (= H_2O)	0.05151	0.01856 CaCl	0.05424
0.00944 NaCl	0.05247	0.04071 "	0.05618
0.02773 "	0.05325	0.1240 "	0.05934
0.04643 "	0.05416	0.2108 "	0.06083
0.07362 "	0.05533	0.2507 "	0.06112
0.1289 "	0.05695	0.3072 "	0.06170
0.2754 "	0.05858	0.4709 "	0.06101
0.3143 "	sat.	0.8170 "	0.05866
0.02296 NaBr	0.05344	1.167 "	0.05360
0.1078 "	0.05708	1.489 "	0.04785
0.2330 "	0.05898	2.316 "	0.01346
0.00853 $NaClO_4$	0.05240	0.01690 $Ca(NO_3)_2$	0.05564
0.03186 "	0.05520	0.03477 "	0.05813
0.06792 "	0.05728	0.1118 "	0.06434
0.09938 "	0.05912	0.1231 "	0.06480
0.3177 "	0.06716	0.1738 "	0.06618
0.01908 $NaNO_3$	0.05330	0.2484 "	0.06845
0.04891 "	0.05508	0.3400 "	0.07015
0.09000 "	0.05712	0.6909 "	0.06955
0.1870 "	0.06106	0.00849 $Sr(NO_3)_2$	0.05401
0.3667 "	0.06322	0.0200 "	0.05575
0.00664 LiCl	0.05250	0.04575 "	sat.
0.00901 "	0.05258	0.02438 HCl	0.03802
0.02050 "	0.05308	0.1062 "	0.02056
0.02791 "	0.05309	0.2930 "	0.00986
0.05841 "	0.05392	0.5906 "	0.006075
0.1285 "	0.05538	1.108 "	0.004572
0.5415 "	0.05251	2.202 "	0.004511
1.088 "	0.04453	3.171 "	0.004948
2.707 "	0.02299	4.802 "	0.007048
0.0422 LiBr	0.05356	0.03615 $HClO_4$	0.03549
0.1070 "	0.05538	0.0859 "	0.01737
0.1936 "	0.05636	0.2291 "	0.01360
0.4136 "	0.05549	1.051 "	0.01069
0.7336 "	0.05136	1.730 "	0.01490
1.178 "	0.04354	2.292 "	0.01842
0.01801 $LiClO_4$	0.05282	0.03031 HNO_3	0.03386
0.06604 "	0.05527	0.0411 "	0.03011
0.1052 "	0.05702	0.1246 "	0.02033
0.1951 "	0.05784	0.2369 "	0.01457
0.4279 "	0.06056	0.3641 "	0.01039
0.02156 $LiNO_3$	0.05288	0.783 "	0.00829
0.05306 "	0.05496	0.8533 "	0.00961(1)
0.09266 "	0.05625	0.9647 "	0.01038(1)
0.1256 "	0.05723	0.983 "	0.00804(1)
0.2723 "	0.05984	1.039 "	0.00834(1)
0.4973 "	0.06084	1.487 "	0.00882(1)
0.5674 "	0.06114	1.681 "	0.01325(1)
0.60[illegible] "	0.06114	1.743 "	0.00946(1)

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF METHYL ALCOHOL.

(Duff and Bills, [illegible].)

Gms. CH_3OH per 100 gms. aq. solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent at 0°	15°	25°
0.0	0.7	1.1	1.1
30.0	1.1	1.8	2.4
40.0	1.6	2.4	3.1
60.0	3.9	5.1	7.1
70.0	5.5	7.1	9.6
80.0	7.6	9.6	12.4
90.0	10.6	14.1	15.0
100.0	11.8	16.1	21.1

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL.

(Duff and Bills, [illegible].)

Gms. C_2H_5OH per 100 gms. aq. solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent at 0°	12°	15°	25°	40°	50°
0.0	0.7	—	1.1	1.1	1.9	2.4
30.0	1.2	2.0	3.9	3.1	4.6	6.5
40.0	2.0	2.9	3.8	7.1	7.15	10.0
60.0	5.6	4.9	7.6	10.5	13.5	17.4
78.0	8.9	6.8	11.1	11.6	17.9	22.5
80.0	9.1	7.1	11.5	11.9	18.1	22.8
81.0	9.1	7.1	11.4	11.8	18.1	22.8
85.0	9.0	7.9	11.0	13.2	17.6	22.1
90.0	8.1	8.6	10.2	12.1	16.6	21.1
100.0	4.5	10.4	6.0	8.0	11.0	14.8

The results at 12° are calculated from the determinations of Angelescu and Dumitrescu, 1928.

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

Results of (Platt and Jordan, 1933.)

Gms. C_2H_5OH per 100 gms. solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. sat. solution	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	1.252	1.268
8.05	1.480	1.502
20.4	2.102	2.147
42.5	5.995	6.377
67.9	11.36	12.82

Results of ([illegible], 1928.)

Gms. C_2H_5OH per 100 gms. solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	1.27
25.5	2.40
54.0	5.29
67.9	14.92
80.0	14.14
100.0	9.79

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF NORMAL PROPYL ALCOHOL.

(Duff and Bills, 1931.)

Gms. C_3H_7OH per 100 gms. aq. solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent at:		
	0°	25°	50°
0	0.7	1.3	2.4
30	2.8	5.0	9.7
40	4.5	7.2	12.4
60	7.1	10.9	18.0
75	8.1	12.2	19.1
80	8.2	12.0	19.0
85	7.9	10.8	17.4
90	6.0	9.4	15.7
95	4.4	7.0	12.6
100	2.4	3.7	7.5

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF ISO PROPYL ALCOHOL.

(Duff and Bills, 1931.)

Gms. i C_3H_7OH per 100 gms. aq. solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent at			
	0°	25°	40°	50°
0	0.7	1.3	1.9	2.4
30	1.5	3.8	4.7	6.4
40	3.3	5.9	8.0	9.5
60	6.9	10.3	13.7	17.8
70	8.5	12.0	16.0	20.1
75	9.1	12.7	16.8	20.8
80	9.7	13.4	17.4	21.3
82	9.6	13.4	17.5	21.5
85	9.5	13.1	17.0	21.2
90	9.2	12.6	16.4	20.4
95	7.8	11.1	15.0	18.0
100	5.8	8.7	12.0	15.4

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF ACETONE AT 25°.

(Duff and Bills, 1931.)

Gms. $(CH_3)_2CO$ per 100 gms. aq. solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. aq. solvent	Gms. $(CH_3)_2CO$ per 100 gms. aq. solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. aq. solvent
0	1.3(2.9)	70	65.8(44.0)
30	9.5(7.9)	80	87.8(70.0)
40	18.9(12.1)	90	110.8(107.0)
50	31.3(20.0)	100	134.3(194.2)
60	46.7(29.0)		

The results in parentheses are calculated from the determinations at 12° of Angelescu and Dumitrescu, 1928.

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF ORGANIC COMPOUNDS.

(Erdey-Gruz, 1928.)

Solvent, Aqueous 1.0 gm. mol. solution of:	Gms. $C_6H_2OH(NO_2)_3$ per 100 cc. aq. solvent
Glycerol	1.119
Mannitol	1.065

DISTRIBUTION OF PICRIC ACID AT 25° BETWEEN:

Water and Bromoform.

(Herz and Lewy — Z. Electrochem. 11, 820, '05.)

Millimols $C_6H_3N_3O_7$ per 10 cc.		Gms. $C_6H_3N_3O_7$ per 100 cc.	
Aq. Layer.	Bromoform Layer.	Aq. Layer.	Bromoform Layer.
0.321	0.365	0.736	0.836
0.401	0.515	0.919	1.180
0.475	0.655	1.088	1.501
0.575	0.871	1.317	1.995
0.674	1.14	1.545	2.612

Water and Chloroform.

(H. and L.)

Millimols $C_6H_3N_3O_7$ per 10 cc.		Gms. $C_6H_3N_3O_7$ per 100 cc.	
Aq. Layer.	Chloroform Layer.	Aq. Layer.	Chloroform Layer.
0.207	0.254	0.474	0.582
0.329	0.547	0.754	1.253
0.488	1.09	1.118	2.498
0.561	1.41	1.285	3.230
0.588	1.53	1.348	3.505

DISTRIBUTION OF PICRIC ACID AT 25° BETWEEN:

Water and Amyl Alcohol.

(Herz and Fischer — Ber. 37, 4747, '04.)

Millimols $C_6H_3N_3O_7$ per 10 cc.		Gms. $C_6H_3N_3O_7$ per 100 cc.	
Aq. Layer.	Alcohol Layer.	Aq. Layer.	Alcohol Layer.
0.0553	0.0930	0.127	0.213
0.0920	0.1850	0.211	0.424
0.1613	0.4127	0.369	0.946
0.1869	0.5182	0.428	1.188
0.3161	1.079	0.724	2.473
0.4471	1.638	1.024	3.753
0.5624	2.189	1.288	5.017
0.6423	2.549	1.472	5.839

Water and Toluene.

(H. and F. — Ber. 38, 1142, '05.)

Millimols $C_6H_3N_3O_7$ per 10 cc.		Gms. $C_6H_3N_3O_7$ per 100 cc.	
Aq. Layer.	Toluene Layer.	Aq. Layer.	Toluene Layer.
0.075	0.126	0.172	0.289
0.109	0.230	0.250	0.527
0.163	0.482	0.374	1.104
0.244	1.026	0.559	2.351
0.389	2.347	0.891	5.380
0.496	3.747	1.137	8.586
0.583	5.135	1.336	11.770

Additional data for the distribution of picric acid between water and amyl alcohol and water and toluene at 20° are given by Sisley (1902). Very irregular results were obtained. The fact that the colors of the two layers are different, was taken to indicate that the picric acid dissolves in a different molecular form in the two layers.

DISTRIBUTION OF PICRIC ACID BETWEEN:

Water and Benzene. (Kuriloff, 1898.)

Mols. Picric Acid per Liter:	
Aq. Layer.	C_6H_6 Layer.
0.0261	0.0940
0.0208	0.0779
0.0188	0.0618
0.0132	0.0359
0.0097	0.0198

Water and Ether at 20°. (Sisley, 1902.)

Gms. Picric Acid per Liter:		
Aq. Layer.	Ether Layer.	Dist. Coef.
6.78	17.85	2.63
3.74	6.70	1.79
2.85	3.72	1.34
0.85	0.11	0.13
0.10	0.001	0.01

Additional results for the distribution of picric acid between water and benzene are given by Rothmund and Ducker, 1903.

Data for the distribution of picric acid between water and mixtures of chloroform and toluene at 25°, are given by Herz and Kurzer, 1910.

DISTRIBUTION OF PICRIC ACID BETWEEN BENZENE AND MIXTURES OF LIGHT AND HEAVY WATER AT 18°.

(Gross and Wischin, 1936.)

A 0.02979 molal solution of picric acid in benzene was used for all experiments. Picric acid was determined by titration using phenolphthaleine as indicator. Micro pipets were used for measuring the volumes. The D_2O percentage of the water was determined by density measurements. One cc. of water was shaken with 1 cc. of the standard picric acid solution in benzene in sealed tubes. After equilibrium was attained 0.5 cc of each layer was titrated.

d 18/18 of $D_2O + H_2O$	Mol. fraction of D_2O	Gm. Mol. $C_6H_2OH(NO_2)_3$ per liter	
		Aqueous phase	C_6H_6 phase
1.0023	0.0217	0.01006	0.01982
1.0274	0.2556	0.00889	0.02122
1.0469	0.426	0.00815	0.02218
1.0520	0.482	0.00797	0.02260
1.0585	0.543	0.00740	0.002245
1.0822	0.765	0.00690	0.002395
1.0942	0.874	0.00615	0.002360
1.1065	0.991	0.00557	0.002450

DISTRIBUTION OF PICRIC ACID BETWEEN AQUEOUS SOLUTIONS OF SALTS AND BENZENE AT 25°.

(Schroinor, 1924.)

Results for Aq. $BaCl_2 + C_6H_6$.

Gm. equiv. $BaCl_2$ per liter.	Mols. $OH.C_6H_2(NO_2)_3$ per liter	
	aq. layer.	C_6H_6 layer.
0.015	0.0187	0.0534
0.025	0.0170	0.0419
0.035	0.0179	0.0442
0.050	0.0165	0.0358

Results for Aq. $NaCl + C_6H_6$.

Gm. equiv. NaCl per liter	Mols. $OH.C_6H_2(NO_2)_3$ per liter	
	aq. layer.	C_6H_6 layer.
0.015	0.0250	0.0924
0.025	0.0254	0.0924
0.050	0.0240	0.0784
0.100	0.0228	0.0674

Results for Aq. $MgSO_4 + C_6H_6$.

Gm. equiv. $MgSO_4$ per liter.	Mols. $OH.C_6H_2(NO_2)_3$ per liter	
	aq. layer.	C_6H_6 layer.
0.015	0.0250	0.0796
0.025	0.0260	0.0772
0.035	0.0249	0.0662
0.050	0.0235	0.0517

Gm. equiv. $MgSO_4$ per liter.	Mols. $OH.C_6H_2(NO_2)_3$ per liter	
	aq. layer.	C_6H_6 layer.
0.065	0.0237	0.0503
0.100	0.0252	0.0471
0.200	0.0253	0.0360

DISTRIBUTION OF PICRIC ACID BETWEEN WATER AND TOLUENE AT 19°.

(Schilow and Lepin, 1922.)

Gms. $OH.C_6H_2(NO_2)_3$ per 100 cc. of	
aq. layer.	toluene layer.
0.236	0.534
0.352	1.132
0.650	3.215

Gms. $OH.C_6H_2(NO_2)_3$ per 100 cc. of	
aq. layer	toluene layer.
0.980	6.810
1.220	10.500*

* Excess picric acid present.

DISTRIBUTION OF PICRIC ACID BETWEEN BENZENE AND AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AT 30°.

(Kozakewitch and Mikhalkov, 1934.)

The picric acid was determined iodometrically instead of by alkali titration using phenol phthaleine as indicator.

Conc. of NaCl in aq. phase	Gm. mol. $C_6H_3OH(NO_2)_3$ per liter Aqueous phase(1)	Gm. mol. $C_6H_3OH(NO_2)_3$ per liter C_6H_6 phase(2)	$\frac{1}{2}$	Conc. of NaCl in aq. phase	Gm. mol. $C_6H_3OH(NO_2)_3$ per liter Aqueous phase(1)	Gm. mol. $C_6H_3OH(NO_2)_3$ per liter C_6H_6 phase(2)	$\frac{1}{2}$
0.0(= H_2O)	0.00323	0.00456	0.710	0.3 normal	0.01975	0.0476	0.415
"	0.00628	0.0985	0.638	"	0.02680	0.0827	0.324
"	0.00777	0.0125	0.617	"	0.03300	0.1215	0.272
"	0.01350	0.0332	0.407	"	0.03815	0.1620	0.237
"	0.01847	0.0573	0.322	0.6 normal	0.00321	0.00428	0.759
"	0.02270	0.0840	0.270	"	0.00787	0.01130	0.698
"	0.03327	0.1640	0.230	"	0.01405	0.02940	0.478
0.1 normal	0.00305	0.003352	0.855	"	0.01930	0.05125	0.377
"	0.00732	0.0105	0.773	"	0.02427	0.07420	0.327
"	0.0133	0.0255	0.521	"	0.02860	0.10050	0.285
"	0.0183	0.0446	0.411	1.0 normal	0.00368	0.00497	0.742
"	0.0226	0.0668	0.338	"	0.00487	0.00673	0.725
"	0.0273	0.0918	0.298	"	0.00707	0.0110	0.640
0.3 normal	0.00527	0.0040	1.330	"	0.00993	0.0193	0.515
"	0.01142	0.0161	0.712	"	0.01205	0.0304	0.397
				"	0.01590	0.0412	0.386

DISTRIBUTION OF PICRIC ACID BETWEEN WATER AND GELATIN AT 15°.

(Cooper and Treadgold, 1934.)

0.5 gm. portions of gelatin were immersed in 40 cc quantities of picric acid solutions of varying concentrations and after standing 3 days at 15° the picric acid remaining in the aqueous phase was determined by titration with alkali.

Gms. $C_6H_3OH(NO_2)_3$ in aq. phase Initially	Gms. $C_6H_3OH(NO_2)_3$ in aq. phase Finally(1)	Gms. $C_6H_3OH(NO_2)_3$ taken up per 1 gm. gelatin(2)	$\frac{2}{1}$
0.0006	0.0004	0.0133	33.2
0.0011	0.0004	0.0534	133.5
0.0019	0.0005	0.1069	214.0(1)
0.0028	0.0009	0.1527	158.5(1)
0.0056	0.0033	0.1814	55.0(1)
0.0112	0.0085	0.2154	25.3(1)

(1) In these cases the gelatin precipitated.

SOLUBILITY OF PICRIC ACID IN ABSOLUTE ALCOHOL.

(Behrend — Z. physik. Ch. 10, 265, '92.)

100 gms. sat. solution contain 5.53 grams $C_6H_3N_3O_7$ at 12.3°, and 5.92 grams at 14.8°. Sp. Gr. of the latter solution = 0.8255.

100 gms. ethyl alcohol dissolve 8.37 gms. $C_6H_2OH(NO_2)_3$ at 22°. (Timofeiew, 1894)
100 gms. methyl alcohol dissolve 22.5 gms. $C_6H_2OH(NO_2)_3$ at 22°. "
100 gms. propyl alcohol dissolve 3.81 gms. $C_6H_2OH(NO_2)_3$ at 22° "

SOLUBILITY OF PICRIC ACID IN MIXTURES OF METHYL AND ETHYL ALCOHOLS AT 25°.

(Duff and Bills, 1931.)

Gms. CH_3OH per 100 gms. $CH_3OH + C_2H_5OH$	Gms. $C_6H_2\ OH(NO_2)_3$ per 100 gms. solvent	Gms. CH_3OH per 100 gms. $CH_3OH + C_2H_5OH$	Gms. $C_6H_2\ OH(NO_2)_3$ per 100 gms. solvent
0	8.0	60	14.9
20	9.8	80	17.6
40	12.3	100	21.1

SOLUBILITY OF PICRIC ACID IN ETHER.

(Bougault, 1903.)

Solvent.	t°.	Gms. $C_6H_3N_3O_7$ per Liter	
Ether of Sp. Gr. 0.721	13	10.8	(B.)
Ether of Sp. Gr. 0.725 (0.8 pt. H_2O per 100)	13	36.8	"
Ether of Sp. Gr. 0.726 (1 pt. H_2O per 100)	13	40	"
Ether saturated with H_2O	15	51.2	
H_2O saturated with Ether	15	13.8	

100 parts of ether dissolve about 2.27 gms. picric acid at 15°. (S. 1905.)
" chloroform " " 2 " " " "
" petroleum ether " " 0.04 " " " "
100 gms. sat. solution in pure ether contain 5 gms. picric acid at 20°. (Sisley, 1902.)
100 cc. sat. solution in pure ether contain 3.7 gms. picric acid at 20°. "
100 gms. sat. solution in pure toluene contain 12 gms. picric acid at 20°. "
100 cc. sat. solution in pure toluene contain 10.28 gms. picric acid at 20°. "
100 cc. sat. solution in pure amyl alcohol contain 1.755 gms. picric acid at 20°. "

SOLUBILITY OF PICRIC ACID IN BENZENE.

(Findlay.)

t°.	Gms. $C_6H_3N_3O_7$ per 100 Gms. C_6H_6.	Mols. $C_6H_3N_3O_7$ per 100 Mols. C_6H_6.	t°.	Gms. $C_6H_3N_3O_7$ per 100 Gms. C_6H_6.	Mols. $C_6H_3N_3O_7$ per 100 Mols. C_6H_6.
5	3.70	1.26	38.4	26.15	8.88
10	5.37	1.83	45	33.57	11.40
15	7.29	2.48	55	50.65	17.21
20	9.56	3.25	58.7	58.42	19.83
25	12.66	4.30	65	71.31	24.20
26.5	13.51	4.60	75	96.77	32.92
35	21.38	7.26			

The solubility of Picric Acid in Benzene and in Tetralin was determined by Piatti, 1931, but the results are presented only in the form of a small diagram.

100 gms. liquid Sulfur Dioxide dissolve about 38 gms. picric acid.
" " " Ammonia " " 58 " " "

SOLUBILITY OF 1.2.4.6 TRINITRO PHENOL (PICRIC ACID) IN SEVERAL SOLVENTS.

(Desvergnes, 1927.)

Solvent	Gms. $C_6H_3O_7N_3$ per 100 gms. solvent at 16°	60°	Solvent	Gms. $C_6H_3O_7N_3$ per 100 gms. solvent at 16°	60°
$CH_3COOC_2H_5$	39.41	68.48	$CHCl_3$	2.02	5.67
$(CH_3)_2CO$	123.23	220.53	$(C_2H_5)_2O$	2.64	3.96 (34°)
CH_3OH	15.95	40.25	C_5H_5N	27.62	58.94
96% C_2H_5OH	9.20	20.69	CS_2	0.11	0.18 (34°)
100 % "	6.83	19.72	CCl_4	0.065	0.35
C_6H_6	7.49	29.45	$C_6H_5CH_3$	12.24	27.84

SOLUBILITY OF PICRIC ACID IN SEVERAL SOLVENTS.

Solvent.	t°	Gms. $OH.C_6H_2(NO_2)_3$ per 100 gms. solvent	Authority
Carbon tetrachloride.............	20	0.07	(Pawlewski, 1914, 1926.)
Chloroform......................	20	1.86	"
Para Cymene (b. pt. 176°-176°.5...	25	2.611	(Wheeler, 1920.)
Glycol Diacetate (b. pt. 188°-189°.6).	25	46.3	(Taylor and Rinkenbach, 1926.)

SOLUBILITY OF PICRIC ACID IN MIXTURES OF SOLVENTS AT 12°.

(Angelescu and Dumitrescu, 1923.)

The mixtures of solvents were saturated with picric acid at 25°-30° and then the excess of picric acid was allowed to crystallize out while the solutions were kept in a thermostat at 12°. Thus constant agitation was not employed. The solutions were analyzed by evaporating the solvent at room temperature, dissolving the residue of picric acid and titrating it with 0.1 *n* KOH, using phenolphthalein as indicator.

RESULTS FOR THE SOLUBILITY OF PICRIC ACID IN MIXTURES OF:

Carbon Tetrachloride and Ethyl Alcohol.

Gms. per 100 gms. sat. sol. CCl_4.	C_2H_5OH.	$OHC_6H_2(NO_2)_3$.
99.91	0.0	0.09
89.81	9.02	1.17
83.77	14.14	2.09
77.67	19.65	2.68
69.73	26.95	3.32
64.07	32.20	3.73
55.99	39.89	4.12
37.59	56.87	5.54
15.13	77.27	7.60
0.0	90.56	9.44

Chloroform and Ethyl Alcohol.

Gms. per 100 gms. sat. sol. $CHCl_3$.	C_2H_5OH.	$OHC_6H_2(NO_2)_3$.
98.01	0.0	1.99
86.48	9.51	4.01
80.57	14.60	4.83
74.65	20.10	5.25
69.18	25.11	5.71
60.54	33.40	6.06
52.82	41.08	6.10
44.96	48.88	6.16
41.99	51.52	6.49
25.30	68.33	6.37
13.94	79.11	6.95

Benzene and Ethyl Alcohol.

Gms. per 100 gms. sat. sol. C_6H_6.	C_2H_5OH.	$OHC_6H_2(NO_2)_3$.
93.51	0.0	6.49
72.64	13.98	13.38
65.01	19.88	15.11
59.21	25.01	15.78
51.18	32.54	16.28
57.81	46.81	15.38
23.37	62.97	13.66
16.14	71.84	12.02
8.78	81.27	9.95
0.0	90.56	9.44

SOLUBILITY OF PICRIC ACID IN MIXTURES OF BENZENE AND HEXANE.

(Tausz and Schnabel, 1919.)

The temperature is not stated. The picric acid was determined by titration with 0.1 *n* Na OH using phenolphthalein as indicator.

Solvent cc. C_6H_6	+ cc. C_6H_{14}.	Cc., 0.1 *n* Na OH per 100 cc. sat. sol.	Gms. $OH.C_6H_2(NO_2)_3$ per 100 cc. sat. sol.
75	25	152	3.474
50	50	49	1.123
25	75	10	0.229
0	100	0	0.0

SOLUBILITY OF PICRIC ACID IN MIXTURES OF CARBON TETRA CHLORIDE AND:

(Angelescu and Dumitrescu, 1928.)

Ethyl Alcohol at 12°

Wt. % C_2H_5OH in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	0.09
9.12	1.18
14.14	2.13
20.19	2.75
27.87	3.43
33.45	3.87
41.60	4.29
60.20	5.86
83.62	8.72
100.0	10.42

Acetone at 12°

Wt. % $(CH_3)_2CO$ in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	0.09
4.16	1.45
8.28	3.61
15.02	8.37
20.32	11.97
26.86	18.31
34.28	26.50
41.13	34.77
51.42	47.73
71.90	79.53
80.99	90.29
100.0	194.20

Benzene at 12°

Wt. % C_6H_6 in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	0.09
8.12	0.31
10.47	0.40
15.58	0.55
21.43	0.93
29.08	1.57
34.52	2.12
41.95	3.20
53.31	4.78
73.82	6.45
84.59	7.17
100.0	6.94

Benzene at 25°(1)

Wt. % C_6H_6 in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	0.12
24.9	1.14
48.1	3.22
76.4	7.59
100.0	10.71

(1) Mathieu, 1936.

In the case of the results of Angelescu and Dumitrescu, the solvent mixtures were saturated with picric acid at 20-25° and the excess allowed to crystallize out while standing at 12°.

SOLUBILITY OF PICRIC ACID IN MIXTURES OF CARBON DISULFIDE AND:

(Mahieu, 1936.)

Acetone at 25°		Ethyl Ether at 25°		Benzene at 25°	
Wt. % $(CH_3)_2CO$ in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent	Wt. % $(C_2H_5)_2O$ in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent	Wt. % C_6H_6 in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	0.14	0.0	0.14	15.12	0.52
25.4	22.4	24.1	0.68	31.1	1.21
50.7	71.4	46.7	2.52	38.6	1.81
76.4	116.24	77.7	2.42	51.0	2.83
100.0	158.6	100.0	2.39	76.7	6.31
				100.0	10.71

SOLUBILITY OF PICRIC ACID IN MIXTURES OF CHLOROFORM AND:

Ethyl Alcohol at 12°

(Angelescu and Dumitrescu, 1928.)

Wt. % C_2H_5OH in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	2.03
9.90	4.17
21.21	5.50
34.42	6.42
44.05	6.54
54.90	6.91
73.07	6.81
84.49	7.42
100.00	10.42

Acetone at 12°

(Angelescu and Dumitrescu, 1928.)

Wt. % $(CH_3)_2CO$ in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	2.03
3.46	5.26
15.27	8.73
28.43	19.65
45.13	42.06
55.12	61.42
65.51	88.86
73.40	132.34
84.34	161.92
100.00	194.20

Acetone at 25°

(Mahieu, 1936.)

Wt. % $(CH_3)_2CO$ in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	2.23
27.7	18.17
47.0	42.72
72.3	87.46
100.0	158.6

Ethyl Ether at 25°

(Mahieu, 1936.)

Wt. % $(C_2H_5)_2O$ in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	2.23
23.9	1.20
49.0	1.18
73.2	1.43
100.0	2.39

SOLUBILITY OF PICRIC ACID IN MIXTURES OF METHYL ALCOHOL AND BENZENE.

(Duff and Bills, 1932.)

Wt. % CH_3OH in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent at		
	0°	12.5°	25°
0	—	5.6	10.4
10	10.0	14.5	28.5
20	13.3	21.0	42.9
30	15.4	26.4	46.5
40	17.2	29.2	46.5
50	18.5	29.8	44.6
60	19.8	29.2	40.6
70	20.5	26.5	36.0
80	18.2	23.1	30.6
90	16.2	19.8	25.6
10	13.8	16.0	21.1

SOLUBILITY OF PICRIC ACID IN MIXTURES OF ETHYL ALCOHOL AND BENZENE.

(Duff and Bills, 1932.)

Wt. % C_2H_5OH in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent at:				
	0°	12° (1)	12.5°	25°	25° (2)
0	—	6.9	5.6	10.4	10.7
10	9.3	12.0	13.4	24.5	23.0
20	10.0	16.6	16.6	31.4	29.0
30	10.7	19.0	18.3	30.6	30.5
40	11.0	19.5	18.1	28.2	29.0
50	10.8	19.0	17.6	25.0	27.0
60	10.3	17.7	16.0	21.7	24.5
70	9.5	16.2	14.0	17.8	21.5
80	8.2	14.0	11.1	13.7	18.0
90	6.6	11.0	8.2	10.1	13.5
100	4.5	10.4	5.8	8.0	7.8

(1) These results taken from curve plotted from the results of Angelescu and Dumitrescu, 1928.

(2) These results taken from curve plotted from the results of Mahiew, 1936.

SOLUBILITY OF PICRIC ACID IN MIXTURES OF BENZENE AND:

(Duff and Bills, 1932.)

Wt. % C_6H_6 in solvent in each case	Propyl Alcohol: Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent at		Iso Propyl Alcohol: Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent at		Butyl Alcohol: Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent at	
	0°	25°	0°	25°	0°	25°
0	2.4	3.7	5.8	8.7	1.8	2.9
10	3.4	5.4	6.2	9.8	2.7	4.4
20	4.3	7.8	6.8	11.3	3.4	6.9
30	5.2	11.2	7.4	13.8	4.2	9.9
40	6.1	14.5	8.0	17.0	5.0	12.6
50	6.9	17.7	8.6	20.0	5.9	15.4
60	7.4	20.7	8.8	22.5	6.5	17.8
70	7.8	23.0	8.8	25.0	6.8	19.9
80	7.6	25.0	8.2	25.4	6.5	21.5
90	6.5	21.0	6.6	22.5	5.8	19.6
100	—	10.4	—	10.4	—	10.4

SOLUBILITY OF PICRIC ACID IN MIXTURES OF BENZENE AND:

Acetone at 12°

(Angelescu and Dumitrescu, 1928.)

Wt. % C_6H_6 in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	194.2
18.52	164.90
26.89	112.58
44.37	87.44
61.18	69.98
75.65	49.89
85.27	34.52

Ethyl Ether at 12°

(Angelescu and Dumitrescu, 1928.)

Wt. % C_6H_6 in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	3.42
11.54	7.76
22.03	10.14
37.16	12.30
62.96	14.43
79.00	14.50
88.68	12.88

Freezing-point data are given for mixtures of Picric Acid and each of the following compounds:

Acetic acid(3)
Acenaphthene(7)
Aceto phenone(2)(10)
Aniline o bromo(18)
Anthracene(21)(35)(48)
Azo benzene(41)
Benzo hydrol(32)(48)
Benzo phenone(34)(10)
α Benzyl naphthalene(7)
Bromo aniline(18)
Chloro " (18)
α and β Bromo naphthalene(7)
Bromo naphthylamine(41)
Camphor(5)
Catechol(25)
Carbazole(13)
  and β Chloro naphthalene(7)
Cinnamic acid(31)
o, m, and p Cresol(3)
Di benzyl(7)(8)
1.2.4 Dichloro aniline(18)
1.2.4 Dibromo " (18)
Diethyl diphenyl urea(38)
Dinitro benzenes(36)
  " naphthalenes(37)
  " toluenes(36)
Diphenyl(8)
Diphenyl amine(9)(20)
Diphenyl methane(7)(14)
Dimethyl oxalate(31)
Dimethyl pyrone(24)
Erithritol(43)
Ethoxy benzal acetophenone(2)
Ethylene bromide + naphthalene(16)
Fenchon(28)
Hydro quinone dimethyl ether(44)
β Methyl naphthoate(4)
Fluorene(48)
Guaiacol(25)
Nitroso di methyl aniline(49)(50)
Methylene dioxy benzal aceto phenone(1)
Methylene dioxy chalcone(2)
  " " " + β naphthol(2)
β Naphthol(2)(3)
" " methyl ether(44)
Naphthalene(11)(17)(21)(27)(45)
β Naphthyl acetate(4)
Nitro acenaphthene(7)
Nitro benzene(29)
α Nitro naphthalene(4)(7)
β " " (4)
o,m,p Nitro phenol(6)
Oxy benzaldehyde(21)(42)
Oxy benzal aceto phenone(1)
Phenanthrene(7)
Phenol(11)(21)(22)
Picramide(7)
Picryl chloride(7)(46)
Quinone(29)
Resorcinol(25)
Retene(7)
Salicylaldehyde(30)
Stilbene(7)
Styph nic acid(47)
Succinic acid(31)
Succinimide(28)
Tetryl(32)
Thymol(3)
Tri bromo aniline(18)
Tri nitro m cresol(19)(39)
2.4 di nitro toluene(33)
Tri nitro toluene(32)
α Tri nitro toluene(26)(36)
Tri phenyl carbinol(12)
Tri phenyl methane(7)(15)(23)
Tri nitro phenyl methyl nitramine(40)
Toluic acid(3)

(1) Asahina, 1934; (2) Asahina, 1934a; (3) Kendall, 1916; (4) Shinomiya, 1940; (5) Kremann and Odelga, 1912; (6) Kremann and Rodinis, 1906; (7) Efremov, 1918; (8) Efremov, 1919, 1919a; (9) Kremann and Schadinger, 1919; (10) Kremann and Marktl, 1920; (11) Kremann, 1904, 1905; (12) Kremann, Hohl and Müller II, 1921; (13) Kremann and Slovak, 1920; (14) Kremann and Fritsch, 1920; (15) Kremann, Odelga and Zawadosky, 1921; (16) Bruni, 1898; (17) de Gee, 1916; (18) Hertel, 1924; (19) Quist, 1924; (20) Giua and Cherchi, 1919; (21) Rheinboldt, Henning and Kircheisen, 1925; (22) Philip, 1903; (23) Rheinboldt and Kirscheisen, 1926; (24) Kendall, 1914; (25) Philip and Smith, 1905; (26) Giua, 1916; (27) Saposchinikow, 1904; (28) Kremann and Dietrich, 1923; (29 Kremann, Sutter, Sitte, Strzelba and Dobotsky, 1922; (30) Kremann and Zechner, 1925; (31) Kremann, Zechner and Drazil, 1924; (32) Taylor and Rinkenbach, 1923a; (33) Wogrinz and Vari, 1919; (34) Puschin and Rikovski, 1930; (35) Milone and Rossingnoli, 1932; (36) Hrynakowski and Kapuscuski, 1933b; (37) Urbanski and Kwistkowski, 1934; (38) Giua and Guastalla, 1933; (39) Jefremow and Tichomirowa, 1927; (40) Jefremow and Trichomirowa,
(41) Kremann, Zechner and W

SOLUBILITY OF PICRIC ACID IN MIXTURES OF:

ACETONE AND NITROBENZENE AT 25°
(Mahieu, 1936.)

Wt. % $(CH_3)_2CO$ in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	39.1
24.9	68.3
47.5	97.7
74.5	118.1
100.0	158.6

ETHYL ETHER AND ETHYL ALCOHOL

Wt. % C_2H_5OH in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	3.42
9.50	8.60
26.90	12.38
60.86	14.15
74.69	13.18
84.65	11.49
100.00	10.42

SOLUBILITY OF PICRIC ACID IN MIXTURES OF BENZENE AND:

Acetone at 25°
(Mahieu, 1936.)

Wt. % C_6H_6 in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0.0	158.6
10.9	127.5
23.7	117.8
49.7	99.7
74.5	62.3
100	10.7

Toluene at 25°
(Mahieu, 1936.)

Wt. % C_6H_6 in solvent	Gms. $C_6H_2OH(NO_2)_3$ per 100 gms. solvent
0	13.16
29.7	13.49
53.1	13.5
74.0	13.39
100.0	10.71

Trinitro **RESORCINOL** $(NO_2)_3C_6H(OH)_2$

100 gms. glycol diacetate dissolve about 13.0 gms. trinitro resorcinol at 20-25°.
(Taylor and Rinkenbach, 1926.)

Tetra Nitr**ANILINE** 1.2.3.5 $(NO_2)_4C_6H\ NH_2$.

SOLUBILITY IN SEVERAL SOLVENTS AT 0°. (Taylor and Rinkenbach. 1926.)

Solvent.	Gms. $(NO_2)_4C_6HNH_2$ per 100 gms. solvent.	Solvent.	Gms. $(NO_2)_4C_6HNH_2$ per 100 gms. solvent.
Water	0.007	Chloroform	0.010
Methyl alcohol	0.45	Carbon tetrachloride	0.0036
Ethyl alcohol	0.34	Carbon bisulfide	0.0056
Ethyl ether	0.081	Benzene (3°.9)	0.13
Acetone	7.50	Toluene	0.188

STYPHNIC ACID (2.4.6 Trinitro Resorcinol) $C_6H(OH)_2(NO_2)_3$.

SOLUBILITY OF STYPHNIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AND OF NITRIC ACID AT 25°. (Knox and Richards, 1919.)

In aq. Hydrochloric acid.				In aq. Nitric acid.			
Equiv. Normality.		Equiv. Normality.		Equiv. Normality.		Equiv. Normality	
HCl.	$C_6H(OH)_2(NO_2)_3$.	HCl.	$C_6H(OH)_2(NO_2)_3$.	HNO_3.	$C_6H(OH)_2(NO_2)_3$.	HNO_3.	$C_6H(OH)_2(NO_2)_3$.
0.00	0.02179	6.997	0.00163	0.00	0.02179	10.31	0.007944
1.410	0.00062	8.418	0.00197	1.785	0.001403	11.97	..01298
2.814	0.00060	11.10	0.00397	4.171	0.002180	13.97	0.02742
4.221	0.00072	11.16	0.00387	6.234	0.003271	15.57	0.05611

Freezing-point data are given by Jefremow, 1918, 1919a, 1927, 1934, for mixtures of Styphnic acid and:

Acenaphthene	Hydroquinone	Phenanthrene
Benzyl naphthalene	Naphthalene	Resorcinol
Bi benzyl	Naphthols	Retene
Bi phenyl	Nitro acenaphthene	Stilbene
" " methane	Nitro anilines	Tri nitro benzene
Bromo naphthalene	Nitro pyrocatechols	" " toluene
Chloro "	Nitro naphthalene	" " xylene
Di nitro resorcinols	Nitro hydroquinone	" chloro phenol
" " phenol	Nitro phenols	" nitro phenol
Fluorene	Nitro resorcinols	" " cresol

Results for mixtures of styphnic acid + anthracene are given by Kremann & Müller II, 1921, for mixtures with tri nitro phenyl methyl nitr amine by Jefremow and Tichomirowa, 1926; and for mixtures with tri chloro phenol by Janecke and Rahlfs, 1932.

TRI NITRO PHLOROGLUCINOL $C_6(OH)_3(NO_2)_3$.

Freezing-point data for mixtures of Tri nitro phloro glucinol and Tri nitro resorcinol. (Hertel and Schneider, 1931.)

DiBromo**BENZENE** (*p*) $C_6H_4Br_2$.

SOLUBILITY IN ETHYL, PROPYL, ISO BUTYL ALCOHOLS, ETC.

(Schröder — Z. physik. Chem. 11, 456, '93.)

Determinations by "Synthetic Method" see Note, p. 292.

t°.	Grams $C_6H_4Br_2$ (*p*) per 100 Grams Sat. Solution in:						
	C_2H_5OH.	C_3H_7OH.	$(CH_3)CH.CH_2OH$.	$(C_2H_5)_2O$.	CS_2.	C_6H_6.	C_6H_5Br.
0	...	..	...	..	27	..	..
10	...	..	...	30	34	34	22
20	...	..	...	38	43	43	29
30	14	..	15	47	53	53	36
40	19	..	20	57	62	62	45
50	26	27	30	67	72	71	54
60	38	40	44	77	81	80	67
70	57.6	67	65	87	90	88	79
75	80.5	85	77	..	..	..	84
80	94.4	95	94.6	..	..	..	90

SOLUBILITY OF MIXTURES OF *p* DIBROMOBENZENE AND *p* DICHLOROBENZENE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL

Solvent, 50 Vol. % C_2H_5OH, $t=49.1°$. (Küster and Dahmer, 1905.)

Solvent, 90.9 Vol. % C_2H_5OH, $t = 25°$ (Küster and Würfel, 1904–05.)

Gms. per 100 cc. Sat. Sol.		Mol. % $C_6H_4Br_2$ in Solute.	Gms. per 100 cc. Sat. Sol.		Mol. % $C_6H_4Br_2$ in Solute.
$C_6H_4Br_2$.	$C_6H_4Cl_2$.		$C_6H_4Br_2$.	$C_6H_4Cl_2$.	
0.484	0	100	2.909	0	100
0.505	0.044	89.8	2.674	0.696	94.3
0.496	0.084	80.7	2.220	2.808	70.7
0.477	0.503	59.3	1.769	4.249	49.1
0.470	0.721	54.4	1.271	6.237	24.5
0.196	1.311	11.6	0.675	6.877	9.9
0	1.614	0			

SOLUBILITY OF *p* DIBROMOBENZENE IN SEVERAL SOLVENTS AT 25°.

(Hildebrand, Ellefson and Beebe, 1917.)

Solvent.	Gms. $C_6H_4Br_2$ (*p*) per 100 Gms. Solvent	Solvent.	Gms. $C_6H_4Br_2$ (*p*) per 100 Gms. Solvent.
Methyl Alcohol	10.35	Carbon Tetrachloride	36.6
Benzene	83.8	Ethyl Ether	71.3
Carbon Disulfide	90	Hexane	25.9

Di Bromo **BENZENE** (Para) $C_6H_4Br_2$.

SOLUBILITY OF DIBROMOBENZENE IN SEVERAL SOLVENTS. (Mortimer, 1923.)

t°.	Mols. *p* $C_6H_4Br_2$ per 100 mols. saturated solution in :					
	C_6H_6.	$C_6H_5CH_3$.	CCl_4.	$C_6H_5NO_2$.	$C_6H_5NH_2$.	C_6H_5OH.
0........	11.0	10.5	7.9	6.9	3.3	–
20........	20.2	19.7	15.9	14.4	8.5	–
40........	34.9	34.3	29.8	27.9	19.7	1.7
60........	55.7	55.1	51.1	49.1	39.6	28.6
80........	84.5	84.0	–	81.1	77.6	72.0

100 gms. methyl formate dissolve 28.4 gms. *p* $C_6H_4Br_2$ at 25°. (Kröber, 1919.)

The critical solution temperature of mixtures of p dibrombenzene and phenyl carbinol is at about 48°. That for mixtures of p dibrom benzene and methyl salicylate, is 69°, for mixtures of p dibrom benzene and n phenyl ethanol is 67°, and for mixtures of p dibrom benzene and menthol is 55°. (Lecat, 1928.)

Freezing-point data are given for mixtures of:

o, m and p Dibromo benzenes. (Holleman and Van der Linden, 1911; Wibaut, van der Lande and Wallagh, 1933.)
Dibrom o benzenes + Dichloro benzenes (Deffet, 1928.)
" " + Nitrobenzene + allyl mustard oil (Schischokim, 1930.)
" " + Bromo iodo benzene (Nagornow, 1911.)
" " + Bromo chloro benzene (Bruni and Gorni, 1899, 1900.)
" " + Bromo toluene (Borodowski and Bogojowlenski, 1904.)
" " + Camphor (Jefremow, 1915.)
" " + p Chloro nitro benzene (Pawlewski, 1898.)
" " + p Di chloro benzene (Bruni and Gorni, 1899, 1900; Küster and Würfel, 1904-5; and Kruyt, 1912.)
" " + Di Chloro benzene + C_2H_5OH (Meyer, 1922, Smits, 1920.)
" " + p Di iodo benzene (Nagornow, 1911.)

BROMO CHLORO BENZENES o, m and p C_6H_4BrCl.

Freezing-point data are given for mixtures of:

o, m and p Bromochloro benzenes (Holleman and Van der Linden, 1911; Van Loon and Wibaut, 1937.)
Bromo chloro benzenes + p Dibromo benzene (Holleman and Van der Linden, 1911.)
" " " + p Dichloro benzene (Bruni and Gorni, 1899; Kruyt, 1912.)

BROMO FLUORO BENZENE C_6H_4BrF.

Freezing-point data for mixtures of o, m and p Bromo Fluoro Benzenes are

BROMO IODO BENZENE C_6H_4BrI.

Freezing-point data for mixtures of:

Bromo Iodo Benzene + Dibromo benzene (Nagornow, 1911.)
" " " + Di iodo benzene (Nagornow, 1911; Rheinboldt and Kircheisen, 1926.)

DI IODO BENZENE $C_6H_4I_2$.

Freezing-point data for mixtures of:

Di iodo benzene + Bromo iodo benzene (Nagornow, 1911; Rheinboldt and Kircheisen, 1926.)
" " " + Chloro iodo benzene (Nagornow, 1911.)

TRI BROMO ANILINE $C_6H_2Br_3NH_2$.

Freezing-point data are given for mixtures of 1 tri bromo aniline and 2 chloro 4.6, di bromo aniline. (Sudborough and Lakhamalani, 1917.)

DICHLORO BENZENES o, m and p. $C_6H_4Cl_2$.

SOLUBILITY OF o, m, AND p DICHLORO BENZENES, EACH SEPARATELY, IN WATER.

(Klemenc and Low, 1930.)

The method of Rex, 1906, modified by increasing the size of the flask to about 1 liter was used.

t^0	Gms. $C_6H_4Cl_2$ per 1000 gms. H_2O		
	o compound	m compound	p compound
20	0.134	0.111	0.0689
25	0.145	0.123	0.0791
30	0.171	0.140	0.0911
35	0.183	0.150	(0.1044)(1) (0.0840)
40	0.194	0.167	0.1008
45	0.203	0.177	0.1219
55	0.223	0.196	0.1561(1)
60	0.232	0.201	0.1631(1)

(1) liquid state.

The p compound has a transition point from stable to unstable form at 35^0.

100 gms. H_2O dissolve 0.077 p $C_6H_4Cl_2$ at 10°. (Gross and Saylor, 1931.)

SOLUBILITY OF p DICHLORO BENZENE IN LIQUID CARBON DIOXIDE.

(Buchner, 1905-06.)

t^0	Gms. p $C_6H_4Cl_2$ per 100 gms. sat. sol.
−33	1.2
−10	

Freezing-point data for mixtures of o, m and p Dichloro benzenes are given by Holleman & Van der Linden, 1911; Wibaut, Van der Linden and Walagh, 1937.)

Results for mixtures of Dichloro benzenes and:

Bromo benzene (Timmermans, 1934.)
Bromo chloro benzene (Bruni and Gorni, 1899.)
Chloro benzene (Timmermans, 1934.)
Chloro iodo benzene (Nagornow, 1911.)
Chloro phenol (Burnham and Madgin, 1936.)
Di bromo benzenes (Bruni and Gorni, 1899,1900; Küster and Würfel, 1904-5; Kruyt, 1912; Deffet, 1938.)
Di bromo benzenes + C_2H_5OH (Meyer, 1922; Smits, 1920.)
Di chloro benzene (Timmermans, 1934.)
Di iodo benzene (Nagornow, 1911.)
Di phenyl (Morris and Cook, 1935.)
Fluoro benzene (Timmermans, 1934.)
Naphthalene (Morris and Cook, 1935.)
Nitro benzene (Hrynakowski and Szymt, 1938a.)
o Chloro toluene (Timmermans, 1934.)
o Cresol (Glass and Madgin, 1934.)
p Toluidine (Glass and Madgin, 1934.)
Tetra chloro benzene (Timmermans, 1934.)
Tri phenyl methane (Morris and Cook, 1935.)

CHLORO IODO BENZENE p C_6H_4ClI.

Freezing-point data are given for mixtures of:

Chloro iodo benzene + di iodo benzene (Nagornow, 1911; Rheinboldt and Kirscheisin, 1926.)
Chloro iodo benzene + di chloro benzene (Nagornow, 1911.)
Di iodo benzene + bromo iodo benzene (Rheinboldt and Kirscheisin, 1926.

TRI BROMO ANILINE $C_6H_2NH_2(2.4.6.).Br_3$.

Freezing-point data for mixtures of tri bromo aniline and tri nitro phenol are given by Hertel, 1924.

BROMO NITROSO BENZENE C_6H_4BrNO.

Freezing-point data are given for mixtures of:

Bromo nitroso benzene + Nitroso anisole (Hammick, Edwards, Illingsworth and Snell, 1933.)
" " " m Nitro nitroso benzene "

QUINONE $CO<(CH.CH)_2>CO$.

100 cc. sat. sol. of Quinone in water	contain	1.37 gm.	$CO<(CH.CH)_2>CO$	at 25°
» » » 0.1 n HCl	»	1.38	»	» »
» » » 1.0 n HCl	»	1.44	»	» »

(Granger and Nelson, 1921.)

The solubility of Quinone in Water at 25°, determined by interferometer readings, is 1.51 gms. $C_6H_4O_2$ per 100 cc H_2O. The solubility in 99.8% D_2O (heavy water) is exactly the same. (Korman and LaMer, 1936.)

SOLUBILITY OF QUINONE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID

(Linderstrom-Lang, 1924, at [illegible] [illegible], 1926)

t°.	Gm. mols. $C_6H_4O_2$ per [illegible]	Gm. mols. $C_6H_4O_2$ per [illegible]
11.85	[illegible]	[illegible]
18.0	[illegible]	[illegible]
23.8	[illegible]	[illegible]
23.75	[illegible]	[illegible]

SOLUBILITY OF QUINONE IN AQUEOUS SALT SOLUTIONS

(Linderstrom-Lang, 1924)

On account of the instability of quinone at lower concentrations of hydrogen ions the aqueous salt solutions were made in 0.01 n HCl instead of pure water. The results, therefore, show, in all cases, the solubility of quinone in aqueous solutions containing both HCl present in 0.01 n concentration, and the several salts present in the concentrations shown in the table. Constant rotation in a thermostat for 3 to 5 hours was employed. The quinone was prepared by distilling a raw quinone with water vapor. The titrations were made according to Knecht and Hibbert (*Ber.*, 43, [illegible], 1910), with titanium chloride in acid solution, and retitration with iron alum, using potassium sulfocyanate as indicator.

Salt.	t°.	Gm. equiv. salt per liter.	Gm. mols. $C_6H_4O_2$ per liter.
LiCl	11.85	0.835	[illegible]
"	"	1.670	[illegible]
"	"	[illegible]	[illegible]
"	"	3.340	[illegible]
"	18.0	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	23.5	0.835	[illegible]
"	"	1.670	[illegible]
"	"	[illegible]	[illegible]
"	"	[illegible]	[illegible]
NaCl	18.85	0.4	[illegible]
"	"	0.8	[illegible]
"	"	1.6	[illegible]
"	"	3.2	[illegible]
"	18.0	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	23.85	0.4	[illegible]
"	"	0.8	[illegible]
"	"	1.6	[illegible]
"	"	[illegible]	[illegible]
KSCN	"	[illegible]	[illegible]*
KNO_3	"	[illegible]	[illegible]*
K_2SO_4	"	[illegible]	[illegible]*
KCl	11.85	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	"	[illegible]	[illegible]
"	18.0	[illegible]	[illegible]

Salt.	t°.	Gm. equiv. salt per liter.	Gm. mols. $C_6H_4O_2$ per liter.
KCl	[illegible]	[illegible]	[illegible]
		[illegible]	0.1114
		[illegible]	[illegible]*
		[illegible]	[illegible]
RbCl	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
CsCl	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
KBr	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
KI		[illegible]	[illegible]*
[illegible]	[illegible]	[illegible]	[illegible]*
		[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
Na_2SO_4	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]
		[illegible]	[illegible]
$MgSO_4$	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]

SOLUBILITY OF QUINONE IN AQUEOUS SALT SOLUTIONS AT 17.9°.

(Linderström-Lang, 1929.)

Salt	Gm. Mol. Salt per liter	Gm. Mol. $C_6H_4O_2$ per liter	Salt	Gm. Mol. Salt per liter	Gm. Mol. $C_6H_4O_2$ per liter
KI	0.0	0.1030	$C_2H_5NH_2.HCl$	0.747	0.0945
"	0.6	0.1231	"	1.493	0.0889
"	1.2	0.1460	"	2.986	0.0808
NH_4Cl	0.8	0.0954	$C_4H_9NH_2.HCl$	0.690	0.1006
"	1.6	0.0916	"	1.390	0.0989
"	3.2	0.0864	$(CH_3)_3(C_2H_5).NCl$	0.455	0.0981
$CH_3NH_2.HCl$	0.666	0.0968	$(C_2H_5)_4NCl$	0.705	0.0930
"	1.332	0.0929	"	1.410	0.0793
"	2.663	0.0859			

Freezing-point data are given by Kremann, Sutter, Sitte, Strzelba and Dobolzky, 1922, for mixtures of Quinone and:

Acenaphthene
Anthracene
Carbazole
Di nitro phenol
Di phenylamine
Fluorene
Hydroquinone
Naphthols
Naphthalene
Naphthylamines
Nitro benzene
Nitro phenols
Paraquinone
Phenol
Picric Acid
Pyrocatechol
Pyrogallol
Resorcinol
Toluidine
Tri chlor acetic acid(1)
Tri nitro phenol
Tri phenyl carbinol
Tri phenyl methane

(1) Kendall and Gibbons, 1915.

BROMO NITRO BENZENES o, m and p $C_6H_4BrNO_2$.

Freezing-points of mixtures of o, m and p bromo nitro benzenes are given by Holleman and de Bruyn, 1900; Narbutt, 1905. Results for mixtures of Bromo nitro benzenes and:

Chloro nitro benzenes	(Kremann, 1908; Kremann and Ehrlich, 1908; Isaac, 1908; Küster, 1891; Hasselblatt, 1913; Kitran, 1924; Puschin, 1926; Puschin and Kitran, 1926; Grimm, Günther and Titus, 1931.
Fluoro nitro benzene	(Hasselblatt, 1913.)
Iodo nitro benzene	" "
Benzene	(Bugojawlewsky, Winogradow and Bogobubow, 1906.)
Cinnamylidene aceto phenone	(Giua, 1925.)
Nitro toluene	(Grimm, Günther and Titus, 1931.)

CHLORO NITRO BENZENES o, m and p $C_6H_4ClNO_2$.

100 gms. H_2O dissolve 0.654 gm. m $C_6H_4ClNO_2$ at 30°. (Gross and Saylor, 1931.)

SOLUBILITY OF p CHLORO NITRO BENZENE IN WATER AND ORGANIC SOLVENTS.

(Desvergnes, 1925.)

Solvent	Gms. $C_6H_4ClNO_2$(1,4) per 100 gms. solvent at 17°	50°	Solvent	Gms. $C_6H_4ClNO_2$(1.4) per 100 gms. solvent at 17°	50°
Water	0.0028	0.0125	$CHCl_3$	73.62	165.75
"	—	0.0153(100°)	C_5H_5N	97.62	312.67
$CH_3COOC_2H_5$	75.67	244.59	CCl_4	17.42	99.11

SOLUBILITY OF o AND OF m CHLORO NITRO BENZENE, EACH SEPARATELY, IN LIQUID CARBON DIOXIDE.

(Büchner, 1905-06.)

Results for:

o Chloro Nitro Benzene

t°	Gms. o $C_6H_4ClNO_2$ per 100 gms. sat. solution
-32	1.0
+ 5	7.8
7	16.5 - 36.0 Quad. pt.
8	58.8
11	65.8

m Chloro Nitro Benzene

t°	Gms. m $C_6H_4ClNO_2$ per 100 gms. sat. solution
-1	1.8
+16.5	11.2
7.5	38.2 Quad. pt.
20	53.2

100 gms. sat. solution of p chloro nitro benzene in liquid sulfur dioxide contain 38 gms. p $C_6H_4ClNO_2$ at (?) t°. (De Carli, 1927.)

The critical solution temperature of mixtures of p chloro nitro benzene and benzoic acid is 86°. (Lecat, 1929.)

SOLUBILITY OF *o*, *m* AND *p* CHLORONITROBENZENES IN ANILINE, DETERMINED BY THE FREEZING-POINT METHOD.

(Kremann, 1907.)

t°.	Gms. Each Compound (Determined Separately) per 100 Gms. Sat. Sol.		
	o $C_6H_4ClNO_2$.	*m* $C_6H_4ClNO_2$.	*p* $C_6H_4ClNO_2$.
−10	43.19 (=31 Mol. %)	21.60 (=14 Mol. %)	27.75 (=18.5 Mol. %)
− 2.5	51.30 (=39 "	31.67 (=21.5 "	31.67 (=21.5 "
+10	69.15 (=57 "	49.29 (=36.5 "	38.50 (=27 "

Freezing-point data for mixtures of o, m and p chloro nitro benzenes are given by Holleman and de Bruyn, 1900; Bogojawlewsky, Winogradow and Bogobubow, 1906; Kohman, 1925.

Results for mixtures of chloro nitro benzenes and:

Aniline (Kremann, 1907; Kremann and Rodinis, 1906.)
Benzene (Bogojawlewski, Winogradow and Bogobubow, 1906.)
Bromo nitro benzenes (Kremann and Ehrlich, 1908; Kitran, 1924; Puchin, 1926.)
Camphor (Jefremow, 1916.)
Cinnamylidine acetophenone (Giua, 1925.)
Di bromo benzenes (Pawlewski, 1898.)
Di phenyl amine (Tinkler, 1913.)
Fluoro nitro benzene (Hasselblatt, 1913.)
Iodo nitro benzene " "
Naphthalene (Kremann and Rodenis, 1906.)
Nitro aniline (Grimm, Gunther and Titus, 1931.)
Nitro bromo benzene (Grimm, Gunther and Titus, 1931.)
Nitro mannite (Urbanski, 1933, 1934.)
Nitro phenol (Grimm, Gunther and Titus, 1931.)
Nitro toluene " " " "

FLUORO NITRO BENZENE $C_6H_4F(NO_2)$

Freezing-point data for mixtures of fluoro nitro benzene and chloro nitro benzene are given by Hasselblatt, 1913.

IODO NITRO BENZENES $C_6H_4INO_2$.

Freezing-point data for mixtures of o, m and p iodo nitro benzenes are given by Holleman, 1913.

NITRO NITROSO BENZENE m $C_6H_4(NO_2)$ NO.

Freezing-point data are given for mixtures of:

m Nitro nitroso benzene + Nitroso mesitylene (Hammick, Edwards, Illingworth and Small, 1933.)
" " " " + Bromo nitroso benzene "
" " " " + Nitroso dimethyl aniline "
" " " " + Nitroso mesitylene "

DINITRO BENZENES o, m and p $C_6H_4(NO_2)_2$.

100 gms. H_2O dissolve 0.21 gm. ortho, 2.14 gm. meta and 1.32 gm. para dinitro benzene at 20-25°. (Dehn, 1917.)

SOLUBILITY OF m DINITRO BENZENE IN WATER AND IN ORGANIC SOLVENTS.

(Desvergnes, 1925.)

Solvent	Gms. $C_6H_4(NO_2)_2(1,3)$ per 100 gms. solvent at:		Solvent	Gms. $C_6H_4(NO_2)_2(1,3)$ per 100 gms. solvent at:	
	15°	50°		15°	50°
H_2O	0.0069	0.0469	C_6H_6	34.09	195.89
"	—	0.1910 (100°)	$CHCl_3$	30.51	69.48
$CH_3COOC_2H_5$	31.09	148.44	$(C_2H_5)_2O$	6.74	11.06 (30°)
$(CH_3)_2CO$	72.37	213.04	C_5H_5N	64.52	216.25
CH_3OH	5.27	11.08	CS_2	1.23	1.38 (33°)
96% C_2H_5OH	2.37	11.49	CCl_4	0.97	8.97
100% "	2.55	12.69	$C_6H_5CH_3$	25.66	134.80
" "	5.9 (24.6°)	—			

SOLUBILITY OF DINITROBENZENE IN CONCENTRATED AQUEOUS SOLUTIONS OF SULFURIC ACID. (Hough, Savage and van Marle, 1920.)

The results are given only in the form of a Chart. The following approximate values were read from the published curve.

t°.	Gms. $C_6H_4(NO_2)_2$ per 100 gms. sat. sol. in 70% H_2SO_4.	80% H_2SO_4.	90% H_2SO_4.	t°.	Gms. $C_6H_4(NO_2)_2$ per 100 gms. sat. sol. in 70% H_2SO_4.	80% H_2SO_4.	90% H_2SO_4
0....	0.5	1.3	7.0	50....	0.9	2.1	9.8
10....	0.6	1.35	7.2	60....	1.0	2.6	11.1
20....	0.7	1.5	7.5	70....	1.3	3.2	13.1
25....	0.75	1.55	7.75	80....	1.7	3.9	15.5
30....	0.8	1.6	8.0	90....	2.0	4.7	18.2
40....	0.85	1.8	8.8	100....	2.8	6.2	22.1

SOLUBILITY OF META DINITROBENZENE IN ETHYL ACETATE.

(Moesveld, 1917, 1918; Cohen and Moesveld, 1919.)

The determinations were made with the greatest possible accuracy. Constant agitation in a thermostat was employed and all precautions taken to insure the purity of the materials and accuracy of the analyses. The results are given to the third place of decimals.

	Gms. m $C_6H_4(NO_2)_2$ per 100 gms. sat. sol.	t°.	Gms. m $C_6H_4(NO_2)_2$ per 100 gms. sat. sol.	t°.	Gms. m $C_6H_4(NO_2)_2$ per 100 gms. sat. sol.
0.02....	17.89	12.5....	23.46	25.0.....	30.85
2.48....	18.93	15.0.....	24.79	27.5.....	32.61
5.0.....	19.94	17.5.....	26.17	30.0.....	34.44
7.5.....	21.02	20.0.....	27.64	32.5.....	36.39
10.0.....	22.21	22.5.....	29.18	35.0.....	38.40

In addition to the above determinations, which were made at the ordinary pressure, results at pressures up to 480 atmospheres are given. These show a diminution of solubility at 30° from 34.44 gms. to 29.567 gms. per 100 gms. sat. sol. at a pressure of 480 atmospheres.

DiNitro**BENZENE** (*m*) $C_6H_4(NO_2)_2$.

SOLUBILITY IN BENZENE, BROM BENZENE AND IN CHLOROFORM.

"Synthetic Method."

(Schröder)

t°.	Gms. $C_6H_4(NO_2)_2$ per 100 Gms. Sol. in:			t°.	Gms. $C_6H_4(NO_2)_2$ per 100 Gms. Sol. in:		
	C_6H_6	C_6H_5Br	$CHCl_3$.		C_6H_6	C_6H_5Br	$CHCl_3$
15	17.5	...	22.2	40	52.0	38.0	42.0
20	26.0	18.5	25.0	50	62.5	47.5	52.5
25	33.0	23.7	29.0	60	71.0	57.0	65.0
30	40.0	28.7	33.0	..	...	...	...

SOLUBILITY OF *m* DINITROBENZENE IN SEVERAL ALCOHOLS AND ACIDS

(Timofeiew, 1894.)

Solvent.	t°.	Gms. m $C_6H_4(NO_2)_2$ per 100 Gms.		Solvent.	t°.	Gms. m $C_6H_4(NO_2)_2$ per 100 Gms.	
		Sat. Sol.	Solvent.			Sat. Sol.	Solvent
CH_3OH	13.8	5.38	5.65	CH_3COOH	15.5	15.7	18.6
C_2H_5OH	13.8	2.83	2.92	"	23	17.8	21.6
C_3H_7OH	13.8	2	2	C_2H_5COOH	13.5	12	13.6
C_3H_7OH	73	43.6	77.3	"	15.5	12.9	14.8
HCOOH	13.5	9	9.9	"	23	13.45	15.5
HCOOH	15.5	9.6	10.5	C_3H_7COOH	13.5	7.3	8.3
CH_3COOH	13.5	15.2	17.9	"	15.5	8.2	8.9

100 gms. 95% formic acid dissolve 11.89 gms. *m* dinitrobenzene at 20.8°. (Aschan, '13).
100 gms. pyridine dissolve 106.3 gms. *m* dinitrobenzene at 20°-25°. (Dehn, 1917.)
100 gms. 50% aq. pyridine dissolve 45.5 gms. *m* dinitrobenzene at 20°-25°. "

100 gms. sat. solution of di nitro benzene in liquid sulfur dioxide contain about 51 gms. $C_6H_4(NO_2)_2$ (o, m, or p?) at (?) t°.

100 gms. sat. solution in liquid ammonia contain about 19 gms. $C_6H_4(NO_2)_2$.

(De Carli, 1927.)

BENZENE DISULFON CHLORIDES $C_6H_4(SO_2)_2Cl$.

Freezing-point data are

Freezing-point data are given for mixtures of o, m and p Di nitro benzenes by Andrews, 1925; Wyler, 1932 and Pounder and Masson, 1934.

Results are given for mixtures of Di nitro benzenes and:

Acetanilide(22)
Acenaphthene(6)(14)
Amino azo benzene(38)
Amino phenol(13)
Aniline(1)(5)
Anthracene(31)
Azo benzene (38)
Benzene(2)
Camphor(35)
Carbazole(7)
Cinnamylidene aceto phenone(14a)
Di chloro dinitro benzene
Di methyl amino azo benzene(38)
Di nitro benzenes(39)
Di nitro toluene(14)(16)(40)
"   "   " + tri nitro toluene(28)
Di phenyl amine(14)
Fluorene(4)(23)
Hydroquinone(15)
Hydroquinone di methyl ether(15)
Naphthalene(1)(5)(17)(25)(26)(29)(30)(36)
Naphthylamines(8)(18)
Naphthol(15)
Naphthol methyl ether(15)
Nitranilines(22)(27)
Nitro benzene(19)(19a)(20)(32)
Nitro erythrite(41)
Nitro glycerine(33)
Nitro mannite(41)
Nitro penta erythrite(41)
Nitro toluene(14)
Oxy benzaldehyde(34)
Phenanthrene(3)
Phenylene diamine(11)(30)
Pyrene(23)
Toluidine(10)
Tri methylene tri nitramine(42)
s Tri nitro benzene(32)
Tri nitro cresol(37)
Tri nitro phenol(40)
Tri nitro phenyl methyl nitramine(37)
Tri nitro toluene(14)(16)(40)
Tri phenyl carbinol(9)
Urea(10)(24)
Urethan(12)

(1) Kremann, 1904; (2) Kremann, 1908; (3) Kremann, et al, 1908; (4) Kremann, 1911; (5) Kremann and Rodinis, 1906; (6) Kremann and Haas, 1919; (7) Kremann and Strzelba, 1921; (8) Kremann and Grasser, 1916; (9) Kremann, Hohl and Müller II, 1921; (10) Kremann and Petritschek, 1917; (11) Kremann and Strohschneider, 1918; (12) Puschin and Fioletova, 1922; (13) Kremann, Lüpfer and Zawadsky, 1920; (14) Giua, 1915; (14a) Giua, 1925) (15) Giua and Marcellino, 1920; (16) Bogojovlewski, 1918; (17) Kitran, 1924; (18) Rheinboldt, Henning and Kirscheisen, 1925; (19) Lehmstedt, 1918; (19a) Lehmstedt, 1932; (20) Hammick and Hanson, 1933; (21) Macleod, Pfund and Kilpatrick, 1922; (22) Crompton and Whiteley, 1895; (23) Shimomiya, 1940; (24) Van Dorp, Limburg and Nobel, 1937; (25) Kurnakov, Krotkov and Oksman, 1915; (26) Skau, 1930; (27) Johnston and Jones, 1928; (28) Hrynakowski, 1934; (29) Puschin, 1926a; (30) Puschin and Rikovski, 1930; (31) Kremann and Müller II, 1921; (32) Hammick, Andrew and Hampson, 1932; (33) Kurita and Hagui, 1929; (34) Kremann and Pogantsch, 1923; (35) Jefremow, 1916; (36) Olivari, 1911; (37) Jefremow and Tichomirow, 1927; (38) Giua and Reggiani, 1925; (39) Wyler, 1932; (40) Hrynakowski and Kapuscinski, 1933; (41) Urbanski, 1933; (42) Urbanski and Rabek-Gawronska, 1934.

COMENIC ACID $C_6H_4O_5$.

100 gms. sat. sol. in water contain 0.51 gm. $C_6H_4O_5$ at 25°. (Verkade, 1924.)
»   » in 0.5 molecular H_3BO_3 solution contain 0.51 gm. $C_6H_4O_5$ at 25°

Dinitro **PHENOLS** $C_6H_3OH(NO_2)_2$ 1.2.3; 1.2.4; 1.2.5 etc.

Solubility of Isomeric Dinitro Phenols, Each Separately, in Water.

(Sidgwick and Aldous, 1921; Sidgwick and Taylor, 1922.)

The determinations were made by the sealed tube method. The temperature of appearance of two layers, or of disappearance of the last crystal was determined. In indicating the structure of the isomers the hydroxyl group is always assumed to occupy position 1.

Results for the 1.2.3 Compound :

t°.	Gms. $C_6H_3OH(NO_2)_2$.1.2.3 per 100 gms. sat. sol.	t°.	Gms. $C_6H_3OH(NO_2)_2$.1.2.3 per 100 gms. sat. sol.	t°.	Gms. $C_6H_3OH(NO_2)_2$.1.2.3 per 100 gms. sat. sol.
94.5.....	6.74	122.5 (crit. t.).		96.0......	74.32*
108.2.....	10.90	120.4......	52.15	112.3......	89.85*
120.1.....	20.83	116.7......	60.44	145.1 (m. pt.).	100.00*
122.2.....	35.13	95.0 (tr. pt.).			

* Solid Dinitro Phenol present.

Solubility of Isomeric Dinitro Phenols, Each Separately in Water (Con.).

Results for the :

1.2.4 Compound. t°.	Gms. $C_6H_3OH(NO_2)_2$1.2.4 per 100 gms. sat. sol.	1.2.5 Compound. t°.	Gms. $C_6H_3OH(NO_2)_2$1.2.5 per 100 gms. sat. sol.	1.2.6 Compound. t°.	Gms. $C_6H_3OH(NO_2)_2$1.2.6 per 100 gms. sat. sol.	1.3.4 Compound. t°.	Gms. $C_6H_3OH(NO_2)_2$1.3.4 per 100 gms. sat. sol.
109.6..	1.95	124.7...	2.33	71.1...	0.703	82.0..	6.05
126.1..	2.98	135.8...	2.97	89.6...	1.00	97.5..	12.74
137.7..	3.81	146.4...	3.91	117.6...	1.87	104.6..	23.18
170.5..	8.99	162.1...	5.69	139.7...	3.24	105.2 crit t.	36.65
182.5..	12.98	194.5...	12.24	147.9...	3.97	101.6..	55.40
200.+ crit.t.	–	200.+ crit.t.	–	192.5...	12.27	73.8..	70.24
187.7..	86.36	172.2...	91.73	200.+ crit t.		52.2 tr. p.	–
156.0..	93.35	146.4...	94.51	158.0...	93.44	53.0..	74.91*
131.2..	97.14	113.5...	96.72	138.3...	95.96	84.5..	89.43*
121.7..	97.70	97.5 tr. pt.	–	102.6...	97.80	134.7 m. pt.	100.0*
117.6..	98.24	98.0...	97.50*	84.5...	98.42		
104.2 tr.pt.	–	100.0...	98.48*	59.2 tr. pt.	–		
108.1..	99.02*	105.6 m.pt.	100.00*	59.5...	99.11*		
112.9 m.pt.	100.0*			62.2 m.pt.	100.00*		

* Solid dinitro phenol present.

Results for the 1.3.5 Compound :

t°.	Gms. $C_6H_3OH.(NO_2)_2$1.3.5 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_3OH(NO_2)_2$1.3.5 per 100 gms. sat. sol.	Solid Phase.
51.6....	1.36	$C_6H_3OH(NO_2)_2.2H_2O$	54.5....	79.57	$C_6H_3OH(NO_2)_2$
70.4....	3.23	two liquid layers	55.5....	81.70	"
109.3....	10.83	" "	57.9....	83.64	"
124.6 ...	29.98	" "	61.9....	86.31	"
125. crit. t.	–	" "	69.9....	90.71	"
121.5....	57.66	" "	81.3....	93.00	"
97.6....	69.66	" " +	100.5....	96.08	"
54.1 tr. pt.	77.6	$C_6H_3OH(NO_2)_2+C_6H_3OH(NO_2)_2.2H_2O$	126.1 m. pt.	100.00	"

SOLUBILITY OF ISOMERIC DINITRO PHENOLS, EACH SEPARATELY, IN BENZENE.

(Sidgwick and Aldous, 1921; Sidgwick and Taylor, 1922).

Solid dinitro phenol was present as the solid phase in all cases.

t°.	Gms. $C_6H_3OH(NO_2)_2$ per 100 gms. sat. sol.	t°.	Gms. $C_6H_3OH(NO_2)_2$ per 100 gms sat. sol	t°.	Gmgs. $C_6H_3OH(NO_2)_2$ per 100 gms. sat. sol.	t°.	Gms. $C_6H_3OH(NO_2)$ per 100 gms. sat. sol.
The 1.2.3 cmpd.		93.9....	79.00	The 1.2.6 cmpd.		113.0....	60.49
78.7....	12.77	99.5....	86.59	25.5....	43.36	116.1....	73.10
93.8....	25.30	105.6....	93.61	34.0....	60.17	122.6....	86.64
102.5....	38.66	The 1.2.5 cmpd.		44.5....	78.52	The 1.3.5 cmpd.	
118 6....	69.05	33.5....	13.96	50.0....	86.87	60.9....	6.39
134.9....	91.57	48.5....	24.22	55.0....	92.85	85.0....	20.13
The 1.2.4 cmpd.		57.0....	33.81	The 1.3.4 cmpd.		94.4....	32.63
51.0....	21.01	67.9....	48.91	89.2....	6.54	97.7....	51.13
65.0....	34.60	71.4....	54.78	106.5....	27.27	103.4....	73.08
77.1....	52.36	82.4....	72.97	109.1....	41.65	102.8....	83.73
83.7....	62.77	88.6....	82.44	112.1....	56.86	116.0....	94.20
87.2....	69.52	98.5....	92.90				

DiNitro **PHENOL** $C_6H_5.OH.(NO_2)_2$.

100 gms. abs. methyl alcohol dissolve 6.3 gms. $C_6H_3.OH.(NO_2)_2$ at 19.5°.
100 gms. abs. ethyl alcohol dissolve 3.9 gms. $C_6H_3.OH.(NO_2)_2$ at 19.5°. (de Bruyn, '92.)

SOLUBILITY OF 1, 2, 4 DINITRO PHENOL IN WATER AND ORGANIC SOLVENTS.

(Desvergnes, 1927; 1931a.)

Solvent	Gms. $C_6H_3(1)OH(2,4)(NO_2)_2$ per 100 gms. solvent at		Solvent	Gms. $C_6H_3(1)OH(2,4)(NO_2)_2$ per 100 gms. solvent at	
	15°	50°		15°	50°
H_2O	0.0202(12.5°)	0.0802	C_6H_6	6.39	25.67
"	0.6285(85°)	1.3488(100°)	$CHCl_3$	5.39	19.83
$CH_3COOC_2H_5$	15.55	39.49	$(C_2H_5)_2O$	3.06	7.19(t°?)
$(CH_3)_2CO$	35.90	98.33	C_5H_5N	20.08	70.98*
CH_3OH	4.97	16.92	CS_2	0.41	1.02(t°?)
96% C_2H_5OH	3.05	11.32	CCl_4	0.42	1.78(t°?)
100% "	3.77	13.29	$C_6H_5CH_3$	6.36	19.98

* A compound with pyridine is formed.

SOLUBILITY OF 1.2.6 DINITRO PHENOL IN WATER AND ORGANIC SOLVENTS.

(Desvergnes, 1927; 1931a.)

Solvent	t°	Gms. $C_6H_3(1)OH(2,6)(NO_2)_2$ per 100 gms. solvent	Solvent	t°	Gms. $C_6H_3(1)OH(2,6)(NO_2)_2$ per 100 gms. solvent
H_2O	15	0.0315	C_6H_6	14	33.65
"	50	0.5121	$CHCl_3$	"	31.85
"	100	1.2200	$(C_2H_5)_2O$	"	8.76
$CH_3COOC_2H_5$	14	68.81	C_5H_5N	"	68.04
$(CH_3)_2CO$	"	162.21	CS_2	"	0.67
CH_3OH	"	14.74	CCl_4	"	0.69
96% C_2H_5OH	"	6.50	$C_6H_5CH_3$	"	23.30

SOLUBILITY OF α DINITRO PHENOL IN AQUEOUS SALT SOLUTIONS AT 25°.

(v. Halban, Kortum and Seiler, 1935.)

The authors give no other identification than α of the di nitro phenol used.

Results for aqueous solutions of:

Potassium Chloride

Gm. mols. per liter	
KCl	$C_6H_4O_5N_2$
0.0	0.002524
0.04523	0.002599
0.1107	0.002623
0.2767	0.002642
0.4482	0.002646
0.6043	0.002646
0.8696	0.002636
1.251	0.002614

Sodium Chloride

Gm. Mols. per liter	
NaCl	$C_6H_4O_5N_2$
0.01209	0.002556
0.06093	0.002551
0.1427	0.002515
0.2059	0.002480
0.5972	0.002278
1.043	0.002065
1.245	0.001741
2.084	0.001608

Barium Chloride

Gm. Equiv. $BaCl_2$ per liter	Gm. Mol. $C_6H_4O_5N_2$ per liter
0.02707	0.002567
0.05884	0.002580
0.1310	0.002579
0.5102	0.002459
1.0075	0.002242
1.0032	0.002240
1.743	0.001950
2.036	0.001829

Potassium Perchlorate

Gm. Mols. per liter	
$KClO_4$	$C_6H_4O_5N_2$
0.03462	0.002632
0.05388	0.002670
0.08664	0.002734
0.1274	0.002811
0.1502	0.002859

Sodium Perchlorate

Gm. Mols. per liter	
$NaClO_4$	$C_6H_4O_5N_2$
0.04788	0.002643
0.1071	0.002726
0.2234	0.002895
0.4027	0.003127
1.0330	0.003833

Freezing-point data for mixtures of Dinitro benzene + Hydroquinone dimethyl ether are given by Giua and Marcellino, 1920.

DINITRO PHENOL

Freezing-point data are given for mixtures of 1.2.4 Dinitro phenol and:

Acetanilide(18)(19)
Acenophthene(2)
Acetophenone(3)
Aniline(1)
Anthracene(4)
Antipyrine(2)
Azobenzene(11)
Benzo hydrol(12)
Benzo phenone(3)
Bromo naphthylamine(21)
Camphor(5) (22)
Carbazole(6)

Cinnamic acid(9)
Di methyl oxalate(9)
Di methyl pyrene(17)
Diphenyl amine(7)
Fenchon(8)(15)
Naphthalene(20)
Nitro benzene(10)
Nitro phenol(18)
Oxy benzaldehyde(18)(8)
Phenylene diamines (13)
Pyrene(23)
Ouinone(10)
Naphthylamines(28)

Salicylaldehyde(14)
Stiphnic acid(25)
Succinic acid(9)
Succinimide(15)
Tri methyl carbinole(16)
Tri phenyl carbinole(16)
Tri phenyl methane(16)
Tri nitro phenyl methyl nitramine(26)
Urea (24)
Urethan (24)
Fluorene(27)

(1) Kremann, 1906; (2) Kremann and Haas, 1919; (3) Kremann and Marktl, 1920; (4) Kremann and Müller II, 1921; (5) Kremann and Odelga, 1921; (6) Kremann and Slovak, 1920; (7) Kremann and Schadinger, 1919; (8) Kremann and Pogantsch, 1923; (9) Kremann, Zechner and Drazil, 1924; (10) Kremann, Sutter, Sitte, Strzelba and Dobolsky, 1922; (11) Kremann, Zechner and Weber, 1924; (12) Kreman and Drazil, 1924; (13) Kremann and Zawodsky; (14) Kremann and Zechner, 1925; (15) Kremann and Dietrich, 1923; (16) Kremann, Mauermann, Müller and

DINITRO RESORCINOLS 2.4 and 4.6 $(NO_2)_2C_6H_2(OH)_2$.

Freezing-point data for mixtures of dinitro resorcinols and Styphnic acid are given by Jefremow, 1934.

PICRAMIDE (1.2.4.6 Tri nitraniline) $NH_2C_6H_2(NO_2)_3$.

100 gms. glycol diacetate ($CH_3.COO.CH_2\ CH_2\ COO.CH_3$, b. pt. 188° 189°.6) dissolve 2.4 gms. $(NO_2)_3C_6H_2.NH_2$ at 25°. (Taylor and Rinkenbach, 1926.)

Freezing-point data are given by Jefremow, 1918, for mixtures of Picramide and each of the following compounds: Anthracene, Acenaphthene, Fluorene, Naphthalene, Phenanthrene, Picric acid and Retene. Results for mixtures of Picramide and Fluoanthene and for Picramide and Pyrene are given by Shinomiya, 1940; Results for Picramide and Tetra nitro methyl aniline are given by Jefremow and Tichomirow, 1928; Results for Tri nitro aniline and naphthalene are given by Grimm, Günther and Titus, 1931.

BROMO BENZENE C_6H_5Br.

100 gms. H_2O dissolve 0.0446 gm. C_6H_5Br at 30°. (Gross and Saylor, 1931.)

Freezing-point data are given for mixtures of Bromo benzene and:

Chloro benzene (Pascal, 1913; Klemm, Klemm and Schiermann, 1933.)
Iodo " " " " " " "
Fluoro " " " " " " "
Benzene (Klemm, Klemm & Schiemann, 1933.)
Nitrogen peroxide (Pascal, 1923.)
Di chloro benzene (Timmermans, 1934.)
o Chloro toluene " "

DIBROM ANILINE 1.2.4 $NH_2C_6H_3Br_2$.

Freezing-point data for mixtures of Dibrom aniline and Picric acid are given by Hertel, 1924.

CHLORO BENZENE C_6H_5Cl.

100 gms. H_2O dissolve 0.0488 gm. C_6H_5Cl at 30°. (Gross and Saylor, 1931.)

SOLUBILITY OF CHLOROBENZENE IN SULPHUR.

"Synthetic Method," see page 292.

(Alexejew.)

t°.	Grams C_6H_5Cl per 100 Grams. Sulphur Layer.	Grams C_6H_5Cl per 100 Grams. Chlor Benzene Layer.
90	13	70
100	18.5	63
110	27	53
116 crit. temp.	38	

Freezing-point data are given for mixtures of Chloro benzene and:

Acetic acid(1)(2)
Benzene(7)
Bromo benzene(4)(7)
Chloro toluene(3)(7)
Cyano benzene(4)
Di bromo ethane(3)
Di chloro benzene(6)
Ethylene bromide(3)
Fluoro benzene(4)(7)
Iodo Benzene(4)(7)
Nitro benzene(5)
Pyridine(2)

(1) Baud, 1913c; (2) Burnham and Madgin, 1936; (3) Linard, 1925; (4) Pascal, 1913; (5) Hrynakowski and Szmyt, 1938a; (6) Timmermans, 1934; (7) Klemm, Klemm and Schiemann, 1933.

DI CHLOR ANILINE 1.2.4 $NH_2C_6H_3Cl_2$.

Freezing-point data for mixtures of Dichlor aniline and:

Picric acid	(Hertel, 1924.)
Diphenyl amine	(Giua and Cherchi, 1919.)

CHLORO NITRO ANILINES $NH_2C_6H_3Cl(NO_2)$.

Freezing-points of mixtures of Chloro nitro anilines are given by de Bruyn, 1917.

FLUORO BENZENE C_6H_5F.

100 gms. H_2O dissolve 0.154 gm. C_6H_5F at 30°. (Gross, Saylor and Gorman, 1933.)

Freezing-point data are given for mixtures of Fluoro benzene and:

Benzene(3)
Bromo benzene(1)(3)
Chloro benzene(1)(3)
Chloro toluene(2)
Dichloro benzene(2)
Iodo benzene(3)

(1) Pascal, 1913; (2) Timmermans, 1934; (3) Klemm, Klemm and Schiemann, 1933.)

IODO BENZENE C_6H_5I.

100 gms. H_2O dissolve 0.034 gm. C_6H_5I at 30°. (Gross, Saylor and Gorman, 1933.)

Freezing-point data are given for mixtures of Iodo benzene and:

Benzene(2)
Bromo benzene(1)(2)
Chloro benzenes(1)(2)
Fluoro benzene(2)

(1) Pascal, 1913; (2) Klemm, Klemm and Schiemann, 1933.

BENZENE DIAZONIUM PHOSPHOR FLUORIDE $C_6H_5N_2PF_6$.

One liter sat. solution in water contains 0.036 gm. mol $C_6H_5N_2PF_6$. (Lange and Muller, 1930.)

BROMO PHENOLS C_6H_4OHBr.

Freezing-point data are given for:

o Bromo phenol + p Bromo phenol (Holleman and Rinkes, 1911.)
p " " + Tetra methyl phthalan (Bennett and Wain, 1936.)

Chloro **PHENOLS** *o m* and *p* $C_6H_4OH.Cl$.

SOLUBILITY OF EACH SEPARATELY IN WATER AND IN BENZENE.

(Sidgwick and Turner, 1922.)

The synthetic method was used at the higher temperatures and the Beckmann freezing-point apparatus at the lower.

RESULTS FOR THE SOLUBILITY IN WATER :

Ortho Chloro Phenol.		Meta Chloro Phenol.		Para Chloro Phenol.	
t°	Wt.% $C_6H_4OH.Cl$(*o*).	t°.	Wt.% $C_6H_4OH.Cl$(*m*).	t°.	Wt.% $C_6H_4OH.Cl$(*p*)
− 0.20	1.56 (+Ice)	− 0.18	0.73 (+Ice)	0.2	2.07 (+Ice)
− 0.30	2.44 (+Ice)	+ 1.2	1.25 S	65.0	3.91 L
+ 82.9	3.76 L	2.5	1.85 S	113.8	10.66 L
106.3	5.12 L	85.25	5.12 L	125.0	20.5 L
159.1	13.58 L	118.0	11.13 L	128.2	29.16 L
165.8	16.45 L	123.0	13.56 L	129 crit. t.	— L
170.7	22.59 L	127.5	17.84 L	128.7	42.57 L
173 crit. t.	33.00 L	130.8 crit. t.	32.02 L	125.8	53.49 L
172.9	45.04 L	130.7	38.89 L	122.4	59.62 L
170.1	54.95 L	130.5	46.12 L	115.5	65.05 L
166.2	60.72 L	129.1	55.65 L	107.7	69.36 L
156.6	70.62 L	109.8	71.23 L	97.0	74.03 L
118.9	82.82 L	23.1	82.3 L	35.5	34.02 L
91.5	85.90 L	11.8	82.9 L	17.0	85.42 L
0.3 tr. pt.	86.5 LL (+Ice)	3.2 tr. pt.	82.3 LLS	5.5	86.19 L
− 2.0	87.73 (+Ice)	− 0.4 tr. pt.	83.4 LL (+Ice)	0.3	86.5 LLS
− 4.0	89.25 (+Ice)	3.2 (−0.9*)	84.87 (+Ice)*) S	0.5	88.92 S
− 5.0	89.62 (+Ice)	4.5	87.19 S	6.2	92.48 S
− 8.0	90.87 (+Ice)	− 4.8	88.66 (+Ice*)	11.0	94.48 S
− 9.3 tr. pt.	91.2 LS (+Ice)	− 8.2	90.11 (+Ice)*	14.2	95.70 S
− 8.2	92.2 S	− 13.2	91.73 (+Ice)*	18.0	96.82 S
− 6.0	93.93 S	+ 10.8 (−17.0*)	92.23 S (+Ice*)	19.5	97.29 S
− 1.5	96.79 S	17.0	95.1 S	41.0	100.00 S
+ 2.0	98.39 S	22.2	97.1 S		
+ 7.0	100.00 S	32.5	100.0 S		

RESULTS FOR THE SOLUBILITY IN BENZENE :

5.3	0.0 (+C_6H_6)	4.0	4.31 (+C_6H_6)	4.5	2.98 (+C_6H_6)
4.6	3.04 »	3.2	7.0 »	2.4	10.25 »
2.7	8.33 »	0.5	15.32 »	1.0	15.10 »
0.0	15.49 »	−1.4	21.40 »	0.2	17.62 »
− 3.2	24.56 »	−4.5	31.77 »	−3.2	29.14 »
− 5.0	29.01 »	−6.5	38.39 »	−5.0	35.50 »
− 11.6	45.22 »	−7.2	40.92 »	−5.5 tr. pt.	37.5 » S
− 16.5	55.54 »	−7.0 tr. pt.	40.0 » S	−5.4	38.07 S
− 18.8	60.68 »	−5.3 (−7.5*)	41.66 S (+C_6H_6*)	−3.2	39.67 »
− 19.5 tr. pt.	61.58 S »	−4.0	43.62 »	+2.8	45.65 »
− 18.5	62.5 S	−8.4	44.9 (+C_6H_6*)	6.0	50.10 »
− 17.4	63.83 »	−1.5	47.78 S	9.1	55.24 »
− 16.4	64.90 »	0.0	50.68 »	12.9	60.53 »
− 13.7	69.05 »	3.4	57.02 »	18.0	68.58 »
− 7.0	80.32 »	7.4	64.65 »	20.8	73.13 »
− 3.8	84.72 »	14.2	75.10 »	25.8	80.06 »
+ 0.2	90.26 »	20.0	83.68 »	30.5	86.65 »
3.6	95.20 »	24.6	89.89 »	33.6	90.63 »
5.6	97.65 »	29.8	96.50 »	37.5	95.52 »

+ Ice = ice present. + C_6H_6 = Benzene present. S = Solid chlorphenol present. L = Second liquid layer present. * Indicates metastable equilibrium.

The critical solution temperature of mixtures of p-chloro phenol and naphthalene is 58.8°. (Lecat, 1928.)

Freezing-point data for mixtures of Chloro phenols and:

Acetone (Bramley, 1916.)
Aniline " "
Benzylamine (Puschin and Rikovsky, 1937.)
Chloro phenol (Holleman and Rinkes, 1911.)
Di phenyl methyl amine (Bramley, 1916.)
Di methyl aniline (Bramley, 1916.)
Nitrobenzene (Hrynakowski and Szmyt, 1938a.)
Phenyl hydrazine (Puschin and Dimitryevic, 1936.)
Pyridine (Bramley, 1916.)
Quinoline " "
Toluidine (Burnham and Madgin, 1936.)
Picric acid " " " "

The critical solution temperature of mixtures of p chloro phenol and naphthalene is 58.2° (Lecat [illegible].)

IODO PHENOL p C_6H_5OHI.

Freezing-point data for mixtures of p and o Iodo phenols are given by Holleman and Rinkes, 1911, and for mixtures of Iodo phenol and Tetra methyl phthalan are given by Bennett and Wain, 1936.

NITROSO BENZENE C_6H_5NO.

Freezing-point data are given for:

Nitroso benzene + Acetic acid (Hammick and Illingworth, 1930.)
" " + Aniline (Kremann, 1904.)
" " + Nitro benzene (Jaeger and Van Kregten, 1912.)
" " + Nitroso toluene {Hammick, Edwards, Illingworth and
" " + Nitroso mesitylene {Small, 1933.)
" "

NITRO BENZENE $C_6H_5NO_2$.

SOLUBILITY OF NITROBENZENE IN WATER.

t°	Gms. $C_6H_5NO_2$ per 100 gms. H_2O	Authority
0	0.00135(1)	Saylor, Stuckey and Gross, 1938.)
0	0.00125	" " " "
15	0.178	Gross and Saylor, 1931.
30	0.205	" " "

(1) In this case the nitrobenzene was in the metastable liquid condition (cooled without crystallization below its m. pt. of 5.7°).

MUTUAL SOLUBILITY OF NITROBENZENE AND WATER
(Campetti and Del Grosso, 1913, Davis, 1916.)

t°.	Gms. $C_6H_5NO_2$ per 100 Gms.		t°.	Gms. $C_6H_5NO_2$ per 100 Gms.	
	H_2O Layer.	$C_6H_5NO_2$ Layer.		H_2O Layer.	$C_6H_5NO_2$ Layer.
20	0.19	99.76	180	4.2	95.7
40	0.3	99.6	200	7.2	91
60	0.4	99.3	220	11.8	87
80	0.8	99	230	15.8	83
100	1	98.7	240	24	72
120	1.3	98.2	241	30	67
140	1.9	97.2	242	32	58
160	2.8	95.8	244.5	crit. t. 50.1	

EQUILIBRIUM IN THE SYSTEM NITROBENZENE, SULFURIC ACID AND WATER.

(Gibby, 1932.)

The binodal curves were determined by titrating aqueous sulfuric acid solutions with nitrobenzene to appearance of turbidity. Tie lines were determined by mixing suitable quantities of the three components to yield two layers and titrating each for sulfuric acid. Determinations were made at 0°, 22° and 34° but the temperature coefficient is so small that the points at the three temperatures all fall upon the same curve.

Binodal curve at 22°

Gms. per 100 gms. homogeneous mixture		
H_2SO_4	$C_6H_5NO_2$	H_2O
64.0	27.3	8.7
79.1	4.0	16.9
79.0	2.0	19.0
63.7	27.7	8.6
61.6	38.4	0.0
72.4	15.4	12.1
74.2	12.8	13.0
76.1	10.2	13.7
77.8	7.7	14.5
78.5	5.7	15.8
79.0	4.5	16.5
77.9	2.5	19.6
58.6	34.1	7.3
62.3	29.1	8.3
30.1	66.8	3.1
13.3	86.7	0.0
76.8	1.9	21.3
49.2	0.0	50.8

Tie Lines at 22°

Total composition Wt. %			Gms. H_2SO_4 per 100 gms.	
H_2SO_4	$C_6H_5NO_2$	H_2O	H_2O layer	$C_6H_5NO_2$ layer
66.3	16.7	17.0	78.1	0.0
33.4	32.4	34.2	49.5	0.0
48.5	26.2	25.3	64.4	0.0
54.1	20.7	20.2	71.8	0.0

Solutions in equilibrium with a solid phase at 0°

Wt. % composition			% H_2SO_4	Solid Phase
H_2SO_4	$C_6H_5NO_2$	H_2O		
83.1	1.9	15.0	79.7	$H_2SO_4.H_2O$
85.0	0.9	14.1	86.2	"
84.1	3.2	12.7	83.9	"
58.5	40.6	0.9	66.6	$C_6H_5NO_2.H_2SO_4$
55.2	43.6	1.2	59.7	"
38.9	60.5	0.6	34.9	"
44.6	54.8	0.6	44.2	"

SOLUBILITY OF NITROBENZENE IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25°.

(Hammett and Chapman, 1934.)

Gms. H_2SO_4 per 100 gms. aq. solvent	Gm. Mols. $C_6H_5NO_2$ per liter sat. sol.	Gms. H_2SO_4 per 100 gms. aq. solvent	Gm. Mols. $C_6H_5NO_2$ per liter sat. sol.
0.0	0.0158(= 1.943 gms.)	58.15	0.0255
19.79	0.0097	64.30	0.0340
35.82	0.0098	70.37	0.0478
44.54	0.0134	74.54	0.0729
48.89	0.0155	79.28	0.1482
52.76	0.0193		

SOLUBILITY OF NITROBENZENE IN SEVERAL SOLVENTS. (von Euler and Svanberg, 1917, 1926.)

Solvent.	Gms. $C_6H_5NO_2$ per 100 cc. solvent.	Solvent.	Gms. $C_6H_5NO_2$ per 100 cc. solvent.
Water................	0.18	1.0*n* Aq. NH_4 benzoate...	0.29
1.0*n* Aq. Na butyrate.....	0.19	1.0*n* Aq. Na phthalate....	0.13
1.0*n* Aq. Na isovalerate...	0.17	1.0*n* Aq. Na picrate......	0.25
1.0*n* Aq. aniline nitrate..	0.28	1.0*n* Aq. nitric acid......	0.29
1.0*n* Aq. picoline nitrate.	0.53	2.0*n* Aq. K valerate......	0.19

100 gms. sat. solution of nitrobenzene in liquid Sulfur Dioxide contain about 50 gms. $C_6H_5NO_2$ at (?) t°.

100 gms. sat. solution of nitrobenzene in liquid Ammonia contain about 24 (?75) gms. $C_6H_5NO_2$ at (?) t°. (De Carli, 1927.)

The critical solution temperature of mixtures of nitrobenzene and hexane is 19°.. (Dessart, 1926.)

The critical solution temperature of mixtures of nitrobenzene and 2.5 Dimethyl hexane (Di iso butyl) is 28.2°. (Timmermans and Hennant-Roland, 1932.)

The critical solution temperature of mixtures of nitrobenzene and borneol is at 70° and the mixture contains 59.8 percent $C_6H_5NO_2$. (Lecat, 1930.)

Data for the mutual solubility of nitrobenzene in hexane, decane and American petroleum in the liquid state at pressures up to 1000 atmospheres, are given by Kohnstamm and Timmermans, 1913.

EQUILIBRIUM IN THE SYSTEM NITROBENZENE AND HEXANE.

(Timofeiew and Stakhorsky, 1929.)

The authors' results were plotted and the following values read from the curve. The freezing-point of nitrobenzene is lowered by hexane to the triple point at which two liquid layers are formed.

Results for the f. pt. curve

t°	Gms. $C_6H_5NO_2$ per 100 gms. mixture	Solid Phase
5.8	100	$C_6H_5NO_2$
4.0	97.5	"
2.5	95.0	"
1.05	92.5	"
0.0	90.0	"
-0.9	87.5	"
-1.7	85.0	"
-2.4	82.5	"
-3.0	80	"
-4.0 tr. pt.	77 (Est.)	+ 2 liquid layers

RResults for the liquid layers

t°	Gms. $C_6H_5NO_2$ per 100 gms.	
	$C_6H_5NO_2$ rich layer	C_6H_{14} rich layer
0	75.5	21.5
2	74.5	24.5
4	73	26.5
6	70.5	29.5
8	66.5	34.0
9	64	37.0
10	59.5	43.5
10.1	59.0	44.5
10.3	56.0	49.5
10.4	52.0	52.0

The authors also give the following results for the densities of mixtures of Nitrobenzene and Hexane.

Wt. % C_6H_{14}	$d\frac{15}{4}$	Wt. % C_6H_{14}	d [illegible] 4
0.00	1.2082	0.0	1.2146
18.18	1.0701	24.99	1.0333
39.81	0.9416	25.70	1.0284
56.90	0.8542	31.76	0.9919
68.99	0.8030	68.81	0.8094
84.98	0.7429	84.66	0.7502
100.0	0.6934	100.0	0.7001

Results are also given for the viscosities and fluidities of these mixtures.

EQUILIBRIUM IN TERNARY MIXTURES COMPOSED OF NITROBENZENE, HEXANE AND ANOTHER LIQUID.

(Timofeiew and Stakhorsky, 1926.)

Results for mixtures of Nitrobenzene, Hexane and:

Resorcinol

Wt. % $C_6H_5NO_2$ in its mixture with C_6H_{14}	t^0 of homogeneity when the percentage of m $C_6H_4(OH)_2$ present is: 0.05	0.10	0.15
30.0	6.10	6.35	6.60
39.94	8.90	9.22	9.50
39.92	10.23	10.50	10.75
42.40	10.58	10.98	11.40
45.99	10.80	11.26	11.66
54.86	10.88	11.62	12.35
65.05	9.78	11.02	12.26
69.82	8.70	10.60	12.12

o Nitrophenol

Wt. % $C_6H_5NO_2$ in its mixture with C_6H_{14}	t^0 of homogeneity when the percentage of o $C_6H_4OH(NO_2)$ present is: 0.5	1.0	1.5
30.0	6.07	6.10	6.13
34.94	8.73	8.80	8.91
39.92	10.02	10.15	10.28
42.40	10.38	10.51	10.66
45.99	10.55	10.71	10.87
54.86	10.35	10.57	10.78
65.05	8.93	9.28	9.58
69.82	7.05	7.50	7.86

Benzoic acid

Wt. % $C_6H_5NO_2$ in its mixture with C_6H_{14}	t^0 of homogeneity when the percentage of C_6H_5COOH present is: 0.0	0.5	1.0	2.0
29.90	6.20	5.82	5.42	4.93
34.86	8.70	8.44	8.16	7.53
39.91	10.05	9.88	9.66	9.22
46.39	10.40	10.34	10.17	9.66
59.91	9.83	9.74	9.42	8.81
64.93	8.56	8.50	8.36	7.75
69.96	6.40	6.40	6.26	5.77

Butyric acid

Wt. % $C_6H_5NO_2$ in its mixture with C_6H_{14}	t^0 of homogeneity when the percentage of C_3H_7COOH present is: 0.0	0.5	1.0
29.99	6.0	5.22	4.44
34.94	8.70	7.82	6.90
39.92	9.90	9.06	8.22
42.40	10.28	9.42	8.60
46.45	10.40	9.56	8.74
54.86	10.14	9.32	8.47
65.05	8.54	7.75	6.94
69.82	6.50	5.73	4.90

Valeric acid

Wt. % $C_6H_5NO_2$ in its mixture with C_6H_{14}	t^0 of homogeneity when the percentage of C_4H_9COOH present is: 0.0	0.5	1.0
29.99	6.00	4.78	3.80
34.82	8.62	7.50	6.50
39.87	10.00	8.92	7.92
42.79	10.30	9.36	8.42
46.37	10.40	9.47	8.57
59.94	10.18	9.28	8.37
65.05	8.50	7.70	6.9
69.82	6.50	5.77	4.97

FREEZING-POINTS OF MIXTURES OF BENZENE AND NITROBENZENE SATURATED WITH WATER. (Simpson and Jones, 1919.)

t° of freezing.	Gms. C_6H_6 per 100 gms. mixture.	t° of freezing.	Gms. C_6H_6 per 100 gms. mixture.	t° of freezing.	Gms. C_6H_6 per 100 gms. mixture.
—2.90	10.0	+0.34	6.0	3.48	2.0
—2.08	9.0	1.14	5.0	4.34	1.0
—1.26	8.0	1.90	4.0	5.22	0.0 (= wet Nitrobenzene)
—0.46	7.0	2.66	3.0		

FREEZING-POINTS OF MIXTURES OF NITROBENZENE AND COMPOUNDS COMMONLY ASSOCIATED WITH IT AS IMPURITIES. Simpson and Jones, 1919

In each case the freezing-point of mixtures, after saturation with water, was determined.

Wt. per cent $C_6H_5NO_2$ in mixtures.	Freezing-Points of Binary mixtures of $C_6H_5NO_2$ with						
	Paraffine.	CS_2	C_6H_6	m $C_6H_4(NO_2)_2$	$C_6H_5CH_3$	o $C_6H_4CH_3NO_2$	p $C_6H_4CH_3NO_2$.
100...	5.22	5.22	5.22	5.22	5.22	5.22	5.22
99...	4.53	4.30	4.34	4.78	4.45	4.74	4.67
98...	3.85	3.43	3.48	4.35	3.69	4.25	4.14
97...	3.20	2.60	2.66	4.00	3.05	3.71	3.59
96...	2.62	1.92	1.90	3.42	2.41	3.18	3.06
95...	2.05	1.23	1.14	2.90	1.78	2.62	2.52
94...	1.53	0.53	0.34	2.41	1.11	2.07	2.00
93...	1.03	-0.17	-0.46	1.94	-0.44	1.55	1.48
92...	0.54	-0.89	-1.26	1.47	-0.24	1.04	0.95
91...	0.04	-1.61	-2.08	1.02	-0.94	0.52	0.36
90...	-0.46	-2.36	-2.90	0.55	-1.64	0.00	-0.22

FREEZING-POINT DATA FOR MIXTURES OF BENZENE AND TOLUENE.

(Robert, 1919)

f. pt.	Per cent C_6H_6.	f. pt.	Per cent C_6H_6	f. pt.	Per cent C_6H_6	f. pt.	Per cent C_6H_6.
5.5....	100	—12.8...	70.0	—39.6...	40.0	—80.0...	15
2.8....	95	—16.5...	65	—45.4...	35	—91.8...	13
0.0....	90	—20.5...	60	—51.8...	30	—98.0	10
—2.5....	85	—24.8...	55	—58.0...	25	—96.0	5
—6.0....	80	—29.4...	50	—67.4...	20	—94.5...	0 $C_6H_5CH_3$
—9.5....	75	—34.3...	45				

Freezing-point data are given for mixtures of Nitrobenzene and:

Acetic acid(1)(3)(25)
Acetonitrile (8)
Allyl iso sulfocyanide(8)
Allyl sulfocyanate(22)
Aniline(2)(4)
Anthracene(5)
Azoxyanisole(6)
Benzene(1)(2)
Carbon disulfide(23)
Carbon tetra chloride(2)(12)
Chloro benzene(11)
Chloro phenol(11)
Cyclohexane(2)
Di bromo benzene(20)
Di chloro benzene(11)
Di ethyl di acetyl tartrate(18)
Di nitro benzenes(9)(14)(24)
(24)

Dinitro phenol(5)
Etheyl acetate(23)
Ethyl ether(16)
Ethylene bromide(1)(2)
Formamide(8)
Hexane(10)(13)(15)
Hydroquinone(5)
Iso pentane(15)
Menthol(18)
Mercuric bromide(19)
Mercuric chloride(19)
Methylene chloride(12)
Naphthols(5)
Naphthalene (4&21)
Naphthylamine + Quinone(5)
Nitranilines(6)
Nitro benzaldehyde(15)
Nitro methane(8)

Nitro phenols(5)
Nitroso benzene(7)
Phenol(1)(5)
Phenol + Quinone(5)
Pyrogallol(5)
Quinone(5)
Resorcinol(5)
Toluidine(5)
Tri chloro methane(12)
Tri chloro phenol(11)
Tri ethyl amine(8)
Tri nitrobenzene(9)
Tri nitro phenol(5)
Tri nitro toluene(9)
Tri phenyl carbinol(5)
Urea (17)

(1) Dahms, 1895; (2) Linard, 1925; (3) Baud, 1913(c); (4) Kremann, 1904; (5) Kremann, Sutter, Sitte, Strzelba, 1922; (6) Bogojaulouski, Winogradow and Bogolubow, 1906; (7) Jaeger and Van Kregten, 1912; (8) Joukovsky, 1934; (9) Hammick, Andrew and Hampson, 1932; (10) Hartenberg, 1926; (11) Hrynakowski and Szmyt, 1938a; (12) Hrynakowski and Szmyt, 1938; (13) Deffet, 1938; (14) Lehmstedt, 1918, 1932; (15) Timmermans, 1907, 1911; (16) Tsakalotos and Guye, 1910; (17) Van Dorp, Limburg and Nobel,

BROMO HYDROQUINONE $BrC_6H_3(OH)_2$.

Freezing-point data for mixtures of bromo hydro quinone and chloro hydro quinone are given by Küster, 1891. Results are also given for the diacetyl bromo and chloro compounds.

NITROSO PHENOL C_6H_4OHNO.

Freezing-point data for mixtures of Nitroso phenol and Nitro phenol are given by Jaeger, 1908.

Nitro**PHENOLS** $C_6H_4(OH).NO_2$ *o*, *m* and *p*.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Sidgwick, Spurrell and Davies, 1915.)

t°.	Gms. per 100 Gms. Sat. Sol.			t°.	Gms. per 100 Gms. Sat. Sol.		
	Ortho.	Meta.	Para.		Ortho.	Meta.	Para.
40	0.330*	3.02*	3.28	100	1.078	...	...
50	0.388	3.68	4.22	110	1.37	...	...
60	0.463	4.54	5.53	120	1.59	...	...
70	0.560	5.80	7.50	120	1.91	...	...
80	0.685	7.90	10.85	140	2.32	...	..
90	0.856	11.69	21.2	150	2.90	...	...
92.8 crit. t.	...	...	∞	160	3.75		
98.7 crit. t.	...	∞	...	200+ crit. t.	∞		

* in above table indicates that a solid phase is present.

The above determinations were made by the synthetic method. M. pt. of *o* = 44.9°; of *m* = 95.1°, of *p* = 113.8°. Triple pt. for *o* = 43.5° at conc. 99.48 and 0.35; for *m* = 41.5° at conc. 74 and 3.16; for *p* = 39.6° at conc. 71.2 and 3.26.

One liter sat. solution in water contains 3.89 gms. *o* nitrophenol at 48°.

One liter sat. solution in 1.0 *n* *o* $C_6H_4(ONa)NO_2$ contains 9.6 gms. *o* nitrophenol at 48°. (Sidgwick, '10.)

100 gms. H_2O dissolve 0.804 gm. p $C_6H_4OHNO_2$ at 15° and 6.052 gms. at 50°. (Desvergnes, 1927.)

100 gms. sat. solution in water contain 0.208 gm. *o* nitrophenol at 20°.
" " " " 2.14 gms. *m* " "
" " " " 1.32 " *p* " " (Vaubel, 1895.)

F.-pt. data for mixtures of *m* nitrophenol and water and for *p* nitrophenol and water are given by Bogojawlewsky, Winogradow, and Bogolubow (1906).

SOLUBILITY OF *m* NITROPHENOL AND OF *p* NITROPHENOL IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Results for *m* Nitrophenol.				Results for *p* Nitrophenol.			
Equiv. Normalities.		Equiv. Normalities.		Equiv. Normalities.		Equiv. Normalities.	
HCl.	$C_6H_4OH.NO_2(m)$.	HCl.	$C_6H_4OH.NO_2(m)$.	HCl.	$C_6H_4OH.NO_2(p)$	HCl.	$C_6H_4OH.NO_2(p)$
0.0	0.0974	7.550	0.1009	0.00	0.1097	6.552	0.0990
1.925	0.0849	9.231	0.1130	1.650	0.0962	8.196	0.1093
3.822	0.0834	10.96	0.1284	3.277	0.0913	9.817	0.1230
5.720	0.0885	11.20	0.1307	4.993	0.0934	11.29	0.1421

SOLUBILITY OF *p* NITROPHENOL (1), *p* NITROANILINE (2), AND *m* NITROANILINE (3), EACH SEPARATELY, IN AQ. SALT SOLUTIONS AT 25°. (Kruyt and Robinson, 1926.)

Aq. 0.2 *n* solution of:	Gms. per 1000 cc. sat. sol.			Aq. 0.2 *n* solution of:	Gms. per 1000 cc. sat. sol.		
	(1).	(2).	(3).		(1).	(2).	(3).
No salt (H_2O).	11.82	0.5735	0.8929	K_2SO_4......	11.50	0.5430	0.8349

SOLUBILITY OF ORTHO NITROPHENOL IN AQUEOUS SOLUTIONS OF METHYL ALCOHOL.

(Duff, 1929.)

NOTE.—In cases where a second liquid layer did not separate the saturated solution was analyzed by evaporation to dryness and weighing the residue. The method used in the cases of formation of liquid was to gradually add nitrophenol to weighed amounts of solvent until a trace just remained undissolved and calculate the solubility from the increase in weight. If an oily layer began to separate the addition of the solid was continued until an excess was present and the solubility again calculated from the increase in weight of the mixture.

Results at 25°

Wt. % CH_3OH in solvent	Gms. o $C_6H_4OHNO_2$ per 100 gms. sat. sol.
0.0	0.25
30.0	0.8
40.0	0.97
70	8.25
75	11.15
80	15.1
85	19.9
90	26.9
95	34.1
100	42.3

Results at 40°

Wt. % CH_3OH in solvent	Gms. o $C_6H_4OHNO_2$ per 100 gms. sat. sol.	
0.0	0.3	—
30	2.1	—
35	2.5	5.5(1)
40	3.1	25.3(1)
50	5.6	55.0(1)
60	8.4	78.5(1)
70	21.6	90.0(1)
75	32.5	93.3(1)
80	50.5	96.3(2)
83	72.5	96.3(2)
90	96.3	—
100	96.6	—

(1) Two liquid layers remain at end point.
(2) Two liquids became miscible at end point.

Results for the system Nitrophenol + Acetone + H_2O are given by Waddell, 1899.

SOLUBILITY OF PARA NITROPHENOL IN AQUEOUS SOLUTIONS OF METHYL ALCOHOL.

(Duff, 1929.)

See note preceding table.

Results at 25°

Wt. % CH_3OH in solvent	Gms. p $C_6H_4OHNO_2$ per 100 gms. solvent		
0.0	2.5		—
10.0	3.1		—
12.5	3.9		14.1(1)
15	4.8		51.5(1)
17.5	6.1		93.2(1)
20.0	9.5		134.5(1)
23.0	15.0		182.6(2)
25	20.0	(190.2)	176.0(2)
30	56.1	(205.3)	138.3(2)
31.5	72.4	(207.1)	123.9(2)
32.5	92.3	(211.6)	92.3(2)
35		(219.5)	
40		(233.1)	
70		(265.6)	
100		(285.2)	

Results at 40°

Wt. % CH_3OH in solvent	Gms. p $C_6H_4OHNO_2$ per 100 gms. solvent		
0.0	2.9	(246.0)	246.0(3)
3.0	3.2	(250.2)	228.5(3)
4.0	3.3	(253.4)	220.5(3)
5.0	3.5	(256.3)	215.0(3)
10.0	5.35	(266.1)	196.2(3)3
15.0	8.7	(275.8)	176.0(3)
20.0	22.8	(286.1)	153.8(3)
25.0	60.5(	(296.4)	106.3(3)
25.5	75.4	(297.0)	99.0(3)
27.5		(304.8)	
30.0		(310.5)	
35.0		(318.3)	
40.C		(322.0)	
70.0		(339.8)	

SOLUBILITY OF ORTHO NITROPHENOL IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(Duff and Bills, 1930.)

Wt. % C_2H_5OH in solvent	Gms. o $C_6H_4OHNO_2$ per 100 gms. solvent	Wt. % C_2H_5OH in solvent	Gms. o $C_6H_4OHNO_2$ per 100 gms. solvent
0.0	0.25	70	12.2
30.0	0.7	80	21.0
40	1.7	90	32.5
50	3.9	100	46.0
60	7.4		

SOLUBILITY OF META NITROPHENOL IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL.

(Duff and Bills, 1930.)

Results at 0°

Wt. % C_2H_5OH in solvent	Gms. o $C_6H_4OHNO_2$ per 100 gms. solvent
0.0	0.9
20	1.6
30	5.0
40	19.8
50	36.8
60	53.7
70	71.5
80	89.5
90	106.6
100	115.5

Results at 12.5°

Wt. % C_2H_5OH in solvent	Gms. o $C_6H_4OHNO_2$ per 100 gms. solvent	
0	1.2	
20	2.5	
25	6.8	10.3(1)
27.5	8.9	17.9(1)
30	12.8	30.5(1)
35	27.2	51.0(1)
40	41.0	71.5(1)
42	52.1	80.5(1)
45	74.4	92.0(1)
46	96.0	
50	106.2	
60	126.2	
63	131.0	
70	139.5	
80	143.5	
90	146.0	
100	148.0	

Results at 25°

Wt. % C_2H_5OH in solvent	Gms. o $C_6H_4OHNO_2$ per 100 gms. solvent		
0	1.35		
10	1.7		
15	4.0		5.9(1)
20	6.5		38.8(1)
25	11.0		76.5(1)
30	25.0		106.3(1)
35	43.5		147.0(1)
37.5	52.2	(156)	142.0(2)
39.0	59.8	(162)	140.0(2)
40.0	65.8	(165)	135.0(2)
41.0	81.5	(167)	122.5(2)
42.0		(171)	
50		(189)	
63		(204)	
70		(202)	
80		(200)	
100		(195)	

(1) Two liquid phases remain at end point.
(2) Two liquids became miscible at end point.

The results in parentheses are for the curve beyond the formation of immiscible layers.

Solubility of Para Nitrophenol in Aqueous Solutions of Ethyl Alcohol.

(Duff and Bills, 1930.)

Results at 0°

Wt. % C_2H_5OH in solvent	Gms. p $C_6H_4OH\ NO_2$ per 100 gms. solvent	
0	0.5	
10	0.6	
25	1.4	
27.5	—	9.2(1)
30	5.2	15.2(1)
35	12.5	30.0(1)
40	25.0	44.8(1)
45	41.0	61.0(1)
50	58.5	76.0(1)
51	82.0	
54	96.0	
56	101.0	
60	108.0	
70	120.0	
80	118.0	
90	117.0	
100	116.4	

Results at 25°

Wt. % C_2H_5OH in solvent	Gms. p $C_6H_4OHNO_2$ per 100 gms. solvent		
0.0	1.6		—
9	—		7.8(1)
10	3.4		17.5(1)
12.5	—		42.5(1)
15.0	5.2		65.6(1)
17.5	6.0		95.6(1)
20.0	8.5		118.7(1)
22.5	13.7		141.6(1)
25.0	19.2		169.1(1)
27.5	26.2	(194)	191. (2)
30	34.9	(198)	177.1(2)
32.5	45.7	(206.1)	160.5(2)
35	57.8	(210.5)	147.9(2)
37.5	70.1	(217.9)	132.7(2)
38.5	80.5	(218.7)	117.6(2)
40		(220.5)	
56		(230.4)	
70		(220.0)	
90		(199.0)	
100		(189.5)	

Results at 40°

Wt. % C_2H_5OH in solvent	Gms. p $C_6H_4OHNO_2$ per 100 gms. solvent		
0	2.9	(246)	246(2)
10	5.5	(258)	233(2)
15	9.0	(268)	220(2)
20	19.0	(277)	206(2)
25	36.5	(286)	190(2)
30	55.1	(296)	149(2)
32.5	79.5	(299)	114(2)
33.3	95.0	—	101(2)
33.8		(300.5)	—
35.0		(303)	
39		(306)	
40		(305)	
50		(298)	
60		(289)	
70		(276)	
80		(265)	
90		(255)	
100		(250)	

(1) Two liquid phases remain at end point.
(2) Two liquids become miscible at end point.

The results in parentheses are for the curve beyond the formation of immiscible layers.

Solubility of Ortho and of Para Nitrophenol, Each Separately, in Several Solvents.

(Desvergnes, 1927.)

Solvent	Gms. per 100 gms. solvent: o $C_6H_5O_3N$ at 15.5°	p $C_6H_5O_3N$ at 14°	Solvent	Gms. per 100 gms. solvent o $C_6H_5O_3N$ at 15.5°	p $C_6H_5O_3N$ at 14°
$CH_3COOC_2H_5$	130.95	126.26	$CHCl_3$	99.68	2.99
$(CH_3)_2CO$	69.14	205.08	$(C_2H_5)_2O$	95.03	130.35(14°)
CH_3OH	11.83	240.45	C_5H_5N	144.44	71.20
96% C_2H_5OH	25.31	160.90	CS_2	47.59	0.05(34.5°)
100% "	24.55	150.92	CCl_4	40.42	0.05
C_6H_6	107.38	1.28	$C_6H_5CH_3$	45.28	1.13

Solubility of *o* Nitrophenol in Liquid Carbon Dioxide. (Büchner, 1905–6.)

t°.	Gms. *o* $C_6H_4(OH)NO_2$ per 100 Gms. Sat. Sol.	t°.	Gms. *o* $C_6H_4(OH)NO_2$ per 100 Gms. Sat. Sol.
−52	1.9	12.5	10
−40	2.5	14	21.2
−20	3.8	15	33.8
0	5.2	16	48.5
+10	7.7	20	60.7

SOLUBILITY OF THE THREE NITROPHENOLS, SEPARATELY, IN TOLUENE, BROMOBENZENE AND IN ETHYLENE DIBROMIDE. (Sidgwick, Spurrell and Davies, 1915.)

t°.	Gms. *o* $C_6H_4(OH)NO_2$ per 100 Gms. Sat. Sol.			t°.	Gms. *p* $C_6H_4(OH)NO_2$ per 100 Gms. Sat. Sol.		
	In $C_6H_5CH_3$.	In C_6H_5Br.	In $C_2H_4Br_2$.		In $C_6H_5CH_3$.	In C_6H_5Br.	In $C_2H_4Br_2$.
15	46.9	...	40	70	18.5	...	31
20	55.2	48.8	47.8	80	28.1	32.7	52
25	64.6	57.7	56.8	90	54.4	59.7	73.2
30	74.6	67.2	67.2	100	79.6	80.6	88.5
35	84.5	78.3	79	110	96.3	96.3	98
40	93.1	89.7	90.6				

t°.	Gms. *m* $C_6H_4(OH)NO_2$ per 100 Gms. Sat. Sol. in $C_6H_5CH_3$.	t°.	Gms. *m* $C_6H_4(OH)NO_2$ per 100 Gms. Sat. Sol. in $C_6H_5CH_3$.	t°.	Gms. *m* $C_6H_4(OH)NO_2$ per 100 Gms. Sat. Sol. in $C_6H_5CH_3$.
39.6	4.63	64.8	16.44	78.5	70.50
45.8	6	67.7	20.26	82.3	79.57
48.9	7.03	71.5	33.16	88.8	91.43
54	9.11	74.5	46.93	95.1	100
58	11.28	75.7	57.71		

SOLUBILITY OF *o*, *m* AND *p* NITROPHENOL, EACH SEPARATELY, IN SEVERAL ORGANIC SOLVENTS. (Carrick, 1921.)

Since saturation is reached very quickly with these compounds the determinations were made by adding to a carefully weighed glass stoppered flask, an accurately weighed amount of the solid and then a small amount of the solvent. The mixture was warmed slowly, while being constantly agitated, untill the solid just disappeared. The temperature was observed and the amount of solvent present determined by carefully weighing the flask. Succeeding determinations were made in exactly the same manner after adding additional amounts of the solvent.

Ortho Nitrophenol.			Meta Nitrophenol.			Para Nitrophenol.		
	Gms. $C_6H_4OH.NO_2(o)$ per			Gms. $C_6H_4OH.NO_2(m)$ per			Gms. $C_6H_4OH.NO_2(p)$ per	
t°.	100 gms. solvent.	100 gms. sat. sol.	t°.	100 gms. solvent.	100 gms. sat. sol.	t°.	100 gms. solvent.	100 gms. sat. sol.
RESULTS FOR THE SOLUBILITY IN ACETONE :								
+0.2...	102.44	50.60	+0.2...	169.35	62.95	0.0...	188.28	66.99
6.0...	131.42	56.79	10.1...	190.91	65.63	10.4...	204.47	67.15
11.5...	166.48	62.48	25.0...	223.43	69.08	24.6...	229.8	69.66
16.1...	211.37	67.88	34.5...	255.22	71.85	33.2...	262.74	72.43
20.1...	258.96	70.50	43.0...	301.32	75.08	41.2...	284.10	73.97
26.1...	398.97	79.97	55.2...	422.81	80.87	50.4...	327.92	76.63
30.3...	566.29	84.98	63.0...	533.20	84.21	61.7...	408.86	80.16
36.5...	1236.67	92.50	74.5...	905.20	90.05	75.2...	546.81	84.54
			84.0...	1305 88	92.88	85.6...	791.31	88.78
						97.0...	1192.50	92.30
RESULTS FOR THE SOLUBILITY IN BENZENE :								
0.0...	45.89	31.45	6.0...	0.63	0.62	8.0...	0.65	0.64
6,0...	68.11	40.51	22.0...	1.83	1.79	20.1...	0.96	0.95
14.1...	103.84	50.94	38.0...	4.99	4.75	32.1...	1.67	1.63
20.1...	148.3	59.72	48.0...	9.86	9.18	41.3...	2.83	2.75
26.9...	246.49	72.79	57.5...	20.96	17.37	65,5...	8.79	8.08
30.1...	365.41	78.51	66.0...	45.94	31.48	73.5...	15.99	13.78
34.6...	561.59	84.88	74.0...	120.43	54.63	78.5...	25.18	20.11
40.1...	873.57	89.73	81.5...	375.51	79.05	85.4...	61.71	38.09
			85.0...	571.09	84.98	91.0*.	124.54	56.05
			87.8*.	852.51	89.55	96.5*.	400.02	80.00
						104.2*.	1071.96	91.54

* Sealed tubes were used.

SOLUBILITY OF *o*, *m* AND *p* NITROPHENOL, EACH SEPARATELY, IN SEVERAL ORGANIC SOLVENTS. (CON.).

RESULTS FOR THE SOLUBILITY IN ETHYL ALCOHOL:

Ortho Nitrophenol. t°.	Gms. $C_6H_4OH.NO_2(o)$ per 100 gms. solvent.	Gms. $C_6H_4OH.NO_2(o)$ per 100 gms. sat. sol.	Meta Nitrophenol. t°.	Gms. $C_6H_4OH.NO_2(m)$ per 100 gms. solvent.	Gms. $C_6H_4OH.NO_2(m)$ per 100 gms. sat. sol.	Para Nitrophenol. t°.	Gms. $C_6H_4OH.NO_2(p)$ per 100 gms. solvent.	Gms. $C_6H_4OH.NO_2(p)$ per 100 gms. sat. sol.
0.0..	10.16	9.22	1.0..	116.91	53.87	0.0..	115.75	53.65
6.7..	13.00	11.50	11.0..	143.55	58.94	10.0..	133.84	57.23
12.4..	17.71	15.04	23.4..	183.77	64.75	18.5..	161.13	61.70
17.3..	22.08	18.09	30.5..	221.24	69.03	26.1..	193.78	65.96
23.1..	34.31	25.54	45.5..	301.54	75.20	38.6..	244.89	71.01
30.2..	60.58	41.03	50.7..	345.27	77.54	45.2..	278.94	73.61
34.3..	200.00	66.67	57.5..	422.62	80.87	52.7..	319.52	76.16
37.3..	545.48	86.68	65.5..	554.25	84.71	62.7..	415.55	80.60
41.3..	1038.44	91.22	77.2..	851.47	89.49	71.2..	545.00	84.50
			85.0..	1105.25	91.72	81.1..	800.38	88.89
						89.8..	1016.75	91.05

RESULTS FOR THE SOLUBILITY IN ETHYL ETHER.

Ortho Nitrophenol. t°.	Gms. $C_6H_4OH.NO_2(o)$ per 100 gms. solvent.	Gms. $C_6H_4OH.NO_2(o)$ per 100 gms. sat. sol.	Meta Nitrophenol. t°.	Gms. $C_6H_4OH.NO_2(m)$ per 100 gms. solvent.	Gms. $C_6H_4OH.NO_2(m)$ per 100 gms. sat. sol.	Para Nitrophenol. t°.	Gms. $C_6H_4OH.NO_2(p)$ per 100 gms. solvent.	Gms. $C_6H_4OH.NO_2(p)$ per 100 gms. sat. sol.
1.0..	37.76	27.41	+0.2..	105.92	51.44	1.0..	109.99	52.38
5.5..	44.81	30.95	8.2..	118.20	54.17	10.1..	115.56	53.61
10.5..	59.41	37.27	12.2..	127.24	55.99	18.0..	122.95	55.06
15.8..	81.07	44.75	23.5..	143.67	58.96	24.1..	131.18	56.74
21.9..	138.79	58.12	39.5..	178.74	63.89	28.7..	133.02	57.07
27.8..	249.45	71.38	48.5..	212.75	68.03	31.7..	139.24	58.20
33.2..	480.61	82.79	59.0..	269.22	72.92	38.1..	149.29	59.89
37.5..	915.45	90.23	68.0..	355.06	78.03	46.8..	167.66	62.64
			75.0..	508.89	83.58	59.9..	202.07	66.89
			83.0..	1065.84	91.42	70.5..	249.39	71.38
						87.8*.	380.29	79.23
						97.1*.	586.58	85.51
						101.9*.	1001.50	90.92

* Sealed tubes were used.

SOLUBILITY OF ORTHO NITROPHENOL IN MIXTURES OF ALCOHOL AND QUINOLINE AT 20-25°. (Pucher and Dehn, 1921.)

Per cent C_7H_9N in solvent.	Gms. $C_6H_4OHNO_2(o)$ per 100 gms. solvent (?).	Per cent C_7H_9N in solvent.	Gms. $C_6H_4OHNO_2(o)$ per 100 gms. solvent (?).	Per cent C_7H_9N in solvent.	Gms. $C_6H_4OHNO_2(o)$ per 100 gms. solvent (?).
0.0 (=C_2H_5OH).	404	47.5......	1008	80.........	1296
10.0.........	504	50.0......	1005	90.........	1367
23.2.........	720	60.0......	1152	100.........	1450
37.5.........	864	70.0......	1224		

The critical solution temperature of mixtures of o Nitrophenol and Naphthalene is 42.5°. (Lecat, 1929.)

Freezing-point data are given for mixtures of Nitrophenols and:

Acenaphthene(10)
Acetamide(42)
Aceto phenone(5)
Acetyl o Nitrophenol(24)
Amino phenols(6)
Aniline(3)
Anthracene(16)
Antipyrine(10)
Azobenzene(38)
Benzal acetophenone(1)
Benzamide(22)(42)
Benzene(31)
Benzohhydrol(39)
Benzo phenone(7)
Camphor(11)(28)
Carbazole(13)
Cineole(29)
Cinnamic acid(33)
Cinnamic aldehyde(7)
Di methyl oxalate(33)
Di methyl pyrone(18)
Di nitro phenol(25)
Di phenyl amine(15)(21)
Di phenyl methane(14)
Fenchon(8)
Methylene dioxybenzal aceto phenone(1)
Naphthalene(2)(23)(27)
Nitraline(40)
Nitro benzene(9)
Nitro chloro benzene(40)
Nitro phenols(26)
Nitroso phenol(20)
Oxybenzaldehyde(34)
Nitro toluene (37)
Nitro mannite(41)
Phenylene diamine(4)
Picric acid(3)
Quinone(9)
Salicylaldehyde(7)
Styphnic acid(36)
Succinimide(8)
Succinic acid(33)
Sulfuric acid(19)
Toluidine(4)(29)(30)
Tri chloro acetic acid(17)
Tri methyl carbinol(32)
Tri nitro phenyl methyl nitramine(35)
Tri phenyl carbinol(16)
Tri phenyl methane(12)
Urea(3)
Naphthylamines (43)

(1) Asahina, 1934; (2) Kremann, 1904; (3) Kremann and Rodinis, 1906; (4) Kremann and Petritschek, 1917; (5) Kremann and Marktl, 1920; (6) Kremann, Lupfer and Zawodsky, 1920; (7) Kremann and Zechner, 1918, 1926; (8) Kremann and Dietrich, 1923; (9) Kremann, Sutter, Sitte, Strzelba, and Dobolzsky, 1922; (10) Kremann and Haas, 1919; (11) Kremann and Odelga, 1921; (12) Kremann, Odelga and Zawodsky, 1921; (13) Kremann and Slovak, 1920; (14) Kremann and Fritsch, 1920; (15) Kremann and Schadinger, 1919; (16) Kremann and Müller, II, 1921; (17) Kendall, 1916; (18) Kendall, 1914a; (19) Kendall and Carpenter, 1914; (20) Jaeger, 1908; (21) Giua and Cherchi, 1919; (22) Puschin and Rikovski, 1930; (23) Rheinboldt, Henning and Kirscheisen, 1925; (24) Boesken, 1912; (25) Crompton and Whiteby, 1895; (26) Carrick, 1921; (27) Saposchinikov, 1904; (28) Jefremov, 1919; (29) Pawlewski, 1893; (30) Philip, 1903; (31) Bogojawlensky, Winogradow and Bogobubow, 1906; (32) Kremann, Mauermann, Müller, II, and Rösler, 1922; (33) Kremann, Zechner and Drazil, 1924; (34) Kremann and Pogantsch, 1923; (35) Jefremow and Tichomirowa, 1926; (36) Jefremow, 1934; (37) Crockford and Simmons, 1933; (38) Kremann, Zechner and Weber, 1924; (39) Kremann and Drazil, 1924; (40) Grimm, Günther and Titus, 1931; (41) Urbanski, 1934; (42) Kremann and Auer, 1918.(43) Kremann and Grasser, 1916.

NITRO HYDROQUINONE, NITRO PYROCATECHOL, NITRO RESORCINOL $NO_2C_6H_3(OH)_2$

Freezing-point data for mixtures of each of these compounds and Styphnic acid are given by Jefremow, 1934. Results for mixtures of each of these compounds and Camphor are given by Jefremow, 1919, and Kremann and Odelga, 1921.

DI NITRO ANILINE $(NO_2)_2C_6H_3NH_2$.

Freezing-point data for mixtures of 2.4 dinitro aniline and 2.4.6 tetra nitro methyl aniline are given by Jefremow and Tichomirowa, 1928.

BENZENE C_6H_6.

SOLUBILITY OF BENZENE IN WATER.

The results of Hill, 1922; Barbaudy, 1926b; Uspenski, 1929; and Gross and Saylor, 1931, were plotted and the following values taken from the average curve.

t°	Gms. C_6H_6 per 100 gms. H_2O	t°	Gms. C_6H_6 per 100 gms. H_2O	t°	Gms. C_6H_6 per 100 gms. H_2O
0	0.153	30	0.190	70	0.277
10	0.163	40	0.206	80	0.325
20	0.175	50	0.225	90	0.395
25	0.180	60	0.250	107.4	0.507

SOLUBILITY OF WATER IN BENZENE.

The results of Groschuff, 1911; Clifford, 1921; Rosenbaum and Walton, 1930; and Tarassenkow and Poloshinzewa, 1932, were plotted and the following values taken from the average curve.

t°	Gms. H_2O per 100 gms. C_6H_6	t°	Gms. H_2O per 100 gms. C_6H_6	t°	Gms. H_2O per 100 gms. C_6H_6
0	0.0275	30	0.072	60	0.256
10	0.036	40	0.102	70	0.280
20	0.050	50	0.147	80	0.367
25	0.060				

The partial vapor pressures at 30° of aqueous solutions of benzene are given by Saylor, Stuckey and Gross, 1938.

SOLUBILITY OF BENZENE VAPOR IN WATER AT 25°. (Milligan, 1923.)

A mixture of air and benzene vapor of known composition was shaken with water at 25° and the residual mixture analyzed by means of a Haldane gas analysis apparatus. The amount of benzene vapor dissolved was thus found by difference. The coefficient of solubility (volume of gas, reduced to 0°, which dissolves in one volume of water at 25°, when the pressure of the gas over the water is 760 mm.) was found to be $\alpha_{25} = 1.5$.

From this value it was calculated that approximately 0.07 cc. of liquid benzene is dissolved by 100 cc. of H_2O at 25°.

SOLUBILITY OF BENZENE IN SUPER-HEATED WATER. (Jaeger, 1923.)

The determinations were made in a large shaking autoclave. Mixtures of 500 cc. of benzene and 2 liters of water were shaken 10 minutes at each temperature, and then allowed to stand 20 minutes, 500 cc. of the solution was withdrawn and allowed to stand a day. The volume of separated oil was then carefully determined.

t°	100°.	150°.	200°.	250°.	285°	300°.
cc. C_6H_6 dissolved per 100 cc. H_2O	0.2	0.6	2.1	7.3	10.6	14.6

The following values were obtained for:

Solvent Benzol
(b. pt. 140°-190°).

t°	150°.	200°.	25°.
Gms. solvent benzol per 100 cc. H_2O	0.04	0.17	1.15

Pure Benzin from Petroleum
(b. pt. 65°-100°).

t	150°.	200°.	240°.
Gms Benzin per 100 cc. H_2O	0.04	0.2	0.9

100 gms. Aq. 0.4 n Sodium Oleate Solution (= 10.8 gm. Na Oleate per 100 gms. solution) dissolve 4.0 gms. C_6H_6 directly and 11.9 gms. by mixing benzene and oleic acid and adding the calculated

THE SYSTEM BENZENE, PHENOL AND WATER AT 25°.

(Horiba, 1914.)

In the case of phenol, the bromine method was used for its determination. In the case of the other two compounds, the amounts required to produce constant turbidity were measured directly from burettes.

Solubility of Benzene in Aqueous Solutions Containing Phenol and Vice Versa.

$d_{\frac{25}{25}}$.	Gms. per 100 Gms. $C_6H_5OH+C_6H_6+H_2O$. C_6H_5OH.	Gms. per 100 Gms. $C_6H_5OH+C_6H_6+H_2O$. C_6H_6.	Saturating Phase.
1.0002	0	0.198	C_6H_6
1.0008	1.059	0.204	"
1.0021	2.602	0.205	"
1.00305	3.526	0.199	"
...	5.65	0.17	$C_6H_6+C_6H_5OH$
...	5.953	0.132	C_6H_5OH
1.0059	6.516	0.075	"
1.0069	7.683	0.025	"
1.0073	8.195	0	"

Solubility of Phenol in Benzene Solutions Containing Water and Vice Versa.

$d_{\frac{25}{25}}$.	Gms. per 100 Gms. $C_6H_5OH+C_6H_6+H_2O$. C_6H_5OH.	Gms. per 100 Gms. $C_6H_5OH+C_6H_6+H_2O$. C_6H_6.	Saturating Phase.
...	29.29	0	C_6H_5OH
...	71.63	1.62	"
...	74.5	3	$C_6H_5OH+C_6H_6$
1.0256	69.18	16.33	C_6H_6
0.9891	55.80	36.13	"
0.9629	44.39	50.56	"
0.9142	21.15	77.22	"
0.8818	4.78	94.98	"
0.8764	0	99.95	"

Data are also given for the solubility of phenol as solid phase, in C_6H_6 and in water and in their mixtures. A complete table for the conjugate points, showing the distribution of phenol between the aqueous and the benzene layers, is given. The results agree with those of Rothmund and Wilsmore. See page 385.

The surface tension, density, viscosity and index of refraction of various mixtures of benzene phenol and water whose compositions fall within the completely miscible part of the system, are given by Wiedman and Swear ington, 1931.

The following values in substantial accord with those of Horiba, 1914 are by Vondracek and Dostal, 1936. These authors used the synthetic method and from the observed temperatures of appearance of opalescene of known mixtures, values for given temperatures were obtained by graphical interpolation.

Results at 20°

Gms. per 100 gms. homogeneous mixture H_2O	Gms. per 100 gms. homogeneous mixture C_6H_6	Gms. per 100 gms. homogeneous mixture C_6H_5OH
2.61	64.71	32.68
4.13	54.52	41.35
5.99	43.97	50.04
8.92	31.49	59.59
13.69	17.71	68.60
18.08	9.42	72.50
21.98	4.64	73.38

Results at 30°

Gms. per 100 gms. homogeneous mixture H_2O	Gms. per 100 gms. homogeneous mixture C_6H_6	Gms. per 100 gms. homogeneous mixture C_6H_5OH
1.77	73.00	25.33
3.77	58.51	37.72
5.60	47.67	46.73
8.46	35.06	56.48
13.22	20.57	66.21
17.63	11.72	70.65
21.55	6.50	71.95

More recent determinations of the equilibrium in this system at 80° and at 90°, made by the synthetic method, are given by Merclin, 1938.

SOLUBILITY OF BENZOIC ACID IN BENZENE AND VICE VERSA. (Roloff, 1895.)

t°.	Gms. C_6H_5COOH per 100 Gms. Sat. Sol.	Solid Phase.	t°.	Gms. C_6H_5COOH per 100 Gms. Sat. Sol.	Solid Phase.
5.37	0	C_6H_6	20	8.8	C_6H_5COOH
5	1.75	"	30	13	"
4.50	3.95	"	50	25	"
4.20	5	$C_6H_6+C_6H_5COOH$	70	43.5	"
5	5.05	C_6H_5COOH	90	64	"
7	5.50	"	110	91.5	"
9	5.70	"	121	100	"

MUTUAL SOLUBILITY OF BENZENE AND β NAPHTHALENE PICRATE, $C_6H_2(NO_2)_3OH.C_{10}H_7OH$. (Kuriloff, 1897.)

Synthetic method used — see Note, p. 292.

t°.	Gms. Picrate	Gms. Benzene	a	t°.	Gms. Picrate.	Gms. Benzene.	a
157	100.	...	100.0	111.6	1.173	1.037	19.2
148.4	2.128	0.115	79.3	102.0	1.087	1.780	11.2
137.4	1.274	0.170	61.1	29.5	0.390	8.430	0.95
134.2	1.384	0.297	49.3	4.6	1.329	21.80	0.48
126.8	1.019	0.343	38.3	5.02	...	100.0	...

a = Mols. β Naphthalene Picrate per 100 Mols. of β Napthalene Picrate plus Benzene.

Determinations for a large number of isothermes are also given.

Freezing-point data are given for mixtures of Benzene and:

Acetamide(23)
Acetic acid(3)(4)(6)(29)
Acetone(39)
Acetonitrile(20)
Allyl iso sulfocyanide(20)
Aniline(2)(30)
Azoxyanisole(11)
Benzhydrol(10)
Benzil mono oximes(40)
Benzoic acid(3)(36)
Bromo benzene(41)
Bromoform(10)
Bromo nitro benzene(11)
Bromo toluene(15)
Butyro nitrile(20)
Camphene(12)
Carbazole(9)
Carbon disulfide(27)
Carbon tetra chloride (30)(43)(25)
Chloro acetic acid(29)
Chloro benzene(41)
Chloroform(31)(24)(42)
Chloro nitro benzene(11)
Cresol(2)(21)
Cyclohexane(13)

Di cetyl(22)
Di ethyl amine(5)(9)
Di ethyl ether(39)
Di methyl aniline
Di nitro benzenes(1)
Di nitro toluenes(1)
Di phenyl(14)
Di phenyl amine(5)(9)
Ethyl alcohol(24)
Ethyl bromide(25)
Ethyl ether(8)(39)
Ethylene bromide(5)(7)(30)
Ethylene chloride(7)(28)
Formamide(20)
Fluoro benzene(41)
Guaicol(17)
Heptane(46)
Hexane(31)(46)
Hydrobromic acid(44)
Iodo benzene(41)
Menthol(5)
Methyl alcohol(8)
Naphthalene(3)(8)(9)(14)
Naphthol(9)
Nitranilines(12)
Nitro benzene(5)(30)

Nitro benzaldehyde(10)
Nitro benzyl chloride(10)
Nitro methane(20)
Nitro phenols(11)
Nitro toluene(37)(30)
Nitro toluidine(37)
Paraldehyde(15)
Pentane(46)
Phenanthrene(9)
Picryl chloride(26)
Propionitrile(20)
Propyl alcohol(8)
Quinine(18)
Sulfur dioxide(45)
Tetra methyl diamine benzhydrol(10)
Thiophene(19)
Toluene(32)
Toluidine(21)(37)(30)
Tri chloro acetic acid(29)
Tri ethyl amine(20)
Tri nitro benzene(26)
Urethane(16)(34)(35)(38)
Valero nitrile(20)
Xylene(15)(33)
Benzo phenone(47)
Salol(47)

(1) Kremann, 1908; (2) Kremann and Borjanovics, 1916; (3) Roloff, 1895; (4) Dahms, 1893, 1896; (5) Dahms, 1895; (6) Baud, 1912, 1912a; (7) Baud and Gay, 1910, 1911; (8) Pickering, 1893; (9) Bruni, 1898; (10) Schmidlin and Lang, 1912; (11) Bogojawlensky, Winogradow and Bogububow, 1906; (12) Kurnakoff and Efremoff, 1912; (13) Mascarelli and Pestalozza, 1907, 1908; (14) Washburn and Reid, 1915; (15) Paterno and Ampola, 1897; (16) Puschin, Glagoleva and Mazarovich, 1914; (17) Puschin and Rikovski, 1917; (18) Van Iterson-Rotgans, 1913; (19) Tsakalotos and Guye, 1910; (20) Joukovsky, 1934; (21) Glass and Madgin, 1934; (22) Seyer, 1938; (23) Moles and Jimeno, 1913; (24) Wyatt, 1928; (25) Wyatt, 1929; (26) Hammick, Hills and Howard, 1932; (27) Hirshberg, 1932; (28) Huettig and Smyth, 1935; (29) Kendall and Boogé, 1916; (30) Linard, 1925; (31) Timmermans, 1928; (32) Mitsukuri and Nakatsuchi, 1926; (33) Nakatsuchi, 1926; (34) Puschin, 1925; (35) Puschin and Mazarourtsch, 1914; (36) Clupmann, 1918; (37) Dessart, 1926; (38) Puschin, 1929; (39) Yamamura, 1926; (40) Taylor and Marks,

BROMO ANILINES o, m and p BrNH$_2$.

Freezing-point data for mixtures of Bromo anilines with Picric acid and with Tri nitro benzene are given by Hertel, 1924. This author also gives results for mixtures of Chloro anilines and Picric acid. Results for mixtures of o Chloro aniline and o Anisidine are given by Aoyama and Morita, 1933.

o, *m* and *p* Chlor**ANILINES**, *o*, *m* and *p* $ClC_6H_4.NH_2$.

SOLUBILITY OF EACH IN WATER.

(Sidgwick and Rubie, 1921.)

See Note, p. 580

Ortho Chloraniline.		Meta Chloraniline.		Para Chloraniline.	
t°.	Gms. *o* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Gms. *m* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Gms. *p* ClC_6H NH_2 per 100 gms. sat. sol.
− 2.1	100.0 *	−10.4	100.0 *	70.5	100.0 *
− 7.0	99.8 * (tr. pt.)	−15.0	99.5 * (tr. pt.)	69.0	99.11 *
+19.0	99.44	− 6.0	99.51	67.0	98.41 *
75.0	98.50	+36.0	98.85	65.0	97.5 * (tr. pt.)
115.0	97.58	88.0	97.90	88.0	96.75
155.0	96.02	130.0	96.50	100.0	96.27
158.0	3.35	150.0	2.23	145.0	94.28
130.0	2.19	125.0	1.47	160.0	4.62
95.0	1.25	100.0	0.91	136.0	3.26
80.0	1.04	75.0	0.574	111.0	2.20
71.0	0.916			55.0	1.04 *
				42.0	0.525*

* Indicates cases in which a solid phase separated.

SOLUBILITY OF *o m* AND *p* CHLORANILINES IN BENZENE.

(Sidgwick and Rubie, 1921.)

The synthetic method was used. A solid phase separated in each case :

Ortho Chloraniline.			Meta Chloraniline.			Para Chloraniline.		
t°.	Gms. *o* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. *m* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. *p* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	Solid Phase.
− 5.0	96.09	*o* $ClC_6H_4NH_2$	−10.4	93.48	*m* $ClC_6H_4NH_2$	70.0	98.90	*p* $ClC_6H_4NH_2$
− 8.7	91.19	»	−21.0	86.18	»	60.0	85.24	»
−14.4	83.13	»	−25.0	80.82	»	47.8	65.36	»
−23.0	72.63	»	−29.0*	75.5	» + C_6H_6	34.8	45.47	»
−25.0*	68.5	» + C_6H_6	−24.4	64.33	C_6H_6	25.7	33.93	»
−21.0	57.26	C_6H_6	−16.2	47.02	»	14.0	21.29	»
−17.4	50.86	»	−14.0	43.28	»	8.5	15.43	»
−12.0	39.50	»	−10.5	35.48	«	2.4	9.42	»
− 6.2	26.46	»	− 5.0	22.68	»	+1.5*	8.5	» + C_6H_6
− 0.8	14.95	»	− 0.4	12.97	»	3.4	4.66	C_6H_6
+ 1.5	8.72	»	+ 2.0	7.20	»	4.2	2.87	»
5.5	0.0	»	3.5	0.0	»	5.1	0.727	»

* Eutec.

DISTRIBUTION OF o, m and p CHLOR ANILINES BETWEEN WATER AND OTHER SOLVENTS AT 25°.

(Williams and Soper, 1930.)

Solvents	Compound	Range of Concentration Gm. Mols. $C_6H_4ClNH_2$ per liter aq. layer	Distribution Coefficient
Water and Benzene	o Chloroaniline	0.00115 0.00300	119
" " "	m " "	0.00832 0.00327	86.2
" " "	p " "	0.00143 - 0.00348	62.4
Water and Heptane	p " "	0.0114 - 0.0142	4.31

Results are also given for the distribution of p chloro aniline between aqueous potassium chloride and bromide solutions and heptane.

PHENOL C_6H_5OH.

FREEZING-POINTS OF MIXTURES OF PHENOL AND WATER. (Rhodes and Markley, 1921.)

Carefully purified natural phenol was used. To weighed amounts in test tubes of 20 × 3.2 cm., weighed amounts of H_2O were added and the mixtures slowly cooled while being stirred. Near the estimated f. pt. the mixture was seeded by adding a small crystal of solid phenol or of phenol hydrate. "The highest temperature at which permanent crystals could be obtained was taken as the f. pt. of the mixture."

t°.	Gms. C_6H_5OH per 100 gms. mixture.	Solid Phase.
40.8 (m. pt.)..	100.00	C_6H_5OH
33.0..	98	C_6H_5OH + liquid phenol containing $2C_6H_5OH.H_2O$ in solution.
29.3.......	97	
23.1.......	95	
16.2.......	92	
15.9.......	91.84	
15.8 (Eutec.)..	91.72	$C_6H_5OH + 2C_6H_5OH.H_2O$
15.9.......	91.51	(1)
15.9 (m. pt.)..	91.24	$2C_6H_5OH.H_2O$
15.9........	91	$2C_6H_5OH.H_2O$ in equilibrium with liquid hydrate containing water.
15.15........	88	
13.3.........	82	
12.4.........	76 *	
12.2.........	71	
12.2.........	9 *	
0.85 (Eutec.)...	5	$2C_6H_5OH.H_2O$ + Ice
0.6........	3	Ice
0.45........	2	"
0.35........	0.5	"

(1) $2C_6H_5OH.H_2O$ in equilibrium with liquid hydrate containing phenol.

* Liquid layers separate between these two points.

At concentrations of phenol between 6.5 and 91 per cent there is a metastable equilibrium having two liquid layers and solid phenol in metastable equilibrium with liquid phenol containing water.

t°......	14°.1.	6°.2.	3°.1.	2°.0.	1°.7.	1°.7	1°.1.	0°.6	0°.0	1°.3 (Eutec.)	1°.1.
Per cent C_6H_5OH.	91	85	80	77	75	10	9	7.5	7.0	6.5	6.

Additional data on this system are also given by Bailey, 1925.

PHENOL

Remarks on the experiments of Rhodes and Markley (previous page).

Phenol forms a definite hydrate, $2\ C_6H_5OH.H_2O$ melting at 15°.9 and forming eutectics with anhydrous phenol and with ice, respectively. Because of the tendency towards suspended transformation, the solid phase which ordinarily appears when a mixture of water and phenol is cooled, is the metastable anhydrous phenol. Hydrated crystals were obtained only by seeding with hydrate or by cooling to very low temperatures. Hydrated crystals were originally obtained by cooling a solution of 15 per. cent H_2O in phenol for 1 hour to a temperature of —78°. These were used for seeding in order to obtain points on the stable curve. This method avoided supercooling and suspended transformation.

(Approximate data for the f. pt. of mixtures of phenol and water are given by Hoffert, 1922.)

Mutual Solubility of Phenol and Water. (Hill and Malisoff, 1926.)

Highly purified materials were used. The m. pt. of the phenol was 40°.92 ± 0.01. The two bulbed solubility flasks described in *J. Am. Chem. Soc.*, 45, 1143 (1923) were used. At higher temperatures up to the consolute point 66°, the plethostatic method of Alexejeff was used.

t°.	Phenol Phase		Water Phase	
	Wt. % C_6H_5OH.	density.	Wt. % C_6H_5OH.	density.
20	72.16	1.0541	8.36	1.0018
25	71.28	1.0469	8.66	1.0045
30	69.90	1.0429	9.22	1.0039
35	67.63	1.0405	9.91	0.9974
54.83	59.22	—	—	—
57.30	—	—	14.87	—
59.20	55.76	—	—	—
62.55	51.87	—	—	—
62.74	—	—	19.35	
65.24	44.09	—	—	—
65.79	—	—	27.77	—
66.01		—	29.13	—
65.79	—	—	30.21	—
65.90	—	—	31.35	
65.84	—		32.23	—
65.86	—		32.79	—
65.84	34.23	—	—	—

According to Bailey, 1925 the two liquid layers are in contact with solid phenol at 1°.7 and contain respectively 7.6 and 75 wt per cent C_6H_5OH. The critical solution temperature is 65.3° and the corresponding phenol content, 36.5 per cent.

A few determinations for the above system are given by Dubrisay, Tripier and Toquet, 1918, 1919.

Several determinations of the mutual solubility of phenol and water at temperatures between 66°.2 and 71°.1 and at pressures up to 1000 kilograms are given by Timmermans, 1922.

The temperature of clouding of various mixtures of phenol and aqueous solutions of sodium hydroxide, barium hydroxide, calcium hydroxide, sulfuric acid, hydrochloric acid, sodium sulfate and sodium chloride were determined by Dubrisay, 1921, 1922, and by Dubrisay, Tripier and Toquet, 1918, 1919. The presence of acids, bases and salts was shown to modify considerably the miscibility of liquid pairs. In general, various mixtures of 0.1 normal aqueous solutions were added to equal volumes of phenol (treated with just enough water to cause it to remain liquid at ordinary temperature) and the temperature of clouding determined. This method was applied to the study of reactions such as the saturation of acids by bases, formation of double sulfates and in general, physical chemical volumetry.

The miscibility of phenol and water as influenced by a third substance, such as azobenzene, anthraquinone, naphthalene, naphthylamine and salol was studied by Boutaric and Nabot, 1923. The results are given in terms of the ratio of the elevation of temperature produced by the addition of the third substance to given mixtures of phenol and water.

PHENOL C_6H_5OH.

SOLUBILITY OF PHENOL IN WATER.

(Alexejew, 1886; Schreinemaker, 1900; Rothmund, 1898.)

The determinations were made by the "Synthetic Method," for which, see Note, p. 292.

t°.	Gms. Phenol per 100 Gms. Aqueous Layer.	Gms. Phenol per 100 Gms. Phenol Layer.
10	7.5	75
20	8.3	72.1
30	8.8	69.8
40	9.6	66.9
50	12	62.7
55	14.1	59.5
60	16.7	55.4
65	21.9	49.2
68.3 (crit. temp.)	33.4	

Results confirming the above, and also viscosity measurements, are given by Scarpa (1904).

The complete $T - x$ data for the system are given by Smits and Maarse (1911).

F.-pt. data for the system are given by Rózsa (1911) and Paterno and Ampola (1897).

Vaubel (1895) states that 100 gms. sat. aqueous solution contain 6.1 gms. phenol at 20°. Sp. Gr. of solution = 1.0057.

The following more recent determinations of the complete T-x diagram of the system are given by Campbell and Campbell, 1937. These authors determined the composition of the two layers at temperatures up to 60° by the refractometric method and do not claim an accuracy equal to the results of Hill and Malisoff, 1926.

t^0	Gms. C_6H_5OH per 100 gms. Aqueous layer	Gms. C_6H_5OH per 100 gms. Phenol layer	Phases present, Vapor +
-0.3	0.9	—	Ice + solution
-0.4	1.8	—	" "
-0.7	3.3	—	" "
-1.0	4.0	—	" "
-1.2	5.0	—	" "
-1.3 (Eutec.)	5.8	—	" " + C_6H_5OH
0.0	6.3	—	" " "
+1.3 (Invar.)	6.8	76.0	2 liquids + "
2.6	6.9	75.6	"
23.9	7.8	71.2	"
29.6	7.5	70.7	"
32.5	8.0	69.0	"
38.8	7.8	66.6	"
45.7	9.7	64.4	2 liquids
50.0	11.5	62.0	"
55.5	12.0	60.0	"
59.8	13.6	57.7	"
60.5	14.0	55.5	"
61.8	15.0	54.0	"
65.0	18.5	50.0	"
66.8	34.5	34.5	1 liquid
4.9	—	79.2	Solution +
7.2	—	79.8	" C_6H_5OH
10.2	—	85.2	" "
16.1	—	87.8	" "
16.7	—	89.1	" "
19.3	—	90.0	" "
21.9	—	91.4	" "

These authors also give results for the refractive indices, surface tensions, viscosities, vapor pressures and composition of the vapor phases of the phenol-water system. They also give similar results for the system phenol - 4% aqueous succinic acid.

Additional results for the mutual solubility of Phenol and Water are given by Dolique, 1932 and by Smith, 1931.

The densities of a series of aqueous phenol solutions over the whole range of miscibility at temperatures between 20° and 70° are given by Howell, 1932.

Results showing the influence of various salts upon the Solubility of Water in Phenol at 18° are given by Cernatescu and Papafil, 1927, and Cernatescu, 1928.

The effect of various concentrations of several potassium salts and of malonic and succinic acids upon the solution temperature (65.6°) of an aqueous phenol mixture containing 36 wt. % C_6H_5OH is reported by Culbertson and Palmer, 1931.

Ferguson, 1927, found that the consolute temperature of the system phenol-water was raised from 65.75° to 68.4° by 0.85% o cresol and from 65.75° to 66.5° by 0.8% quinone.

Results for the effect of various concentrations of $HgCl_2$, CuCl and HCl upon the critical solution temperature of the system phenol + water are given by Carter and Megson, 1927.

Results for the effect of increasing amounts of ammonium, potassium and sodium salts upon the temperature of solution of 36.1 percent phenol in water are given by Duckett and Patterson, 1925.

EQUILIBRIUM IN THE SYSTEM PHENOL AND WATER AT TEMPERATURES BELOW 13°.

(Jones, 1927.)

The determinations were made to clear up the uncertainties in regard to the hydrate of phenol and the eutectic points of the system.

t°	Gms. C_6H_5OH per 100 gms. sat. sol.	Solid Phase	t°	Gms. C_6H_5OH per 100 gms. sat. sol.	Solid Phase
-0.534	2.803	Ice	9.93	6.771	$(C_6H_5OH)_2.H_2O$
-0.843 Eutec.	4.607	" + $(C_6H_5OH)_2.H_2O$	12.17 m.pt. (1)	—	" + Phenol rich liquid layer
-1.174 Eutec.	6.839	" + C_6H_5OH			
0	7.005	C_6H_5OH	1.0 " (1)	—	C_6H_5OH + "
0	4.695	$(C_6H_5CH)_2.H_2O$	0	7.147	Phenol rich liquid layer
4.93	5.530	"	4.93	7.308	"
			9.93	7.454	"
			13.00	7.574	"

(1) Under water.

SOLUBILITY OF PHENOL AT ROOM TEMPERATURE IN ORDINARY WATER AND IN HEAVY WATER.

(Nachod, 1938.)

An excess of phenol was shaken with ordinary water and with heavy water and the milky emulsions subjected to centrifugation.

100 gms. sat. solution in ordinary water contained 8.2 gms. C_6H_5OH.
100 gms. sat. solution in heavy water contained 6.2 gms. C_6H_5OH.

The critical solution temperature of a 35.2 percent solution of phenol in ordinary water (H_2O) is 66.45°.

The critical solution temperature of a 35.0 percent solution of phenol in heavy water (D_2O) is 78.7°. (Timmermans and Poppe, 1935.)

The following results for the change in the critical solution temperature of the system Phenol-Water caused by increasing percentages of heavy water (D_2O) are given by Hall, Wentzel and Smith, 1934.

Percent D_2O in $D_2O + H_2O$ mixture	Critical Solution Temperature
3.89	66.93
5.81	67.21
10.62	67.74
47.20	72.08
100.00	78.3 (66.5 + 11.8)

SOLUBILITY OF PHENOL IN AQUEOUS SALT SOLUTIONS AT 25°.

(Herz and Hiebenthal, 1928.)

In aqueous solutions of:

Barium Chloride		Calcium Chloride		Magnesium Chloride		Strontium Chloride	
Gms. per liter		Gms. per liter		Gms. per liter		Gms. per liter	
$BaCl_2$	C_6H_5OH	$CaCl_2$	C_6H_5OH	$MgCl_2$	C_6H_5OH	$SrCl_2$	C_6H_5OH
37.5	75.2	67	62	40	67	37	73
79.2	67.7	109	54	100	52	89	62
93.7	65.8	211	38	126	47	174	51
183.0	54.0	283	31	146	43	442	26
342.0	40.0	527	15	290	26	986(1)	7
671.0(1)	22.0	1169	2	919	4(1)		

Potassium Chloride		Lithium Chloride		Sodium Chloride	
Gms. per liter		Gms. per liter		Gms. per liter	
KCl	C_6H_5OH	LiCl	C_6H_5OH	NaCl	C_6H_5OH
16	74	27	60	16	70
40	62	45	51	32	61
79	48	77	39	54	51
147	33	93	34	91	39
245	12	137	25	152	25
301(1)	5			312(1)	8

(1) The salt was also present in excess.

EQUILIBRIUM IN THE SYSTEM PHENOL, SODIUM OLEATE AND WATER AT SEVERAL TEMPERATURES. (Bailey, 1923.)

The binodal curves at several temperatures were determined by the synthetic method. Especial care to secure pure sodium oleate was observed.

Results at 0°.

Gms. per 100 gms. sat. sol.	
Phenol.	Na Oleate.
7.2	0.0
8.7	0.2
12.1	0.8
16.0	1.3
34.8	2.9
58.5	4.4
64.7	3.5
70.4	2.0
74.7	–

Results at 20°.

Gms. per 100 gms. sat. sol.	
Phenol.	Na Oleate.
7.9	0.0
9.8	0.2
10.3	0.3
13.2	0.6
16.5	1.0
22.9	1.4
41.2	2.3
59.7	3.1
62.6	2.8
70.8	0.4
71.4	–

Results at 40°.

Gms. per 100 gms. sat. sol.	
Phenol.	Na Oleate
9.4	0.0
12.8	0.2
16.2	0.4
24.2	0.8
48.4	1.8
50.5	1.8
57.6	1.7
61.0	1.3
64.5	0.5
65.6	–

Results at 60°.

Gms. per 100 gms. sat. sol.	
Phenol.	Na Oleate.
17.6	0.0
28.4	0.1
36.7	0.2
53.6	–

EQUILIBRIUM IN THE SYSTEM PHENOL, PYROGALLOL AND WATER AT 20°.

(Bailey, 1923.)

Gms. per 100 gms. sat..sol.		Gms. per 100 gms. sot. sol.		Gms. per 100 gms. sat. sol.	
Phenol.	Pyrogallol.	Phenol.	Pyrogallol.	Phenol.	Pyrogallol.
7.9	0.0	24.5	5.8	53.1	4.8
8.5	0.8	30.1	6.0	61.0	3.3
9.2	1.6	38.7	5.9	66.9	1.7
12.5	4.1	43.2	5.7	71.4	0.0
19.2	5.3	45.2	5.5		

SOLUBILITY OF PHENOL IN AQUEOUS SOLUTIONS OF PHOSPHOROUS AND OF PHOSPHORIC ACID AT 25°.

(Redfield and King, 1936.)

Results for:

Aq. Phosphorus acid

Normalities	
H_3PO_3	C_6H_5OH
0.0	0.896
9.59	0.808
10.02	0.881
17.99	0.918
22.95	1.060
26.65	1.214

Aq. Phosphoric acid

Normalities	
H_3PO_4	C_6H_5OH
7.65	0.441
14.47	0.281
20.16	0.215
26.38	0.177
31.81	0.155
35.25	0.152
37.47	0.156

These authors also give the freezing-points of mixtures of phenol and phosphorus acid.

PHENOL.

SOLUBILITY OF PHENOL IN AQUEOUS ACETONE SOLUTIONS.

(Schreinemakers, 1900.)

t°.	In 4.24% Acetone. Grams Phenol per 100 Gms. Aq. Acetone Layer.	In 4.24% Acetone. Grams Phenol per 100 Gms. Phenol Layer.	In 12.2% Acetone. Gms. Phenol per 100 Gms. Aq. Acetone Layer.	In 12.2% Acetone. Gms. Phenol per 100 Gms. Phenol Layer.	In 24.6% Acetone. Gms. Phenol per 100 Gms. Aq. Acetone Layer.	In 24.6% Acetone. Gms. Phenol per 100 Gms. Phenol Layer.	In 59.9% Acetone. Gms. Phenol per 100 Gms. Aq. Acetone Layer.	In 59.9% Acetone. Gms. Phenol per 100 Gms. Phenol Layer
20	...	...	...	...	...	...	26.0	60.5
30	5.0	74.0	4.0	71.0	6.0	69.5	28.5	57.0
40	5.5	70.0	...	...	...	...	32.0	52.0
50	5.7	67.0	5.0	67.0	8.0	64.0	34.5§	49.0§
60	6.5	61.0	...	...	...	...	36.5‖	46.5‖
70	9.0	51.0	7.5	57.5	19.0	57.0	(49.5°) 41.5	
80	14.0	34.0	10.5	49.5	14.0	52.5		
	(84°) 22.5		20.4*	30.5*	23.0†	47.0†		
			(90.3°) 25.0		26.5‡	44.0‡		
					(90.5°) 35.0			

*90° †85° ‡87°.5 §45° ‖47°.5

The figures in the above table were read from curves plotted from the original results. Similar data are also given for acetone solutions of seven other concentrations.

The determinations were made by adding various quantities of phenol to the mixtures of water and acetone and observing the temperature at which the two layers became homogeneous. The isothermal lines for 30°, 50°, 68°, 80°, 85° and 87° were located. The results for 30° and 80° are as follows: (Schreinemakers, 1900.)

Results at 30°.

Gms. per 100 Gms. Mixture. H_2O.	$(CH_3)_2CO$.	C_6H_5OH.	Gms. per 100 Gms. Mixture. H_2O.	$(CH_3)_2CO$.	C_6H_5OH.
92	0	8	18.4	34.1	47.5
92.3	1.7	6	17.2	25.8	57
91	4	5	17.9	81.1	64
88.4	7.6	4	19.1	12.9	68
81	15	4	21.1	9.9	69
70.9	23.1	6	22.6	7.4	70
62.1	28.9	9	25.2	4.6	70.2
51.6	34.9	13.5	27.1	2.3	70.6
39.8	40.2	20	28.7	1.3	70
28.9	43.1	28	30	0.5	69.5
21.8	40.2	38			

Results at 80°.

Gms. per 100 Gms. Mixture. H_2O.	$(CH_3)_2CO$.	C_6H_5OH.
83.3	3.7	13
82.9	7.1	10
74.7	13.8	11.5
61.8	20.2	18
52.5	24.5	23
40.6	27.4	32
32.2	21.8	46
33.4	15.6	51
35.4	11.6	53
40.5	7.5	52
49.7	4.3	46
62.7	2.8	34.5

EQUILIBRIUM IN THE SYSTEM PHENOL, BENZENE AND WATER AT 25°.

(Horiba, 1914–1916.)

Gms. per 100 Gms. Sat. Sol. C_6H_5OH.	C_6H_6.	H_2O.	Solid Phase.
81.06	18.94	0	C_6H_5OH
89.78	7.92	2.30	"
92.31	4.07	3.62	"
95.14	0	4.86	"

The results for the conjugated liquid layers are as follows:

Upper Layer. Gms. per 100 Gms. of the Liquid.			Lower Layer. Gms. per 100 Gms. of the Liquid.		
C_6H_5OH.	C_6H_6.	H_2O.	C_6H_5OH.	C_6H_6.	H_2O.
0	99.95	0.05	0	0.198	99.802
4.78	94.98	0.24	1.43	0.21	98.36
17.36	81.83	0.81	2.80	0.21	96.99
21.15	77.22	1.63	3.01	0.21	96.77
28.01	69.81	2.18	3.35	0.21	96.44
44.39	50.56	5.05	4.07	0.19	95.74
55.80	36.13	8.07	4.58	0.19	59.23
74.5	3	22.5	5.65	0.17	94.18
70.70	0	29.29	8.195	0	91.805

Data for this system are also given by Rózsa (1911).

The coefficient of distribution of phenol between olive oil and water at 25°, conc. in oil ÷ conc. in H_2O, is given by Boeseken and Waterman (1911) as greater than 9 and less than 10.3. The figure was obtained by dividing the solubility of phenol in olive oil by the solubility in water, each being determined separately. Results for this system are also given by Reichel (1909).

According to Greenish and Smith (1903), 100 cc. of olive oil dissolve about 50 gms. of phenol at 15.5°. These authors report that 100 cc. of glycerol dissolve about 300 gms. of phenol at 15.5°.

MISCIBILITY OF AQUEOUS ALKALINE SOLUTIONS OF PHENOL WITH SEVERAL ORGANIC COMPOUNDS INSOLUBLE IN WATER.

(Scheuble, 1907.)

To 5 cc. portions of aq. KOH solution (250 gms. per liter) were added the given amounts of the aq. insoluble compound from a buret and then the phenol, dropwise, until solution occurred. Temperature not stated.

Composition of Homogeneous Solutions.		
cc. Aq. KOH.	cc. Aq. Insol. Cmpd.	Gms. Phenol.
5	2 (= 1.64 gms.) Octyl * Alcohol	2.6
5	5 (= 4.1 gms.) " "	3.9
5	2 (= 1.74 gms.) Toluene	4.9
5	3 (= 2.61 gms.) Toluene	6.7
5	2 (= 1.36 gms.) Heptane	15

* = the normal secondary octyl alcohol, *i. e.*, the so-called capryl alcohol, $CH_3(CH_2)_5.CH(OH)CH_3$.

SOLUBILITY OF PHENOL IN AQUEOUS SOLUTIONS OF DEXTRO TARTARIC ACID AND OF RACEMIC ACID.

(Schreinemakers, 1900.)

In 5.093% Acid.			In 19.34% Acid.			In 40.9% Acid.		
	Gms. Phenol per 100 Gms.			Gms. Phenol per 100 Gms.			Gms. Phenol per 100 Gms	
t°.	Aq. Acid Layer.	Phenol Layer.	t°.	Aq. Acid Layer.	Phenol Layer.	t°.	Aq. Acid. Layer.	Phenol Layer.
30	7.5	72.5	50	10	77	70	13	...
50	10.5	65.5	60	12.5	72	80	16.5	77
60	14.5	58	70	19	64	85	20	74
65	19.5	53	75	29	56	90	26.5	71
67.5	25	48.5	77*	47		95	39	63.5
69*	47.5					97*	54	

* Critical temperature.

Identical results were obtained with the dextro and racemic acids, showing that both have exactly the same influence on the formation of layers in the system

Results for equilibrium in the system Phenol + Glycerol + H_2O at 15°, 20°, 30°, 40°, 50° and 60° are given by Dolique, 1932.

EQUILIBRIUM IN THE SYSTEM PHENOL, PHENYL HYDRAZINE AND WATER.

(Ousti-Katchkintzov, 1939.)

t° homogeneity	Gms. per 100 gms. mixture			t° homogeneity	Gms. per 100 gms. mixture		
	$C_6H_5NHNH_2$	H_2O	C_6H_5OH		$C_6H_5NHNH_2$	H_2O	C_6H_5OH
72.5	10	88.2	1.8	110.3	30	50.1	19.9
90.2	10	85.9	4.1	107.5	30	39.7	30.3
109.8	10	80.2	9.8	98.6	30	29.8	40.2
112.0	10	75.0	15.0	74.7	30	20.0	50.0
110.0	10	70.1	19.9	17.6	30	8.9	61.1
106.0	10	64.9	25.1	72.0	40	58.2	1.8
102.2	10	60.3	29.7	92.8	40	55.0	5.0
96.1	10	54.7	35.3	102.0	40	50.0	10.0
92.2	10	50.0	40.0	105.2	40	44.8	15.2
76.2	10	40.0	50.0	106.4	40	39.7	20.3
54.9	10	30.3	59.7	100.4	40	30.0	30.0
27.0	10	20.0	70.0	77.6	40	18.9	41.1
58.0	20	78.7	1.3	20.2	50	10.0	50.0
99.8	20	75.8	4.2	73.0	50	47.5	2.5
111.2	20	70.0	10.0	86.0	50	44.0	6.0
112.9	20	64.8	15.2	92.8	50	40.0	10.0
113.0	20	59.9	20.1	95.2	50	34.8	15.2
112.0	20	55.0	25.0	92.0	50	28.9	21.1
108.8	20	49.7	30.3	75.0	50	19.6	30.4
106.5	20	44.6	35.4	31.0	50	12.0	38.0
102.0	20	40.3	39.7	74.0	60	35.2	4.8
82.0	20	30.0	50.0	80.2	60	30.0	10.0
49.1	20	19.4	60.6	75.5	60	25.8	14.2
26.7	20	16.0	64.0	54.0	60	20.3	19.7
74.2	30	68.8	1.2	32.0	60	14.4	25.6
102.0	30	63.6	6.4	21.5	70	26.8	3.2
106.5	30	60.0	10.0	23.0	70	25.0	5.0
108.0	30	55.9	14.1	20.4	70	20.0	10.0

EQUILIBRIUM IN THE SYSTEM WATER, PHENOL AND :

(Hœflake, 1915, 1926.)

Ortho Nitro Phenol.

Maximum temp. of complete miscibility.	Gms. $o\,C_6H_4.OH.NO_2$ per 100 gms C_6H_5OH.
66.45	0.0
69.35	0.87
69.6	0.95
72.15	1.70
76.8	3.04

Para Nitro Phenol.

Maximum temp. of complete miscibility.	Gms. $p\,C_6H_4.OH.NO_2$ per 100 gms. C_6H_5OH.	Maximum temp. of complete miscibility	Gms. $p\,C_6H_4.OH.NO_2$ per 100 gms. C_6H_5OH
66.4	0.0	68.3	17.38
66.55	0.12	69.95	31.74
66.8	3.65	71.65	47.4
67.2	7.71	74.5	79.6

The method consisted in adding the amount of water to the several mixtures necessary to give the maximum temperature of complete miscibility.

EQUILIBRIUM IN THE SYSTEM PHENOL, PYROCATECHOL AND WATER.

(Leone and Angelescu, 1922.)

Synthetic mixtures of weighed amounts of the three components were made and the temperatures of clearing and of clouding of each were determined The mixtures were prepared either by adding increasing amounts of phenol to definite

EQUILIBRIUM IN THE SYSTEM PHENOL, PYROCATECHOL AND WATER (CON).

Results for

Aq. 1.09 wt. % $C_6H_4(OH)_2(o)$

t°.	Gms. C_6H_5OH per 100 gms. mixture.
27.2....	9.14
38.7....	10.44
47.0....	13.02
57.2....	18.55
59.8....	21.99
61.4....	26.80
63.2....	36.09
62.4....	47.46
60.6....	51.62
56.0....	56.84
44.4....	63.47
29.0....	68.67
17.8....	70.80

Results for

Aq. 5.0 wt. % $C_6H_4(OH)_2(o)$.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
15.4....	13.72
31.0....	19.25
43.6....	27.97
51.4....	40.84
52.2....	46.68
50.6....	51.67
47.4....	55.61
36.0....	62.72
31.0....	65.01
20.4....	68.06
16.2....	69.16

Results for

Aq. 9.25 wt. % $C_6H_4(OH)_2(o)$.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
14.0....	27.75
28.6....	35.85
34.8....	41.71
36.8....	50.13
33.6....	55.48
26.6....	60.11
18.0....	64.01
12.2....	65.98
Aq. 14.88 wt. % $C_6H_4(OH)_2(o)$.	
7.0....	42.78
12.4....	49.57
10.0....	55.60
7.6....	57.69

Results for

Aq. 12.5 wt. % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2(o)$. per 100 gms. mixture.
52.0....	0.0
49.8....	0.42
44.8....	1.05
39.6....	1.65
34.4....	2.16
17.8....	3.65

Results for

Aq. 35.2 wt. % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2(o)$. per 100 gms. mixture
66.6....	0.0
61.8....	0.87
56.0....	1.92
50.8....	2.75
37.4....	4.68
30.8....	5.45
26.2 ...	6.00
18.2....	6.84
10.4....	7.56
7.0....	7.88

Results for

Aq. 60.7 wt. % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2(o)$ per 100 gms. mixture.
53.0....	0.0
48.6....	0.79
48.6....	1.70
37.6....	2.64
33.8....	3.27
23.6....	4.67
13.8....	5.88

ISOTHERMS FOR THE SYSTEM PHENOL, PYROCATECHOL AND WATER AT 0° AND AT 10°

(Leone and Angelescu, 1922.)

The determinations were made by titrations using weight pipets.

Results at 0°.

Gms. per 100 gms. sat. sol.	
C_6H_5OH.	$C_6H_4(OH)_2(o)$.
7.23	0.0
10.53	3.82
17.20	5.94
23.05	6.95
26.47	7.55
29.32	8.01
33.98	8.55
37.42	8.81
42.29	8.97
44.77	8.96
48.68	8.74
52.71	7.96
59.85	6.23
66.00	4.07
71.46	1.69
75.42	0.00

Results at 10°.

Gms. per 100 gms. sat. sol.	
C_6H_5OH.	$C_6H_4(OH)_2(o)$.
7.40	0.0
8.44	1.67
10.54	3.57
14.10	4.83
17.50	5.63
20.74	6.17
25.30	6.78
30.09	7.44
33.52	7.82
36.75	8.11
40.90	8.09
43.25	8.08
46.38	7.90
49.68	7.48
53.00	7.00
57.80	5.85
59.95	5.26
65.32	3.49
73.34	0.0

EQUILIBRIUM IN THE SYSTEM PHENOL, RESORCINOL AND WATER.

(Leone and Angelescu, 1922.)

The determinations were made as in the case of the system phenol, pyrocatechol and water.

Results for Water + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
46.5...	11.15
53.5...	13.17
58.6...	15.77
62.5...	19.16
63.8...	21.36
65.2...	25.48
65.8...	26.06
66.6...	35.43
65.8...	37.42
64.4...	46.46
58.8...	54.98
54.4...	54.42

Results for Aq. 1.0 wt. % $C_6H_4(OH)_2$ (m) + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
38.8...	11.23
47.0...	13.53
52.2...	16.00
58.6...	22.13
60.2...	26.52
61.6...	34.87
61.8...	40.48
61.6...	44.63
59.8...	50.66
58.8...	52.49
53.0...	57.97
49.0...	60.58
42.4...	63.70
34.0...	66.51

Results for Aq. 2.91 wt. % $C_6H_4(OH)_2$ (m) + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
25.4...	12.17
41.0...	17.34
47.4...	22.75
51.0...	28.63
53.8...	35.40
54.6...	39.10
55.0...	41.58
55.4...	44.97
55.0...	47.16
54.6...	49.15
53.8...	50.98
51.4...	54.07
46.0...	58.70
32.6...	65.40

Results for Aq. 4.76 wt. % $C_6H_4(OH)_2$ (m) + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
22.0...	16.47
35.6...	23.47
41.8...	31.33
46.0...	38.95
47.6...	43.67
47.8...	45.94
47.6...	48.60
45.0...	54.05
40.2...	58.57
31.0...	63.45
19.8...	67.48

Aq. 9.09 wt. % $C_6H_4(OH)_2$ (m) + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
18.6...	38.20
24.0...	42.00
26.4...	45.51
27.6...	49.80
27.2...	52.58
25.7...	55.03
22.0...	57.04
16.1...	61.95

Aq. 13.04 wt. % C_6H_5OH + $C_6H_4(OH)_2$ (m).

t°.	Gms. $C_6H_4(OH)_2$ (m) per 100 gms. mixture.
54.0...	0.0
51.6...	0.29
48.8...	0.60
47.2...	0.78
43.8...	1.14
39.8...	1.56
35.7...	1.94
31.8...	2.29
24.8...	2.89
20.2...	3.26
17.4...	3.43

Aq. 24.81 % C_6H_5OH + $C_6H_4(OH)_2$ (m)

t°.	Gms. $C_6H_4(OH)_2$ (m) per 100 gms. mixture.
66.4...	0.0
65.4...	0.17
62.0...	0.66
59.2...	1.11
54.6...	1.79
49.4...	2.50
44.4...	3.13
41.8...	3.43
31.0...	4.62
24.0...	5.32
17.5...	5.88

Aq. 61.83 % C_6H_5OH + $C_6H_4(OH)_2$ (m).

t°.	Gms. $C_6H_4(OH)_2$ (m) per 100 gms. mixture.
51.1...	0.0
49.4...	0.25
37.6...	1.83
37.4...	1.98
28.4...	2.99
24.8...	3.37
21.4...	3.77
15.2...	4.38

ISOTHERMS FOR THE SYSTEM PHENOL, RESORCINOL AND WATER.

Results at 0°.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$C_6H_5(OH)$.	$C_6H_4(OH)_2(m)$.	C_6H_5OH.	$C_6H_4(OH)_2$ (m).
7.23	0.0	40.03	7.45
8.11	1.72	43.12	7.50
9.19	2.43	47.88	7.29
10.07	3.11	50.67	7.03
13.62	4.81	53.98	6.73
19.41	5.98	56.72	6.12
24.12	6.57	59.12	5.60
27.65	6.74	62.67	4.68
32.98	7.16	66.78	3.37
36.23	7.33	70.50	2.01
40.91	7.36	72.57	1.22
45.03	7.42	75.42	0.0

Results at 10°.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
C_6H_5OH.	$C_6H_4(OH_2)$ (m).	C_6H_5OH.	$C_6H_4(OH)_2$ (m).
7.40	0.0	43.30	6.59
8.44	1.71	44.39	6.58
9.75	2.41	45.23	6.49
10.95	3.07	48.54	6.24
13.71	4.19	50.66	6.19
15.75	4.69	54.15	5.62
23.19	5.69	61.37	4.09
28.71	6.17	64.33	3.26
31.04	6.37	67.86	2.09
32.81	6.42	70.64	1.14
38.31	6.59	72.36	0.30
45.04	6.59	73.34	0.0

The preceeding results by Leone and Angelescu are presented in part by Angelescu, 1928a, in connection

EQUILIBRIUM IN THE SYSTEM PHENOL, SALICYLIC ACID AND WATER.

(Bailey, 1925.)

The synthetic method was employed. Varying amounts of salicylic acid were added to known mixtures of phenol and water and placed in sealed tubes. The temperature of *sudden thickening* was determined. This point was considered as a more accurate indication of the saturation temperature than the mean between the temperature of clouding and clearing. This was found especially true at the higher temperatures. No compounds or mixed crystals were found at any temperature.

THE BINARY AND TERNARY EQUILIBRIUM END POINTS ARE AS FOLLOWS:

t°.	Gms. per 100 gms. of mixture. C_6H_5OH.	$C_6H_4OH.COOH(o)$.	H_2O.	Solid Phase.
−0.07..	0.0	0.103	99.9	$C_6H_4OH.COOH(o)+H_2O$ (Eutectic)
−1.2...	6.5	0.00	93.5	$C_6H_5OH + H_2O$ »
38.16..	95.0	5.0	0.0	$C_6H_4OH.COOH(o)+C_6H_5OH$ »
1.7...	7.6	0.0	92.4	C_6H_5OH + 2 liquid layers
1.7...	75.0	0.0	25.0	» + 2 » »
65.3...	36.5	0.0	63.5	Critical solution temperature for phenol + water
87.0...	0.0	30.0	70.0*	» » » » salicylic ac. + »
−1.3...	6.5	0.2	93.3	$C_6H_4OH.COOH(o)+C_6H_5OH+H_2O$ (Eutectic
61.2...	20.4	7.6	72.0	Point where two binodal surfaces touch
63.4...	21.7	12.7	65.6	$C_6H_4OH.COOH(o)$ + liquid layers
−0.6...	6.6	0.2	93.2	$C_6H_4OH.COOH(o)+C_6H_4OH$ + two liquid layers
−0.6...	69.6	4.2	25.9	

* Indicates unstable equilibrium.

RESULTS FOR THE ISOTHERM AT 25°:

The mixtures were stirred in a thermostat and equilibrium approached from above and from below

d_{25}^{25} of sat. sol.	Gms. per 100 gms. sat. sol. C_6H_5OH.	C_6H_4OH $COOH(o)$.	Solid Phase.	d_{25}^{25} of sat. sol.	Gms. per 100 gms. sat. sol. C_6H_5OH.	C_6H_4OH $COOH(o)$.	Solid Phase
1.0008	0.0	0.22	$C_6H_4OH.COOH(o)$	1.0470	70.19	0.0	$L_1 + L_2$
1.0032	2.42	0.28	»	1.0070	8.43	0.0	
1.0057	5.05	0.40	»	1.050	69.28	0.51	$L_1 + L_2$
1.0080	7.51	0.53	» + L_1+L_2	1.0072	8.35	0.04	
1.0064	59.07	8.77		1.0529	67.41	1.81	$L_1 + L_2$
1.0700	62.66	8.96	$C_6H_4OH.COOH(o)$	1.0074	8.23	0.13	
1.0761	83.00	6.32	»	1.0544	65.79	3.12	$L_1 + L_2$
1.0785	90.74	4.60	» + C_6H_5OH	1.0075	8.14	0.21	
1.0793	93.10	2.49	C_6H_5OH	1.0610	60.8	7.56	$L_1 + L_2$
1.0803	95.70	0.0	»	1.0078	7.66	0.46	

L_1 = liquid layer rich in phenol (low in salicylic acid)
L_2 = » » » » water (» » » »).

Results similar to the above are given for 30°, 44°, 58°, 61°, 63° and 68°.8.

FREEZING-POINTS OF MIXTURES OF PHENOL AND SALICYLIC ACID

(Bailey, 1925.)

t° of f. pt.	Gms. C_6H_5OH per 100 gms. mixture.	t° of f. pt.	Gms. C_6H_5OH per 100 gms. mixture.	t° of f. pt.	Gms. C_6H_5OH per 100 gms. mixtur
40.8.......	100.0	45.9.......	92.62	128.7........	40.0
39.95......	92.36	55.6.......	89.91	147.2........	18.2
39.12......	96.83	65.6.......	85.8	157.0.......	5.1
38.47.. ...	95.61	89.2......	72.5	160.4......	0.0
38.16 (Eutec.).	95.0	113.5.......	54.0		

EQUILIBRIUM IN THE SYSTEM PHENOL, SALICYLIC ACID AND WATER

(Bailey, 1925.)

The following data for the binodal curves were obtained by the synthetic method. The author determined for each mixture the temperature of the beginning of critical opalescence (C. op.) and the critical solution temperature (C.S.T.). S = gms. $C_6H_4OH.COOH$ (o) per 100 gms. sat. solutior.

RESULTS FOR AQUEOUS PHENOL OF :

9.2 % C_6H_5OH.

C. S. T.	C. op.	S.
32.9	32.9	0.0
58.0	58.0	5.8*
61.0	61.0	6.8*
63.0	63.0	7.7*
68.8	69.5	11.7*
79.0	83.5	35.4*
79.0	79.5	45.5*
68.8	68.8	58.5*
58.0	58.0	65.4*

14.6 % C_6H_5OH

C. S. T.	C. op.	S.
56.6	56.8	0.0
58.0	59.0	3.5
61.0	62.0	5.9
61.0	62.5	6.5
61.0	63.0	7.2*
63.0	65.0	9.0*
68.8	71.0	15.8*
68.8	69.0	53.4*
58.0	58.0	61.3*

17.0 % C_6H_5OH

C. S. T.	C. op.	S.
59.7	60.0	0.0
61.0	64.0	6.5
63.0	65.0	8.8
68.8	73.0	21.5*
68.0	69.0	49.5*
63.0	63.0	57.0*
58.0	58.0	58.0*

20.6 % C_6H_5OH.

C. S. T.	C. op.	S
62.0	63.2	0.0
61.0	63.5	5.2
61.0	64.0	5.6
63.0	68.0	10.8
68.8	72.2	28.0*
68.8	68.8	45.3*
63.0	63.0	53.3*
58.0	58.0	54.7*

23.0 % C_6H_5OH.

C. S. T.	C. op.	S.
63.4	65.8	0.0
63.0	65.0	1.3
63.0	71.5	12.6
63.0	63.0	45.6*
58.0	58.0	49.3*

29.3 % C_6H_5OH

C. S. T.	C. op.	S.
64.6	67.0	0.0
63.0	66.0	2.2
61.0	69.0	8.3
61.0	70.0	11.9
63.5	73.0	21.0
61.0	61.0	39.2*
58.0	58.0	42.4*

34.9 % C_6H_5OH.

C. S. T.	C. op.	S.
65.3	67.3	0.0
63.0	68.0	2.3
61.0	64.5	8.1
61.0	62.0	16.0
61.0	61.0	22.5*
58.0	58.0	32.6*

41.7 % C_6H_5OH

C. S. T.	C. op.	S.
65.0	68.3	0.0
63.0	66.0	2.3
6.01	64.0	4.8
58.0	58.0	13.3

50.8 % C_6H_5OH.

C. S. T.	C. op.	S.
62.2	64.4	0.0
61.0	63.0	1.6
58.0	59.0	4.1

* estable points.

SOLUBILITY OF PHENOL IN LIQUID PARAFFIN.

A series of mixtures of phenol and liquid paraffin were prepared by rubbing and warming They were then kept at 15° for 24 hours. A small amount of phenol separated from the mixture containing 2.0 per cent C_6H_5OH but none from that containing 1.0 per cent. The solubility of phenol in liquid paraffin was, therefore, considered to be between 1 and 2 per cent at 15°.

(Gofman-Nicoresti, 1922.)

EQUILIBRIUM IN THE SYSTEM PHENOL, THYMOL AND WATER.

(Wilcox and Bailey, 1929.)

The synthetic method was used and from the curves plotted from the results the values for the following isotherms were obtained.

t°	Gms. per 100 gms. homogeneous mixture		t°	Gms. per 100 gms. homogeneous mixture		t°	Gms. per 100 gms. homogeneous mixture	
	C_6H_5OH	$C_{10}H_{13}OH$		C_6H_5OH	$C_{10}H_{13}OH$		C_6H_5OH	$C_{10}H_{13}OH$
15	73.1	0.0	65	49.2	0.8	200	0.0	10.0
"	70.0	1.0	"	50.2	0.5	"	4.8	4.0
"	71.0	2.0	"	59.2	3.3	"	18.0	9.1
"	70.2	9.5	"	61.0	6.0	"	26.1	18.2
"	15.9	80.3	"	59.5	18.5	"	8.1	75.8
"	2.3	94.0	"	41.0	47.0	"	1.0	87.0
"	0.6	95.2	"	34.5	55.0	"	0.0	75.1
"	0.0	95.6	"	19.4	73.1	250	0.0	71.5
65	0.0	0.1	"	2.4	93.0	"	6.7	67.3
"	10.9	0.1	"	0.5	94.5	"	14.5	55.0
"	19.8	0.1	"	0.0	95.0	"	19.3	40.0
"	32.2	0.0				"	15.9	20.1
"	42.0	0.0				"	4.9	8.9
						"	0.0	19.0

DISTRIBUTION OF PHENOL BETWEEN WATER AND BENZENE AND BETWEEN AQUEOUS K_2SO_4 SOLUTIONS AND BENZENE AT 25°.

(Rothmund and Wilsmore — Z. physik. Ch. 40, 623, '02)

NOTE. — The original results, which are given in terms of gram mols. per liter, were calculated to grams per liter, and plotted on cross-section paper. The following figures were read from the curves obtained.

Between H_2O and C_6H_6.		Effect of K_2SO_4 upon the Distribution.				
Grams C_6H_5OH per Liter of:		Gms. K_2SO_4 per Liter Aq. Solution.	(1) Gms. C_6H_5OH per Liter of:		(2) Gms. C_6H_5OH per Liter of:	
H_2O Layer.	C_6H_6 Layer.		Aq. Layer.	C_6H_6 Layer.	Aq. Layer.	C_6H_6 Layer.
5	10	1.36	17.08	59.96	9.52	26.28
10	28	2.72	16.92	60.63	9.50	26.38
15	52	5.44	16.85	60.92	9.46	26.55
20	84	10.89	16.44	62.73	9.35	27.06
25	128	21.79	15.89	65.19	9.09	28.27
30	200	43.59	14.85	69.71	8.68	30.21
35	300	87.18	12.92	78.00	7.79	34.38
40	410					
45	520					
50	610					

(1) First series.

(2) Second series.

DISTRIBUTION OF PHENOL BETWEEN WATER AND CARBON TETRA CHLORIDE AT 20°.

(Vaubel — J. pr. Ch. [2] 67, 476, '03.)

Gms. Phenol Used.	Volumes of Solvents.	Grams Phenol In: H₂O Layer.	Grams Phenol In: CCl_4 Layer.
1	50 cc. H_2O + 10 cc. CCl_4	0.8605	0.1285
1	" + 20 cc. "	0.7990	0.1900
1	" + 30 cc. "	0.7275	0.2615
1	" + 50 cc. "	0.6435	0.3455
1	" + 100 cc. "	0.4680	0.5210
1	" + 150 cc. "	0.3645	0.6245
1	" + 200 cc. "	0.3240	0.6650

DISTRIBUTION OF PHENOL BETWEEN WATER AND ORGANIC SOLVENTS AT 25°.

(Herz and Rathmann, 1913.)

Results for:

H_2O and Chloroform.

Mols. C_6H_5OH per Liter. H_2O Layer.	Mols. C_6H_5OH per Liter. $CHCl_3$ Layer.
0.0737	0.254
0.163	0.761
0.211	1.27
0.330	3.36
0.436	5.43

H_2O and Carbon Tetrachloride.

Mols. C_6H_5OH per Liter. H_2O Layer.	Mols. C_6H_5OH per Liter. CCl_4 Layer.
0.0605	0.0247
0.140	0.072
0.213	0.141
0.355	0.392
0.489	1.47
0.525	2.49

H_2O and Tetrachlor Ethane.

Mols. C_6H_5OH per Liter. H_2O Layer.	Mols. C_6H_5OH per Liter. $C_2H_2Cl_4$ Layer.
0.023	0.061
0.0345	0.094
0.081	0.265
0.114	0.406
0.151	0.617
0.155	0.651

H_2O and Pentachlor Ethane.

Mols. C_6H_5OH per Liter. H_2O Layer.	Mols. C_6H_5OH per Liter. C_2HCl_5 Layer.
0.0420	0.0495
0.0866	0.110
0.150	0.226
0.222	0.432
0.280	0.708
0.333	1.170

H_2O and Trichlor Ethylene.

Mols. C_6H_5OH per Liter. H_2O Layer.	Mols. C_6H_5OH per Liter. $CHCl:CCl_2$ Layer.
0.044	0.046
0.101	0.107
0.180	0.236
0.236	0.388
0.277	0.555
0.339	0.986

H_2O and Tetrachlor Ethylene.

Mols. C_6H_5OH per Liter. H_2O Layer.	Mols. C_6H_5OH per Liter. $CCl_2:CCl_2$ Layer.
0.0653	0.0277
0.143	0.0650
0.327	0.198
0.421	0.411
0.490	0.684

DISTRIBUTION OF PHENOL AT 25° BETWEEN:

(Herz and Fischer — Ber. 38, 1143, '05.)

Water and Toluene.

Millimols C_6H_5OH per 10 cc. $C_6H_5CH_3$ Layer.	Millimols C_6H_5OH per 10 cc. H_2O Layer.	Grams C_6H_5OH per 100 cc. $C_6H_5CH_3$ Layer.	Grams C_6H_5OH per 100 cc. H_2O Layer.
1.244	0.724	1.169	0.681
3.047	1.469	2.865	1.381
4.667	2.200	4.389	2.068
6.446	2.861	6.061	2.691
14.960	4.750	14.07	4.467
17.725	5.346	16.69	5.027
47.003	7.706	44.20	7.246
53.783	8.087	50.58	7.604
90.287	9.651	84.89	9.074

Water and *m* Xylene.

Millimols C_6H_5OH per 10 cc. $mC_6H_4(CH_3)_2$ Layer.	Millimols C_6H_5OH per 10 cc. H_2O Layer.	Grams C_6H_5OH per 100 cc. $mC_6H_4(CH_3)_2$ Layer.	Grams C_6H_5OH per 100 cc. H_2O Layer.
1.610	1.071	1.514	1.007
4.787	2.726	4.501	2.563
12.210	5.168	11.22	4.860
22.718	6.994	21.36	6.577
34.827	8.124	32.75	7.640
51.352	9.123	48.28	8.578
77.703	10.050	73.07	9.450

DISTRIBUTION OF PHENOL BETWEEN:

AMYL ALCOHOL AND WATER AT 25°.

(Herz and Fischer — Ber. 37, 4747, '04.)

Millimols Phenol per 10 cc.		Gms. Phenol per 100 cc.	
Alcoholic Layer.	Aqueous Layer.	Alcoholic Layer.	Aqueous Layer.
0.75	0.047	0.705	0.0441
0.9	0.05	0.846	0.047
1.1	0.07	1.035	0.066
2.6	0.16	2.445	0.150
54.1	3.83	50.88	3.601
56.3	3.9	52.93	3.667

BENZENE AND WATER AT 20°.

(Vaubel — J. pr. Ch. [2] 67, 476, '03.)

Volumes of Solvents used per 1 Gm. Phenol	Gms. Phenol in:	
	H_2O Layer.	C_6H_6 Layer
50 cc. H_2O + 50 cc. C_6H_6	0.286	0.714
" + 100 cc. "	0.1188	0.8212
" + 150 cc. "	0.0893	0.9107
" + 200 cc. "	0.0893	0.9107

DISTRIBUTION OF PHENOL BETWEEN WATER AND BENZENE AT 20°.

(Philip and Bramley, 1915.)

Gms. Phenol per Liter.		Ratio $\frac{b}{a}$.
Aq. Layer, a.	C_6H_6 Layer, b.	
0.945	2.073	2.194
0.888	1.944	2.189
0.711	1.553	2.184
0.594	1.293	2.176
0.475	1 036	2.181
0.356	0.7736	2.173
0.238	0.5177	2.175
0.119	0.2594	2.180
0.0601	0.1314	2.189

Results are also given for the effect of NaCl, KCl and of LiCl upon the above distribution.

DISTRIBUTION OF PHENOL BETWEEN WATER AND BENZENE AT 25°.

(Philip and Clark, 1925.)

Gms. Mols. C_6H_5OH per liter		$\frac{1}{2}$
H_2O layer(1)	C_6H_6 layer(2)	
0.00202	0.00466	0.433
0.00565	0.01324	0.427
0.00797	0.01859	0.429
0.01094	0.02528	0.433
0.01440	0.03428	0.420
0.01829	0.04370	0.419
0.03105	0.07485	0.415
0.05306	0.1329	0.399
0.1029	0.2913	0.353
0.2531	1.198	0.211

DISTRIBUTION OF PHENOL BETWEEN WATER AND COLLODION.

(Northrup, 1929.)

Gm. Mol. C_6H_5OH per liter		$\frac{2}{1}$
H_2O layer(1)	Collodion(2)	
0.025	0.071	(2.8)
0.05	0.20	(4.0)
0.28	0.10	2.8
0.57	0.20	2.8

PHENOL

DISTRIBUTION OF PHENOL BETWEEN BENZENE AND AQUEOUS SOLUTIONS OF SILVER NITRATE AT 25°.

(Endo, 1927.)

Gm. Mol. $AgNO_3$ per liter aq. layer	Gm. Mol. C_6H_5OH per liter		Gm. Mol. $AgNO_3$ per liter aq. layer	Gm. Mol. C_6H_5OH per liter	
	Aq. layer	C_6H_6 layer		Aq. layer	C_6H_6 layer
0.25	0.0564	0.1079	1.0	0.0829	0.0813
"	0.1174	0.2111	"	0.1588	0.1697
"	0.1866	0.4189	"	0.3197	0.3862
"	0.2303	0.6429	"	0.4190	0.5665
"	0.3092	0.9561	"	0.5966	1.1136
0.50	0.0680	0.0963	2.0	0.0988	0.0615
"	0.1303	0.1982	"	0.2056	0.1229
"	0.2181	0.3905	"	0.4129	0.2836
"	0.3139	0.6716	"	0.6965	0.5688
"	0.3637	0.9177	"	0.8517	0.8213

DISTRIBUTION OF PHENOL BETWEEN BENZENE AND AQUEOUS 0.3 NORMAL SALT SOLUTIONS AT 25°.

(Herz and Stanner, 1927.)

Aq. 3.0 n Solutions of:	Gm. Mol. C_6H_5OH per liter		$\frac{2}{1}$	Aq. 3.0 n Solutions of:	Gm. Mol. C_6H_5OH per liter		$\frac{2}{1}$
	Aq. layer(1)	C_6H_6 layer(2)			Aq. layer(1)	C_6H_6 layer(2)	
H_2O alone	0.0400	0.0895	2.24	KBr	0.0230	0.1203	5.23
"	0.0588	0.1331	2.26	"	0.0334	0.1700	5.09
"	0.0718	0.1668	2.32	"	0.0448	0.2255	5.03
"	0.1183	0.2731	2.31	"	0.0571	0.3010	5.27
LiCl	0.0204	0.1250	6.13	K_2SO_4(1)	0.0306	0.1062	3.47
"	0.0313	0.1883	6.02	"	0.0468	0.1620	3.46
"	0.0403	0.2500	6.20	"	0.0634	0.2265	3.57
"	0.0512	0.3093	6.04	"	0.0796	0.2870	3.61
NaCl	0.0177	0.1203	6.80	$MgCl_2$	0.0188	0.1152	6.13
"	0.0266	0.1789	6.73	"	0.0296	0.1800	6.08
"	0.0350	0.2503	7.15	"	0.0399	0.2487	6.23
"	0.0440	0.3158	7.18	$CaCl_2$	0.0188	0.1196	6.36
NaBr	0.0181	0.1133	6.26	"	0.0296	0.1829	6.18
"	0.0280	0.1769	6.32	"	0.0384	0.2389	6.22
"	0.0379	0.2443	6.45	"	0.0526	0.3324	6.32
"	0.0483	0.3049	6.31	$SrCl_2$	0.0188	0.1199	6.38
Na_2SO_4(1)	0.0291	0.1180	4.05	"	0.0281	0.1796	6.39
"	0.0414	0.1689	4.08	"	0.0379	0.2491	6.57
"	0.0590	0.2255	3.82	"	0.0468	0.3147	6.72
"	0.0792	0.2958	3.93	$BaCl_2$	0.0188	0.1229	6.54
KCl	0.0191	0.1084	5.67	"	0.0287	0.1791	6.24
"	0.0309	0.1779	5.76	"	0.0375	0.2520	6.72
"	0.0409	0.2364	5.78	"	0.0468	0.3197	6.83
"	0.0518	0.3014	5.82				

(1) The concentration was 0.5 equivalent normal instead of 3.0 normal.

RECIPROCAL SOLUBILITY OF CAMPHOR AND PHENOL, DETERMINED BY THE FREEZING-POINT METHOD.

(Wood and Scott, 1910.)

(The freezing-point was determined in most cases by measuring the rate of cooling of the mixtures and ascertaining the point at which the rate changed. The experiments were made with very great care.)

t° of Freezing.	Gms. Camphor per 100 Gms. Mixture.	Solid Phase.	t° of Freezing.	Gms. Camphor per 100 Gms. Mixture.	Solid Phase.	t° of Freezing.	Gms. Camphor per 100 Gms. Mixture.	Solid Phase.
174.5	100.0	$C_{10}H_{16}O$	−13.8	71.48	$C_{10}H_{16}O$	−22.6	52.52	1.1
158	95.98	"	−26.4, −32	70.12	" +1.1	−23.6	44.90	"
140	92.55	"	−15.9	69.32	1.1	−28−30.5	40.35	" $+C_6H_5OH$
112	88.86	"	−20.1	67.76	"	−15.7	38.57	C_6H_5OH
80	82.88	"	−19.3	66.64	"	−3	34.50	"
50.7	79.73	"	−18.7	62.21	"	+5	30.31	"
29.5	76.58	"	−18.6 m. pt.	...	"	16.1	25.40	"
−0.1	73.37	"	−20.1	61.51	"	25	20.31	"
−13.5	72.24	"	−20	55.80	"	36.1	6.87	"

1.1 = $C_{10}H_{16}O.C_6H_5OH$.

Data for the above system obtained by the method of determination of the temperature of disappearance of the last crystal, are given by Kremann, Wischo and Paul (1915). The results are not in good agreement with the above. These authors also give similar determinations for the systems camphor + resorcinol and camphor + β naphthol.

Data for the systems camphor + phenol + water, camphor + *n* butyric acid + water, camphor + succinic acid nitrile + water and camphor + triethylamine + water are given by Timmermans, 1907.

SOLUBILITY OF PHENOL IN BENZENE AND IN PARAFFIN.

(Schweissinger, 1884–85.)

Solvent.	Gms. C_6H_5OH per 100 Gms. Solvent at: 16°.	21°.	25°.	43°.
Paraffin	1.66	...	...	5
Benzene	2.5	8.33	10	100

Data for equilibrium in systems composed of phenol, water and each of the following compounds are given by Timmermans (1907): NaCl, KCl, KBr, KNO_3, K_2SO_4, $MgSO_4$, tartaric acid, salicylic acid, succinic acid and sodium oleate,

The critical solution temperature of mixtures of phenol and iso amyl butyrate is about 7°. (Lecat, 1927.)

100 gms. sat. solution of phenol in liquid sulfur dioxide contain 28 gms. C_6H_5OH at t°(?). (De Carli, 1927.)

$C_6H_6O_1$

Freezing-points of mixtures of Phenol and:

Acetamide(5)(29)(55)
Acetanilide(3)
Acetone(41)(60)
Aceto phenone(33)
Acetic acid(41)
Amido phenols(38)
Aniline(8)
Antipyrine(32)
Benzamide(29)
Benzaldehyde(54a)
Benzoic acid(43)
Benzo hydrol(25)(54a)
Benzo phenone(36)
Benzoyl chloride(58)
Benzylamine(49)
Bromo toluene(47)
Camphor(13)(56)
Chloro acetic acid(40)(24)(41)
Chloro acetic acid + naphthalene(40)
Cineole(6)
Cinnamic acid(37)
Cresols(10)(11)(12)
Cyclohexanol(45)
Di ethyl di acetyl tartartrate( )
Di methyl aniline(2)(22)
Di methyl methane(47)
Di methyl oxalate(47)
Di methyl pyrone(17)
Di methyl ureas(23)
Di phenyl amine(46)
Di phenyl methane(47)
Di phenyl methyl amine(2)
Erythritol(51)
Ethyl alcohol + acetamide(29)(35)
Ethylene bromide(9)(47)
Ethylene diamine(50)
Fenchon(26)
Methyl urea(23)
Naphthalene(4)(15)(59)(25)(40)(44)
Naphthol(44)
Nitraniline(34)
Nitro benzene(9)
Nitro benzene + Quinone(35)
Nitroso di methyl aniline(4)(21)(25)
Oxybenzaldehyde(27)
Phenylene diamines(28)
Phenyl hydrazine(7)
Picric acid(21)(46)(53)
Pyridine(2)(15)
Quinone(35)
Quinone + nitrobenzene(35)
Quinoline(2)
Resorcinol(18)
Salicylic acid(1)
Salicylicaldehyde(36)
Styphnic acid(16)
Succinic acid(37)
Succinimide(26)
Sulfuric acid(19)
Thymol(14)(47)(57)
Toluidines(20)(22)(46)(48)
Tri chloro acetic acid(24)
Tri phenyl carbinol(30)
Tri phenyl methane(31)
Urea(52)(53)(34)(46)
" + Urethan(14)
Urethan(45)
Xylene(47)
Xylidines(22)(42)
Naphthylamine(22)(46)

(1) Baily, 1925; (2) Bramley, 1916; (3) Angelleti, 1928; (4) Bernoulli and Veillon, 1932; (5) Boon, 1939; (6) Belluci and Grassi, 1913; (7) Cuisa and Bernardi, 1910; (8) Deffet, 1938; (9) Dahms, 1895; (10) Dawson and Mountford, 1918; (11) Fox and Barker, 1918; (12) Fischer and Gröppel, 1917; (13) Günther and Peiser, 1927; (14) Hrynakowski and Szmyt, 1935(a); (15) Hatcher and Skirrow, 1917; (16) Jefremow, 1914; (17) Kendall, 1914a; (18) Jaeger, 1907; (19) Kendall and Carpenter, 1914; (20) Kitran, 1924; (21) Kremann, 1904; (22) Kremann, 1906; (23) Kremann, 1910; (24) Kendall, 1916; (25) Kremann and Drazil, 1924; (26) Kremann and Dietrich, 1923; (27) Kremann and Pogantsch, 1923; (28) Kremann and Petritschek, 1917; (29) Kremann and Wenzig, 1917; (30) Kremann and Wlk, 1919; (31) Kremann, Odelga and Zawodsky, 1921; (32) Kremann and Haas, 1919; (33) Kremann and Markl(1920) (34) Kremann and Rodinis; 1906; (35) Kremann, Sutter, Sitte, Strzelba and Dobolzky, 1922; (36) Kremann and Zechner, 1918; 1925; (37) Kremann, Zechner and Drazil, 1921; (38) Kremann, Lupfer and Zawodsky, 1920; (40) Mameli and Mannessier-Mameli,1933; (41) Mameli and Cocconi, 1923; (42) Morgan and Pettet, 1935; (43) Moermann, 1933; (44) Migliacci and Garguilo, 1927; (45) Mascarelli and Pestalozza, 1908, 1909; (46) Philip, 1903; (47) Paterno and Ampola,; (48) Puschin, 1926b; (49) Puschin and Rikovski, 1937; (50) Puschin and Sladovick, 1928(a); (51) Puschin and Dezelic, 1932; (52) Puschin and König, 1928; (53) Rheinboldt, Henning and Kirscheisen, 1925; (54) Schmidlin and Lang, 1910; (54a) Schmidlin and Lang, 1912; (55) Speyers, 1902; (56) Wood and Scott, 1910; (57) Wilcox and Bailey, 1929; (58) Tsakalotos and Guye, 1910; (59) Yamamoto, 1908; (60) Waddell, 1889.

NITROSO ANILINE p $NOC_6H_4NH_2$.

Freezing-point data for mixture of p nitroso aniline and p nitraniline are given by Jaeger and van Kregten, 1912.

PYROCATECHOL o $C_6H_4(OH)_2$.

SOLUBILITY OF PYROCATECHOL IN WATER AND IN OTHER SOLVENTS.

(Walker, Collett and Lazell, 1931.)

The determinations were made by the synthetic method. In order to prevent oxidation the air in the sealed bulbs was replaced by hydrogen. The determinations were plotted and the following values obtained from the curves.

t°	Gm. Mols. o $C_6H_4(OH)_2$ per 100 gm. mols. sat. solution in:						
	Water	Ethyl Alcohol	Ethyl Ether	Acetone	Carbon Tetrachloride	Chloroform	Benzene
20	6.88	36.40	—	50.08	0.10	2.10	0.60
30	14.10	39.80	—	52.20	0.35	2.70	1.15
40	21.95	43.95	46.95	54.48	0.60	3.30	1.80
50	30.78	48.92	51.10	57.58	0.95	4.32	3.02
60	40.25	54.37	55.86	61.55	1.18	7.38	5.35
70	51.65	60.38	61.55	66.42	1.75	14.70	10.60
80	64.69	68.20	68.50	77.65	3.15	39.20	29.55
90	78.70	80.09	77.85	80.35	15.80	67.18	64.30
100	93.20	93.55	92.40	93.00	89.42	89.45	90.32
104.5	100.00	100.00	100.00	100.00	100.00	100.00	100.00

PYROCATECHOL *o* $C_6H_4(OH)_2$.

100 gms. H_2O dissolve 45.1 gms. $C_6H_4(OH)_2$ at 20°. (Vaubel, 1899.)
100 gms. pyridine dissolve an unlimited amount of $C_6H_4(OH)_2$ at 20°. (Dehn, 1917.)
100 gms. aq. 50% pyridine dissolve 101 + gms. of $C_6H_4(OH)_2$ at 20–25°. "

SOLUBILITY OF PYROCATECHOL IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.

(Knox and Richards, 1919.)

Normality HCl.	Normality $C_6H_4(OH)_2$.	Normality HCl.	Normality $C_6H_4(OH)_2$.
0.0	4.19	7.30	0.62
1.68	2.13	9.11	0.55
3.53	1.18	10.83	0.55
5.39	0.81		

PYROCATECHOL Arsenic Acid $[O:As(O.C_6H_4O)_3]H_3 + 4H_2O$.

100 gms. sat. solution in water contain 42.4 gms. of the compound at ord. temps.
» » » » alcohol » 82.7 » » » » »
(Weinland and Heinzler, 1920.)

Freezing-points of mixtures of Pyrocatechol and:

Acetamide(22)
Acetone(36)
Acetophenone(17)
Amino phenols(6)
Aniline(27)
Antipyrine(18)
" + Hydroquinone(4)(5)
" + Resorcinol(4)(11)
Azo benzene(28)
Benzamide(22)
Benzo hydrol(23)(40)
Benzo phenone(7)(39)
Camphor(12)(6)
Carbazole(15)
Cineole(2)
Cinnamic acid(26)
Cinnamic aldehyde(30)
Di methyl oxalate(20)
Di phenyl amine(14)
Di phenyl methane(20)
Ethylene diamine(33)
Fenchon(23)
Hydroquinone(37)
" + antipyrine(4)(5)
Naphthalene(19)(35)
Naphthylamine(34)
Nitro naphthalene(37)
Oxy benzaldehyde(29)
Phenanthrene(1)
Phenyl tetra methyl tetra hydro pyran (3)
Phenylene diamine(24)(31)
Picric acid(34)
Quinone(25)
Resorcinol(37)(10)
" + antipyrine(4)
+ hydroquinone(4)
Styphnic acid(9)
Succinic acid(26)
Succinimide(23)
Tetra methyl phthalan(3)
Toluidine(34)
Tri chloro acetic acid(8)
Tri phenyl carbinole(21)
Tri phenyl methane(13)
Urea(32)(38)
Urethan(32)

(1) Bernoulli and Sarasin, 1930; (2) Bellucci and Grassi, 1913; (3) Bennett and Wain, 1936; (4) Hrynakowski, 1934; (5) Hrynakowski and Adamis, 1937; (6) Jefremow, 1912, 1913; (7) Freundlich and Posnjak, 1912; (8) Kitran, 1924; (9) Jefremow, 1934; (10) Jaeger, 1907; (11) Jaeger, 1905; (12) Kremann and Odelga, 1921; (13) Kremann, Odelga and Zawodsky, 1921; (14) Kremann and Schadinger, 1919; (15) Kremann and Slovak, 1920; (16) Kremann, Lupfer and Zawodsky, 1920; (17) Kremann and Marktl, 1920; (18) Kremann and Haas, 1909; (19) Kremann and Janetzky, 1912; (20) Kremann and Fritsch, 1920; (21) Kremann and Wlk, 1919; (22) Kremann and Auer, 1918; (23) Kremann and Dietrich, 1923; (24) Kremann and Strohschneider, 1918; (25) Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922; (26) Kremann, Zechner and Drazil, 1924; (27) Kremann, 1906; (28) Kremann Zechner and Weber, 1924; (29) Kremann and Pogantsch, 1923; (30) Kremann, Hönigsberg and Mauermann, 1923; (31) Naegli and Kaltman, 1913; (32) Puschin and Rikovsky, 1932; (33) Puschin and Sladovick, 1928a; (34) Philip and Smith, 1905; (35) Rheinboldt, Henning and Kirscheisen, 1925; (36) Schmidlin and Lang, 1910; (37) Senden, 1923; (38) Van der Hammen, 1931; (39) Kremann and Zechner, 1918; (40) Kremann and Drazil, 1924.

RESORCINOL $C_6H_4(OH)_2$ 1, 3.

SOLUBILITY OF RESORCINOL IN WATER.

(Loskit, 1928.)

The determinations were made by the synthetic and also by the freezing-point method. The author's results were plotted and the following values taken from the average curve.

t°	Gms. $C_6H_4(OH)_2$ per 100 gms. sat. sol.	Solid Phase	t°	Gms. $C_6H_4(OH)_2$ per 100 gms. sat. sol.	Solid Phase
-0.1	6.4	Ice	20	58.5 (58.3)	$C_6H_4(OH)_2$
-0.2	16.0	"	25	62.5	"
-0.3	22.0	"	30	66.0 (66.2)	"
-0.4	27.5	"	40	72.7 (72.7)	"
-0.5(Eutec.)	34.0	" + $C_6H_4(OH)_2$	50	78.3	"
-0.6(Unstable)	40.0	"	60	83.5 (83.3)	"
0.0	40	$C_6H_4(OH)_2$	70	87.7	"
10.0	50	"	80	91.5 (91.2)	"
			90	94.5	"

SOLUBILITY OF RESORCINOL IN WATER AND IN ETHYL ALCOHOL. (Speyers, 1902.)

Results for Water.

t°.	d of sat. sol.	Gms. $C_6H_4(OH)_2$ (m) per 100 gms. H_2O.
0	1.101	66.2
10	1.118	93.5
20	1.134	123
25	1.142	143
30	1.148	166
40	1.157	225
50	1.165	300
60	1.172	390
70	1.176	495
80	1.179	634

Results for Alcohol.

t°.	d of sat. sol.	Gms. $C_6H_4(OH)_2$(m) per 100 gms. H_2O.
0	1.033	125
10	1.036	141
20	1.041	155
25	1.045	162
30	1.048	170
40	1.056	186
50	1.065	206
60	1.075	235
70	1.087	300
73	1.092	330

SOLUBILITY OF RESORCINOL IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Saturation was obtained by constant shaking in a thermostat for several days.

Equiv. Normality.		Equiv. Normality.		Equiv. Normality.	
HCl.	$C_6H_4(OH)_2$.	HCl.	$C_6H_4(OH)_2$.	HCl.	$C_6H_4(OH)_2$.
0.0	6.515	4.402	2.307	9.610	1.118
0.656	5.705	6.076	1.616	11.31	1.389
1.671	4.570	7.567	1.287		
3.410	3.020	9.157	1.125		

According to Vaubel (1895), 100 gms. H_2O dissolve 175.5 gms. $C_6H_4(OH)_2$, or 100 gms. sat. solution contain 63.7 gms. at 20°. Sp. Gr. of sol. = 1.1335.

SOLUBILITY OF RESORCINOL IN ALCOHOLS AND IN ACIDS.

(Timofeiew, 1894.)

Solvent.	t°.	Gms. $C_6H_4(OH)_2$ m per 100 Gms. Sat. Sol.	Solvent.	t°.	Gms. $C_6H_4(OH)_2$ m per 100 Gms. Sat. Sol.
Methyl Alcohol	11.6	69	Formic Acid	15	29.2
Ethyl "	10.4	59.2	Acetic "	15	32.5
" "	11.6	61.5	Propionic "	15	22.8
Propyl "	10.4	51.5	Butyric "	15	14.7
" "	11.6	51.6	Isobutyric "	15	9.6
			Valeric "	15	6.5

100 gms. abs. alcohol dissolve about 236 gms. $C_6H_4(OH)_2$ (m) at 20-25°.

100 gms. equi. mol. mixture of alcohol and quinoline dissolve about 99.8 gms. $C_6H_4(OH)_2$ (m) at 20-25°. (Pucher and Dehn, 1921.)

RESORCINOL

SOLUBILITY OF RESORCINOL IN SEVERAL SOLVENTS.

(Walker, Collett and Lazzell, 1931.)

The determinations were made by the synthetic method. In order to prevent oxidation the air in the sealed tubes was replaced by hydrogen. The determinations were plotted and the following values obtained from the curves.

t°	Gm. Mols. m $C_6H_4(OH)_2$ per 100 gm. mols. sat. solution in: Water	Ethyl Alcohol	Acetone	Carbon Tetrachloride	Chloroform	Benzene
20	18.65	39.34	51.55	—	—	(0.15)
30	24.25	41.91	53.94	0.07	0.63	0.40
40	30.44	44.79	56.20	0.17	0.84	0.60
50	37.49	48.40	58.63	0.27	1.06	0.75
60	45.00	53.10	61.38	0.38	1.27	1.00
70	53.45	58.34	65.25	0.47	1.48	1.76
80	63.01	64.69	71.21	0.58	1.70	3.17
90	73.83	74.65	79.60	0.69	5.64	6.40
100	86.09	87.38	89.35	0.80	78.50	79.80
109.4	100.00	100.00	100.00	100.00	100.00	100.00

SOLUBILITY OF RESORCINOL IN ACETIC ACID IN NITROBENZENE AND IN URETHAN.

(Mortimer, 1923.)

	In Acetic Acid.		In Nitrobenzene.		In Urethan.	
t°.	Mols. $C_6H_4(OH)_2$ per 100 mols. sat. sol.	Gms. $C_6H_4(OH)_2$ per 100 gms. CH_3COOH.	Mols. $C_6H_4(OH)_2$ per 100 mols. sat. sol.	Gms. $C_6H_4(OH)_2$ per 100 gms. $C_6H_5NO_2$.	Mols. $C_6H_4(OH)_2$ per 100 mols. sat. sol.	Gms. $C_6H_4(OH)_2$ per 100 gms. $NH_2CO_2C_2H_5$.
20.....	17.6	39.13	6.6	6.33		
40.....	27.2	69.45	16.0	17.02	46.8	108.6
60.....	39.4	119.1	32.2	42.45	56.3	159.0
80.....	56.3	236.0	55.3	110.6	68.2	264.7
100.....	81.0	780.9	83.3	445.8	85.5	727.8

SOLUBILITY OF RESORCINOL IN BENZENE.

(Rothmund, 1898.)

t°	Gms. $C_6H_4(OH)_2$ per 100 Gms. Sat. Sol.	t°.	Gms. $C_6H_4(OH)_2$ per 100 Gms. Sat. Sol.
73	3.18	95.5	61.7
77	4.75	96.5	77.64
82	6.94	83.46	98.5
95.5	37.44	90.23	100

Between the concentrations 37.44 and 61.7 at 95.5° two liquid layers are formed. The reciprocal solubilities of these two layers, determined by the synthetic method (see Note, p.292), are as follows:

t°.	Gms. $C_6H_4(OH)_2$ per 100 Gms. C_6H_6 Layer.	$C_6H_4(OH)_2$ Layer.	t°.	Gms. $C_6H_4(OH)_2$ per 100 Gms. C_6H_6 Layer.	$C_6H_4(OH)_2$ Layer.
60	4.8	79.4	90	13	71.3
70	6.6	77.5	100	19.5	65.7
80	9.2	75	105	24.6	60.7
			109.3 crit. temp.	42.4	

Resorcinol mixes with pyridine in all proportions. (Dehn

The critical solution temperature of mixtures of Resorcinol and α Bromo naphthalene is 135.2° and there is 45 percent of resorcinol present. (Lecat, 1929, 1930.)

Freezing-point data are given for mixtures of Resorcinol and:

Anthracene(46)
Acetamide(18)
Acetanilide(2)
" + hydroquinone(48)
" + phenacetin(9)
Acetone(43)
Aceto phenone(24)
Amino phenols(25)
Aniline(28)
Antipyrine(22)(11)(42)
" + pyrocatechol(9)
Azobenzene(36)
Benzamide(18)
Benzo hydrol(19)
Benzoic acid(11)(42)(48)
Benzoin(8)
Benzo phenone(33)(37)(38)(49)
Camphor(7)(16)
Carbazole(29)
Cineole(4)
Cinnamic acid(34)
Cinnamic aldehyde(33)
Cinnamylidene aceto phenone(37)
Di anisal acetone(38)
Di methyl oxalate(34)
Di phenyl amine(20)(30)(11)(46)
Di phenyl amine + Urea (13)
Di phenyl methane(20)
Erythritol(40)
Ethyl oxalate(34)
Fenchon(21)
Hexane + nitrobenzene(45)
Hydroquinone(11)(14)(44)
" + pyrocatechol(9)
Hexane + nitrobenzene(45)
Naphthalene(23)(46)
Naphthol(46)
Naphthylamine(39)(46)(50)
Nitrobenzene + hexane(45
" + quinone(31)
Nitro naphthalene(44)
Oxy benzaldehyde(27)
Phenacetine + acetanilide(9)
Phenacetine + sulfonal(9)
Phenanthrene(5)
Phenylene diamine(32)
Phenyl tetra methyl-tetra hydro pyran(3)
Phenol(14)
Pyrocatechol(44)
Quinone (31)
" + nitrobenzene(31)
Salol(11)
Succinic acid(34)
Succinimide(21)
Sulfonal(10)
" + phenacetine(9)
Styphnic acid(15)
Styrylketone(38)
Tetra methyl p diamino benzo phenone(37)(38)
Tetra methyl phthalan(3)
Toluidine(39)(46)
Tri chloro acetic acid(17)
" phenyl amine(26)
" " carbinole (35)
" " methane(26)
Urea(11)(41)(47)(48)
" + antipyrine(9)
" + di phenyl amine(13)
Urethan(1)(12)
Xylene(6)

(1) Adamanis, 1933; (2) Angeletti, 1928; (3) Bennett and Wain, 1936; (4) Bellucci and Grassi, 1913; (5) Bernouilli and Sarasin, 1930; (6) Campetti, 1917; (7) Caille, 1909; (8) Dischendorfer, 1933; (9) Hrynakowski, 1934; (10) Hrynakowski and Adamanis, 1933(a); (11) Hrynakowski and Adamanis, 1933(b); (12) Hrynakowski and Adamanis, 1933; (14) Jaeger, 1907; (15) Jefremow, 1934; (16) Jefremow, 1912, 1913; (17) Kitran, 1924; (18) Kremann and Auer, 1918; (19) Kremann and Drazil, 1924; (20) Kremann and Fritsch, 1920; (21) Kremann and Dietrich, 1923; (22) Kremann and Haas, 1919; (23) Kremann and Janetzky, 1912; (24) Kremann and Marktl, 1920; (25) Kremann, Lupfer and Zawodsky, 1920; (26) Kremann, Odelga and Zawodsky, 1921; (27) Kremann and Pogantsch, 1923; (28) Kremann and Rodinis, 1906; Kremann and Slovak, 1920; (30) Kremann and Schadinger, 1919; (31) Kremann, Sutter, Sitte, Strzelba and Dobolsky, 1922; (32) Kremann and Strohschneider, 1918; (33) Kremann and Zechner, 1925; (34) Kremann, Zechner and Drazil, 1924; (35) Kremann and Wlk, 1919; (36) Kremann, Zechner and Weber, 1924; (37) Pfeiffer, 1924; (38) Pfeiffer, Goebel and Angern, 1925; (39) Philip and Smith, 1905; (40) Puschin and Dezelic, 1932; (41) Puschin and Konig, 1928; (42) Puschin and Wilowitsch, 1925; (43) Schmidlin and Lang, 1910; (44) Senden, 1923; (45) Timmermans, 1907; (46) Vignon, 1891; (47) Van der Hammen, 1931; (48) Hrynakowski and Szmyt, 1935(b); (49) Freundlich and Posnjak, 1912.(50) Kremann and Csanyi, 1916.

DISTRIBUTION OF RESORCINOL BETWEEN WATER AND ORGANIC SOLVENTS AT ORDINARY TEMPERATURE.

(Vaubel — J. pr. Ch. [2] 67, 478, '03.)

Gms. $C_6H_4(OH)_2$ Used.	Solvents.	Gms. $C_6H_4(OH)$ in H_2O Layer.	Gms. $C_6H_4(OH)$ in Organic Solvent Layer
1.191	60 cc. H_2O + 30 cc. Ether	0.2014	0.9896
1.191	60 cc. H_2O + 60 cc. Ether	0.2475	0.9525
0.800	40 cc. H_2O + 40 cc. Benzene	0.5873	0.2127
0.800	40 cc. H_2O + 80 cc. Benzene	0.5773	0.2227
0.500	50 cc. H_2O + 50 cc. CCl_4	0.4885	0.0115
0.500	50 cc. H_2O + 100 cc. CCl_4	0.4880	0.0120
0.500	50 cc. H_2O + 150 cc. CCl_4	0.4880	0.0120

The coefficient of distribution of resorcinol at 25° between olive oil and water (conc. in oil ÷ conc. in H_2O) is given as 0.04 by Boeseken and Waterman (1911, 1912).

HYDROQUINONE p $C_6H_4(OH)_2$.

SOLUBILITY OF HYDROQUINONE IN WATER AND IN OTHER SOLVENTS.

(Walker, Collett and Lazzell, 1931.)

The determinations were made by the synthetic method. In order to prevent oxidation the air in the sealed bulbs was replaced by hydrogen. The determinations were plotted and the following values obtained from the curves.

t°	Gm. Mols. p $C_6H_4(OH)_2$ per 100 gms. mols. sat. solution in: Water	Ethyl Alcohol	Ethyl Ether	Acetone	Carbon Tetrachloride	Benzene
20	1.16	17.25	—	11.30	—	0.02
30	1.35	19.40	—	15.00	0.01	0.04
40	2.10	21.58	—	18.95	0.07	0.20
50	3.35	23.89	—	23.45	0.14	0.50
60	5.45	26.08	8.39	30.90	0.20	0.62
70	8.42	28.57	12.70	35.22	0.27	0.80
80	12.61	31.16	17.07	37.60	0.33	0.90
90	18.29	34.25	21.66	40.58	0.40	1.00
100	24.50	37.70	26.30	44.30	0.47	1.18
110	31.08	41.83	31.28	48.35	0.54	1.41
120	38.50	47.01	36.85	52.75	0.60	2.00
130	47.30	53.60	43.51	58.18	0.68	3.08
140	57.01	61.75	52.60	64.90	0.95	4.96
150	68.28	71.56	63.63	72.71	1.60	8.10
160	80.74	82.79	76.90	82.30	2.20	72.30
172	100.00	100.00	100.00	100.00	100.00	100.00

100 gms. H_2O dissolve 8.02 gms. p $C_6H_4(OH)_2$ at 25°.
100 gm. mols. H_2O dissolve 1.31 gm. mols. p $C_6H_4(OH)_2$ at 25°.
100 gms. D_2O (heavy water) dissolve 6.11 gms. p $C_6H_4(OD)_2$ at 25°.
100 gm. mols. D_2O dissolve 1.09 gm. mols. p $C_6H_4(OD)_2$ at 25°.

(Korman and LaMer, 1936.)

SOLUBILITY OF HYDROQUINOL IN WATER AND IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.

(Granger and Nelson, 1921; Knox and Richards, 1919.)

Normality of aq. H Cl.	Gm. mol. $C_6H_4(OH)_2$ per liter sat. sol.	Normality of aq. H Cl.	Gm. mol. $C_6H_4(OH)_2$ per liter sat. sol.
0.0 (= H_2O)...	0.666 (K. and R.)	3.793..........	0.282 (K. and R.)
0.0 » ...	0.645 (G and N.)	5.728..........	0.215 »
0.01..........	0.645 »	7.597..........	0.188 »
0.10..........	0.633 »	9.237..........	0.178 »
1.0..........	0.494 »	10.97..........	0.166 »
1.892..........	0.402 (K. and R.)		

100 gms. sat. solution in water contain 6.7 gms. hydroquinol at 20°, Sp. Gr. of sol. = 1.012. (Vaubel, 1899.)

100 gms. 95% formic acid dissolve 6.07 gms. hydroquinol at 20.2°. (Aschan, 1913.)

SOLUBILITY OF HYDROQUINOL IN AQUEOUS SOLUTIONS OF SALTS AT 18°.

(Linderstrom-Lang, 1924.)

Due to the instability of hydroquinol at low hydrogen ion concentrations all the determinations were made in presence of 0.01 *n* hydrochloric acid. Hence in each case the solvent is composed of 0.01 *n* H Cl containing the stated gram equivalents per liter (normality *n*) of the several salts.

Aq. solvents 0.01 *n* H Cl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.	Aq. solvents 0.01 *n* H Cl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.	Aq. solvents 0.01 *n* H Cl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.
0.0..........	0.5103	0.6 *n* K Br.....	0.4394	0.4 *n* Sr Cl_2....	0.4444
0.835 *n* Li Cl..	0.3747	1.2 »	0.3787	0.8 » ...	0.3894
2.087 » ..	0.2362	1.8 »	0.3281	1.6 »	0.2948
3.340 » ..	0.1493	0.6 *n* K I.......	0.4427	3.2 »	0.1636
4.175 » ..	0.1117	1.2 »	0.3923	0.477 *n* Al Cl_3..	0.4273
6.262 » ..	0.0577	1.8 »	0.3457	1.192 » ..	0.3291
0.49 *n* Na Cl..	0.4270	2.4 »	0.3045	2.385 » ..	0.2099
0.99 » ..	0.3579	2.82 »	0.2791	4.770 » ..	0.0815
1.99 » ..	0.2496	0.495 *n* Mg Cl_2..	0.4299	0.497 *n* La Cl_3..	0.4360
2.99 » ..	0.1752	0.989 » ..	0.3635	1.242 » ..	0.3478
3.99 » ..	0.1199	1.979 » ..	0.2589	2.485 » ..	0.2349
0.70 *n* K Cl...	0.4258	3.958 » ..	0.1308	4.970 » ..	0.1053
1.4 » ...	0.3530	0.598 *n* Ca Cl_2..	0.4180	0.978 *n* Mg SO_4.	0.3708
2.1 » ...	0.2940	1.195 » ..	0.3408	1.956 » .	0.2632
2.8 » ...	0.2546	2.390 » ..	0.2263	2.934 » ..	0.1809
1.2 *n* Rb Cl...	0.4075	4.780 » ..	0.0978	1.5 *n* H_2SO_4...	0.3760
1.8 » ...	0.3665	0.4 *n* Ba Cl_2....	0.4449	1.5 *n* H Cl.....	0.3520
2.4 » ...	0.3413	1.2 »	0.3417	1.5 *n* Na_2SO_4..	0.2976
0.578 *n* Cs Cl..	0.4983	1.5 »	0.3068	0.2 *n* Mannitol..	0.5030
0.867 » ..	0.4961	1.6 »	0.2983	0.4 » ..	0.4925
1.733 » ..	0.4913	2.0 »	0.2606	0.6 » ..	0.4828
				0.8 » ..	0.4721

SOLUBILITY OF HYDROQUINOL IN AQUEOUS SOLUTIONS OF SALTS AT 23°.75.

(Linderstrom-Lang. 1924.)

Aq. solvents 0.01 *n* H Cl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.	Aq. solvents 0.01 *n* H Cl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.	Aq. solvents 0.01 *n* H Cl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.
0.0..........	0.6144 (1)	1.5 *n* K I.......	0.458' (1)	1.438 » ...	0.5890
0.0..........	0.6180	1.5 *n* K NO_3...	0.4912 (1)	0.598 *n* Ca Cl_2..	0.5072
0.669 *n* Li Cl..	0.4844	0.5 *n* K_2SO_4..	0.4788 (1)	1.195 » ..	0.4177
1.338 » ..	0.3787	0.4 *n* Na Cl....	0.5353	2.390 » ..	0.2786
2.676 » ..	0.2324	0.8 »	0.4631	3.585 » ..	0.1850
4.113 » ..	0.1427	1.6 »	0.3487	0.4 *n* Ba Cl_2....	0.5385
0.7 *n* K Cl....	0.5132	3.2 »	0.1050	0.8 »	[illegible]

SOLUBILITY OF HYDROQUINONE IN AQUEOUS SOLUTIONS OF SALTS AT 17.9°.

(Linderstrom-Lang, 1929.)

Aqueous Solvent	Gm. Mols. p $C_6H_4(OH)_2$ per liter sat. sol.	Aqueous Solvent	Gm. Mols. p $C_6H_4(OH)_2$ per liter sat. sol.
H_2O alone	0.5077	0.747 n $C_4H_5NH_2.HCl$	0.5225
0.8 NH_4Cl	0.4322	1.493 n "	0.5504
1.6 n "	0.3741	2.986 n "	0.6624
3.2 n "	0.2895	0.69 n $C_4H_9NH_2.HCl$	0.6311
0.666 n $CH_3NH_2.HCl$	0.4977	1.39 n "	0.8084
1.332 n "	0.4913	0.277 n $(CH_3)_3(C_2H_5)N.HCl$	0.6775
2.663 n "	0.4825	0.705 n $(C_2H_5)_4N.HCl$	1.4013
		1.410 n " "	2.3896

EQUILIBRIUM IN THE SYSTEM HYDROQUINOL, PHENOL AND WATER

(Leone and Angelescu, 1922.)

Synthetic mixtures of weighed amounts of the three components were made and the temperatures of clearing and of clouding of each were determined. Different amounts of phenol were first added to known concentrations of aqueous hydroquinol and then different amounts of hydroquinol were added to known concentrations of aqueous phenol solutions.

Aq. 1.02 % $C_6H_4(OH)_2$.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
22.0......	8.68
53.6......	15.14
60.6......	21.90
62.4......	27.52
63.0......	33.42
63.4......	40.00
63.0......	45.10
61.8......	49.17
58.4......	54.69
54.2......	58.32
48.4......	62.23
37.2......	66.37
32.0......	66.89

Aq. 4.77 % $C_6H_4(OH)_2$.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
34.0......	16.05
42.6......	21.54
47.4......	27.84
50.8......	36.18
52.2......	40.88
53.0......	44.88
52.6......	47.78
49.2......	55.03
45.6......	58.08
40.8......	61.44
32.6......	65.13
26.6......	57.13

Aq. 9.16 % $C_6H_4(OH)_2$.

t°.	Gms. C_6H_5OH per 100 gms. mixture
24.2......	25.52
34.4......	34.82
40.4......	45.92
40.0......	52.14
36.8......	57.44
28.6......	62.18

Aq. 13.41 % $C_6H_4(OH)_2$.

t°.	Gm. $C_6H_5(OH)_2$ per 100 gm. mixture.
16.6......	33.94
24.0......	40.99
27.0......	46.02
27.0......	52.57
15.6......	62.65

Aq. 13.2 % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2$ per 100 gms. mixture.
53.6......	—
49.6......	0.62
44.0......	1.93
33.6......	2.82
30.8......	3.17
29.8......	3.39
23.8......	4.02

Aq. 36.15 % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2$ per 100 gms. mixture.
66.4......	—
64.8......	0.37
62.0......	0.95
56.8......	1.98
47.6......	3.72
38.8......	5.21
30.8......	6.44
26.0......	7.33

Aq. 61.97 % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2$ per 100 gms. mixture.
51.0......	—
48.4......	0.52
46.2......	1.02
40.9......	2.08
35.0......	3.21
33.0......	3.51
26.8......	4.67

EQUILIBRIUM IN THE SYSTEM HYDROQUINOL, PHENOL AND WATER AT 0° AND AT 10°.

(Leone and Angelescu, 1922.)

The isotherms for this system were determined at 0° and at 10° using the titration method with weight pipets.

Results at 0°.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$C_6H_4(OH)_2$.	C_6H_5OH.	$C_6H_4(OH)_2$.	$C_6H_5(OH)$.
0.0	7.23	11.50	39.96
1.82	8.67	11.42	44.16
3.04	8.97	11.05	47.93
4.37	10.09	9.67	54.92
6.66	13.49	7.34	60.77
8.76	18.94	5.31	66.10
9.85	23.38	3.78	69.01
10.80	34.17	1.32	73.31
11.25	39.37	0.0	75.42

Results at 10°.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$C_6H_4(OH)_2$.	C_6H_5OH.	$C_6H_4(OH)_2$.	C_6H_5OH.
0.0	7.40	9.39	46.70
0.42	8.23	8.71	51.07
4.14	10.54	8.14	54.91
7.99	20.04	7.14	58.69
9.29	28.01	5.17	63.65
10.07	40.17	3.27	67.80
10.05	42.80	0.99	72.00
9.59	44.18	0.0	73.34

Freezing-point data are given for mixtures of Hydroquinone and:

Acetamide(29)
Acetanilide(6)
" + resorcinol(5)
Acetone + water(39
Aceto phenone(17)
Amino phenol(36)
Aniline(22)
Antipyrine(16)(34)
" + pyrocatechol(3)(4)
Azobenzene(30)
Azoxyanisol(9)
Benzamide(29)
Benzo hydrol(13)
Benzo phenone(27)
Camphor(11)(19)
Carbazole(23)
Cineole(1)
Cinnamic acid(26)
Di methyl oxalate(26)
Di phenyl amine(24)(15)
" " methane(15)
Ethyl oxalate(26)
Fenchon(14)
Methoxy cinnamic acid(9)
Naphthalene(18)
Naphthylamine(35)(32)
Nitrobenzene + quinone(25)
Nitro naphthalene(33)
Oxy benzaldehyde(21)
Phenanthrene(2)
Phenylene diamines(37)
Pyrocatechol(3)(8)(33)
Pyrocatechol +
antipyrine(3)(4)
Quinone(25)
" + nitrobenzene(25)
Resorcinol(7)(8)(3)(33)
Salicylic aldehyde(27)
Styphnic acid(12)
Succinic acid(26)
Succinimide(14)
Toluidine(32)
Tri chloro acetic acid(10)
Tri phenyl amine(20)
Tri phenyl carbinole(28)
Tri phenyl methane(20)
Tri nitrobenzene(38)
Urea(31)

(1) Bellucci and Grassi, 1913; (23) Bernoulli and Sarasin, 1930; (3) Hrynakowski, 1934; (4) Hrynakowski and Adamanis, 1937; (5) Hrynakowski and Szmyt, 1935(b); (6) Hrynakowski and Adamanis, 1933a; (7) Hrynakowski and Adamanis, 1933b; (8) Jaeger, 1907; (9) deKock, 1904; (10) Kitran, 1924; (11) Jefremow, 1912, 1913; (12) Jefremow, 1934; (13) Kremann & Drazil, 1924; (14) Kremann & Dietrick, 1923; (15) Kremann and Fritsch, 1920; (16) Kremann and Haas, 1919; (17) Kremann and Marktl; 1920; (18) Kremann and Janetzky, 1912; (19) Kremann and Odelga, 1921; (20) Kremann, Odelga and Zawodsky, 1921; (21) Kremann and Pogantsch, 1923; (22) Kremann and Rodinis, 1906; (23) Kremann and Slovak, 1920; (24) Kremann and Schadinger, 1919; (25) Kremann, Sutter, Sitte, Strzelba and Dobotsky, 1922; (26) Kremann, Zechner and Drazil, 1924; (27) Kremann and Zechner, 1918, 1925; (28) Kremann and Wlk, 1919; (29) Kremann and Auer, 1918; (30) Kremann, Zechner and Weber, 1924; (31) Puschin and König, 1928; (32) Philip and Smith, 1905; (33) Senden, 1923; (34) Rheinboldt, Henning and Kirscheisen, 1925; (35) Kremann and Csanyi, 1916; (36) Kremann and Lupfer, 1920; (37) Kremann and Strohschneider, 1918; (38) Sudborough and Beard, 1911; (39) Waddell, 1899.

SOLUBILITY OF HYDROQUINOL IN SULFUR DIOXIDE IN THE CRITICAL VICINITY.

(Centnerswer and Teletow, 1903.)

Determinations made by the Synthetic Method, for which see Note, p. 292.

t°.	Gms. Hydroquinol per 100 Gms. SO_2	t°.	Gms. Hydroquinol per 100 Gms. SO_2	t°.	Gms. Hydroquinol per 100 Gms. SO_2
63	0.89	117.6	4.46	136.7	10.31
73.5	1.22	123.3	5.66	141.4	13.3
89.2	2.18	134.2	8.31	145	14.9

DISTRIBUTION OF HYDROQUINOL BETWEEN WATER AND ETHER AT 15°.

(Pinnow, 1911.)

Conc.* Hydroquinol in:		Conc. Hydroquinol in:	
H_2O Layer.	Ether Layer.	H_2O Layer.	Ether Layer.
0.00502	0.0111	0.0502	0.1275
0.01196	0.0249	0.0818	0.2343
0.0128	0.0274	0.1105	0.3543
0.0236	0.0552	0.1411	0.5300
0.0455	0.1148	0.1502	0.5604

* The terms in which the conc. is expressed are not stated.

Nitr**ANILINES** $C_6H_4NH_2NO_2$. *o*, *m*, and *p*.

SOLUBILITY IN WATER.

(Carnelly and Thomson — J. Chem. Soc. 53, 768, '88; Vaubel — J. pr. Chem. [2] 52, 73, '95; above 20°, Löwenherz — Z. physik. Chem. 25, 407, '98.)

t°.	Grams Nitraniline per Liter of Solution.		
	Ortho Nitraniline.	Meta Nitraniline.	Para Nitraniline.
20	...	1.14-1.67	0.77-0.80
24.2	1.25 (25°)	1.205	...
27.3	...	1.422	...

100 cc. H_2O dissolve 2.2 gms. *p* nitraniline at 100°. (Jaeger and Kregten, 1912.)

100 gms. H_2O dissolve 0.147 gm. o $C_6H_4NH_2NO_2$ at 30°. (Gross, Saylor and
" " " " 0.121 " m " " " Gorman, 1933.)
" " " " 0.0728 " p " " " (Gross and Saylor, 1931

SOLUBILITY OF META NITRANILINE IN WATER.

(Walton and Finzel, 1928.)

Large volumes of water were saturated with m nitraniline at 15° - 20° above the temperature of the determinations and cooled to the desired temperature. A miniature Gooch asbestos filter was used to remove the finely suspended solid from the saturated solution. The authors found that saturation was reached quite slowly. The solutions were analyzed by the titanium tri chloride method and the sodium nitrite method.

t°	Gms. m $C_6H_4NH_2NO_2$ per 100 gms. sat. sol.	t°	Gms. m $C_6H_4NH_2NO_2$ per 100 gms. sat. sol.
0	0.030	44	0.211
10	0.047	55	0.338
20	0.073	65.4	0.543
25	0.091	75	0.838
35	0.141	83.4	1.23

SOLUBILITY OF o, m AND OF p NITRANILINES IN WATER.

(Sidgwick and Rubie, 1921.)

The Synthetic method was used. Both the triple points and the critical solution temperatures, for the two liquid layers which separate, were determined. Asterisks indicate that a solid phase is present.

Ortho Nitraniline.		Meta Nitraniline.		Para Nitraniline.	
t°.	Gms. $o\ NO_2C_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Gms. $m\ NO_2C_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Gms. $p\ NO_2C_6H_4NH_2$ per 100 gms. sat. sol.
69.7	100.0 *	114.6	100.0 *	147.0	100.0
68.0	99.43*	113.5	99.86*	144.8	98.96
66.0	98.29*	103.2	94.96*	136.8	96.38
63.0 (tr. pt)	97.5 *	99.0 (tr. pt)	93.5 *	128.0	93.86
68.0	97.23	125.6	90.02	124.2	92.52
91.0	96.16	159.9	83.60	115.5	90.0
142.0	92.06	169.3	79.82	129.2	86.82
160.2	89.50	176.7	75.77	148.6	81.27
188.5	81.88	185.8	57.55	167.8	68.19
206.2	66.89	186.1	50.57	170.4	62.58
210.3	52.30	187.5	(crit. sol. temp.)	172.0	51.07
211.0	(crit. sol. temp.)	185.2	36.94	172.5	(crit. sol. temp.)
208.6	36.71	180.5	25.34	172.0	39.49
194.2	17.50	164.2	13.08	169.5	28.82
178.5	10.74	136.5	6.04	141.5	9.29
164.5	7.19	83.4	1.70 *	123.5	5.16
128.4	2.95			92.0	2.79*

SOLUBILITY OF ORTHO META AND PARA NITRANILINE IN BENZENE.

(Sidgwick and Rubie, 1921.)

t°.	Ortho Nitraniline. Gms. $o\ NO_2C_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Meta Nitraniline. Gms. $m\ NO_2C_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Para Nitraniline. Gms. $p\ NO_2C_6H_4NH_2$ per 100 gms. sat. sol.
67.2	95.35	110.3	96.37	143.7	96.78
62.0	88.69	105.4	90.55	132.3	81.71
55.0	78.64	99.2	79.96	122.5	64.03
47.4	58.96	88.7	57.95	119.5	54.15
39.2	40.92	78.4	32.42	108.6	25.46
23.2	21.52	60.9	14.18	95.0	11.42
10.5	12.26	38.2	4.42	70.0	3.21

SOLUBILITY OF ORTHO, META AND PARA NITRANILINE IN SEVERAL SOLVENTS

(Collett and Johnson, 1926.)

Solvent in each Case.	t°.	Solubility of : Ortho Nitraniline. Gms. $o\ NO_2C_6H_4NH_2$ per 100 gms. solvent.	t°.	Solubility of : Meta Nitraniline. Gms. $m\ NO_2C_6H_4NH_2$ per 100 gms. solvent.	t°.	Solubility of : Para Nitraniline Gms. $p\ NO_2C_6H_4NH_2$ per 100 gms. solv.
Water.............	25.0	0.1212	25.0	0.0910	25.0	0.0568
»	40.1	0.2423	40.1	0.1785	40.1	0.1157
Benzene..........	25.0	20.80	25.0	2.718	25.0	0.5794
»	....	.....	40.1	5.137	40.1	1.050
Ethyl alcohol(abs.)..	....	.....	0.0	4.035	0.0	3.382
» ..	25.0	27.87	25.0	7.778	25.0	6.048
» ..	....	.....	....	.....	40.1	8.234
» (95 %).	....	.....	25.0	7.155	25.0	5.674
Chloroform........	0.0	11.17	0.0	1.358	0.0	0.4331
»	...	.....	25.0	3.216	25.0	0.929
»	...	.....	40.1	6.102	40.1	1.550

SOLUBILITY OF ORTHO AND OF META NITRANILINE IN HYDROCHLORIC ACID.

(Lowenherz.)

Ortho Nitraniline at 25°.

G. Mols. per Liter.		Grams per Liter.	
HCl	$C_6H_4NH_2.NO_2(o)$	HCl	$C_6H_4NH_2.NO_2(o)$
0.0	0.0091	0.0	1.25
0.63	0.0143	22.97	1.97
0.95	0.0174	34.63	2.40
1.26	0.0215	45.94	2.97

Meta Nitraniline.

	G. Mols. per Liter.		Grams per Liter.	
	HCl	$C_6H_4NH_2.NO_2(m)$	HCl	$C_6H_4NH_2.NO_2(m)$
(25°)	0.0	0.0091	0.0	1.20
(26.5°)	0.0125	0.0183	0.46	2.53
(23.3°)	0.0247	0.0274	0.90	3.85

Data showing the effect of increasing amounts of several gum arabic sols upon the solubility of o, m and of p Nitraniline in Water are given by Brintzinger and Beier, 1934.

The coefficient of distribution at 25° of o nitraniline between water and heptane at concentrations varying from 0.00764 to 0.0119 gm. mols. per liter of the aqueous phase is 1.79. (Williams and Soper, 1930.)

SOLUBILITY OF META AND OF PARA NITRANILINE IN ORGANIC SOLVENTS AT 20°.

(Carnelly and Thomson.)

Solvent.	Gms. per Liter. Meta.	Gms. per Liter. Para.	Solvent.	Gms. per Liter. Meta	Gms. per Liter. Para
Methyl Alcohol	110.6	95.9	Benzene	24.5	19.8
Ethyl Alcohol	70.5	58.4	Toluene	17.1	13.1
Propyl Alcohol	56.5	43.5	Cumene	11.5	9.0
Iso Butyl Alcohol	26.4	19.1	Chloroform	30.1	23.1
Iso Amyl Alcohol	85.1	62.9	Carbon Tetra Chloride	2.1	1.7
Ethyl Ether	78.9	61.0	Carbon Disulfide	3.3	2.6

SOLUBILITY OF ORTHO NITRANILINE (M. PT. 69°.3) IN SEVERAL SOLVENTS.

(Collett and Johnston, 1926.)

Gm. mols. $o\ NO_2.C_6H_4NH_2$ per 100 gm. mols. saturated solution in

t°.	Acetone.	Ethyl acetate.	Chloroform.	Benzene.	Ethyl ether.	Ethyl alcohol.	Carbon tetrachloride.	Nitro benzene.	Dibrom acetylene (C_2Br_2).
25...	40.0	34.1	23.0	10.5	18.7	8.5	–	24.8 (?)	24.8 (?)
30...	44.6	38.3	28.4	13.6	21.5	10.4		29.0	29.0
40...	54.5	48.2	42.0	27.6	30.6	18.7	4.6	39.8	39.8
50...	65.6	61.6	60.0	51.6	50.1	40.3	21.1	56.4	56.4
60...	79.2	77.6	77.3	75.8	74.0	74.0	73.9	76.0	76.0

100 gms. Carbon Tetrachlor. dissolve 1.18 gms. o Nitraniline at 20° (Pawlewski, 1914, 1926.)
100 gms. Chloroform dissolve 27.83 » » » » » »

100 gms. liquid ammonia dissolve 15 gms. o $C_6H_4NH_2NO_2$ at ? t°.
100 gms. liquid ammonia dissolve 10 gms. p $C_6H_4NH_2NO_2$ at ? t°.
100 gms. liquid sulfur dioxide dissolve 15 gms. $C_6H_4NH_2NO_2$ at ? t°.
(De Carli, 1927.)

SOLUBILITY OF META NITRANILINE (M. PT. 111°.8) IN SEVERAL SOLVENTS.

(Collett and Johnston, 1926.)

t°.	Gm. mols. m $NO_2.C_6H_4.NH_2$ per 100 gm. mols saturated solution in Acetone.	Ethyl acetate.	Chloroform.	Benzene.	Ethyl alcohol.	Ethyl ether.	Carbon tetrachloride.	Nitro benzene	Dibrom acetylene.
25.0......	19.5	16.1	2.6	1.5	2.4	3.6	-	11.3	-
30.0......	21.7	17.3	3.1	1.8	2.4	4,5	-	13.6	-
40.0......	26.3	20.0	4.4	2.8	4.1	6.3	-	16.7	-
50.0......	31.2	23.4	6.6	4.1	5.6	8.4	-	21.3	7.8
60.0......	36.9	28.2	10.8	7.2	8.5	11.3	-	27.0	12.5
70.0	43.7	35.6	19.0	13.3	14.1	16.4	-	35.6	20.0
80.0......	52.4	46.0	33.1	25.2	25.8	25.9	-	46.0	33.0
90.0......	64.1	59.2	54.0	48.7	49.5	42,1	7.0	59.2	50.8
100.0......	78.9	76.0	73.3	72.7	73.0	68.6	86.7	76.0	72.7
110.0......	96.8	96.1	95.5	95.6	94.9	94.6	-	96.0	95.6

SOLUBILITY OF PARA NITRANILINE (M. PT. 147°.5) IN SEVERAL SOLVENTS.

(Collett and Johnson, 1926).

t°.	Gm. mol. p $NO_2.C_6H_4NH_2$ per 100 gms. mol. saturated solution in Acetone.	Ethyl acetate.	Chloroform.	Benzene.	Ethyl ether.	Ethyl alcohol.	Nitro benzene.	Dibrom acetylene.
25............	-	-	0.8	0.3	-	2.0	6.7	-
30............	-	-	1.0	0.4	-	2.2	7.5	-
40............	-	11.4	1.3	0.6	-	2.9	9.3	-
50............	23.8	13.4	1.8	0.8	-	3.9	11.7	-
60............	26.5	15.8	2.5	1.2	3.4	5.1	14.9	-
70............	29.7	18.8	3.8	1.7	3.8	6.6	19.3	-
80............	33.5	22.9	5.3	2.6	4.8	9.4	24.6	6.5
90............	38.6	28.6	8.8	4.3	5.7	15.3	31.2	11.0
100............	45.1	35.8	16.1	8.4	7.9	25.9	39.2	18.8
110............	53.2	44.6	29.8	16.8	12.7	39.2	48.6	30.9
130............	63.0	56.5	51.0	40.9	32.4	54.7	59.0	46.2
140............	88.8	87.1	86.5	84.8	85.6	87.5	87.1	84.8

The results in the above tables for the solvents Nitrobenzene and Dibromacetylene are taken from the paper of Bogojavlewski, Bogolinbov and Vinogradov

(Chem. Abs, 1, 2874, 1907.)

SOLUBILITY OF *o*, *m* AND *p* NITRANILINE, SEPARATELY, IN PARA CYMENE AND IN XYLENE

Solvent.	t°.	Gms. of each compound per 100 gms. solvent. o $NO_2.C_6H_4NH_2$.	m $NO_2.C_6H_4NH_2$.	p $NO_2.C_6H_4NH_2$.	Authority.
Para Cymene (b. pt. 176°-176°.5)........	30	6.33	1.36	0.83	(Wheeler, 1920.)
m Xylene	15	11.6	1.74	0.28	(Chapas, 1921.)

Freezing-point data are given for mixtures of Nitranilines and:

Acetanilide(2)
Benzene(1)
Chloro dinitro benzene(3)
Dianisol acetone(21)
Dinitro benzenes(2)(8)
Ethylene bromide(1)
Naphthalene(16)
Nitracetanilide(4)
Nitranilines(9)(10)(11)(12)(13)(19)(20)(25)
Michler's Ketone(15)
Nitro benzene(1)
Nitro mannite(22)
Nitro chloro benzene(24)
Nitro phenol(24)
Nitro toluene(24)
Nitroso aniline(5)
Phenol(14)
Styphnic acid(6)
Tetra methyl di amino benzo phenone(21)
Tri nitro benzene(17)(18)
Tri nitro anisole(23)
Tri nitro phenyl methyl nitramine(7)

(1) Bogojawlensky, Winogradow and Bogolubow, 1906; (2) Crompton and Whiteby, 1895; (3) Giua, Marcellino and Curti, 1920; (4) Jaeger, 1906; (5) Jaeger and Van Kregten, 1912; (6) Jefremow, 1927; (7) Jefremow and Tichomirowa, 1926; (8) Johnston and Jones, 1928; (9) Hartogs and Van der Linden, 1911; (10) Holleman, Hartogs and Van der Linden, 1911; (11) Kohman, 1925; (12) Kremann, 1910; (13) Kremann, Geba and Moss, 1910; (14) Kremann and Rodinis, 1906; (15) Pfeiffer, 1924; (16) Puschin and Grebenschikov, 1913; (17) Smith and Watts, 1910; (18) Sudborough and Beard, 1910; (19) Nichols, 1918; (20) Valeton, 1910; (21) Pfeiffer,

PYROGALLOL $C_6H_3(OH)_3$ 1, 2, 3.

SOLUBILITY IN WATER, ETC.
(U. S. P. VIII.)

100 gms. water dissolve 62.5 gms. $C_6H_3(OH)_3$ at 25°.
100 gms. alcohol dissolve 100 gms. $C_6H_3(OH)_3$ at 25°.
100 gms. ether dissolve 90.9 gms. $C_6H_3(OH)_3$ at 25°.

SOLUBILITY OF PYROGALLOL IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.
(Knox and Richards, 1919.)

Equiv. Normality.		Equiv. Normality.		Equiv. Normality.	
HCl.	$C_6H_3(OH)_3$.	HCl.	$C_6H_3(OH)_3$.	HCl.	$C_6H_3(OH)_3$.
0.0	4.02	5.12	1.25	10.51	0.92
1.53	2.81	6.86	1.01	10.58	0.91
3.18	1.86	8.68	0.91		

Freezing-point data for mixtures of Pyrogallol and:

Acetamide(16)	Benzo phenone(16)	Oxy benzaldehyde(10)
Acetone(21)	Camphor(2)(12)	Phenylene diamine(1)(16)(20)
Aceto phenone(8)	Carbazole(13)	Quinone(14)
Amino phenol(9)	Cinnamic acid(17)	Salicylaldehyde(16)
Aniline(16)	Di methyl oxalate(17)	Succinic acid(17)
Antipyrine(7)	Di phenyl amine(15)	Succinimide(5)
Azo benzene(19)	" " methane(6)	Toluidine(16)
Benzamide(16)	Fenchon(5)	Tri phenyl methane(18)
Benz hydrol(4)	Nitro benzene(14)	Tri chloro acetic acid(3)
	Naphthylamines (16)	

(1) Betts, 1937; (2) Journiaux, 1912; (3) Kitran, 1924; (4) Kremann and Drazil, 1924; (5) Kremann and Dietrich, 1922; (6) Kremann and Fritsch, 1920; (7) Kremann and Haas, 1919; (8) Kremann and Marktl, 1920; (9) Kremann, Lupfer and Zawodsky, 1920; (10) Kremann and Pogantsch, 1923; (11) Kremann, Hohl and Müller II, 1921; Kremann and Odelga, 1921; (13) Kremann and Slovak, 1920; (14) Kremann, Sutter, Sitte, Strzelba and Dobolsky, 1922; (15) Kremann and Schadinger, 1919, (16) Kremann and Zechner, 1918, 1925; (17) Kremann, Zechner and Drazil, 1924; (18) Kremann, Odelga and Zawodsky, 1921; Kremann, Zechner and Weber, 1924; (20) Naegli and Kaltaman, 1933; (21) Schmidlin and Lang, 1910.

PHLOROGLUCINOL 1, 3, 5 $C_6H_3(OH)_3.2H_2O$

100 gms. Cymene dissolve 0.12 gm. $C_6H_3(OH)_3$ at 15°. (Wheeler, 1920.)

100 gms. H_2O	dissolve	1.13 gms.	phloroglucinol	at 20-25°.	(Dehn, '17.)	
" pyridine	"	296	"	"	"	"
" aq. 50% pyridine	"	134	"	"	"	"

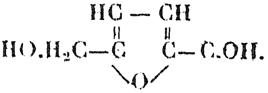
Freezing-point data for mixtures of phloro glucinol and p phenylene diamine are given by Naegli and Koltman, 1933.

Oxymethyl **FURFURAL** $C_6H_6O_3$.

FREEZING-POINTS OF MIXTURES OF OXYMETHYL FURFURAL AND WATER.

(Middendorp. 1919.)

The compound was shown to have the structural formula



$$HO.H_2C-\overset{HC\,-\,CH}{C\quad C}-C.OH$$

It distills at 114-116°, at 1 mm. pressure, yielding a liquid of $d_{\frac{15}{15}} = 1.268$. At very low temperatures it yields crystals of m. pt. 31°.5. It is soluble in all proportions in water. The following results for the f. pts. of its mixtures with water were obtained.

t° of f. pt.	Mol. per cent $C_6H_6O_3$ in mixture.	t° of f. pt.	Mol. per cent $C_6H_6O_3$ in mixture.	t° of f. pt.	Mol. per cent $C_6H_6O_3$ in mixture.
31.5	100	9.85	52.2	—4.5 (Eutec.).	21.3
27.0	90.8	8.95	49.9	—3.25	17.8
24.3	84	7.35	46.4	—2.95	15.3
20.2	75	4.55	41.6	—2.4	11.1
17.6	69.1	3.55	38.0	—2.24	9.4
15.2	64.1	1.6	34.6	—1.5	5.0
13.05	59.4	—0.4	30.9	0.0	0.0
10.95	55.4	—2.2	25.9		

p Brom**ANILINE** *o* Sulfonic Acid, *p* $BrC_6H_3(NH_2)$, *o* SO_3H.

SOLUBILITY IN WATER (Philip and Colborne, 1924.)

t°.	Gms. $BrC_6H_3(NH_2)SO_3H$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $BrC_6H_3(NH_2)SO_3H$ per 100 gms. sat. sol.	Solid Phase.
0.0	0.223	$BrC_6H_3(NH_2)SO_3H$	70	1.375	$BrC_6H_3(NH_2)SO_3H$
8.35	0.279	»	85	2.02	»
16.75	0.359	»	0.0	0.259	$BrC_6H_3(NH_2)SO_3H.H_2O$
25.0	0.446	»	8.35	0.352	» (unstable)
40.0	0.650	»	16.8	0.473	» »
55.0	0.965	»	25.0	0.606	» »

p Brom**ANILINE** *m* Sulfonic Acid, *p* $BrC_6H_3(NH_2)$ *m* SO_3H.

SOLUBILITY IN WATER.

(Philip and Colborne, 1924.)

This compound exists in two enantiotropic forms. It also forms a labile monohydrate.

t°.	Gms. $BrC_6H_3(NH_2)SO_3H$ per 100 gms. sol. sat.	Solid Phase.	t°.	Gms. $BrC_6H_3(NH_2)SO_3H$ per 100 gms. sat. sol.	Solid Phase.
0.0	0.726	$BrC_6H_3(NH_2)SO_3H$(rhombic)	0.0	0.475	$BrC_6H_3(NH_2)SO_3H$ (monoclinic)
9.8	0.885	» »	12.55	0.645	» »
25.0	1.198	» »	25.0	0.862	» »
40.1	1.610	» »	40.0	1.215	» »
54.8	2.10	» »	56.3	1.790	» »
70.4	2.81	» »	70.0	2.44	» »
85.0	3.66	» »	85.0	3.35	» »

SOLUBILITY OF CHLOR ANILINE SULFONIC ACIDS, IN WATER.

(Philip and Colborne, 1924.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 gms. sat. sol.	Solid Phase.
p Chloraniline *o* sulfonic acid.	*p* $ClC_6H_3NH_2$ *o* SO_3H	0	0.313	*p* $ClC_6H_3NH_2$ *o* $SO_3H.H_2O$
p » *m* » .	*p* $ClC_6H_3NH_2$ *m* SO_3H	0	1.131	*p* $ClC_6H_3NH_2$ *m* SO_3H
p » *m* » .	»	0	1.160	*p* $ClC_6H_3NH_2$ *m* $SO_3H.H_2O$

IodoANILINE Sulfonic Acids, $IC_6H_3(NH_2)SO_3H$.

SOLUBILITY OF EACH IN WATER AT 25°. (Boyle, 1919.)

Compound.	Formula	Gms. cmpd. per 100 gms. H_2O.
4 Iodo aniline 2 sulfonic acid . . .	$C_6H_3NH_2(1)I(4)SO_3H(2)$	0.51
5 » 2 » . . .	$C_6H_3NH_2(1)I(5)SO_3H(2)$	0.26
4 » 3 » . . .	$C_6H_3NH_2(1)I(4)SO_3H(3)$	1.36
5 » 3 » . . .	$C_6H_3NH_2(1)I(5)SO_3H(3)$	1.31
6 » 3 » . . .	$C_6H_3NH_2(1)I(6)SO_3H(3)$	0.48
2 » 4 » . . .	$C_6H_3NH_2(1)I(2)SO_3H(4)$	2.07
3 » 4 » . . .	$C_6H_3NH_2(1)I(3)SO_3H(4)$	0.194

ACONITIC ACID $C_3H_3(COOH)_3$.

100 grams of formic acid (95% HCOOH) dissolve 2.01 grams $C_3H_3(COOH)_3$ at 20.6° C. (Aschan, 1913.)

ALLOXANTIN $C_6H_6O_8N_4.2H_2O$.

SOLUBILITY IN WATER AND IN AQUEOUS SOLUTIONS OF ALLOXAN AT 25°.
(Billmann and Bentzon 1918.)

Oxygen was excluded during the determinations by the use of CO_2. Aqueous solutions rotated from 3.8 to 5.5 hours gave practically identical results. The solutions were analyzed by estimations of total nitrogen and alloxantin nitrogen determined colorimetrically. The solubility of alloxantin in water at 25° was found to be 0.2885 gms. $C_6H_6O_8N_4.2H_2O$ per 100 gms. sat. solution. The solubility in aqueous solutions of alloxan was as follows.

Grams per 100 grams sat. solution.		Gm mols ×10^{-4} per 100 gms. sat. sol.	
Alloxan nitrogen.	Alloxantin nitrogen.	Alloxan.	Alloxantin.
0.0023	0.0487	0.82	8.69
0.0032	0.0475	1.14	[illegible]
0.0045	0.0458	1.61	8.19
0.0054	0.0455	1.93	8.1[illegible]
0.0112	0.0412	4.00	[illegible]
0.0197	0.0363	7.03	[illegible]
0.0258	0.0335	9.[illegible]	5.98
0.0409	0.0278	14.6	4.98
0.0773	0.0219	27.6	3.91
0.0827	0.0204	29.5	3.64
0.0869	0.0200	31.0	3.5[illegible]
0.1140	0.0177	40.7	3.18
0.1656	0.0151	59.[illegible]	2.68

ANILINE $C_6H_5(NH_2)$.

SOLUBILITY IN WATER AT 22°.
(Herz, 1898; see also Vaubel, 1895; Aignan and Dugas, 1899.)

100 cc. H_2O dissolve 3.481 cc. $C_6H_5(NH_2)$ — Vol. of Sol. = 103.48, Sp. Gr. = 0.9986.

100 cc. $C_6H_5(NH_2)$ dissolve 5.22 cc. H_2O — Vol. of Sol. = 104.96, Sp. Gr. = 1.0175.

100 cc. sat. aq. sol. contain 3.607 gms. $C_6H_5NH_2$ at 25°. (Riedel, 1906.)

SOLUBILITY OF ANILINE IN WATER DETERMINED BY THE SYNTHETIC METHOD.
(Sidgwick, Pickford and Wilsden, 1911.)

t°	Gms. $C_6H_5NH_2$ per 100 gms. aq. layer	Gms. H_2O per 100 gms. $C_6H_5NH_2$ layer	t°	Gms. $C_6H_5NH_2$ per 100 gms. aq. layer	Gms. H_2O per 100 gms. $C_6H_5NH_2$ layer
13.8	3.611	5.12(20°)	120	9.1	14.6
30	3.7	5.4	130	11.2	16.9
50	4.2	6.4	140	13.5	19.5
70	5	7.7	150	17.1	24
90	6.4	9.9	160	22	32
110	8	13	165	26	

SOLUBILITY OF WATER IN ANILINE, DETERMINED BY THE SYNTHETIC METHOD.

(Appleby and Davies, 1925.)

t°.	Gms. H_2O per 100 gms. sat. sol.	t°.	Gms. H_2O per 100 gms. sat. sol.	t°.	Gms. H_2O per 100 gms. sat. sol
15.9	4.534	20.5	4.815	34.1	5.398
18.3	4.659	21.15	4.926	43.5	5.899
20.0	4.835	22.6	4.950	47.5	6.104

100 gms. sat. sol. of Aniline in water contain 3.66 gms. $C_6H_5NH_2$ at 25°.
" " " " " Water in aniline " 5.22 " H_2O at 25°.
(Hill and Macy, 1924.)

Determinations of the densities of each of the two layers formed by mixtures of aniline and water between 20° and 100° are given in the form of a diagram by Mondain-Monval and Schlegel, 1933. The two curves cross at 77° and below this temperature the aniline rich layer is the lower and above the aniline rich layer is the upper. At 77° the two layers have the same density.

RECIPROCAL SOLUBILITY OF ANILINE AND WATER DETERMINED BY THE FREEZING-POINT METHOD.

(Average curve from the results of Hill and Macy, 1924, and Appleby and Davies, 1925.)

t°.	Gms. $C_6H_5NH_2$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_5NH_2$ per 100 gms. sat. sol.	Solid Phase.
−0.1	0.5	Ice	−7.0	96.32	Ice
−0.2	1.0	"	−9.0	96.7	"
−0.3	1.55	"	−11.0	97.05	"
−0.4	2.07	"	−11.9 (Eutec.)	97.25	" + $C_6H_5NH_2$
−0.5	2.6	"	−11.0	97.85	$C_6H_5NH_2$
−0.66	3.5	" (quad. pt.)	−10.0	98.4	"
congruent solutions here			−9.0	98.9	"
−0.66	95.4	" (quad. pt.)	−8.0	99.35	"
−3.0	95.7	"	−7.0	99.7	"
−5.0	96.0	"	−6.0	100.0	"

Using an optical method, Chéneveau (1922) found that 100 gms. of H_2O dissolve 3.73 gms. aniline at 16° and 100 gms. aniline dissolve 4.68 gms. H_2O at 15°.

SOLUBILITY OF ANILINE IN AQUEOUS SALT SOLUTIONS AT 18°.

(Euler — Z. physik. Chem. 49, 307, '04.)

Aq. Solution.	Gms. Salt per liter.	Gms. $C_6H_5(NH_2)$ per 100 g. solvent.	Aq. Solution.	Gms. Salt per liter.	Gms. $C_6H_5(NH_2)$ per 100 g. solvent.
H_2O alone	0	3.61	1 *n*NaOH	40.06	1.90
0.5 *n*KCl	37.3	3.15	1 *n*LiCl	42.48	2.80
1 *n*KCl	74.6	2.68	1 *n*$CaCl_2$	67.25	3.00
1 *n*NaCl	58.5	2.55			

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF SALTS AT 18°.

(von Euler an Svanberg, 1917, 1917*a*, 1926.)

Aqueous solvent.	Gms. $C_6H_5NH_2$ per 100 cc. sat. sol.	Aqueous solvent.	Gms. $C_6H_5NH_2$ per 100 cc. sat. sol.
Water	3.61	1.0 normal Na salicylate	7.14
1.0 normal NaCl	2.55	2.0 " K valerate	3.37
1.0 " Na acetate	2.32	2.0 " K isovalerate	3.37
1.0 " Na butyrate	2.53	0.5 " Aniline chloride	4.60
1.0 " Na isovalerate	1.88	1.0 " " "	5.30
1.0 " Na benzoate	3.80	0.5 " Aniline nitrate	4.60
1.0 " NH_4 benzoate	4.60	1.0 " " "	5.25

Determinations of the solubility of aniline in saturated aqueous solutions of sodium benzene sulfonate, sodium xylene sulfonate and sodium cymene sulfonate at various temperatures are given by Hauslick, 1935.

100 gms. aq. 0.4 normal sodium Oleate solution (= 10.8 gm. Na oleate per 100 gms. solution)dissolve 11.5 gms. $C_6H_5NH_2$ at 20°. (Smith, 1932.)

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF SALTS.

(Glasstone, Bridgeman and Hodgson, 1927.)

The authors' original results are in terms of gm. mols. of salt and of water required to yield a homogeneous mixture with 1 gm. mol. of aniline. The following weight percentage values are those recalculated for the Landoldt and Bornstein Tabellen.

t°	Salt	Gms. per 100 gms. sat. sol.		t°	Salt	Gms. per 100 gms. sat. sol.	
		Salt	$C_6H_5NH_2$			Salt	$C_6H_5NH_2$
25	$BaCl_2$	1.66	3.43	25	CsBr	4.79	3.74
"	"	2.90	3.26	"	"	19.35	3.57
"	"	3.48	3.18	"	"	43.51	3.25
"	"	7.00	2.75	50	"	4.75	4.44
"	"	14.26	1.98	"	"	19.26	3.81
"	$Ba(NO_3)_2$	0.93	3.68	"	"	43.56	3.22
"	"	1.91	3.58	25	CsI	5.58	4.00
"	"	2.85	3.50	"	"	19.21	4.02
"	"	3.86	3.44	"	"	33.51	4.62
"	"	4.85	3.39	50	"	5.41	4.40
"	CsCl	4.79	3.58	"	"	19.17	4.52
"	"	19.34	2.98	"	"	33.54	4.73
"	"	44.70	1.95	25	KF	1.94	2.91
50	"	4.79	4.01	"	"	4.89	2.04
"	"	19.06	3.09	"	"	9.87	1.12
"	"	44.71	1.94	"	KOH	1.96	3.07
25	KCl	1.96	3.30	"	"	4.90	2.20
"	"	4.84	2.86	"	"	9.87	1.25
"	"	9.73	2.28	"	"	19.92	0.422
"	"	14.71	1.76	"	"	35.00	0.055
"	"	24.75	0.99	"	"	49.96	0.020
50	"	1.93	3.77	"	K_2CrO_4	1.97	3.25
"	"	4.82	3.15	"	"	4.97	2.70
"	"	9.72	2.46	"	"	9.81	2.02
"	"	19.71	1.46	"	"	18.95	1.08
25	KBr	1.91	3.48	"	"	29.81	0.47
"	"	4.80	3.23	"	K_2SO_4	0.96	3.40
"	"	9.69	2.88	"	"	1.95	3.16
"	"	20.16	2.29	"	"	3.87	2.72
"	"	39.51	1.12	"	"	7.84	2.00
50	"	1.89	4.00	"	$K_4Fe(CN)_6$	2.02	2.68
"	"	9.65	3.21	"	"	4.41	2.79
"	"	19.75	2.47	"	"	8.85	2.15
"	"	39.47	1.22	"	"	17.71	1.25
25	KI	1.90	3.56	"	CH_3COOK	1.94	3.35
"	"	4.84	3.52	"	"	4.81	2.98
"	"	9.64	3.40	"	"	9.76	2.37
"	"	19.53	3.02	"	"	19.70	1.58
"	"	59.06	1.46	"	"	39.01	1.23
50	"	1.95	4.05	"	"	49.72	0.57
"	"	4.84	3.93	"	$(COOK)_2$	1.97	3.14
"	"	19.39	3.54	"	"	4.87	2.53
"	"	59.01	1.59	"	"	9.71	1.86
25	KNO_3	1.92	3.54	"	$KClO_3$	0.95	3.59
"	"	4.83	3.32	"	"	1.94	3.50
"	"	9.71	2.94	"	"	2.86	3.45
"	"	14.63	2.53	"	"	3.83	3.38
"	"			"	"		

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF SALTS (CON.).

t°	Salt	Gms. per 100 gms. sat. sol.	
		Salt	$C_6H_5NH_2$
25	K_2CO_3	1.94	3.11
"	"	4.98	2.27
"	"	9.85	1.35
"	"	19.89	0.38
"	"	34.87	0.047
"	LiCl	1.95	3.37
"	"	17.94	1.22
"	"	39.22	0.37
50	"	1.94	3.88
"	"	19.71	1.37
"	"	39.20	0.43
25	LiBr	1.91	3.80
"	"	19.39	3.01
"	"	58.74	1.72
50	"	1.90	4.25
"	"	19.32	3.26
"	"	58.70	1.83
25	LiI	1.89	3.87
"	"	9.58	3.94
"	"	31.92	4.62
50	"	1.90	4.39
"	"	9.57	4.38
"	"	31.89	4.81
25	$MgSO_4$	1.89	3.11
"	"	4.97	2.37
"	"	9.86	1.52
"	"	13.59	0.35
"	NH_4Cl	2.09	3.46
"	"	9.73	2.91
"	"	19.83	2.47
50	"	2.08	3.81
"	"	9.72	3.12
"	"	19.49	2.47
25	NH_4Br	1.97	3.83
"	"	19.01	3.45
"	"	38.51	3.09
50	"	1.96	4.33
"	"	19.24	3.84
"	"	38.74	3.30
25	NH_4I	1.96	3.70
"	"	19.11	4.35
"	"	57.0	5.01
50	"	1.96	4.19
"	"	18.98	5.06
"	"	56.53	5.81
25	$(COONH_4)_2$	0.96	3.42
"	"	1.88	3.20
"	"	2.91	2.99
"	"	13.97	2.59
"	NaCl	1.90	3.18
"	"	4.87	2.56
"	"	9.74	1.85
"	"	15.08	1.25
"	"	25.01	0.543

t°	Salt	Gms. per 100 gms. sat. sol.	
		Salt	$C_6H_5NH_2$
50	NaCl	4.86	2.91
"	"	9.72	2.08
"	"	19.85	1.993
25	NaBr	1.90	3.50
"	"	4.64	3.25
"	"	9.71	2.77
"	"	29.59	1.46
"	"	44.64	0.68
50	"	1.91	3.93
"	"	9.69	3.13
"	"	29.58	1.56
25	NaI	1.85	3.85
"	"	4.84	3.45
"	"	9.68	3.34
"	"	39.04	2.39
"	"	56.37	1.17
50	"	1.83	4.05
"	"	4.79	3.91
"	"	59.20	1.44
25	$NaNO_3$	1.94	3.42
"	"	4.83	3.17
"	"	9.83	2.70
"	"	19.60	1.80
"	"	39.74	0.59
"	Na_2SO_4	1.94	3.02
"	"	4.91	2.22
"	"	9.75	1.33
"	"	14.79	0.73
"	Na citrate	1.91	3.13
"	"	4.90	2.49
"	"	11.98	2.07
"	"	19.86	0.74
"	"	24.76	0.47
"	RbCl	4.86	3.31
"	"	19.48	2.08
"	"	44.70	0.86
50	"	4.84	3.73
"	"	19.41	2.26
"	"	44.63	0.90
25	RbBr	4.76	3.57
"	"	19.31	2.86
"	"	49.06	1.41
50	"	4.76	4.06
"	"	19.27	3.08
"	"	49.03	1.49
25	RbI	4.77	3.80
"	"	19.39	3.69
"	"	43.58	3.28
50	"	4.80	4.29
"	"	19.32	3.99
"	"	43.53	3.42
25	$Sr(NO_3)_2$	1.96	3.58
"	"	4.16	3.42
"	"	9.69	3.15
"	"	19.49	2.60
"	"	39.42	1.47

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF SALTS AT 18.15°.

(Pedersen, 1934.)

Results for aqueous solutions of:

Sodium Picrate		Sodium Benzoate		Anilinium Sulfate		Potassium Sulfate	
Gm. Equiv $C_6H_2(NO_2)_3ONa$ per liter	Gm. Mols. $C_6H_5NH_2$ per liter	Gm. Equiv. C_6H_5COONa per liter	Gm. Mols. $C_6H_5NH_2$ per liter	Gm. Equiv. $(C_6H_5NH)_2SO_4$ per liter	Gm. Mols. $C_6H_5NH_2$ per liter	Gm. Equiv. K_2SO_4 per liter	Gm. Mols. $C_6H_5NH_2$ per liter
0.000	0.3818	0.0000	0.3818	0.0289	0.3791	0.000	0.3818
0.0297	0.4058	0.0659	0.3833	0.0356	0.3792	0.0483	0.3589
0.0594	0.4303	0.1318	0.3827	0.0968	0.3792	0.0970	0.3384
0.0889	0.4554	0.1977	0.3841	0.1417	0.3829	0.1456	0.3197
0.1181	0.8820	0.2636	0.3850	0.1912	0.3839	0.1948	0.3012

SOLUBILITY OF ANILINIUM SULFATE IN AQUEOUS SOLUTIONS OF ANILINE AT 18.15°.

(Pedersen, 1934.)

Gm. Equivalents of $C_6H_5NH_2$ per liter	Gm. Mols. $(C_6H_5NH_2)_2H_2SO_4$ per liter of sat. solution
0.0000	0.2038
0.0298	0.2014
0.1444	0.2015
0.2905	0.2019

SOLUBILITY OF ANILINIUM PICRATE AT 18.15° IN AQUEOUS SOLUTIONS OF:

(Pedersen, 1934.)

0.00993 n HCl containing NaCl		Aniline	
Gm. Mols. NaCl per liter solvent	Gm. Mols $C_6H_5NH_2 \cdot OHC_6H_2(NO_2)_3$ per liter sat. solution	Gm. Equiv. $C_6H_5NH_2$ per liter solvent	Gm. Mols. $C_6H_5NH_2 \cdot HOC_6H_2(NO_2)_3$ per liter sat. solution
0.000	0.01200	0.0000	0.01176
0.0100	0.01234	0.0513	0.01225
0.0200	0.01258	0.0990	0.01299
0.0400	0.01297	0.1535	0.01386
0.0800	0.01344	0.2050	0.01472
		0.2524	0.01554

Anilinium picrate exists in both an unstable form (resembling picric acid in color) and a stable form (resembling potassium picrate). The solubility determinations were made with the stable form.

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF:

(Traube, Schöning and Weber, 1927.)

Sodium Benzoate		Sodium Salicylate		Sodium Butyrate	
Conc. of aq. salt sol.	cc $C_6H_5NH_2$ per 5cc of aq. salt sol.	Conc. of aq. salt sol.	cc $C_6H_5NH_2$ per 5cc of aq. salt.sol.	Conc. of aq. salt sol.	cc $C_6H_5NH_2$ per 5cc of aq. salt sol.
0.0	0.15	¼ saturated	0.3	0.0	0.15
2.0 normal	0.6	½ saturated	2.8	saturated	0.15
saturated	1.8	"	∞		

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF ANILINE HYDROCHLORIDE.

(Sidgwick, Pickford and Wilsden, 1911.)

The temperatures at which a second liquid phase separated from homogeneous mixtures of known amounts of aniline + HCl + H_2O were determined for a very extensive series of mixtures. The procedure consisted in first heating a given mixture until it became homogeneous and then cooling it slowly, with constant shaking. A critical turbidity preceding the actual separation by a few degrees was always noticed. The point of separation was taken as that at which a small gas flame seen through the liquid disappeared. At higher temperatures, the observations were made on mixtures contained in sealed bulbs. In the actual experiments, binodal curves for mixtures of Aq. HCl (of different strengths) and aniline were determined. By interpolation from these, the following isothermal curves were obtained.

Isotherm for 15°.				Isotherm for 25°.			
H_2O Rich Mixtures. Gms. per 100 Gms. Sat. Solution.		Aniline Rich Mixtures. Gms. per 100 Gms. Sat. Solution.		H_2O Rich Mixtures. Gms. per 100 Gms. Sat. Solution.		Aniline Rich Mixtures. Gms. per 100 Gms. Sat. Solution.	
$C_6H_5NH_2$.	$C_6H_5NH_2.HCl$.	H_2O.	$C_6H_5NH_2.HCl$.	$C_6H_5NH_2$.	$C_6H_5NH_2.HCl$.	H_2O.	$C_6H_5NH_2.HCl$.
3.615	0	7.276	3.025	3.681	0	14	8.884
3.791	1.529	7.231	1.989	4.020	3.02	10.84	6.062
4.144	5.829	5.816	1.195	5.380	11.40	6.949	1.912
4.940	11.44	5.230	0.340	7.023	15.83	6.043	0.828
5.995	16.03	5.006	0.163	11.86	19.02	5.568	0.363
10.44	19.35	4.960	0.080	31.35	20.15	5.311	0.089
26.80	21.49	4.942	0	59.95	15.55	5.299	0
Isotherm for 40°.				Isotherm for 60°.			
3.941	0	15.65	8.752	4.58	0	14.27	5.93
4.187	1.523	10.21	4.243	4.87	1.512	9.569	2.632
4.371	3.009	7.874	2.166	5.13	2.984	8.109	1.112
4.823	5.815	7.069	1.452	5.67	5.762	7.492	0.4876
6.210	11.30	7.058	0.9669	7.69	11.14	7.051	0.2284
8.779	15.55	6.225	0.4052	11.53	15.25	7.047	0.1138
38.69	18	5.940	0.0960	22.80	16.66	7.030	0
64.20	12.84	5.930	0	51.10	14.36		
Isotherm for 80°.				Isotherm for 100°.			
5.66	0	12.31	3.387	7.10	0	41.57	11.45
5.95	1.495	9.848	1.350	7.68	1.467	18.16	4.995
6.26	2.950	8.998	0.5857	8.10	2.891	12.76	1.784
7.11	5.678	8.524	0.2769	9.60	5.522	11.37	0.1836
9.95	10.85	8.512	0.1387	13.60	10.41	11.90	0
31.18	14.85	8.500	0				
Isotherm for 120°.				Isotherm for 140°.			
9.30	0	17.94	2.459	13.75	0	29.52	4.043
21.21	9.497	14.45	0	38.75	7.384	21.09	0

The authors also calculated the position of tie lines for the binodal curves with the aid of distribution coefficients, which they determined at 25° and which are quoted in a subsequent table (page 420 following).

Additional data for the system aniline + HCl + H_2O at 0°, 25° and at 35° are given by Thonus (1913), and for aniline + HCl by Leopold (1910).

SOLUBILITY OF ANILINE IN AQUEOUS ANILINE HYDROCHLORIDE SOLUTIONS AT 18°.

(Lidow — J. russ. phys. chem. Ges. 15, 420, '83; Ber. 16, 2297, '83.)

Per cent $C_6H_5NH_2HCl$ in Solvent.	Gms. $C_6H_5NH_2$ per 100 g. Solvent	Per cent $C_6H_5NH_2HCl$ in Solvent.	Gms. $C_6H_5NH_2$ per 100 g. Solvent.
5	3·8	30	39·2
12	5·3	35	50·4

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF ACETIC ACID.

(Angelescu and Motzoc, 1925.)

The determinations were made by adding aniline drop by drop to water or aqueous acetic acid just to the appearance of clouding at a definite temperature. The quantities of the three constituents were determined by careful weighings.

Results at 0°.

Gms. per 100 gms. sat. sol.

$C_6H_5NH_2$.	CH_3COOH.	H_2O.
3.68	0.00	96.32
7.13	2.89	89.98
10.00	5.91	84.09
13.59	9.74	76.67
17.10	12.41	70.49
20.82	14.02	65.16
26.76	15.33	57.88
30.10	15.73	54.17
32.17	15.88	51.95
34.75	16.01	49.24
37.76	16.16	46.08
38.72	16.20	45.08
47.68	16.26	36.06
58.15	15.60	26.25
68.92	13.38	17.70
76.83	10.68	12.49
83.36	6 23	7.41
90.37	4.02	5.61
95.71	0.00	4.29

Results at 20°.

Gms. per 100 gms. sat. sol.

$C_6H_5NH_2$	CH_3COOH.	H_2O
3.59	0.00	96.41
4.14	0.35	95.51
5.30	1.41	93.29
7.58	3.87	88.55
11.05	8.08	80.87
15.73	12.16	72.11
22.26	14.86	62.88
26.56	15.67	57.77
30.80	16.18	53.02
34.03	16.40	49.57
43.91	16.59	39.50
58.64	16.39	24.97
63.76	15.63	20.61
67.90	14.33	17.77
76.68	10.73	12.59
81.43	8.69	9.88
86.58	5.94	7.48
91.18	3.07	5.75
94.84	0.00	5.16

In order to determine which of the above mixtures represent the upper and lower layers in contact with each other, a series of determinations of the distribution of acetic acid between water and aniline was needed. The results of these determinations at 20°, are as follows :

Gms. CH_3COOH per 100 gms.		
H_2O layer (C_1).	$C_6H_5NH_2$ layer (C_2).	$\frac{C_1}{C_2}$.
1.68	0.65	2.58
2.15	0.92	2.33
3.05	1.51	2.02
4.65	2.56	1.82
5.22	3.11	1 68

Gms. CH_3COOH per 100 gms.		
H_2O layer (C_1).	$C_6H_5NH_2$ layer (C_2).	$\frac{C_1}{C_2}$.
6.82	4.33	1.57
8.77	6.22	1.41
9.63	7.25	1 33
11.19	9.30	1.20

The authors next determined the temperatures at which two layers are formed in solutions containing constant concentrations of acetic acid and variable percentages of water and aniline. For this purpose mixtures of aniline and acetic acid and of water and acetic acid, containing in both cases the same weight per cent of acetic acid, were prepared. Variable mixtures of these two solutions yield in every case a ternary mixture containing a constant concentration of acetic acid. On gradually changing the temperature of such ternary mixtures, containing respectively 15.83, 16.25 and 16.56 per cent of CH_3COOH, an upper and a lower point was found at which clouding occurs. Thus for these ranges of concentration the systems yield closed curves of solubility having an upper and a lower critical temperature of solution.

ANILINE

VARIATION OF THE TEMPERATURE OF SOLUTION IN TERNARY MIXTURES CONTAINING :

15.83 % CH_3COOH			16.25 % CH_3COOH.			16.56 % CH_3COOH		
Gms. $C_6H_5NH_2$ per 100 gms. mixture.	Lower temp.	Upper temp.	Gms. $C_6H_5NH_2$ per 100 gms. mixture.	Lower temp.	Upper temp.	Gms. $C_6H_5NH_2$ per 100 gms. mixture.	Lower temp.	Upper temp.
56.60	+ 2.0	35.6	51.88	10.4	34.9	47.25	22.7	29.0
55.40	−10.3	43.0	49.88	3.8	42.2	46.52	20.5	33.5
54.22	not. det.	47.5	47.89	0.4	46.4	45.42	18.8	36.1
52.32	»	52.0	45.46	0.2	49.8	44.10	18.0	38.8
51.0	»	54.6	42.71	1.0	52.8	42.79	17.7	40.6
49.34	»	57.6	39.91	3.7	54.5	41.30	18.1	42.3
47.25	»	60.2	36.95	7.4	55.5	39.82	19.4	43.0
45.67	»	62.0	35.43	9.9	55.5	38.53	20.5	43.1
43.85	»	63.2	34.61	11.5	55.3	37.14	22.7	43.0
41.98	»	64.2	33.94	12.7	54.7	35.87	25.2	42.7
40.31	»	65.1	33.38	13.9	54.2	35.02	27.6	41.1
38.77	»	65.0	32.76	15.5	53.7	34.32	30.3	39.3
37.53	»	65.1	32.15	17.2	53.0	33.43	33.6	–
36.33	»	65.4	31.49	19.3	51.8			
35.14	− 8.6	65.3	30.85	22.0	49.9			
33.81	5.3	65.2	30.27	25.0	47.9			
32.87	− 2.8	64.9	29.97	26.8	46.3			
31.81	+ 0.2	64.2	29.66	29.4	44.3			
30.82	3.3	63.3	29.43	31.9	41.8			
29.51	8.0	61.4						
28.38	12.8	58.7						
27.74	16.1	56.4						
27.37	18.2	55.6						
26.85	21.7	52.7						
26.42	25.3	50.0						
26.06	29.1	46.6						
25.84	32.6	43.6						
25.73	35.7	40.0						

With mixtures containing 16.75 % CH_3COOH two layers were not formed but an intense opalescence between 25° and 30° was observed.

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL, AND OF MIXTURES OF ETHYL ALCOHOL AND NITROBENZENE.

(Rossett, M rango and Vintor, 1923.)

t° of clouding......	26.5.	22.5.	14.5.	8.0.	2.5.
In mixtures composed of 10 gms. $C_6H_5NH_2$ + 5 cc. of Aq. C_2H_5OH of :	57.5%	58.3 %	59.3%	61.2%	62.8%

t° of clouding.	In 5 cc Aq. 59.3 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2$ + $C_6H_5NO_2$ containing.	
14.5........	0.0	% $C_6H_5NO_2$
16.0........	1.005	»
20.00......	3.26	»

t° of clouding.	In 5 cc. Aq. 59.3 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2$ + $C_6H_5NO_2$ containing :	
24.5.........	5.84	% $C_6H_5NO_2$
34.0.........	11.54	»
43.5.........	17.22	»

t° of clouding.	In 5 cc. Aq. 68.2 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2$ + $C_6H_5NO_2$ containing.	
14.0...	22.89	% $C_6H_5NO_2$
21.0...	28.16	»
29....	87.43	»

t° of clouding.	In 5 cc. Aq. 80 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2$ + $C_6H_5NO_2$ containing :	
19...	78.13	% $C_6H_5NO_2$
26...	82.13	»
88...	87.43	»

t° of clouding.	In 5 cc Aq. 89 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2$ + $C_6H_5NO_2$ containing :	
6.0...	91.49	% C_6H_5NO
10.5...	95.57	»
13.5...	98.27	»
16.0...	100.00	»

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF LACTIC ACID.

(Angelesco, 1925.)

The determinations were made by adding aniline drop by drop to water or aqueous lactic acid just to the appearance of clouding at a definite temperature. The quantities of the three constituents were determined by careful weighings.

Results at 0°.

Gms. per 100 gms. sat. solution.		
$C_6H_5NH_2$.	$CH_3.CHOH.COOH$.	H_2O.
3.68	0.00	96.32
5.43	1.91	92.66
7.86	4.34	87.80
9.78	6.25	83.97
11.89	8.19	79.92
14.57	10.40	75.03
17.00	11.74	71.26
21.23	12.96	65.81
27.94	13.68	58.38
34.07	13.72	52.21
40.56	13.48	45.96
48.19	12.97	38.84
52.07	12.60	35.33
56.27	12.05	31.68
60.97	11.28	27.75
65.82	10.32	23.86
72.60	8.65	18.75
78.84	6.83	14.33
85.14	4.62	10.24
91.95	1.93	6.12
95.71	0.00	4.29

Results at 20°.

Gms. per 100 gms. sat. solution		
$C_6H_5NH_2$	$CH_3.CHOH.COOH$	H_2O
3.59	0.00	96.41
6.73	2.96	90.31
8.85	5.02	86.13
10.99	7.14	81.87
14.07	9.52	76.41
17.59	11.42	70.99
21.96	12.65	65.39
29.45	13.39	57.16
42.76	13.02	44.22
45.59	12.82	41.59
48.40	12.52	39.06
50.79	12.35	36.86
53.31	11.84	34.85
60.16	11.14	28.70
66.18	10.02	23.80
71.36	8.99	19.65
76.70	7.31	15.99
81.90	5.66	12.44
86.53	3.91	9.56
92.24	1.61	6.15
94.84	0.00	5.16

In order to have complete information in regard to the isotherms the author also determined the distribution of lactic acid between water and aniline at 20°.

Gms. $CH_3CHOH.COOH$ per 100 gms.			Gms. $CH_3CHOH.COOH$ per 100 gms.		
H_2O layer (C_1).	Aniline layer C_2.	$\frac{C_1}{C_2}$.	H_2O layer (C_1)	Aniline layer C_2	$\frac{C_1}{C_2}$.
2.29	0.32	7.16	11.62	5.18	2.24
4.14	0.64	6.47	12.85	8.20	1.56
7.88	1.85	4.26	13.57	10.01	1.36
9.43	2.80	3.37	13.50	11.70	1.15

The critical concentration at 20° is approximately 13.3 per cent $CH_3CHOHCOOH$.

The author also determined the temperatures of solution of different percentages of aniline in three concentrations of aqueous lactic acid. The following results were read from the curves obtained by plotting the author's determinations.

THEY SHOW THE SOLUBILITY OF ANILINE IN:

Aq. Lactic Acid of 13.27 % conc.

t°	Gms. $C_6H_5NH_2$ per 100 gms. lower layer.	upper layer.
−7...	25.2	39.5
−5...	26.1	38.0
−3...	27.2	36.2
−1...	28.4	34.5
0...	29.4	33.5
+1...	30.7	32.0
1.1 (crit. temp.)	31.6	

Aq. Lactic Acid of 13.5 % conc.

t°.	Gms. $C_6H_5NH_2$ per 100 gms. lower layer.	upper layer.
−7...	22.3	45.3
0...	24.1	41.7
+5...	25.4	39.6
10...	26.8	37.8
15...	28.2	36.3
20...	30.0	34.9
23 (crit. t.)..	32.4	

Aq. Lactic Acid of 13.8 % conc.

t°.	Gms. $C_6H_5NH_2$ per 100 gms. lower layer	upper layer
−7...	20.9	49.0
0...	22.2	45.1
10...	24.2	42.1
20...	26.1	39.9
30...	28.0	38.2
40...	30.5	36.0
43.4 crit. t..	33.0	

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF GLYCEROL AND VICE VERSA.

(Kolthoff, 1917.)

(The liquids were measured from burets. The determinations at 100° were made in sealed tubes. The others were made in open tubes.)

Results for the Solubility of Aniline in Aqueous Glycerol.

Per cent Glycerol in Aq. Mixture used.	cc. Aniline dissolved by 100 cc. of Aq. Glycerol of Conc. shown at: 18°.	25°.	36°.	100°.
0 (= water)	3·25	3·4	5·6	9·9
39	5·15	5·3	...	...
56	7·5	7·6	...	28 (58% Glycerol)
65	10	...	...	38 (66% ")
74·3	11.75	12.1	...	...
78	20	20	16	...
87	70	...	...	...

Results for the Solubility of Aqueous Glycerol in Aniline.

Per cent Glycerol in Aq. Mixture used.	cc. of Aq. Glycerol Mixture dissolved by 100 cc. Aniline at: 18°.	25°.	36°.	100°.
0 (= water)	4.6	5	4	5·3
39	...	6.4	...	...
47	5·2	...	...	...
56	7·9	7·7	...	15 (58% Glycerol)
74·3	13·1	11·7	...	17 (66% ")
78	17·1	14·8	...	...

SOLUBILITY OF ANILINE, PHENOL MIXTURES IN WATER.

(Schreinemaker — Z. physik. Chem. 29, 584; 30, 460, '99.)

t°.	Mixture used = 25.4 Mols. Aniline + 74.6 Mols. Phenol. Gms. of Mixture per 100 Gms. Aq. Layer.	A. + P. Layer.	t°.	Mixture used = 50 Mols. Aniline + 50 Mols. Phenol. Gms. of Mixture per 100 Gms. Aq. Layer.	A. + P. Layer.
40	5·0	86·0	40	4·0	91·5
60	5·5	82·0	80	5·5	85·5
80	8·0	77·0	100	8·0	82·0
100	12·5	67·0	120	13·5	73·5
110	19·0	56·5	130	19·0	66·0
104 (crit. temp.)	33	...	135	23·5	58·0
			140 (crit. temp.)	35	...

Determinations in above table by "Synthetic Method," see NOTE, p. 292 Schreinemakers gives results for several other mixtures of aniline and phenol which yield curves entirely similar to those for the two mixtures here shown.

SOLUBILITY OF MIXTURES OF ANILINE, OILS AND WATER. (Jansen and Schut, 1923.)

The authors determined the temperature of clouding in mixtures composed of 4 parts of aniline (containing increasing percentages of H_2O) and one part of oil.

Results for Rape Oil.

Per cent of H_2O in aniline.	t° of clouding.
0.0	37.6
1.16	44.6
2.07	50.4
3.11	57.3
4.22	64.5
4.87	69.3

Results for Soya, Peanut and Corn Oil.

Per cent of H_2O in aniline.	t° of clouding with Soya Oil.	Peanut Oil.	Corn Oil.
0.0	8.7	26.2	11.0
1.01	13.6	31.6	15.5
1.98	18.6	37.3	20.4
3.01	24.3	43.5	25.6
4.07	30.6	50.3	31.6
4.71	34.0	54.1	35.0

DISTRIBUTION OF ANILINE BETWEEN:

(Vaubel — J. pr. Chem [2] 67, 477, '03.)

Water and Ether.

Composition of Solutions.		Gms. $C_6H_5NH_2$ in:	
G. $C_6H_5NH_2$ Used.	Solvent.	Aq Layer.	Ether Layer.
1.2478	50 cc. H_2O + 20 cc. Ether	0.1671	1.0807
1.2478	50 cc. H_2O + 50 cc. Ether	0.0835	1.1643
1.2478	50 cc. H_2O + 100 cc. Ether	0.0504	1.1884

Water and Carbon Tetrachloride.

Composition of Solutions.		Gms. $C_6H_5NH_2$ in:	
G. $C_6H_5NH_2$ Used.	Solvent.	Aq Layer.	CCl_4 Layer.
0.3478	50 cc. H_2O + 20 cc. CCl_4	0.3358	0.012
1.2478	50 cc. H_2O + 50 cc. CCl_4	0.2767	1.0711
1.2478	50 cc. H_2O + 100 cc. CCl_4	0.1845	1.063

DISTRIBUTION OF ANILINE BETWEEN WATER AND BENZENE AT 25°.

(Farmer and Warth, 1904.)

Gms. $C_6H_5NH_2$ per 100 cc.		Ratio.
Water Layer.	C_6H_6 Layer.	
0.0135	0.1312	9.7
0.0122	0.1282	10.5
0.0065	0.0656	10.1

Data for the distribution between water and benzene at 25° of each of the following substituted anilines; *o*, *m* and *p* nitraniline, chloraniline, bromaniline, *p* nitrosmethylaniline, and *p* nitrosodimethylaniline are given by Farmer and Warth (1904).

DISTRIBUTION OF ANILINE BETWEEN WATER AND TOLUENE AT 25°.

(Riedel, 1906.)

NOTE. — Mixtures of aniline and toluene were shaken with water and after separation of the two layers the Sp. Gr. of the A : T mixture (layer) was determined and also the amount of aniline in each layer.

Solution Shaken with A : T Mixture.	Vol. per cent Aniline : Toluene in Mixtures Used.	Sp. Gr. of A : T Mixture after Separation.	Gms. $C_6H_5NH_2$ in 100 cc. of:	
			A : T Layer.	Aq Layer.
H_2O	50:50	0.9257	41.5	2.14
"	25:75	0.8928	20.7	1.5
"	12.5:87.5	0.8737	8.62	0.86
"	5.5:94.5	0.8661	3.87	0.45
"	2.5:97.5	0.8627	1.68	0.21

The author also gives data for the distribution of aniline between toluene and aqueous solutions of K_2SO_4, KBO_3, $Ba(OH)_2$, $Sr(OH)_2$ and $Ca(OH)_2$.

DISTRIBUTION OF ANILINE AND OF METHYL ANILINE BETWEEN WATER AND XYLENE AT 25°.

(Smith, 1921-1922.)

Millimols. $C_6H_5NH_2$ per liter of		$\frac{(C_2)}{(C_1)}$.	Millimols. $C_6H_4(CH_3)NH_2$ per liter of		$\frac{(C_2)}{(C_1)}$.
H_2O layer (C_1).	Xylene layer (C_2).		H_2O layer (C_1).	Xylene layer (C_2).	
0.150	0.45	2.9	0.125	1.31	10.5
0.203	0.67	3.3	0.185	2.10	10.9
0.279	1.20	4.3	0.300	3.40	11.3
0.378	2.00	5.3			

DISTRIBUTION OF ANILINE BETWEEN AQUEOUS SODIUM OLEATE SOLUTIONS AND ETHYL ACETATE AT 25°.

(Smith, 1932a.)

Initial Conc. of Aq. Na Oleate in Percent	Gms. $C_6H_5NH_2$ per 100 gms. Aqueous layer(1)	Gms. $C_6H_5NH_2$ per 100 gms. Acetate layer(2)	$\frac{2}{1}$	Initial Conc. of Aq. Na Oleate in Percent	Gms. $C_6H_5NH_2$ per 100 gms. Aqueous layer(1)	Gms. $C_6H_5NH_2$ per 100 gms. Acetate layer(2)	$\frac{2}{1}$
0.0	0.00182	0.0561	30.7	10.83*	0.0610	0.422	6.9
0.0	0.0146	0.442	30.2	10.83*	0.0648	0.439	6.8
0.0*	0.0146	0.481	33.0	10.83	0.0728	0.517	7.1
0.0	0.0182	0.550	30.3	10.83	0.0752	0.528	7.0
0.0	0.157	4.62	29.5	10.83	0.534	3.82	7.15
1.5	0.0242	0.542	22.4	10.83	2.239	16.90	7.55
2.95	0.0320	0.539	16.8	13.2	0.0844	0.501	5.93
2.95*	0.0256	0.399	15.6	17.55	0.1106	0.509	4.61
4.37	0.0360	0.436	12.1	21.5	0.1507	0.620	4.11
5.73	0.0303	0.316	10.5	21.5	0.1584	0.649	4.10
8.36	0.0502	0.396	7.9	26.7	0.1229	0.469	3.82

* In these cases NaCl was present to the extent of 0.5 normal.

SOLUBILITY OF ANILINE IN SULPHUR.

(Alexejew — Ann. Physik. Chem. 28, 305, '86.)

t°.	Gms. $C_6H_5NH_2$ per 100 g. S. Layer.	Gms. $C_6H_5NH_2$ per 100 g. Anilin Layer.	t°	Gms. $C_6H_5NH_2$ per 100 g. S. Layer.	Gms. $C_6H_5NH_2$ per 100 g. Anilin Layer.
100	4	75	130	15	58
110	6	70	135	17.5	47
120	10	64	138 (crit. temp.)	23	..

RECIPROCAL SOLUBILITY OF ANILINE AND HEXANE.

(Keyes and Hildebrand, 1917.)

t° of Complete Miscibility.	Gms. Hexane per 100 Gms. Mixture.	t° of Complete Miscibility.	Gms. Hexane per 100 Gms. Mixture.
26.1	9.6	59.2	35.9
43.9	14.8	59.4	41.6
45.9	16.3	59.6	48
49.9	20	57.9	62.9
51.4	21	53.9	73.1
56	27.2	47.2	80.6
58.2	31	35.6	88.1
58.2	34.6	16.5	93.8

RECIPROCAL SOLUBILITY OF ANILINE AND PHENOL, DETERMINED BY THE FREEZING-POINT METHOD.

(Schreinemakers, 1899.)

t° of Melting.	Mols. $C_6H_5NH_2$ per 100 Mols. Mixture.	Solid Phase.	t° of Melting.	Mols. $C_6H_5NH_2$ per 100 Mols. Mixture.	Solid Phase.
− 6.1	100	$C_6H_5NH_2$	30.4 m. pt.	50	1.1
− 8.9	96	"	28.6	40	"
−11.7 Eutec.	92.3	$C_6H_5NH_2$+1.1	22.3	30	"
− 6.5	90	1.1	14.8 Eutec.	21.2	1.1+C_6H_5OH
+10.1	80	"	18.4	20	C_6H_5OH
22	70	"	31.4	10	"
28.5	60	"	37.3	4	"

1.1 = $C_6H_5NH_2.C_6H_5OH$.

of aniline in cyclohexane at pressures up to 300 at-

MUTUAL SOLUBILITY OF ANILINE AND CYCLOHEXANE. (Buchner and Kleyn, 1924.)

Saturation temp.	18°.2.	29°.8.	31°.2.	31°.3.	31°.3.	30°.[illegible]	[illegible]	[illegible]	[illegible]
Gms. $C_6H_5NH_2$ per 100 gms. sat. sol...	11.5	19.3	26.8	40.0	57.2	64.9	68.0	75.0	76.0

Later very careful determinations of this system are given by Schlegel, 1934.

CRITICAL SOLUTION TEMPERATURES OF ANILINE, IN VARIOUS SOLVENTS. (Thiry, 1925.)

Solvent.	Constants of the solvent.				Solubility results.	
	f. pt.	b. pt.	$d_{\frac{15}{4}}$.	Mol. wt.	Critical solution temp.	Per cent conc. $C_6H_5NH_2$ at C. S. T.
Cyclopentane...........	– 94.8	49.37 (49.5)	0.7505 (0.750)	70.08	16.8 (18°)	37.5
Methyl cyclopentane....	–141.0	71.9 (72.0)	0.7528 (0.7533)	84.1	35.2 (35)	30.0
Ethyl »	–137.9	103.0	0.7710	98.11	39.8	35.0
Propyl »	–120.3	131.4	0.7813	112.13	45.5	40.0
Butyl »	–108.2	156.8	0.7887	126.15	51.1	42.5
Cyclo hexane...........	+ 6.55	80.77 (80.8)	0.7830 (d_4^0 0.7967)	84.036	30.8 (31.0)	40.0
Methyl cyclohexane....	–147.5	100.5 (100.4)	0.7693 (d_4^0 0.798)	98.112	41.0 (41.0)	40.0
Hexane.................	– 94.65	69.0 (69.0)	0.6780 (0.6638)	86.112	69.2 (69.0)	41.0
Methyl 3 pentane.......	—	63.2	0.6687		69.6	41.5
Isohexane..............	–137.1	60.18 (61.7–62.4)	0.6580 (0.658)		74.9 (74.8)	37.5
Trimethylethylmethane.	– 98.2	19.70	0.6538		80.65	40.0

The results given in parentheses in the above table are those of Chavanne and Simon, 1919 and 1920. These authors also give for mixtures containing aniline the following additional critical solution temperatures. Isopentane (b. p. 27°-29°; $d_{\frac{0}{4}}$ = 0.6394) 77°; Pentane (b. p. 35°.8-36°.3; $d_{\frac{0}{4}}$ 0.6454) 72°; Isoheptane (b. p. 90-91°; $d_{\frac{15}{4}}$ = 0.6842) 72°.8; Heptane (b. pt. 98°-98°.3; $d_{\frac{15}{4}}$ = 0.6879) 70°; Isooctane (b. p. 116°) 74°; Octane (b. p. 125.8°; $d_{\frac{15}{4}}$ = 0.7063) 72°; Dimethylcyclopentane (b. p. 91°-94°) 45°; Dimethylcyclohexane (b. pt. 121.2°-121.8°; $d_{\frac{15}{4}}$ = 0.775) 49°.

Van Rysselberge, gives 42° as the C. S. T. of Aniline + Dimethyl 1.2 Cyclopentane.

CRITICAL SOLUTION TEMPERATURES OF MIXTURES OF ANILINE AND OTHER COMPOUNDS.

Mixture of Aniline and:	C.S.T.	Mixture of Aniline and:	C.S.T.
Cyclohexane	30.2(4)	Hexane	65.9(8)
"	31.0(3)(7)	"	67.3(4)
n Decane	77.5(2)	"	69.0(2)
"	77.6(3)	"	70.0(7)
Di iso butyl		Methyl cyclo hexane	40 (4)
2.5 Dimethyl hexane	78.3(5)	" " "	41 (6)(7)
2.2 Dimethyl pentane	77.2(1)	" cyclo pentane	34.7(3)
2.3 " "	68.1(1)	2, Methyl hexane	74.1(1)
2.4 " "	78.8(1)	3, " "	70.5(1)
3.3 " "	71.0(1)	n Nonane	74.4(2)
n Dodecane	83.7(2)	n Octane	71.8(2)
3 Ethyl pentane	66.3(1)	n Pentane	71.4(2)
n Heptane	67.3(4)	2,2,3 Trimethyl butane	72.4(1)
"	69.9(2)	n Undecane	80.6(2)
"	70.0(1)(3)		

(1) Edgar, Calingaert and Marken, 1929; (2) Shepard, Henne and Midgley, Jr., 1931; (3) Bruun, Hicks-Bruun, 1931, 1932; (4) Schaarschmidt, Hofmeier and Leist, 1930; (5) Timmermans and Hennant-Roland, 1932; (6) Hicks-Bruun and Bruun, 1932; (7) Dessart, 1926; (8) Drucker, 1923.

RECIPROCAL SOLUBILITY OF ANILINE AND HYDROCARBONS. (Tizard and Marshall, 1921.)

The authors desired a method for the determination of aromatic hydrocarbons in certain mixtures. For this purpose they made a long series of experiments showing the effect of the addition of various aromatic hydrocarbons, upon the temperature of clouding of mixtures of equal volumes of aniline and a sample of « petrol », free of aromatic hydrocarbons. The results are presented, for the most part, in the form of curves.

THE FREEZING-POINTS OF ANILINE CONTAINING SMALL AMOUNTS OF IMPURITIES. (Sanderson and Jones, 1920.)

Mixtures of pure dry aniline and the several compounds, each carefully purified and dried, were prepared and their freezing-points determined. The table shows the percentage by weight of aniline in the mixture and the corresponding freezing-point.

Wt. per cent of Aniline.	Freezing-point of the dry binary mixture of aniline with								
	Benzene.	Phenyl hydroxyl amine.	Nitroso benzene.	*p* Amino phenol.	Nitro benzene.	*o* Toluidine.	*p* Toluidine.	*m* Phenylene diamine.	Xylidine.
100	−6.00	−6.00	−6.00	−6.00	−6.00	−6.00	−6.00	−6.00	−6.00
99	−7.18	−6.47	−6.58	−6.58	−6.53	−6.60	−6.65	−6.60	−7.00
98	−8.00	−6.94	−7.16	−7.16	−7.03	−7.18	−7.25	−7.18	−7.75
97	−8.70	−7.41	−7.74	−7.74	−7.50	−7.75	−7.85	−7.75	−9.00
96	−9.30				−7.97	−8.33	−8.45	−	
95					−8.43	−8.95	−9.05		
94					−8.85	−9.53	−9.63	−	−
93					−9.27	−10.11	−	−	−

Freezing-point data are given for mixtures of Aniline and:

Acetanilide(15)
Acetic acid(8)(12)(14)
Acetone(16)(17)
Amino phenol(3)
Allyl mustard oil(21)(22)
Allyl phenyl thio urea (15)
Benzene(2)(9)
Benzoic acid(8)(23)
Carbon tetra chloride(16)(17)
Chloroform(25)
Chloro phenol(26)
Chloro nitro benzenes(27)(28)
Cresols(29)(30)
Crotonic acid nitrile(10)
Cyclohexane(1)(9)
Dibrom ethane(17)
Diethyl aniline(19)(20)
Dinitro benzenes(28)(31)
Dinitro phenol(29)
Dinitro toluenes(6)(29)
Ethyl acetate(18)
Ethyl aniline(20)
Ethylene bromide(16)(17)
Ethyl ether(17)
Guaiacol(13)
Hydroquinone(28)
Iso pentane(32)
Mercuric acetate(11)
Naphthols(5)
Nitro benzene(9)(31)
Nitro phenols(28)
Nitroso benzene(31)
Nitroso dimethyl aniline(31)
Nitro toluene(31)
Phenol(1)
Pyrocatechol(29)
Pyrogallol(7)
Resorcinol(28)
Toluene(16)(17)
Toluidine(9)
Trinitro benzene(31)
Trinitro toluene(29)
Triphenyl methane(4)
Vinyl acetic nitrile (10)

(1) Deffet, 1938; (2) Kremann and Borjanovics, 1916; (3) Kremann and Hohl, 1920; (4) Kremann, Odelga and Zawodsky, 1921; (5) Kremann, Lupfer and Zawodsky, 1920; Kremann, Hönigsberg and Mauermann, 1923; (7) Kremann and Zechner, 1918; (8) Kremann, Weber and Zechner, 1925; (9) Linard, 1925; (10) Lafortune, 1923; (11) Mameli and Cocconi, 1922; (12) O'Connor, 1921; (13) Puschin and Vaic, 1926; (14) Puschin and Rikovski, 1932; (15) Schischokin, 1930; (16) Timmermans, 1928; (17) Timmermans, 1930; (18) Wroczynski and Guye, 1910; (19) Yamamura, 1926; (20) Yaginuma and Hayakawa, 1932; (21) Kurnakof and Kviot, 1913; (22) Kurnakov and Solover, 1916; (23) Baskov, 1913; (25) Tsakalatos and Guye, 1910; (26) Bramley, 1916; (27) Kremann, 1907; (28) Kremann and Rodinis, 1906; (29) Kremann, 1906; (30) Philip, 1903; (31) Kremann, 1904; (32) Campetti and del Grosso, 1913.

ANILINE HYDROCHLORIDE $C_6H_5NH_2.HCl$.

100 cc. H_2O dissolve 17.8 gms. of the salt at 15°. (Niementowski and Roszkowski, 1897.)
100 gms. H_2O dissolve 107.1 gms. of the salt at 25°. (Peddle and Turner, 1913.)
100 gms. sat. solution in water contain 52.1 gms. $C_6H_5NH_2.HCl$ at 25°.
100 gms. sat. solution in aniline contain 8.89 gms. $C_6H_5NH_2.HCl$ at 25°.
(Sidgwick, Pickford and Wilsden, 1911.)

Distribution of Aniline Hydrochloride between Water and Aniline at 25°
(Sidgwick, Pickford and Wilsden, 1911.)

$C_{aq.}$	$C_{an.}$	$C_{aq.}/C_{an.}$	$C_{aq.}$	C_{an}	$C_{aq}/C_{an.}$	C_{aq}	$C_{an.}$	C_{aq}/C_{an}
0.11	0.006	19.30	0.6	0.210	2.74	1	0.804	1.24
0.2	0.020	10	0.7	0.327	2.14	1.1	1.005	1
0.3	0.043	6.98	0.8	0.471	1.70	1.2	1.228	0.98
0.4	0.086	4.65	0.9	0.631	1.43	1.3	1.412	0.92
0.5	0.146	3.42						

$C_{aq.}$ = gms. salt per 100 gms. aq. layer. $C_{an.}$ = gms. salt per 100 gms. aniline layer.

Freezing-point data for mixtures of $C_6H_5NH_2.HCl + AsBr_3$ are given by Puschin and Löwy, 1926.

ANILINE OXALATE $C_6H_5NH_2.(COOH)_2$.

Solubility of Aniline Oxalate and of Ethyl Aniline Oxalate and of Dimethyl Aniline Oxalate, Each Separately in Water and in Aqueous Alcohol.
(Desvergnes, 1930.)

Solvent	t°	Gms. per 100 gms. solvent Aniline Oxalate	 Ethyl aniline Oxalate	 Dimethyl aniline Oxalate
Water	0	0.748	4.439	2.706
"	16.5	1.542	6.882	14.214
"	50.0	3.01	—	49.23
Aq. 50 wt. % C_2H_5OH	0	0.430	7.736	7.317
" " "	20.5	0.748	16.716	14.111
" " "	50.0	2.93	103.47	59.39
Aq. 95.7 wt. % C_2H_5OH	0	0.201	2.591	1.738
" " "	18.5	0.513	3.959	2.131

ANILINE SULFATE $C_6H_5NH_2.H_2SO_4$.

100 cc. H_2O dissolve 6.6 gms. $C_6H_5NH_2.H_2SO_4$ at 15°.
(Niementowski and Roszkowski, 1897.)

ANILINE HELIANTHATE $C_6H_5NH_2.C_{14}H_{15}N_3SO_3$; also Methyl and Dimethyl Aniline Helianthates.

1000 cc. H_2O dissolve 0.26 gm. Aniline Helianthate at 20°-25° (Stark and Dehn, 1918.)
1000 cc. » 0.54 gm. Methyl " " "
1000 cc » 0.70 gm. Dimethyl " " "

ANILINE CHLOROSTANNATE $(C_6H_5NH_2)_2.H_2SnCl_6$.

00 cc. H_2O dissolve about 28.0 gms. aniline chlorostannate at 16° (Druce, 1918.

Methyl **PYRIDINES** (Picolines) $CH_3C_5H_4N$.

Data for the reciprocal solubility of 3 methyl pyridine (= β picoline) and water, 2.6 dimethyl pyridine (= 2.6 lutidine) and water, methyl pyridine (= γ picoline) zinc chloride and water, methyl pyridine zinc chloride and each of the following alcohols; methyl, ethyl, propyl, isobutyl, isoamyl, cetyl and methyl hexylcarbinol, determined by the synthetic method (see Note, p. 292), are given by Flaschner (1909). See also p. 616, for 2.4.6 trimethyl pyridine (collidine) and water.

1000 cc. H_2O dissolve 65.3 gms. α Picoline Helianthate at

Amino **PHENOLS** *o*, *m* and *p* $C_6H_4.OH.NH_2$.

Solubility of Each Separately in Water and in Benzene.

(Sidgwick and Callow, 1924.)

The determinations were made by the sealed tube method. In the case of meta amino phenol it was difficult to avoid supersaturation. By proper care the two-liquid curve (L) lying some 60° below the stable solid curve (S) and even the meta stable ice curve in dilute solution, could be determined.

Results for the Solubility in Water:

Ortho Amino Phenol.

t°.	Wt. per cent $C_6H_4.OH.NH_2$ (*o*).
0.0	1.7
80.8	3.02
88.0	4.04
100.2	7.10
107.1	9.98
116.7	17.93
120.9	25.08
123.8	31.96
126.2	40.03
128.6	50.17
131.7	59.73
135.8	69.61
143.0	80.46
155.6	90.48
177.0	100.0

Meta Amino Phenol.

t° (S)	t° (L)	Wt. per cent $C_6H_4.OH.NH_2$ (*m*).
20.0		2.76
32.6		3.69
47.9		8.0
53.0		10.69
60.4	−7 L*	18.13
−4.2 L* (ice)		18.13
	−4.6 L*	20.16
	−2.0 L*	25.47
66.4	+0.3 L*	30.62
68.9	+1.3 L*	40.18
70.2	+1.9 L*	46.93
71.5	+1.7 L*	52.67
73.2	+0.2 L*	59.27
77.2		68.87
85.2		80.89
96.0		88.84
122.1		100.00
−4.0 tr. pt.		21.5
+1.9 crit. sol. pt.		

Para Amino Phenol.

t°.	Wt per cent $C_6H_4.OH.NH_2$ (*p*)
0.0	1.1
59	3.01
77	6.44
86.7	10.09
96.6	19.53
102.0	33.42
103.7	40.34
106.5	50.79
110.1	59.95
116.5	69.95
128.0	79.93
145.8	89.48
186.0	100.0

L indicates that a second liquid phase separates.
* Indicates metastable points.

Results for the Solubility in Benzene:

Ortho Amino Phenol.

t°.	Wt per cent $C_6H_4.OH.NH_2$ (*o*)
114.9	3.87
132.2	9.02
141.8	16.1
146.8	23.2
149.7	29.3
151.5	34.1
153.6	41.3
155.7	49.3
158.4	59.7
161.5	69.8
165.2	80.4
168.2	87.6
177.0	100.0

Meta Amino Phenol.

t°.	Wt. per cent $C_6H_4.OH.NH_2$ (*m*).
96.5	4.87
105.9 (100.8 L*)	10.4
114.3 L	20.3
121.2 L	31.3
122.1 L	37.7
122.3 L (crit. t.)	40.0
122.1 L	46.1
121.9 L	50.9
119.3 L	59.0
111.2 L	68.9
110.8 (105.8 L*)	72.5
111.4 (96.9 L*)	76.4
112.6	82.6
116.4	91.8
110.6 (tr. pt.)	16.5
110.6 (tr. pt.)	69.4

Para Amino Phenol.

t°.	Wt. per cent $C_6H_4.OH.NH_2$ (*p*).
103	3.16
124	7.56
130	11.6
135	20.4
138.5	30.4
143	40.1
145	51.0
149	60.9
154	69.2
186	100.0

AMINO PHENOLS

Freezing-point data are given for mixtures of o, m and p Amino phenols by Hrynakowski and Szmyt, 1936. Results are given for mixtures of amino phenols and each of the following compounds.

- Aniline (Kremann and Hohl, 1920.)
- Anthracene (Bernoulli and Lotta, 1933.)
- Antipyrine (Pfeiffer and Seydel, 1928b.)
- Cineole (Bellucci and Grassi, 1913.)
- Dinitro benzenes (Kremann, Lupfer and Zawodsky, 1920.)
- Hydroquinone (Kremann and Lupfer, 1920.)
- Naphthalene (Bernoulli and Lotta, 1933.)
- Naphthols (Kremann, Lupfer and Zawodsky, 1920.)
- Naphthylamines (Kremann and Hohl, 1920.)
- Nitro phenols (Kremann, Lupfer and Zawodsky, 1920.)
- Phenanthrene (Bernoulli and Lotta, 1933.)
- Phenol (Kremann, Lupfer and Zawodsky, 1920.)
- Phenylene diamine (Kremann and Hohl, 1920.)
- Pyramidon (Pfeiffer and Seydel, 1928b.)
- Pyrocatechol (Kremann, Lupfer and Zawodsky, 1920.)
- Pyrogallol (" " " "
- Resorcinol " " " "
- Sarcosine anhydride (Pfeiffer and Seydel, 1928.)
- Toluidine (Kremann and Hohl, 1920.)

ANILINE SULFONIC ACIDS, *o* and *m* $C_6H_4(NH_2).SO_3H$.

SOLUBILITY OF EACH IN WATER. (Philip and Colborne, 1924.)

Results for Aniline Ortho Sulfonic Acid.

t°.	Gms. *o* $C_6H_4(NH_2)SO_3H$ per 100 gms. sat. sol.	Solid Phase.
0.0....	0.794	*o* $C_6H_4(NH_2)SO_3H.H_2O$
8.25...	1.130	"
12.3....	1.305	"
15.55...	1.465	*o* $C_6H_4(NH_2)SO_3H$
16.75...	1.52	"
25.0....	1.93	"
41.3....	3.01	"
55 0....	4.29	"
70.0....	6.36	"
85.0....	8.98	"

Results for Aniline Meta Sulfonic Acid (Metanilic Acid).

t°.	Gms. *m* $C_6H_4(NH_2)SO_3H$ per 100 gms. sat. sol.	Solid Phase.
0.0....	0.790	*m* $C_6H_4(NH_2)SO_3H$
7.75...	1.022	"
16.75 ..	1.42	"
24.95...	1.635	"
40.0....	2.395	"
55.0....	3.42	"
70.0....	4.70	"
85.0....	6.50	"
0.0....	1.07	$2C_6H_4(NH_2)SO_3H.3H_2O$
8.35...	1.61	" (unstable)
15.55...	2.64	"
16.8....	2.37	"

Considerable difficulty was experienced in preventing supersaturation of the anhydrous meta aniline sulfonic acid.

SOLUBILITY OF AMINO BENZENE SULFONIC ACIDS IN WATER.

(Vaubel, 1895.)

Acid		Formula	t°	Gms. acid per 100 gms. sat. sol.
Ortho Aniline Sulfonic acid	o	$NH_2C_6H_4SO_3H$	7	1.06
Meta " " "	m	"	7	1.276
Para " " "	p	"	6	0.592

SULFANILIC ACID *p* $NH_2.C_6H_4SO_3H.H_2O$.

SOLUBILITY IN WATER.

(Philip, 1913; results for 60° and over by Dolinski, 1905.)

t°.	Gms. $NH_2.C_6H_4.SO_3H$ per 100 Gms. Sat. Sol.	Solid Phase.	t°.	Gms. $NH_2.C_6H_4.SO_3H$ per 100 Gms. Sat. Sol.	Solid Phase.
0	0.444	$NH_2.C_6H_4.SO_3H.2H_2O$	44	2.44	$NH_2.C_6H_4.SO_3H.H_2O$
7.2	0.622	"	44	2.36	$NH_2.C_6H_4.SO_3H$
13.3	0.841	"	47.5	2.52	"
18.9	1.003	"	54.5	2.85	"
18.9	1.137	$NH_2.C_6H_4.SO_3H.H_2O$	60	3.01	"
25.1	1.384	"	70	3.65	"
31.1	1.662	"	80	4.32	"
37.2	2.004	"	100	6.26	"

SOLUBILITY OF SULFANILIC ACID IN WATER. (Philip and Colborne, 1924.)

t°.	Gms. $NH_2.C_6H_4SO_3H$ per 100 gms. sat. sol.	Solid Phase.
69.9	3.74	$NH_2.C_6H_4SO_3.H$
85.0	4.74	»

Data for the solubility of trimethyl sulfanilic acid in water and in aqueous solutions of acetic and hydrochloric acids are given by Katayama and Yamada, 1920.

SOLUBILITY OF p AMINO BENZENE SULFONIC ACID IN AQUEOUS SOLUTIONS OF BARIUM NITRATE AT 20°.

(Yajnik, Jain and Nath, 1926.)

The results are given only in the form of a curve from which the following approximate values have been taken.

Gm. Mol. $Ba(NO_3)_2$ per liter aq. solvent	Gms. $NH_2C_6H_4SO_3H$ per 100 gms. solvent	Gm. Mol. $Ba(NO_3)_2$ per liter aq. solvent	Gms. $NH_2C_6H_4SO_3H$ per 100 gms. solvent
0.0000	1.00	0.0008	1.40
0.00005	1.08	0.0016	1.51
0.0001	1.16	0.0024	1.56
0.0004	1.32	0.0032	1.59

The authors' results for the solubility in water are 1.0 gm. at 20°, 1.45 gm. at 30° and 1.95 gm. at 40°,

Data showing the effect of increasing amounts of several gum arabic sols. upon the solubility of Sulfanilic acid in Water are given by Brintzinger and Beir, 1934.

100 gms. sat. solution of Sulfanilic acid in liquid ammonia contain 28, gms. $NH_2.C_6H_4SO_3H(?.H_2O)$ at (?)t°. (DeCarli, 1927.)

PHENYL HYDRAZINE $C_6H_5NHNH_2$

[illegible] Phenyl Hydrazine [illegible] Water. Determined by the Synthetic Method. [illegible]

t°	Gms. $C_6H_5NHNH_2$ per 100 Gms. Sat. Sol.	Solid Phase	t°	Gms. $C_6H_5NHNH_2$ per 100 Gms. Sat. Sol.	Solid Phase
[illegible]	[illegible]		[illegible]	80.2	$C_6H_5NHNH_2.H_2O$
[illegible]	[illegible]		20.4	84.2	
[illegible]	[illegible]		22.8	86	
[illegible]	4[illegible]	$C_6H_5NHNH_2.H_2O$	23	[illegible]	
6.1	4[illegible]	$C_6H_5NHNH_2.H_2O$	24.2	9[illegible]	
[illegible]	[illegible]		[illegible]	94	
28[illegible]	[illegible]		[illegible]	95.1	
34	8		[illegible]	96	
[illegible]	[illegible]		23.2	97.2	
[illegible]	[illegible]		27	98.8	
			[illegible]	[illegible]	$C_6H_5NHNH_2$
			19.6 m. pt.	100	$C_6H_5NHNH_2$

Between the concentrations [illegible] and [illegible], two liquid layers are formed.

The temperatures of separation [illegible] of mixtures containing [illegible] $C_6H_5NHNH_2$ [illegible]

t° of Separation	Gms. $C_6H_5NHNH_2$ per 100 Gms. Mixture	t° of Separation	Gms. $C_6H_5NHNH_2$ per 100 Gms. Mixture	t° of Separation	Gms. $C_6H_5NHNH_2$ per 100 Gms. Mixture
19.8	34.6	54.6	39.2	50.6	48.9
34	33.8	55.3	44.4	50	51.2
45	38.[illegible]	55.3 (crit.)	45.6	49	51.5
49.4	28.[illegible]	55.2	56.9	44.2	54.7
53.4	33.9	55	59.3	39.6	56.7
54	35.2	54	42.7	24	59.5
54.4	28.3	53.6	45	19.8	60.1

Additional data for concentrations of $C_6H_5NHNH_2$ above [illegible] per cent, are given [illegible]

Freezing point data are given for mixtures of Phenyl hydrazine and: Acetic Acid (Trifonow and Tscherbow, [illegible]); Guaiacol (Puschin and [illegible], [illegible]; Puschin and Rikovsky, 1932a.) Phenol (Puschin and Rikovsky [illegible]; [illegible] and Bernardi, [illegible])

PHENYLENE DIAMINES o, m and p $C_6H_4(NH_2)_2$

Solubility in Water at 20°. [illegible]

100 cc. sat. solution contain 35.8 gms. m-$C_6H_4(NH_2)_2$, d_{20} of sat. sol. = 1.0317.

100 cc. sat. solution contain 3.8 gms. p-$C_6H_4(NH_2)_2$, d_{20} of sat. sol. = 1.0038.

Ratio of Distribution between Water and Benzene at 25°.

(Farmer and Warth, [illegible])

Results for p-Phenylene Diamine.

Gms. p-$C_6H_4(NH_2)_2$ per [illegible] in C_6H_6	Gms. p-$C_6H_4(NH_2)_2$ per [illegible] in H_2O	Ratio $\frac{\text{conc. } C_6H_6}{\text{conc. } H_2O}$
0.0275	0.9818	0.556
0.2040	7.5470	0.541

Results for m-Phenylene Diamine.

Gms. m-$C_6H_4(NH_2)_2$ per [illegible] in C_6H_6	Gms. m-$C_6H_4(NH_2)_2$ per [illegible] in H_2O	Ratio $\frac{\text{conc. } C_6H_6}{\text{conc. } H_2O}$
0.0438	9.088	0.182
0.0404	5.760	0.176

PHENYLENE DIAMINES *o*, *m* and *p* $C_6H_4(NH_2)_2$.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Sidgwick and Neill, 1923.)

The determinations were made by the synthetic method.

m phenylene diamine was found to be dimorphic. The two forms are enantiotropic with a transition point at 36°. The α form (stable above 36°) consists of brown needles, the β form (stable below 36°) of mauve plates

Results for the Ortho compound.		Results for the two forms of the Meta compound.				Results for the Para compound.	
		α Form		β Form			
t°.	Gms. $C_6H_4(NH_2)_2$ (o) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (m) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(OH_2)_2$ (m) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (p) per 100 gms. sat. sol.
35.1...	4.05	0.3...	8.71	0.3...	3.27	3.6...	1.08
45.8...	5.85	4.6...	12.64	14.3...	9.22	23.7...	3.70
56.3...	11.86	9.3...	17.16	18.3...	12.64	37.8...	9.85
61.3...	18.72	11.7...	21.21	22.0...	17.16	49.9...	18.75
62.8...	23.43	16.1...	32.83	24.1...	21.21	59.2...	27.22
64.2...	31.55	18.7...	49.83	26.3...	32.83	64.6...	34.43
66.1...	46.81	20.8...	61.94	27.1...	40.62	69.2...	41.75
67.7...	62.53	22.7...	69.63	27.9...	49.83	75.5...	51.80
71.3...	74.74	26.0...	75.52	29.0...	56.51	80.3...	59.02
80.8...	88,36	30.6...	83.83	29.1...	61.94	88.5...	70.03
88.1...	93.83	43.5...	92.32	30.2...	69.63	95.9..	78.10
91.7...	96.15	53.6...	96.81	31.5...	75.52	107.0...	86.63
95.5...	97.72	57.6...	98.40	32.8...	79.15	125.1...	95.04
103.8...	100.00	62.8...	100.0	34.4...	83.83	139.7...	100.00

SOLUBILITY OF *o*, *m* AND *p* PHENYLENE DIAMINES IN BENZENE.

(Sidgwick and Neill, 1923.)

Results for the Ortho compound.		Results for the Meta compound.				Results for the Para compound.	
t°.	Gms. $C_6H_4(NH_2)_2$ (o) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (m) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (m) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (p) per 100 gms. sat. sol.
22.2..	1.72	19.0....	1.02	58.8...	72.14 L	57.1..	1.20
36.0..	3.13	34.1....	2.84	55.5...	74.56 L	79.9..	3.25
58.4..	9.35	46.8....	7.43	54.7...	74.84 L	98.5..	9.67
72.1..	21.06	50.7....	9.75	53.8tr.pt.	75.01 L+S.	110.6..	20.14
76.9..	31.43	59.8....	19.36 L	53.9...	75.33	112.9..	33.32
80.0..	40.95	69.0....	39.04 L	54.1...	76.84	113.9..	41.04
82.5..	49.47	69.0 crit. t.	—	54.2...	78.57	115.2..	49.10
85.6..	62.05	68.8....	50.91 L	54.7...	79.31	117.1..	59.12
91.1..	77.94	66.5....	61.60 L	56.3...	85.85	124.0..	77.86
96.8..	90.04	64.2....	65.91 L	57.2...	88.64	135.5..	94.75
100.1..	95.12	60.0....	71.04 L	62.8...	100.00	139.7..	100.00
103.8..	100.00						

L indicates two liquid layers; S indicates solid phenylene diamine.

One liter of sat. solution of *p* phenylene diamine in water contains 47.23 gms. $C_6H_4(NH_2)_2$ *p* at 25°. The corresponding figures for aq. 0.2 *n* salt solutions are: KI, 51.68; KBr, 49.68; KCl, 46.85; K_2SO_4, 43.21; LaCl, 48.32 NaCl, 47.23

(Kruyt and Robinson, 1926.)

PHENYLENE DIAMINES

Freezing-point data are given for mixtures of Phenylene Diamines and:

Acetic acid(15)(19)
Amino phenols(7)
Antipyrine(18)
Anthracene(2)
Benzo hydrol(4)
Benzoic acid(15)(21)(24)
Butyric acid(15)
Cinnamic acid(15)(21)
Dinitro benzene(14)(19)
Dinitro phenol(17)(19)
Dinitro toluene(14)
Dioxy naphthalene(11)
Diphenyl methane(6)
Erythritols(20)
Guaicol(3)
Hydro quinone(14)
Menthol(21)
Naphthalene(2)
Nitroso dimethyl aniline(25)
Naphthols (14)
Phenanthrene(2)
Phenol(12)
Phenylene diamines(21)
Phloro glucinol(5)
Pyrocatechol(5)(14)
Pyrogallol(16)(1)(5)
Resorcinol(14)
Salicylic acid(15)
Salol(21)
Sarcosine anhydride(22)
Succinic acid(15)
Trinitro benzene(8)
Trinitro toluene(8)
Thymol(21)
Triphenyl carbinol(10)
Triphenyl methane(9)(13)(23)

(1) Beets, 1937; (2) Bernoulli and Lotter, 1913; (3) Dezelic, 1932; (4) Kremann and Drazil, 1924; (5) Naegeli and Kaltman, 1913; (6) Kremann and Fritsch, 1920; (7) Kremann and Hohl, 1920; (8) Kremann and Mauermann, 1922; (9) Kremann, Mauermann, Muller and Rosler, 1923; (10) Kremann, Hohl and Müller II, 1921; (11) Kremann, Hemmelmayr and Riemer, 1922; (12) Kremann and Petritschek, 1917; (13) Kremann, Odelga and Zawodsky, 1921; (14) Kremann and Strohschneider, 1918; (15) Kremann, Weber and Zechner, 1925; (16) Kremann and Zechner, 1918; (17) Kremann and Zawodsky, 1921; (18) Pfeiffer and Angern, 1926; (19) Puschin and Rikovski, 1930; 1932a; (20) Puschin and Dezelic, 1932; (21) Puschin and Dezelic, 1938; (22) Pfeiffer, Angern and Wang, 1927; (23) Rheinboldt and Kirscheisen, 1926; (24) Puschin and Wilowitsch, 1925; (25) Kremann and Wlk, 1919.

METHYL BARBITAL (Methyl Veronal) $\underline{NHCONHCOC(CH_3)_2CO}$.

Freezing-point data for mixtures of methyl barbital and pyramidon and for methyl barbital and sarcosine anhydride are given by Pfeiffer and Seydel, 1928.

FUMARIC ACID DIMETHYL ESTER $(:CHCOOCH_3)_2$
MALEIC ACID DIMETHYL ESTER $(:CHCOOCH_3)_2$

100 gms. ligroine dissolve 0.018 gm. trans fumaric acid di methyl ester at -39°.

100 gms. ligroine dissolve 0.031 gm. cis maleic acid di methyl ester at -39°. (Wasserman, 1940.)

Freezing-point data are given for mixtures of:

Fumaric acid Dimethyl Ester + Dimethyl Succinate (Viseur, 1926.)
" " " " + Diphenyl Butadien (Kuhn and Wagner-Jauregg, 1929.)
Maleic " " " + Dimethyl Succinate (Viseur, 1926.)
Fumaric acid Ethyl Ester + Ethyl Succinate " "
Maleic " " " + " " " "
" " " " + " Formate " "
" " " " + Methyl " " "

Sodium **TRICARBALLATES.**

Solvent	t°	Compound	Gms. compound per 100cc solvent	
Aq. 60 Vol.% C H OH	23-25	(CH) CH(COOH) (COONa)	6.24	(McDermott, 1940.

CITRIC ACID $(CH_2)_2COH(COOH)_3.H_2O$.

SOLUBILITY OF CITRIC ACID IN WATER, DETERMINED BY THE FREEZING-POINT METHOD. (Kremann and Eitel, 1923.)

t° of crystallization.	Gms. $(CH_2)_2COH(COOH)_3$ per 100 gms. sat. sol.	Solid Phase.	t° of cristallization.	Gms. $(CH_2)_2COH(COOH)_3$ per 100 gms. sat. sol.	Solid Phase.
− 0.9	7.95	Ice	−11.30	45.71	Ice
− 1.67	12.59	»	−11.8 (Eutectic.	46.47	» + $(CH_2)_2COH(COOH)_3.H_2O$
− 1.60	13.81	»	−12.63	47.35	Ice (unstable)
− 2.40	18.53	»	−12.81	48.14	»
− 3.00	21.37	»	−10.20	−	$(CH_2)_2COH(COOH)_3.H_2O$
− 3.78	25.46	»	− 8.5	49.93	»
− 4.87	29.26	»	− 3.0	54.30	»
5.40	32.05	»	+ 1.6	56.31	»
− 6.3	34.93	»	1.2	56.56	»
− 7.91	38.54	»	0.0	56.77	»
8.00	39.89	»	10.8	58.78	»
8.73	41.50	»	10.0	59.30	»
−10.45	43.83	»	15.0	59.06	»

Freezing-point data are also given for the ternary mixture citric acid + sugar + water.

SOLUBILITY OF CITRIC ACID IN WATER, DETERMINED BY TITRATION OF THE SATURATED SOLUTIONS.

(Dalman, 1937a.)

t°	Gms. $C_6H_7O_7$ per 100 gms. sat. sol.	Solid Phase	t°	Gms. $C_6H_7O_7$ per 100 gms. sat. sol.	Solid Phase
0	48.956(48.72)	$C_6H_7O_7.H_2O$	35.8tr.pt.	67.222	$C_6H_7O_7H_2O + C_6H_7O$
5	51.571(51.21)	"	40	68.320	$C_6H_7O_7$
10	54.187(54.68)	"	50	70.936	"
15	56.802(60.34)	"	60	73.552	"
20	59.418	"	70	76.168	"
25	62.033	"	80	78.784	"
30	64.658	"	90	81.400	"
35.8tr.pt	67.683	" + $C_6H_7O_7$.	100	84.017	"

The results in parentheses are by Guttmann and Klewa, 1927.

SOLUBILITY OF CITRIC ACID AT 25° IN AQUEOUS SOLUTIONS OF:

Phosphorus Acid(H_3PO_3)
(Redfield and King, 1936.)

Normality of Aq. H_3PO_3	Normality of dissolved $C_6H_8O_7$
0.0	12.61
6.18	11.42
11.64	9.13
15.21	8.07
21.01	6.15
25.61	5.12
30.77	3.70
37.38	2.66
41.42	2.22

Phosphoric Acid(H_3PO_4)
(Walton and Kepfer, 1930.)

Normality of Aq. H_3PO_4	Normality of dissolved $C_6H_8O_7$
0.0	12.54
5.32	9.88
13.02	6.61
16.61	5.23
23.44	2.89
33.14	1.20
34.92	1.02
36.10	0.96
39.70	0.92

SOLUBILITY OF CITRIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Equivalent Normality.		Equivalent Normality.		Equivalent Normality.	
HCl.	$C_6H_8O_7$.	HCl.	$C_6H_8O_7$.	HCl.	$C_6H_8O_7$.
0.0	12.54	3.795	7.36	9.635	3.46
0.949	11.03	5.718	5.38	10.36	3.35
2.189	9.30	7.736	4.09	11.09	3.29

SOLUBILITY OF CITRIC ACID IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25° (Knox and Richards, 1919.)

Equivalent Normality.		Equivalent Normality.		Equivalent Normality.	
H_2SO_4.	$C_6H_8O_7$.	H_2SO_4.	$C_6H_8O_7$.	H_2SO_4.	$C_6H_8O_7$.
1.689	10.57	10.83	3.28	18.18	1.76
4.206	7.97	11.46	3.07	20.59	2.00
7.145	5.61	14.24	2.23	22.37	2.88

100 gms para cymene (b. pt. 176°-176°.5) dissolve 0.034 gm. citric acid at 25°. (Wheeler, 1920.)

SOLUBILITY OF HYDRATED AND OF ANHYDROUS CITRIC ACID, DETERMINED SEPARATELY, IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°. (Seidell, 1910.)

Results for Hydrated Citric Acid.

Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $(CH_2)_2COH\text{-}(COOH)_3.H_2O$ per 100 Gms. Sat. Solution.
0	1.311	67.5
20	1.286	66
40	1.257	64.3
50	1.237	63.3
60	1.216	62
70	1.192	60.8*
80	1.163	58.1*
90	1.125	54.7*
100	1.068	49.8*

Results for Anhydrous Citric Acid.

Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $(CH_2)_2COH\text{-}(COOH)_3$ per 100 Gms. Sat. Solution.
20	1.297	62.3
40	1.246	59
60	1.190	54.8
70	1.160	52.2
80	1.120	48.5
90	1.065	43.7
100	1.010	38.3

* Solid phase dehydrated more or less completely.

SOLUBILITY OF HYDRATED AND OF ANHYDROUS CITRIC ACID, DETERMINED SEPARATELY, IN SEVERAL ORGANIC ACIDS AT 25°. (Seidell, 1910.)

Results for Hydrated Citric Acid.

Solvent.	d_{25} of Sat. Sol.	Gms. $(CH_2)_2$-COH $(COOH)_3.H_2O$ per 100 Gms. Sat. Sol.
Amyl Acetate of $d_{20}=0.8750$	0.8917	5.980
Amyl Alcohol of $d_{20}=0.8170$	0.8774	15.430
Ethyl Acetate of $d_{25}=0.8915$	0.9175	5.276
Ether (abs.) of $d_{22}=0.7110$	0.7228	2.174
Chloroform of $d_{22}=1.476$	1.4850	0.007

Results for Anhydrous Citric Acid.

Solvent.	d_{25} of Sat. Sol.	Gms. $(CH_2)_2COH$ $(COOH)_3$ per 100 Gms. Sat. Sol.
Amyl Acetate	0.8861	4.22
Ether (abs.)	0.7160	1.05
Chloroform	1.4880	0
C_6H_6, CS_2		
CCl_4 or $C_6H_5CH_3$	...	0

100 gms. 95% formic acid dissolve 12.25 gms. citric acid at 20°. (Aschan, 1913.)

100 gms. dichlorethylene dissolve 0.005 gm. citric acid at 15°. (Wester & Bruins, '14.)
" trichlorethylene " 0.012 " " " " ". " "
" methyl alcohol " 197 gms. " " " 19°. (Timofeiew, 1914)
" propyl alcohol " 62.8 " " " " ". "

DISTRIBUTION OF CITRIC ACID BETWEEN WATER AND ETHER. (Pinnow, 1915.)

Results at 15°.			Results at 25.5°.		
Mols. Citric Acid per Liter.		Dist. Coef.	Mols. Citric Acid per Liter.		Dist. Coef.
In H_2O Layer.	In Ether Layer.		In H_2O Layer.	In Ether Layer.	
0.902	0.0077	117	0.9175	0.0063	114
0.460	0.0036	128	0.481	0.0031	155
0.220	0.0017	129	0.241	0.00155	155
0.297	0.0023	129	0.315	0.0020	158

DISTRIBUTION OF CITRIC ACID BETWEEN WATER AND ISO AMYL ALCOHOL AT 25°.

(Kolossowsky, Kulikow and Bekturow, 1935.)

Gm. Mols. $C_6H_8O_7$ per liter		$\frac{1}{2}$	Gm. Mols. $C_6H_8O_7$ per liter		$\frac{1}{2}$
H_2O layer(1)	Alcohol layer(2)		H_2O layer(1)	Alcohol layer(2)	
0.0936	0.0150	6.31	3.7800	0.8379	4.54
1.4805	0.2797	5.29	5.2794	1.2033	4.39
1.5930	0.3087	5.16	7.2198	1.9215	3.76
2.0286	0.4095	4.95	8.4559	2.8476	2.97
2.5641	0.5418	4.73	9.7020	3.6792	2.64
3.2004	0.7256	4.41	11.1510	4.8888	2.28

Sodium CITRATES

Solvent	t°	Compound	Gms. compound per 100cc solvent	
94 Vol. % C_2H_5OH	23-25	$(CH_2)_2COH(COONa)_3.5\frac{1}{2}H_2O$	0.0047	(McDermott,
" " "	"	$(CH_2)_2COH(COOH(COONa)_2.?H_2O$	0.0207	" 1940.)
" " "	"	$(CH_2)_2COH(COOH)_2(COONa).?H_2O$	0.0527	"

D MANNITOL HEXANITRATE $C_6H_8(NO_3)_6$.

Freezing-point data are given by Urbanski, 1933, 1934, for mixtures of D Mannitol hexanitrate and each of the following compounds:

Diethyl diphenyl urea
Dimethyl diphenyl urea
Dinitro anisole
Dinitro benzene
Dinitro chloro benzene
Dinitro toluene
Hydroquinone dimethyl ether
Naphthalene
Nitro aniline
Nitro anisole
Nitro benzaldehyde
Nitro benzoic acid ethyl ester
Nitro chloro benzene
Nitro erythritol
Nitro naphthalene
Nitro penta erythritol
Nitro phenetol
Nitro phenol
Nitro toluene
Trinitro benzene
Trinitro toluene

ETHYL SUCCINIMIDE $(CH_2CO)_2NC_2H_5$.

Freezing-point data for mixtures of ethyl succinimide and bromo toluene and of ethyl succinimide and p xylene are given by Paterno and Ampola, 1897.)

METHYL CYCLOPENTANE $C_5H_7.CH_3$.

The critical solution temperature of mixtures of methyl cyclopentane and sulfur dioxide is 8° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 45 and 90 gm. mol. percent SO_2. (Leslie, 1934.)

DI ALLYL ETHER $(C_3H_5)_2O$.

RECIPROCAL SOLUBILITY OF DI ALLYL ETHER AND WATER.

(Bennett and Philip, 1928.)

The determinations were made by the method of Hill, 1923, modified by reducing the scale of the apparatus to require only 4-5cc of each liquid, and adding a globule of Hg to hasten mixing.

t°	Wt.% $(C_3H_5)_2O$ in Aq. Phase	Wt.% H_2O in Ether Phase	t°	Wt.% $(C_3H_5)_2O$ in Aq. Phase	Wt.% H_2O in Ether Phase

CYCLOHEXANONE $(CH_2)_5:CO$.

Freezing-point data for mixtures of cyclohexanone and phenol are given by Schmidlin and Lang, 1910.

SARCOSINE ANHYDRIDE $(CH_3N.CH_2CO)_2$.

Freezing-point are given for mixtures of sarcosine anhydride and di phenyl amine by Pfeiffer and Angern, 1926. Results for mixtures of sarcosine anhydride and each of the following compounds are given by Pfeiffer and Seydel, 1928b: o amino phenol, m amino benzoic acid methyl ester, p oxy benzoic acid methyl ester and orthoform. For other results see Sarcosine, $C_3H_7O_2N$.

Di ETHYL OXALATE $(COOC_2H_5)_2$.

Freezing-point data for mixtures of diethyl oxalate and hydroquinol, resorcinol and β naphthol are given by Kremann, Zechner and Drazil, 1924. Results for mixtures of diethyl oxalate and trichlor acetic acid are given by Kendall and Booge, 1916.

Di METHYL SUCCINATE $(CH_2)_2(COOCH_3)_2$.

Freezing-points are given for :

Dimethyl succinate + Acetic acid (Kendall and Booge, 1916.)
" " + Acetylene methyl-tetra carbonate (Timmermans and Vesselovsky, 1931.)
" " + Chlor acetic acid (Kendall and Booge, 1916.)
" " + Methyl fumarate (Viseur, 1926.)
" " + Methyl maleate " "
" " + Succino nitrile (Timmermans and Vesselovsky, 1931.)
" " + Tri chlor acetic acid (Kendall and Booge, 1916.)

n PROPYL MALONIC ACID $CH(C_3H_7)(COOH)_2$.

100 gms. H_2O dissolve 202.2 gm. $CH(C_3H_7)(COOH)_2$ at 25°.
100 gms. C_6H_6 dissolve 0.052 gm. $CH(C_3H_7)(COOH)_2$ at 25°.
(Verkade and Coops, 1930a.)

ADIPIC ACID (Normal) $(CH_2)_4(COOH)_2$.

100 grams H_2O dissolve 1.44 grams adipic acid at 15°.

(Henry — Compt. rend., 99, 1157, '84; Lamouroux — *Ibid.*, 128, 998, '99.)

100 grams of formic acid (95% HCOOH) dissolve 4.04 grams of $(CH_2)_4(COOH)_2$ at 18.5°; 100 cc. of the saturated solution contain 4.684 grams of the acid. (Aschan, 1913.)

Diagrams showing the solubility of adipic acid in binary mixtures of water, acetone, methyl alcohol, ethyl alcohol, propyl alcohol and carbon tetrachloride at 20° and at 40° are given by Bancroft and Butler, 1932.

Sodium ADIPATES.

SOLUBILITY OF EACH SEPARATELY IN AQUEOUS ETHYL ALCOHOL AT 23-25°.

(McDermott, 1940.)

Salt	Vol.% C_2H_5OH in Solvent	Gms. salt per 100cc solvent
$(CH_2)_4(COOH)COONa.H_2O$	65.8	3.88
$(CH_2)_4(COONa)_2$	60.0	3.00

METHYL MALATE $CH_2CH(OH)(COOCH_3)_2$.

Freezing-point data for mixtures of methyl malates and methyl tartrates and methyl chloro succinate are given by Timmermans and Mme. Vesselovsky, 1932.

GLYCOGEN $(C_6H_{10}O_5)_x$.

SOLUBILITY OF GLYCOGEN IN WATER.

(Kerley 1930.)

Since the usual method of preparing glycogen by boiling tissue with 60% KOH appeared to affect its solubility, samples were prepared by dehydration with alcohol and subsequent extraction with water. Samples prepared without boiling with alkali, take from 3 to 4 days to reach saturation in water. Similar samples boiled for 2½ hours with 60% potassium hydroxide reached a slightly higher solubility value within a few hours. The solubility determinations were made under sterile conditions. Successive small portions of the saturated solutions were withdrawn at intervals and analyzed by a micro modification of Pfluger's method of estimating glycogen.

Sample employed	t°	Gms. glycogen dissolved per 100 gms. sat. sol.
Muscle glycogen not boiled with KOH	0	16.0
" " " " " "	20	17.7
" " " " " "	37	40.0+
Frog muscle glycogen	20	14.9
Rabbit liver glycogen	20	21.0

Glycogen is slightly soluble in aqueous alcohol. Results are given showing the decreasing solubility of glycogen with increasing concentration of alcohol in presence of potassium acetate, potassium trichlor acetate, potassium hydroxide and trichlor acetic acid.

BROMURAL (α Bromo Iso Valerylurea) $NH_2.CO.NH.COCHBrCH(CH_3)_2$.

Freezing-point data are given for mixtures of:

Bromural + Salol (Hrynakowski and Szmyt, 1935d.)
" + Phenacetine " " "
" + Pyramidon {Sandquist and Hök, 1927.

UREIDES $C_6H_{11}O_2N_2Br$.

SOLUBILITY OF SEVERAL UREIDES, EACH SEPARATELY, IN WATER AND IN OIL AT (?) TEMPERATURE.

(Fourneau and Florence, 1928.)

Ureide of:	Gms. Ureide per 100 gms. sat. solution in:	
	Water	Oil
α Bromo-n-Valeric acid	0.833	0.26
β " " " "	0.78	0.19
γ " " " "	0.97	0.22
α " iso " "	1.94	—
2, " Methyl ethyl acetic acid	5.3	3.53
β " α ethyl propionic acid	4.01	1.84
3, " 2-methyl butanoic acid	3.2	1.01
γ " α " " "	1.05	0.92
" pivalic acid	5.4	—

BUTYL OXAMATE *iso* $CONH_2COO.(CH_3)_2CHCH_2$.

Freezing-point lowering data for binary and ternary mixtures of iso butyl, methyl and ethyl oxaminic acid Esters are given by Praetorius, 1924.

TRIGLYCINE $NH_2CH_2CONHCH_2CONHCH_2COOH$.

SOLUBILITY OF TRIGLYCINE IN AQUEOUS ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1936.)

Solvent	d. of sat. sol.	Gm. Mols. $C_6H_{11}O_4N_3$ per liter
Water	1.0229	0.309
Aq. 80% C_2H_5OH	0.8554	0.000608
Aq. 90% C_2H_5OH	0.8249	0.0000381
Aq. 100% C_2H_5OH	0.7851	0.00000106

CYCLOHEXANE C_6H_{12}.

SOLUBILITY OF WATER IN CYCLOHEXANE.

(Tarassenkow and Poloshinzewa, 1932.)

t°	Gms. H_2O per 100 gms. sat. sol. in C_6H_{12}	t°	Gms. H_2O per 100 gms sat. sol. in C_6H_{12}
14	0.005	32.5	0.020
19	0.010	38.0	0.031
28.5	0.015	53.0	0.050

TETRA METHYL THIURAM SULFIDE $[(CH_3)_2NCS]_2$.

Determinations of the solubility of tetra methyl thiuram sulfides (sulfide, bis (dimethyl thio carbamyl) and other compounds in rubber, by means of microscope examinations of prepared samples are described by Morris, 1932.

CYCLOHEXANE (Hexamethylene, Hexahydrobenzene) $CH_2<(CH_2.CH_2)_2>CH_2$.

The Mutual Solubility of Cyclohexane and Methyl Alcohol.

(Timmermans, 1912.)

The following determinations of the critical temperature of solution at high pressures are given. The constants of the cyclohexane were : b. pt. 80°.75; f. pt. + 6°.5. The methyl alcohol was rendered anhydrous by distilling over sodium.

Pressure in kilogm.	Critical temp. of solution.	Pressure in kilogm.	Critical temp. of solution.
50	59.45	400	69.10
100	61.02	700	75.26
200	63.98	1000	81.0

The triphase system crystallizes at + 5°.

Reciprocal Solubility of Cyclohexane and Liquid Sulfur Dioxide.

(Seyer and Dunbar, 1922.)

The cyclohexane had a boiling point of 79° and freezing-point of +6.4. It was dried by refluxing over sodium. The SO_2 was the ordinary commercial product carefully freed of H_2O. Weighed amounts of the two constituents were sealed in bulbs of about 15 cc. capacity and the temperatures at which two distinct layers or cyclohexane crystals just appear, were determined.

Solubility of the Two Liquids.

t°.	Wt. per cent SO_2.	t°.	Wt. per cent SO_2.
— 1.0	18.0	13.3	65.4
+ 1.5	22.0	8.8	83.2
11.0	35.0	4.0	87.9
11.3	40.9	—6.0	92.2
13.5	59.2	—8.5	94.0

Temperatures at Which Cyclohexane Crystals Appear.

t°.	Wt. per cent SO_2.	t°.	Wt. per cent SO_2.
— 4.3	4.0	About —51.0	98.4
—17.0	18.0	—56.0	99.0
—17.0	22.0	—60.0	99.2
—24.3	96.0	—6045	99.5
—34.2	97.5	—72.5 (Eutectic)	—

The critical solution temperature of mixtures of cyclohexane and liquid sulfur dioxide is 12° and the reciprocal solubility curve is practically flat between the concentrations 40 and 90 mol.percent SO_2. (Leslie, 1934.)

The critical solution temperature of mixtures of cyclohexane and aniline is 31°. The calculated critical solution temperature of mixtures of cyclohexane and m toluidine is -18°. (Dessart, 1926.)

The critical solution temp of cyclohexane + propionitrile is 12°.2 and the mixture contains 70 per cent of cyclohexane. (Hortenberg, 1926.)

The critical solution temp of methylcyclohexane and *o* toluidine is — 5°.6 and the mixture contains 45.5 per cent methyl cyclohexane. (Hortenberg, 1926.)

Numerical data are given by Dessart, 1926, for the curve of separation in the system methyl cyclohexane + *m* toluidine.

Freezing-point data are given for mixtures of Cyclohexane and:

Acetic acid(1)
Aniline(2)(6)
Azobenzene(7)
Benzene(12)
Benzoin(11)
Carbon disulfide(4)
Carbon tetrachloride(10)
Chloroform(10)
Dicetyl (dotria contane(9)
Ethylene bromide(1)
Hexane(10)
Methyl alcohol(5)
Methyl cyclohexane(10)
Naphthalene(6)
Nitro benzene(6)
Nitro toluenes(6)(3)
Piperidine(8)
Proprio nitrile(5)
Toluene(10)
Toluidines(3)(5)(6)

(1) Baud, 1913(a)(b); (2) Deffet, 1938; (3) Dessart, 1926; (4) Hirshberg, 1932; (5) Lecat, 1909; (6) Linard, 1925; (7) Pascal and Normand, 1913; (8) Mascarelli and Constantino, 1909, 1910; (9) Seyer, 1938; (10) Timmermans, 1928; (11) Vanstone, 1913; (12) Mascarelli and

HEXAMETHYLENE TETRAMINE $(CH_2)_6N_4$.

100 gms. H_2O dissolve 81.32 gms. $(CH_2)_6N_4$ at 12°. (Delepine, 1895.)
100 gms. abs. alcohol dissolve 3.22 gms. $(CH_2)_6N_4$ at 12°. "
100 cc. 90% alcohol dissolve 12.5 gms. $(CH_2)_6N_4$ at 15-20°. (Squire and Caines, 1905.)
100 gms. $CHCl_3$ dissolve 8.09 gms. $(CH_2)_6N_4$ at 12°. (Delepine, 1895.)

SOLUBILITY OF HEXAMETHYLENE TETRAMINE IN SEVERAL SOLVENTS AT ORDINARY TEMPERATURE. (Utz, 1919.)

Solvent.	Gms. $(CH_2)_6N_4$ per 100 gms. solvent.	Solvent.	Gms. $(CH_2)_6N_4$ per 100 gms. solvent.
Water	167.0	Carbon tetrachloride	0.85
Ethyl ether	0.06	Amyl alcohol	1.84
Trichlor ethylene	0.11	Absolute alcohol	2.89
Xylene	0.14	90% alcohol	5.58
Carbon disulfide	0.17	Methyl alcohol	7.25
Benzene	0.23	Chloroform	13.40
Tetrachlor ethane	0.50	86.5% glycerol (d = 1.2326).	26.50*
Acetone	0.65	98.5% " (d = 1.2645).	20.9*

* Holm, 1921, 1922.

100 gms. glycol diacetate dissolve about 0.9 gm. HEXA METHYLENE TRIPEROXIDE DIAMINE at 25°. (Taylor and Rinkenbach, 1926.)

α and β TRITHIOACETALDEHYDE, $(CH_3CHS)_3$.

α and β TRITHIOBENZALDEHYDE, $(C_6H_5CHS)_3$.

SOLUBILITY OF EACH (DETERMINED SEPARATELY) IN SEVERAL SOLVENTS AT 25°.
(Suyver, 1905.)

Solvent.	Gms. per 100 Gms. Solvent.			
	α $(CH_3CHS)_3$.	β $(CH_3CHS)_3$.	α $(C_6H_5CHS)_3$.	β $(C_6H_5CHS)_3$.
Ether	15.58	13.67	1.09	0.37
Ethyl Alcohol	3.86	3.97	0.20	0.04
Methyl Alcohol	4.04	3.89	0.17	0.04
Acetone	20.96	18.31	2.45	1.12
Chloroform	57.59	51.22	11.11	0.20
Carbon Disulfide	25.50	20.75	5.81	0.22
Benzene	36.40	26.98	6.08	0.014
Ethyl acetate	17.52	15.48	2.05	0.93

Data for the solidification points of mixtures of α and β trithioacetaldehyde are also given. Similar data for mixtures of α and β trithiobenzaldehyde could not be determined on account of decomposition with production of resins.

CYCLOHEXANOL $(CH_2)_5.CHOH$.

100 gms. H_2O dissolve 5.67 gms. cyclohexanol at 11°. (de Forcrand, 1912.)
100 gms. cyclohexanol dissolve 11.27 gms. H_2O at 11°. "

RECIPROCAL SOLUBILITY OF CYCLOHEXANOL AND WATER, DETERMINED BY THE FREEZING-POINT METHOD.
(de Forcrand, 1912.)

t° of Solidification.	Gm. $(CH_2)_5.CHOH$ per 100 Gms. Mixture.	t° of Solidification.	Gm. $(CH_2)_5.CHOH$ per 100 Gms. Mixture.
+22.45	100	−57.4 Eutec.	95.030
17.48	99.767	−43.2	93.150
− 1.40	98.817	−33	91.962
−34.10	96.868	−18.50	90.980
−46.80	95.910	−14.58	90.36
−55.70	95.170	−12.05	88.73

Freezing-point data for mixtures of cyclohexanol

CYCLOHEXANOL

EQUILIBRIUM IN THE SYSTEM CYCLOHEXANOL AND WATER.

(Sidgwick and Sutton, 1930.)

The determinations were made by the synthetic method. In the case of the portion of curve where solid cyclohexanol separated, 88-93%, the mixtures were super cooled and then warmed slowly and the temperature noted at which only a trace of solid remained.

t°	Wt. Percent $C_6H_{11}OH$ in sat. solution	t°	Wt. Percent $C_6H_{11}OH$ in sat. solution	t°	Wt. Percent $C_6H_{11}OH$ in sat. solution
-0.3	1.67(1)	7.2	5.0	121.95	5.14
-0.6	3.33(1)	9.7	4.58	156.9	9.22
-0.9	5.00(1)	15.2	4.29	174.3	15.00
-1.2	88.3 (2)	20.6	3.82	184.7	32.4
-2.0	89.0 (2)	28.7	3.57	183.7	52.3
-4.9	90.45(2)	31.85	3.37	180.1	59.4
-7.6	91.2 (2)	40.4	3.26	163.0	70.1
-10.2	92.3((2)	66.3	3.19	130.9	80.2
-15.1	93.0 (2)	70.45	3.18	93.6	85.3
		82.4	3.37	51.55	87.9

(1) Solid phase, Ice; (2) Solid phase, Chclohexanol.

The existence of the solid hydrate described by Forcrand was not confirmed.

100 gms. H_2O dissolve 6.0 gms. cyclohexanol at 20°. (Smith, 1932.)

100 gms. of aq. 0.4 normal sodium oleate solution (- 10.8 gm. Na oleate per 100 gms. solution) dissolve 59.0.gms. cyclohexanol at 20°. (Smith, 1932.)

1-HEXENE-3-OL $CH_2:CH.CH(OH)CH_2.CH_2CH_3$.

4-HEXENE-3-OL $CH_3.CH_2CH(OH)CH:CHCH_3$(?)

2-METHYL PENTENE-3-OL $CH_2:C(CH_3)CH(OH)CH_2CH_3$(?)

RECIPROCAL SOLUBILITY OF EACH OF THE ABOVE UNSATURATED ALCOHOLS IN WATER.

(Ginnings, Herring and Coltrane, 1939.)

The authors describe the preparation of each of the alcohols but do not give the structural formulas.

Compound	t°	Density of the:		Gms. Alcohol per 100 gms.:	
		H_2O rich phase	Alcohol rich phase	H_2O rich phase	Alcohol rich phase
1-Hexene-3-ol	20	0.9953	0.8466	2.72	94.12
" "	25	0.9944	0.8430	2.52	93.92
" "	30	0.9936	0.8376	2.36	93.90
4-Hexene-3-ol	20	0.9936	0.8559	4.06	96.07
" "	25	0.9928	0.8524	3.81	95.85
" "	30	0.9917	0.8480	3.58	95.74
2-Methyl Pentene-3-ol	20	0.9947	0.8535	3.29	94.16
" " "	25	0.9938	0.8494	3.06	94.10
" " "	30	0.9926	0.8451	2.89	93.97

METHYL n BUTYL KETONE (2-HEXANONE) $CH_3CO(CH_2)_3CH_3$.

METHYL Iso BUTYL KETONE (2- Pentanone-4-methyl) $CH_3COCH_2CH(CH_3)_2$.

SOLUBILITY OF EACH SEPARATELY IN WATER.

(Gross, Rintelen and Saylor, 1939.)

The saturated solutions were analyzed by means of a Zeiss combination liquid and gas interferometer.

t^0	Gm. Mols. 2-Hexanone per 1000 gms. H_2O	Gm. Mols. 2-Pentanone-4-methyl per 1000 gms. H_2O
0	—	0.307
10	0.204	0.231
30	0.145	0.166
50	0.124	0.141
75	—	0.137

100 gms. sat. solution of methyl butyl ketone in water contain 3.44 gm. $C_6H_{12}O$ at 25°.

100 gms. sat. solution of H_2O in methyl butyl ketone contain 3.7 gms. H_2O at 25°. (Park and Hofmann, 1932.)

PINACOLIN $CH_3.CO.C(CH_3)_3$.

SOLUBILITY IN WATER AND IN AQ. ACETONE AT 15°. (Delange, 1908.)

Per cent Acetone in Solvent.	cc. Pinacolin Dissolved per 100 cc. Solvent.
0 (= pure H_2O)	2.44
20	3.47
33	6.06
50	9.09
60	14.27

AMYL FORMATE $HCOO(CH_2)_4CH_3$.

SOLUBILITY OF AMYL FORMATE IN AQUEOUS ETHYL ALCOHOL MIXTURES.

(Pfeiffer, 1892.)

Composition of Homogeneous Mixture			Composition of Homogeneous Mixture		
cc $HCOOC_5H_{11}$	cc C_2H_5OH	cc H_2O	cc $HCOOC_5H_{11}$	cc C_2H_5OH	cc H_2O
3.0	3.0	1.80	3.0	33.0	50.71
3.0	9.0	8.77	3.0	39.0	65.21
3.0	15.0	17.01	3.0	45.0	85.10
3.0	21.0	27.06	3.0	48.0	94.20
3.0	27.0	38.31			

100cc H_2O dissolve 0.3 gm. Iso amyl formate at 22°. (Traube, 1884; Bancroft, 1895-96.)

BUTYL ACETATE (n) $CH_3COOC_4H_9$.

SOLUBILITY OF BUTYL ACETATE IN AQUEOUS ETHYL ALCOHOL MIXTURES.

(Pfeiffer, 1892; Bancroft, 1895.)

Composition of Homogeneous Mixture			Composition of Homogeneous Mixture		
cc $CH_3COOC_4H_9$	cc C_2H_5OH	cc H_2O	cc $CH_3COOC_4H_9$	cc. C_2H_5OH	cc. H_2O
3.0	3.0	2.08	3.0	21.0	31.48
3.0	6.0	6.08	3.0	24.0	37.48
3.0	9.0	10.46	3.0	27.0	43.75
3.0	12.0	15.37	3.0	30.0	50.74
3.0	15.0	20.42	3.0	33.0	59.97
3.0	18.0	26.60			

100 gms. sat. solution of normal butyl acetate in water contain 2.3 gms. $CH_3COOC_4H_9$ at 25°.

100 gms. sat. solution of water in n butyl acetate contain 2.4 gms. H_2O at 25°. (Park and Hofmann, 1932.)

BUTYL ACETATE (*iso*) $C_2H_3O_2.C_4H_9$.

100 gms. sat. solution of iso butyl acetate in water at 20° contain 0.67 gm. $C_2H_3O_2.C_4H_9$. (Fühner, 1924.

100 cc H_2O dissolve 0.7 cc iso butyl acetate at 25°. (Bancroft, 1895.

100 gms. H_2O dissolve 0.5 gm. iso butyl acetate at 22°. (Traube, 1884

100 cc H_2O dissolve 1.0 cc secondary Butyl acetate at about 25°. (Park and Hopkins, 1930.

PROPYL PROPIONATE $C_2H_5COOC_3H_7$.

SOLUBILITY OF PROPYL PROPIONATE IN AQUEOUS ETHYL ALCOHOL.

(Pfeiffer, 1892; Bancroft, 1895.)

Composition of Homogeneous Mixture			Composition of Homogeneous Mixture		
cc $C_2H_5COOC_3H_7$	cc C_2H_5OH	cc H_2O	cc $C_2H_5COOC_3H_7$	cc C_2H_5OH	cc H_2O
3.0	3.0	1.58	3.0	21.0	27.83
3.0	6.0	4.70	3.0	24.0	33.75
3.0	9.0	8.35	3.0	30.0	47.15
3.0	12.0	12.54	3.0	36.0	63.18
3.0	15.0	17.15	3.0	42.0	83.05
3.0	18.0	22.27	3.0	48.0	107.46

100 cc H_2O dissolve 0.6 cc $C_2H_5COOC_3H_7$ at 25°. (Bancroft, 1895.)

ETHYL BUTYRATE $C_3H_7COOC_2H_5$.

SOLUBILITY OF ETHYL BUTYRATE IN AQUEOUS ETHYL ALCOHOL AT 20°.

(Bancroft, 1895.)

Composition of Homogeneous Mixture			Composition of Homogeneous Mixture		
cc $C_3H_7COOC_2H_5$	cc C_2H_5OH	cc H_2O	cc $C_3H_7COOC_2H_5$	cc C_2H_5OH	cc H_2O
0.34	5.0	10.0	6.0	5.0	2.10
0.96	5.0	6.0	0.8	0.0	100.0
2.47	5.0	4.0	100.0	0.0	0.45
4.0	5.0	2.96			

100 gms. H_2O dissolve 0.5 gm. $C_3H_7COOC_2H_5$ at 22°. (Traube, 1884.)
" " " " 0.62 " " " " (Fuhner, 1924.)

CAPROIC ACID (Hexoic Acid) $CH_3(CH_2)_4COOH$ (*normal*) and $(CH_3)_2CH(CH_2)_2COOH$ (*iso*).

100 gms. H_2O dissolve 1.08 gm. Caproic acid at 20°. (Lipetz and Rimskaja 1931.)

DISTRIBUTION OF NORMAL CAPROIC ACID BETWEEN:

Water and Chloroform at 25°.
(Smith, 1921-1922.)

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.0843	0.4281	5.07
0.1158	0.6349	5.49
0.1875	1.1375	6.08
0.2125	1.4375	6.77

Water and Ether at 23°.
(Behrens, 1926.)

Concentration in H_2O layer (*a*).	Concentration in $(C_2H_5)_2O$ layer (*b*).	$\frac{a}{b}$.
0.00336	0.294	87.5
0.00428	0.380	88.8
0.00439	0.394	89.7
0.00545	0.492	90.3
0.00643	0.595	92.5
0.00978	0.967	98.9

Water and Xylene at 25°.
(Smith, 1921-1922.)

Millimols per liter of H_2O layer (C_1).	Millimols per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.2625	0.5375	2.04
0.3375	0.7375	2.18
0.575	1.50	2.61
0.75	2.15	2.86
0.95	2.95	3.10
2.80	17.7	6.32

DISTRIBUTION OF HEXOIC ACID BETWEEN WATER AND BENZENE AT 25°.
(Brown and Bury, 1923.)

Normality of $CH_3(CH_2)_4COOH$ in						
H_2O layer.	0.0078	0.0091	0.0102	0.0114	0.0131	0.0162
C_6H_6 layer.	0.159	0.210	0.256	0.328	0.413	0.619

DISTRIBUTION OF ISO CAPROIC ACID AT 25° BETWEEN: (Smith 1921, 1922.)

Water and Chloroform.

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.1710	0.755	4.38
0.2175	1.000	4.6
0.2900	1.450	5.0
4.475	2.550	5.7

Water and Xylene.

Millimols. per liter of H_2O layer (C_1)	Millimols. per liter of $C_6H_4(CH_3)_2$ (C_2)	$\frac{C_2}{C_1}$.
0.4625	0.7500	1.62
0.8125	1.6375	2.02
1.325	3.375	2.54
1.85	5.6	3.02

DISTRIBUTION OF NORMAL CAPROIC ACID AT 25° BETWEEN:
(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. $C_6H_{12}O_2$ per liter H_2O layer	Gm. Mols. $C_6H_{12}O_2$ per liter $CHCl_3$ layer
0.00102	0.01625
0.00138	0.0256
0.00171	0.0358
0.00222	0.0545
0.00308	0.0944
0.00398	0.1465

Water and Benzene

Gm. Mols. $C_6H_{12}O_2$ per liter H_2O layer	Gm. Mols. $C_6H_{12}O_2$ per liter C_6H_6 layer
0.00219	0.01989
0.00247	0.02408
0.00263	0.02675
0.00360	0.04580
0.00388	0.05287
0.00568	0.10310

Water and Toluene

Gm. Mols. $C_6H_{12}O_2$ per liter H_2O layer	Gm. Mols. $C_6H_{12}O_2$ per liter $C_6H_5CH_3$ layer
0.00236	0.01956
0.00263	0.02377
0.00281	0.02637
0.00385	0.04531
0.00412	0.05238
0.00494	0.07063
0.00607	0.10236

DISTRIBUTION OF ISO CAPROIC ACID AT 25° BETWEEN:
(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. ½ $C_6H_{12}O_2$ per liter H_2O layer	Gm. Mols. ½ $C_6H_{12}O_2$ per liter $CHCl_3$ layer
0.00021	0.00148
0.00041	0.00358
0.00075	0.00813
0.00114	0.01530
0.00163	0.02708
0.00231	0.04718
0.00351	0.09298

Water and Benzene

Gm. Mols. ½ $C_6H_{12}O_2$ per liter H_2O layer	Gm. Mols. ½ $C_6H_{12}O_2$ per liter C_6H_6 layer
0.00498	0.0589
0.00564	0.0742
0.00615	0.0874
0.00685	0.1030
0.00807	0.1420
0.00922	0.1800

DISTRIBUTION OF NORMAL CAPROIC ACID AT 25° BETWEEN:

(Kolossovsky and Levitas, 1935.)

Water and Benzene

Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	C_6H_6 layer(2)	
0.01415	0.6917	0.0205
0.01493	0.08159	0.0183
0.02319	1.898	0.0122
0.03144	2.790	0.0113
0.05643	5.286	0.0107
0.09157	7.703	0.0119

Water and Toluene

Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	$C_6H_5CH_3$ layer(2)	
0.00550	0.09668	0.0569
0.00904	0.2515	0.0359
0.01336	0.5345	0.0250
0.01753	0.9039	0.0194
0.03105	2.154	0.0144
0.05974	5.313	0.0112
0.09039	7.703	0.0117

DISTRIBUTION OF NORMAL CAPROIC ACID AT 25° BETWEEN:

(Kolossowsky and Levitas, 1935.)

Water and Anisole

Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	$C_6H_5OCH_3$ layer (2)	
0.0063	0.1438	0.0438
0.0094	0.2476	0.0380
0.0126	0.4441	0.0284
0.0189	0.8096	0.0233
0.0236	1.2262	0.0192
0.0355	2.7314	0.0130
0.0910	7.7040	0.0118

Water and Decalin

Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	$C_{10}H_{18}$ layer(2)	
0.00181	0.00393	0.472
0.00338	0.01572	0.215
0.006524	0.03537	0.184
0.01651	0.2083	0.0793
0.02279	0.7153	0.0319
0.04480	1.729	0.0259
0.06642	4.622	0.0144
0.09100	7.704	0.0118

Water and Carbon Tetrachloride

Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{1}{2}$
H_2O layer(2)	CCl_4 layer(2)	
0.001572	0.00786	0.200
0.003144	0.02948	0.107
0.006131	0.1124	0.0547
0.009866	0.2633	0.0375
0.01281	0.4677	0.0274
0.01886	0.8764	0.0215
0.02830	1.827	0.0155
0.0452	3.458	0.0131
0.091	7.704	0.0118

Water and Methyl Iodide

Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	CH_3I layer(2)	
0.0025	0.0244	0.1024
0.0035	0.0432	0.0810
0.0049	0.0770	0.0636
0.0077	0.1871	0.0412
0.0108	0.3458	0.0312
0.0157	0.6602	0.0238
0.0266	1.7135	0.0155
0.0377	2.9080	0.0130
0.0910	7.7040	0.0118

Water and Bromo benzene

Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	C_6H_5Br layer(2)	
0.0025	0.0259	0:0965
0.0040	0.0432	0.0929
0.0057	0.0825	0.0691
0.0105	0.2830	0.0371
0.0156	0.5345	0.0292
0.0193	0.8017	0.0241

Water and Nitro benzene

Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{1}{2}$
H_2O layer(1)	$C_6H_5NO_2$ layer(2)	
0.00220	0.01045	0.211
0.00371	0.03655	0.102
0.00582	0.0676	0.0861
0.01258	0.2279	0.0552
0.01886	0.4363	0.0432
0.02987	0.9982	0.0299

DISTRIBUTION OF NORMAL CAPROIC ACID BETWEEN WATER AND SEVERAL ORGANIC SOLVENTS AT 25°.

(Archibald, 1932.)

Organic Solvent	Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{2}{1}$
	H_2O layer(1)	Organic Solvent layer(2)	
Ethyl Methyl Ketone	0.01343	0.2989	22.26
Tertiary Amyl Alcohol	0.00355	0.2917	82.17
Secondary Butyl Alcohol	0.01165	0.2886	24.77
Normal Butyl Alcohol	0.00403	0.2874	71.32
Normal Amyl Alcohol	0.00260	0.2843	109.3
Ethyl Ether	—	—	75.0

CAPROIC ACID

DISTRIBUTION OF CAPROIC ACID BETWEEN WATER AND PETROLEUM ETHER AT ROOM TEMPERATURE.

(Grossfeld and Miermeister, 1931.)

cc 0.1 n NaOH required per 25 cc of:		$\frac{1}{2}$
H_2O layer(1)	Pet. Ether layer(2)	
0.34	0.36	0.92
0.57	1.06	0.53
1.14	4.40	0.26
1.67	9.34	0.18
1.99	13.11	0.15

DISTRIBUTION OF CAPROIC ACID BETWEEN WATER AND OLIVE OIL.

(Bodansky and Meigs, 1932.)

t°	Gm. Mols. $C_6H_{12}O_2$ per liter		$\frac{1}{2}$
	H_2O layer(1)	Oil layer(2)	
25	0.0012	0.0082	0.146
"	0.0024	0.0170	0.141
"	0.0056	0.0440	0.127
37.5	0.0013	0.0082	0.159
"	0.0027	0.0170	0.159
"	0.0066	0.0440	0.165

Additional results for the distribution of caproic acid and of iso caproic acid between water and olive oil at 23° are given by Bodansky, 1928.)

TRI CAPROIN $C_3H_5(CH_3(CH_2)_4COO)_3$.

Results for the reciprocal solubility of tri caproin and benzene are given by Loskit, 1928.

PARALDEHYDE $(CH_3.CHO)_3$.

RECIPROCAL SOLUBILITY OF PARALDEHYDE AND WATER. (Pascal and Dupuy, 1920.)

Mixtures of paraldehyde and water were cooled or rewarmed while being energetically agitated and the temperature of appearance or disappearance of clouding determined to within 0°.5. At temperatures above 50° it was necessary to renew the mixture for each determination to avoid the production of a small amount of aldehyde. The paraldehyde was purified by drying and recrystallizing many times untill the fusion-point became constant at 12°.4. It contained so little aldehyde that it scarcely gave a coloration with Schiff's reagent.

Solubility of Liquid Paraldehyde in Water

(Mixtures containing an excess of H_2O).

t° of clouding or clearing.	Gms Paraldehyde per 100 gms. of solution.
8.5	13.25
11.5	12.45
12.0	12.80
13.5	11.90
17.0	11.20
27.0	9.10
40.0	7.65
42.5	7.45
68.0	6.00
75.0	5.80
Ice curve.	
−1.53	9.37
−1.99	13.10
Solid Paraldehyde Curve.	
1.71 (Eutec.).	11.8
5.0	12.27
6.0	12.45
9.5	12.70

Solubility of H_2O in Paraldehyde

(Mixtures containing a large excess of Paraldehyde).

t° of clouding or clearing.	Gms. H_2O per 100 gms. of solution.
85.0	3.50
63.0	2.45
46.0	1.75
28.5	1.30
19.0	1.05
14.5	0.95
10.5	0.90
6.5	0.80
F. pt. of H_2O in Paraldehyde.	
9.78	1.15
10.02	0.88*
10.28	0.635

* The curve of the f. pt. cuts the solubility curve at 10°.02 and 0.88 % H_2O. This is the f. pt. of moist paraldehyde.

SOLUBILITY OF PARALDEHYDE IN DILUTE SULFURIC ACID (5.15 % H_2SO_4).

t° of clouding or clearing.	Gms. Paraldehyde per 100 gms. sol.	t° of clouding of clearing.	Gms. Paraldehyde per 100 gms. sol.
13.0	10.70	24.0	8.45
13.5	10.50	28.0	7.95
16.0	10.10	32.0	7.50
19.5	9.55	40.0	6.95
20.0	9.05	52.0	6.15

DISTRIBUTION OF ALDEHYDE BETWEEN PARALDEHYDE AND : (Pascal and Dupuy, 1920.)

	Pure water.		Aq. 5 % H_2SO_4.		Aq. 10 % H_2SO_4.	
	Gms. Aldehyde per liter		Gms. Aldehyde per liter		Gms. Aldehyde per liter	
t° in each case	upper layer	lower layer.	upper layer.	lower layer.	upper layer.	lower layer.
12°	0.62	2.00	1.87	5.39	2.31	6.05
12	1.10	3.20	3.45	8.60	3.55	9.10
12	1.95	5.70				
20	1.15	3.15	7.70	12.60	8.30	11.66
20	1.20	3.20	7.90	14.10	8.35	12.15
20	2.30	5.30	8.03	13.97		–
40	1.43	2.35	19.90	19.60	20.02	12.87
40	1.70	2.90	19.91	19.03	20.02	15.30
40	2.90	4.60	19.91	19.14	–	..

SOLUBILITY OF PARALDEHYDE IN AQ. SALT SOLUTIONS AT ABOUT 18°.

(Traube, Schöning and Weber, 1927.)

Aq. solution of:	Concentration	cc Paraldehyde per 5 cc salt solution
Water alone	—	0.5
Sodium Salicylate	saturated	1.7
Sodium benzoate	"	0.65
Aniline hydrochloride	"	0.7

Freezing-point data are given by Paterno and Ampola, 1897, for mixtures of paraldehyde and ethylene bromide and for mixtures of paraldehyde and benzene.

δ AMINOVALERIC HYDANTOIC ACID (δ Uramido valeric acid) $C_6H_{12}O_3N_2$.

Solvent	t°	d. of sat. sol.	Gm. Mol. $C_6H_{12}O_3N_2$ per liter sat. sol.	
Water	25	0.99763	0.0174	McMeekin, Cohn
100% C_2H_5OH	25	0.78622	0.00762	and Weare, 1936.

CYSTINE $[SCH_2CH(NH_2)COOH]_2$, $C_6H_{12}O_4N_2S_2$.

SOLUBILITY OF LAEVO CYSTINE IN WATER.

t°	Gms. $C_6H_{12}O_4N_2S_2$ per liter sat. sol.	Authority	t°	Gms. $C_6H_{12}O_4N_2S_2$ per liter sat. sol.	Authority
16-18	0.109	(Blix, 1928.)	25	0.115.	(Sano, 1926.)
19	0.113	(Neuberg, 1905.)	25	0.109	(McMeekin, Cohn and Blanchard, 1937.)
20	0.168	(Pfeiffer and Angern, 1924.)	25	0.1095	(Dalton and Schmidt, 1935.)
20	0.190	(Hoffman and Gortner, 1922.)	25	0.108-0.113	(Loring and du Vigneaud, 1934.)
24-27.5	0.133	(Toennies and Lavine, 1930.)	25	0.1097	(Takahashi and Yaginuma, 1929.)

The solubility of other isomers of Cystine was studied by Andrews and de Beer 1928, and by Loring and du Vigneaud, 1934. The former obtained results which suggested that d cystine may be about 4 times as soluble as l cystine. The subsequent results of Loring and du Vigeaud showed however, that these two isomers have identical solubilities. They also found that a mixture of d and l cystine in contact with water is transformed slowly into dl cystine. A mixture of 0.020 gm. of l + 0.020 gm. of d cystine + 100 cc of H_2O, rotated constantly at 25°, was found to contain the following amounts of cystine after successive intervals of time.

Time	Gms. Cystine per liter
After 15 minutes	0.202
" 10 hours	0.215
" 180 "	0.057

The solid phase after 180 hours, as shown by microscopic examination, consisted of dl crystals. The solubility of meso cystine was found to be 0.056 gm. per liter. The solubility of mixtures of the two inactive isomers and of mixtures of the active and inactive isomers was found to be approximately the summation of the individual solubilities of each isomer.

SOLUBILITY OF *l* CYSTINE IN WATER.

(Dalton and Schmidt, 1935.)

The following values were derived from a solubility equation calculated from 20 very careful determinations at 9 different temperatures between 0° and 65°. The sample of cystine was prepared from a cystine stone taking care that the preparation should not be in contact with acid any longer than absolutely necessary and crystallizing twice from hot water. Determinations made with 0.01 gm. and with 0.10 gm. of sample per 60 cc of water gave results which agreed within 3 percent hence only insignificant amounts of inactive isomers were present.

t°	Gms. *l* Cystine per 1000gms. H_2O	t°	Gms. *l* Cystine per 1000 gms. H_2O	t°	Gms. *l* cystine per 1000 gms. H_2O
0.0	0.0502	30	0.1281	55	0.2799
5	0.0587	35	0.1498	60	0.3272
10	0.0686	40	0.1751	65	0.3826
15	0.0802	45	0.2048	70	0.4472
20	0.0938	50	0.2394	75	0.5229
25	0.1096			100	1.142

CYSTINE

SOLUBILITY OF *l* CYSTINE IN AQUEOUS SALT SOLUTIONS AT 16-18°

(Blix, 1928.)

The experiments were made by adding 0.15 -0.20 gm. *l* cystine to 15-20 cc of 0.1 n NaOH and then the amount of salt to yield the desired final concentration, next enough 0.1 n CH_3COOH to bring the p_H to 5.6 (the mean of urine p_H) and finally enough H_2O to bring the volume to 300 cc. A drop of $CHCl_3$ was added to prevent growth of bacteria. The mixtures were shaken constantly for 5 hours daily for 5 days. The cystine in the saturated solutions was calculated from determinations of sulfur made by oxidizing with alkaline permanganate and precipitating with $BaCl_2$.

Salt and conc. in normality		Gms. Cystine per liter sat. sol.	Salt and conc. in normality		Gms. Cystine per liter sat. sol.
KCl	0.25 n	0.133	NaH_2PO_4 + Na_2HPO_4	0.25	0.166
NaCl	"	0.138	$CaCl_2$	0.0625	0.128
NH_4Cl	"	0.121	"	0.125	0.144
$MgCl_2$	"	0.155	"	0.25	0.173
Na_2SO_4	"	0.129	"	0.50	0.215
K_2SO_4	"	0.126	"	1.00	0.274
KH_2PO_4 + K_2HPO_4	"	0.133			

The influence of the diffusible organic substances and of the colloids of urine upon the solubility of cystine was also studied. The solubility of cystine in urine is greater than corresponds to the increase produced by the combinations studied.

SOLUBILITY OF CYSTINE IN AQUEOUS ALCOHOL SOLUTIONS OF SODIUM CHLORIDE AND OF CALCIUM CHLORIDE AT 25°.

(McMeekin, Cohn, and Blanchard, 1937.)

Results for Aq. 15% C_2H_5OH Solutions of NaCl

Conc. of NaCl in solvent		d. of sat. sol.	Gm. Mols. $C_6H_{12}O_4N_2S_2$ per liter sat. sol.
Mols.	Ionic		
0.0	0.0	0.97764	0.000161
0.025	0.05	0.97972	0.000169
0.05	0.10	0.98183	0.000178
0.125	0.25	0.98777	0.000197
0.25	0.50	0.99791	0.000220

Results for Aq. 30% C_2H_5OH Solutions of NaCl

Conc. of NaCl in solvent		d. of sat. sol.	Gm. Mols. $C_6H_{12}O_4N_2S_2$ per liter sat. sol.
Mols.	Ionic		
0.0	0.0	0.95980	0.0000507
0.025	0.05	0.96223	0.0000544
0.05	0.10	0.96388	0.0000582
0.125	0.25	0.97046	0.0000685
0.25	0.50	0.97937	0.0000866

Results for Aq. 30% C_2H_5OH Solutions of $CaCl_2$

Conc. of $CaCl_2$ in solvent		d. of sat. sol.	Gm. Mols. $C_6H_{12}O_4N_2S_2$ per liter sat. sol.
Mols.	Ionic		
0.025	0.05	0.96124	0.0000550
0.05	0.10	0.96267	0.0000597
0.075	0.15	0.96418	0.0000649
0.15	0.30	0.96857	0.0000801
0.25	0.75	0.98155	0.000128

Experiments showing the influence of pH and of several salts upon the solubility of cystine in water are given by Okabe, 1928. Constant agitation was not employed for reaching equilibrium. The prepared mixtures were cooled to 0° and the excess of dissolved cystine was caused to crystallize out by stirring now and then during one hour. A minimum solubility of about 0.05 gm. cystine per liter in 0.046 mol. NaCl and NH_4Cl solutions was found at pH 6.0. NaCl, $(NH_4)_2SO_4$ and Na_2SO_4 increase the solubility of cystine, NH_4Cl and CH_3COONH_4 have no effect and C_2H_5OH decreased its solubility in water.

SOLUBILITY OF *l* CYSTINE IN AQUEOUS SALT SOLUTIONS AT 25°.

(McMeekin, Cohn and Blanchard, 1937.)

Results for aq. solutions of:

Sodium Chloride

Concentration of aq. salt solution Mols.	Ionic	d. of sat. sol.	Gm. Mols. $C_6H_{12}O_4N_2S_2$ per liter
0.0	0.0	0.9972	0.000454
0.025	0.05	0.9993	0.000478
0.05	0.10	1.0014	0.000494
0.10	0.20	1.0054	0.000522
0.25	0.50	1.0176	0.000578
0.50	1.00	1.0372	0.000650
2.00	4.00	1.475	0.000845

Calcium Chloride

Concentration of aq. salt solution Mols.	Ionic	d. of sat. sol.	Gm. Mols. $C_6H_{12}O_4N_2S_2$ per liter
0.0625	0.188	1.0030	0.000532
0.10	0.30	1.00627	0.000580
0.125	0.375	1.0083	0.000599
0.15	0.45	1.01083	0.000633
0.25	0.75	1.0195	0.000720
0.50	1.50	1.0421	0.000895
1.00	3.00	1.0840	0.001140

Sodium Sulfate

Concentration of aq. salt solution Mols.	Ionic	d. of sat. sol.	Gm. Mols. $C_6H_{12}O_4N_2S_2$ per liter
0.10	0.30	1.0091	0.000533
0.25	0.75	1.0280	0.000579
0.50	1.50	1.0587	0.000616
1.00	3.00	1.1157	0.000645
1.10	3.30	1.1273	0.000649
1.25	3.75	1.1441	0.000621
1.41	4.23	1.1632	0.000612
1.50	4.50	1.1652	0.000595

Ammonium Sulfate

Concentration of aq. salt solution Mols.	Ionic	d. of sat. sol.	Gm. Mols. $C_6H_{12}O_4N_2S_2$ per liter
0.10	0.30	1.0047	0.000529
0.25	0.75	1.0164	0.000591
0.50	1.50	1.0345	0.000666
1.00	3.00	1.0690	0.000720
1.50	4.50	1.1015	0.000699
2.00	6.00	1.1322	0.000662
2.50	7.50	1.1618	0.000579
2.63	7.89	1.1670	0.000545
3.00	9.00	1.1901	0.000475
3.50	10.50	1.2145	0.000416
4.00	12.00	1.2409	0.000316

GLUCOSE *d* $C_6H_{12}O_6.H_2O$.

100 gms. H_2O	dissolve	82	gms. glucose at	20–25°.	(Dehn, 1917.)
100 gms. pyridine	"	7.62	" "	"	"
100 gms. aq. 50% pyridine	"	49.17	" "	"	"
100 gms. trichlor ethylene	"	0.006	" "	15°	(Wester and Bruins, 1914.)

GLUCOSE (Dextrose) $C_6H_{12}O_6.H_2O$.

SOLUBILITY OF GLUCOSE IN WATER. (Jackson and Silsbee, 1922.)

Saturation was obtained by constant agitation in a thermostat. The saturated solutions were analyzed by a densimetric and polariscopic determination of the dextrose in the sample.

t°.	Gms $C_6H_{12}O_6$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_{12}O_6$ per 100 gms. sat. sol.	Solid Phase.
−0.772	6.83	Ice	41.5	62.82	$\alpha C_6H_{12}O_6.H_2O$
−2.116	16.65	"	45.0	65.71	"
−2.305	17.59	"	50.0 (tr. pt.)	70.90	" + $\alpha C_6H_{12}O_6$
−5.605	33.02	"	38.0	67.0 (unstable)	$\alpha C_6H_{12}O_6$
−5.3 (Eutec.)	31.75	" + $C_6H_{12}O_6.H_2O$	40.0	67.6 "	"
+0.5	35.2	$\alpha C_6H_{12}O_6.H_2O$	45.0	69.69 "	"
15.0	44.96	"	55.22	73.08 (stable)	"
22.98	49.37	"	64.75	76.36 "	"
28.07	52.99	"	70.2	78.23 "	"
30.0	54.64	"	80.5	81.49 "	"
35.0	58.02	"	90.8	84.90 "	"
40.4	62.13	"			

SOLUBILITY OF GLUCOSE IN METHYL ALCOHOL.

(Gillis and Nachtergaele, 1934.)

At temperatures below 50° the saturated solutions obtained by constant agitation were analyzed by evaporation and weighing the residue and also by polarametric analysis. Above 50° the point of disappearance of the last crystal in known mixtures was determined.

t°	Gms. $C_6H_{12}O_6$ per 100 gms.		Solid Phase	t°	Gms. $C_6H_{12}O_6$ per 100 gms.		Solid Phase
	sat. sol.	CH_3OH			sat. sol.	CH_3OH	
0.0	1.5	1.52	α $C_6H_{12}O_6$	105.0	49.5	98.00	α $C_6H_{12}O_6$
25.0	2.3	2.35	"	106.6	54.6	120.26	"
35.0	3.4	3.51	"	108.6 tr.pt.	64.8	184.10	" + β $C_6H_{12}O_6$
50.0	4.9	5.15	"	113	69.8	231.12	β $C_6H_{12}O_6$
76.1	9.96	11.06	"	117.2	74.9	298.40	"
87.5	15.3	18.06	"	119.2	78.3	360.82	"
98.0	24.43	32.32	"	122.8	83.2	495.23	"
99.5	27.6	38.1	"	125.9	87.2	681.25	"
104.2	40.0	66.66	"	128.5	92.0	1150.00	"

SOLUBILITY OF SEVERAL SUGARS IN AQUEOUS ALCOHOL AT 20°.

(Hudson and Yanovsky, 1917.)

Sugar.	Formula.	Solvent.	Gms. Anhydrous Sugar per 100 cc. Solution.	
			Initial Solubility.	Final Solubility.
α Arabinose	$C_5H_{10}O_5$	80% C_2H_5OH	0.74	1.04
β Cellose	$C_{12}H_{22}O_{11}$	20% "	3.2	4.7
β Fructose	$C_6H_{12}O_6$	80% "	13.4	27.4
β "	"	95% "	1.8	4.2
β "	"	Methyl Alcohol	5.2	11.1
α Galactose	$C_6H_{12}O_6$	60% C_2H_5OH	1.1	3.1
α "	"	80% "	0.27	0.65
β, α Glucoheptose	$C_7H_{14}O_7$	20% "	4	4.5
α Glucose	$C_6H_{12}O_6$	80% "	2	4.5
α "	"	Methyl Alcohol	0.85	1.6
α " hydrate	$C_6H_{12}O_6.H_2O$	80% C_2H_5OH	1.3	3
β Glucose	$C_6H_{12}O_6$.	80% "	4.9	9.1
α Lactose hydrate	$C_{12}H_{22}O_{11}.H_2O$	40% "	1.1	2.4
α Lyxose	$C_5H_{11}O_5$	90% "	5.4	7.9
β Maltose hydrate	$C_{12}H_{22}O_{11}.H_2O$	60% "	3	4.75
β Mannose	$C_6H_{12}O_6$	80% "	2.4	13
β "	"	Methyl Alcohol	0.78	4.4
β Mellibose Dihydrate	$C_{12}H_{22}O_4.2H_2O$	80% C_2H_5OH	0.70	1.3
α Rhamnose Hydrate	$C_6H_{12}O_5.H_2O$	100% "	8.6	9.5
α " "	"	70% "	8.2	9.0
α Xylose	$C_5H_{10}O_5$	80% "	2.7	6.2
Sucrose	$C_{12}H_{22}O_{11}$	80% "	3.7	3.7
Trehalose Dihydrate	$C_{12}H_{22}O_{11}.2H_2O$	70% "	1.8	1.8
Raffinose Pentahydrate	$C_{18}H_{32}O_{16}.5H_2O$	50% "	1.4	1.4

SOLUBILITY OF GLUCOSE IN SEVERAL SOLVENTS AT 23°.

(Parks, Huffman and Cattoir, 1928.)

Solvent	Gms. per 100 gms. sat. solution	
	Vitreous glucose	Crystalline glucose
Ethyl alcohol 99%	4.70	0.44
" " 100%	1.58	0.22
i Propyl alcohol	1.07	0.08
Acetone	0.184	0.014

SOLUBILITY OF SORBOSE AND GULOSE IN WATER AND ALCOHOLS.

(de Bruyn and van Ekenstein, 1900.)

Sugar.	M.-pt.	Gms. Sugar per 100 cc. Sat. Sol. in:		
		H_2O at 100°.	CH_3OH at 17°.	C_2H_5OH at 17°.
d Sorbose	151	0.22	1.70	1.02
l Sorbose	150	0.23	1.68	1
l Gulose	150	0.24	1.72	1.04

100 gms. H_2O dissolve 108 gms. maltose at 20°–25°. (Dehn, 1917.)
100 gms. H_2O dissolve 14.3 gms. raffinose at 20°–25°. "

SOLUBILITY OF PHENYLHYDRAZONES AND β NAPHTHYLHYDRAZONES OF THE SUGARS IN WATER AND IN ALCOHOLS AT 16°–18°.

(van Ekenstein and de Bruyn, 1896.)

The hydrazones were prepared by adding to a concentrated and warm solution of the sugar the equivalent quantity of the hydrazine dissolved in the molecular quantity of glacial acetic acid. The precipitated hydrazones were recrystallized from 30 to 50 per cent alcohol. No details in regard to the method of obtaining saturation or of analysis of the solutions are given.

Phenylhydrazone of:	M.-pt.	Gms. Compound per 100 cc. Sat. Sol. in:		
		Water.	CH_3OH.	C_2H_5OH.
Methyl Mannose	178	0.2–0.06	0.59	0.05–0.02
" Arabinose	161	"	...	"
" Rhamnose	124	"	very sl. sol.	"
" Galactose	180	"	"	"
Ethyl Galactose	169	...	...	0.1
" Mannose	159	...	...	0.2
" Arabinose	153	...	...	0.4
" Rhamnose	123	...	very sl. sol.	...
Amyl Galactose	116	...	...	0.6
" Mannose	134	...	...	3.5
" Arabinose	120	...	...	3.6
" Rhamnose	99	...	very sl. sol.	6.5
" Glucose	128	...	...	1.2
" Lactose	123	...	...	0.4
Allyl Galactose	157	...	...	0.3
" Mannose	142	...	...	0.7
" Arabinose	145	...	...	0.5
" Rhamnose	135	...	...	...
" Glucose	155	...	...	...
" Lactose	132	...	...	0.2
" Melibose	192	...	...	0.3
Benzyl Galactose	154	...	0.9	0.08
" Mannose	165	...	0.55	0.2
" Arabinose	170	...	0.4	0.06
" Rhamnose	121	...	15.4	6.7
" Glucose	150	...	0.5	0.10
" Lactose	128	...	0.9	0.06
β Naphthyl Galactose	167	0.14	...	0.24*
" Mannose	157	0.18	...	0.25*
" Arabinose	141	0.22	...	0.62*
" Rhamnose	170	0.20	...	0.44*
" Glucose	95	0.25	...	5*
" Xylose	70	0.32	...	6.62*
" Lactose	203	0.07	...	0.2*
" Maltose	170	...	...	0.4*
" Melibose	135	...	...	1.3*

GALACTOSE $C_6H_{12}O_6$.

100 gms. saturated solution in pyridine contain 5.45 gms. $C_6H_{12}O_6$ at 26°, density of solution = 1.0065. (Holty, 1905.)

100 gms. H_2O dissolve 68.3 gms. galactose at 20-25°. (Dehn, 917.)

100 gms. aq. 50% pyridine dissolve 6.83 gms. galactose at 20-25°. "

Iso**INOSITOL** $C_6H_{12}O_6$.

100 gms. H_2O dissolve 25.12 gms. $C_6H_{12}O_2$ at 18° and 43.22 gms. at 100°. (Muller, 1912.)

RHAMNOSE-*l*-$CH_3(CHOH)_4CHO + H_2O$.

SOLUBILITY OF RHAMNOSE IN SEVERAL ALCOHOLS.

(Upson, Fluevog and Albert, 1936.)

The determinations were made by observing the temperatures at which the last crystal disappeared from mixtures of known amounts of solid and solvent contained in 3 to 15 cc sealed glass bulbs while being slowly heated.

Results for the solubility in:

Methyl alcohol

t^0	Gm. Mols. $C_6H_{12}O_5 \cdot H_2O$ per 100 gm. mols. CH_3OH
35.9	16.7
42.6	24.4
49.1	35.5
53.3	44.4
56.0	49.9
60.5	61.4

Ethyl alcohol

t^0	Gm. Mols. $C_6H_{12}O_5 \cdot H_2O$ per 100 gm. mols. C_2H_5OH
42.0	7.93
49.3	12.6
53.6	17.2
56.1	21.5
59.2	26.1
61.1	30.7

n Propyl alcohol

t^0	Gm. Mols. $C_6H_{12}O_5 \cdot H_2O$ per 100 gm. mols. C_3H_7OH
31.0	2.43
40.0	3.32
46.1	4.43
51.2	6.04
56.5	8.04
61.1	10.33
63.2	12.44

Iso propyl alcohol

t^0	Gm. Mols. $C_6H_{12}O_5 \cdot H_2O$ per 100 gm. mols. C_3H_7OH
36.8	3.01
44.5	4.06
49.3	5.37
53.8	6.86
55.3	7.49
61.2	10.70

n Butyl alcohol

t^0	Gm. Mols. $C_6H_{12}O_5 \cdot H_2O$ per 100 gm. mols. C_4H_9OH
32.3	1.85
40.9	2.27
47.6	3.38
53.6	4.39
55.2	4.89
61.0	6.66

Iso Butyl alcohol

t^0	Gm. Mols. $C_6H_{12}O_5 \cdot H_2O$ per 100 gm. mols. C_4H_9OH
40.4	2.18
44.8	2.85
51.4	3.78
55.0	4.51
61.2	6.17
66.6	7.83

Secondary Butyl alcohol

t^0	Gm. Mols. $C_6H_{12}O_5 \cdot H_2O$ per 100 gm. mols. C_4H_9OH
43.1	3.25
49.1	4.04
52.5	4.68
58.6	6.41
65.4	8.74
72.4	13.86

Tertiary Butyl alcohol

t^0	Gm. Mols. $C_6H_{12}O_5 \cdot H_2O$ per 100 gm. mols. C_4H_9OH
42.4	3.97
53.2	5.99
57.1	7.10
62.3	8.72
67.4	11.40

Allyl alcohol

t^0	Gm. Mols. $C_6H_{12}O_5 \cdot H_2O$ per 100 gm. mols. C_3H_5OH
35.8	4.05
46.1	6.28
54.5	10.72
60.5	15.62
62.4	18.60

MANNOSE α-d and β-d, $CH_2OH(CHOH)_4CHO$.

SOLUBILITY OF EACH SEPARATELY IN SEVERAL ALCOHOLS.

(Upson, Fluevog and Albert, 1935.)

Results for the Solubility in:

Methyl Alcohol				Ethyl Alcohol			
α-d-Mannose		β-d-Mannose		α-d-Mannose		β-d-Mannose	
t°	Gm. Mol. $C_6H_{12}O_6$ per 100 gm. mol. Alcohol	t°	Gm. Mol. $C_6H_{12}O_6$ per 100 gm. mol. Alcohol	t°	Gm. Mol. $C_6H_{12}O_6$ per 100 gm. mol. Alcohol	t°	Gm. Mol. $C_6H_{12}O_6$ per 100 gm. mol. Alcohol
44.8	2.18	41.5	1.84	43.3	0.353	48.2	0.337
46.1	2.29	45.0	2.19	52.0	0.490	51.8	0.394
50.2	2.84	51.3	2.82	57.9	0.627	55.3	0.455
53.9	3.38	55.0	3.26	58.3	0.639	61.2	0.568
58.9	4.22	59.1	3.95	61.1	0.695	65.4	0.697
62.6	5.07	64.2	4.97	67.6	0.895	71.4	0.867
Normal Propyl Alcohol				Iso Propyl Alcohol			
41.3	0.129	48.7	0.123	40.2	0.131	47.1	0.130
47.1	0.164	53.0	0.149	49.3	0.191	51.7	0.159
56.4	0.248	59.8	0.192	52.3	0.227	58.3	0.206
60.0	0.290	65.6	0.250	57.7	0.297	62.4	0.250
63.1	0.320	70.3	0.306	59.3	0.321	67.6	0.312
68.4	0.396	75.7	0.419	64.2	0.388	71.1	0.371
Normal Butyl Alcohol				Iso Butyl Alcohol			
42.9	0.0888	41.3	0.0679	47.1	0.0848	47.0	0.0608
47.1	0.101	51.2	0.0815	52.1	0.106	49.8	0.0679
51.0	0.116	55.8	0.101	55.1	0.118	54.0	0.0820
55.8	0.142	60.1	0.127	57.6	0.135	58.2	0.103
62.9	0.199	65.1	0.165	62.6	0.180	63.8	0.137
69.6	0.281	72.6	0.249	72.5	0.269	72.1	0.203
Secondary Butyl Alcohol				Tertiary Butyl Alcohol			
46.1	0.132	45.1	0.0933	45.3	0.208	47.9	0.204
50.8	0.162	48.7	0.116	47.3	0.227	52.3	0.246
55.4	0.199	53.9	0.144	52.8	0.272	58.1	0.318
56.4	0.209	58.0	0.175	54.2	0.308	65.0	0.411
66.0	0.281	65.2	0.239	64.2	0.447	69.5	0.487
76.1	0.438	70.6	0.301	68.7	0.521	74.0	0.589
Allyl Alcohol							
48.2	0.323	47.2	0.235				
52.0	0.378	51.8	0.281				
55.3	0.438	58.4	0.392				
56.5	0.455	65.0	0.511				
66.6	0.672	68.2	0.586				

d **MANNONIC** γ-**LACTONE** M. pt. 152 $[\alpha]_{D}^{20^\circ} = +52.3^\circ$.

d **MANNONIC** δ-**LACTONE** M. pt. 162.5 $[\alpha]_{D}^{20^\circ} = +112^\circ$.

SOLUBILITY OF EACH SEPARATELY IN SEVERAL ALCOHOLS.

(Upson, Fluevog and Albert, 1936.)

Results for the solubility in:

Methyl Alcohol

t°	Gm. Mols. γ Lactone per 100 gm. mols. Alcohol	t°	Gm. Mols. δ Lactone per 100 gm. mols. Alcohol
40.0	0.813	35.8	0.235
47.9	1.083	45.3	0.341
53.4	1.325	54.9	0.508
60.9	1.797	63.4	0.779
67.4	2.367	66.9	0.957

Ethyl Alcohol

t°	Gm. Mols. γ Lactone per 100 gm. mols. Alcohol	t°	Gm. Mols. δ Lactone per 100 gm. mols. Alcohol
44.1	0.207	42.0	0.0853
48.3	0.250	49.8	0.124
55.9	0.357	53.6	0.144
60.4	0.427	60.4	0.192
64.5	0.519	68.2	0.279

Normal Propyl Alcohol

42.2	0.0849	45.9	0.0476
47.3	0.105	53.9	0.0679
55.3	0.158	65.4	0.123
64.6	0.244	65.4	0.123
68.6	0.296	71.4	0.157

Iso Propyl Alcohol

43.8	0.109	45.6	0.0607
51.6	0.163	55.4	0.0935
57.4	0.215	61.1	0.121
64.4	0.294	65.3	0.146
67.9	0.349	69.7	0.181

Normal Butyl Alcohol

47.1	0.0719	48.1	0.0379
51.3	0.0868	50.8	0.0414
54.7	0.106	53.9	0.0472
60.1	0.139	59.6	0.0634
63.0	0.163	65.0	0.0822
71.5	0.242	69.4	0.103

Iso Butyl Alcohol

49.5	0.0659	46.8	0.0307
51.7	0.0770	52.3	0.0402
56.9	0.102	55.4	0.0461
63.3	0.142	59.5	0.0582
66.4	0.164	63.0	0.0693
75.1	0.236	68.1	0.0842

Secondary Butyl Alcohol

43.1	0.0807	44.9	0.0415
46.6	0.0927	49.2	0.0487
52.0	0.125	52.0	0.0637
57.4	0.167	58.5	0.0827
64.7	0.238	64.9	0.115
68.7	0.286	71.9	0.152

Tertiary Butyl Alcohol

35.2	0.0938	39.4	0.0638
41.9	0.123	43.4	0.0752
48.7	0.173	47.6	0.0907
55.6	0.250	53.7	0.125
59.0	0.288	57.7	0.153
70.0	0.424	67.1	0.226

Allyl Alcohol

46.4	0.215	42.0	0.0806
49.7	0.250	46.6	0.0964
55.1	0.320	53.0	0.127
60.4	0.404	57.7	0.156

α METHYL-d-MANNOSIDE M. pt. 195°, $[\alpha]\frac{20°}{D}$ = +24.5°.

Results for the solubility in:

Methyl Alcohol

t°	Gm. Mols. Mannoside in 100 gm. Mols. CH_3OH
40.2	0.458
43.7	0.523
49.8	0.652
54.9	0.776
58.4	0.867
62.4	1.010
64.6	1.094
66.8	1.205

Ethyl Alcohol

t°	Gm. Mols. Mannoside in 100 gm. mols. C_2H_5OH
37.9	0.0940
47.4	0.177
54.6	0.249
62.0	0.342
66.1	0.413
76.2	0.615
81.0	0.761
84.6	0.905

Propyl Alcohol

t°	Gm. Mols. Mannoside in 100 gm. mols. C_3H_7OH
45.8	0.077
48.9	0.099
54.6	0.148
60.1	0.194
68.1	0.270
75.3	0.386

Iso Propyl Alcohol

t°	Gm. Mols. Mannoside per 100 gm. mols. C_3H_7OH
46.3	0.0876
51.6	0.129
57.3	0.164
60.8	0.206
65.7	0.254
68.0	0.276
73.8	0.362
79.7	0.486

Normal Butyl Alcohol

t°	Gm. Mols. Mannoside per 100 gm. mols. C_4H_9OH
45.8	0.0539
56.1	0.107
56.2	0.109
62.7	0.165
67.5	0.219
73.1	0.290
91.1	0.632

Iso Butyl Alcohol

t°	Gm. Mols. Mannoside per 100 gm. mols. C_4H_9OH
46.1	0.0528
51.1	0.0746
56.0	0.104
63.5	0.154
69.4	0.221
74.3	0.285
80.1	0.363
83.0	0.420

Secondary Butyl Alcohol

t°	Gm. Mols. Mannoside per 100 gm. mols. C_4H_9OH
49.7	0.107
53.9	0.140
58.6	0.175
66.7	0.251
75.6	0.367
80.5	0.440
93.9	0.768

Tertiary Butyl Alcohol

t°	Gm. Mols. Mannoside per 100 gm. mols. C_4H_9OH
38.0	0.102
41.4	0.114
55.0	0.200
60.9	0.258
71.7	0.402
83.8	0.613

Allyl Alcohol

t°	Gm. Mols. Mannoside per 100 gm. mols. C_3H_5OH
46.2	0.197
49.4	0.229
53.3	0.275
58.55	0.345
60.5	0.391
63.2	0.436
70.3	0.581

n Methyl **PIPERIDINE** $C_5H_{10}N.CH_3$

RECIPROCAL SOLUBILITY OF METHYL PIPERIDINE AND WATER.
(Flashner, 1908.)

t°	Gms. $C_5H_{10}N.CH_3$ per 100 gms. sat. sol.	t°	Gms. $C_5H_{10}N.CH_3$ per 100 gms. sat. sol.	t°	Gms. $C_5H_{10}N.CH_3$ per 100 gms. sat. sol.
77	5.3	48.5	21.3	85.5	83.4
69.5	5.8	48.7	26.9	112.0	89.6
63.6	6.4	49.5	37.2	230.4	83.4
54.1	8.0	51.2	46.3	275.	65.3
50.3	10.3	55.0	55.9	236.	13.5
48.7	13.0	61.5	65.3	196	8.8
48.3(1)	16.7	70.0	74.2	178	5.3

(1) Lower critical temperature. The upper critical temperature is higher than 280°.

DISTRIBUTION OF *n* METHYL PIPERIDINE AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether.

Millimols. $C_5H_{10}N.CH_3$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.805	1.37	1.70
1.33	2.31	1.74
2.065	3.59	1.74
3.42	6.20	1.81
5.92	10.92	1.85

Water and Xylene.

Millimols. $C_5H_{10}N.CH_3$ per liter of		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.683	0.934	1.365
1.05	1.325	1.260
1.70	2.300	1.350
1.85	2.575	1.390
2.40	3.40	1.420
3.70	6.21	1.640
7.33	12.67	1.725

Acetone and Glycerol.

Millimols. $C_5H_{10}N.CH_3$ per liter of		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.29	1.03	0.282
0.65	1.30	0.500
1.375	2.00	0.687
3.10	3.50	0.886
6.10	6.60	0.924
11.15	11.05	1.010
22.2	20.8	1.068

PIPECOLINE $C_5H_9(CH_3)NH$ *d* and *l*.

F.-pt. data for mixtures of *d* and *l* pipecoline are given by Ladenburg and Sobecki (1910).

PROPYL URETHAN $C_3H_7NHCOOC_2H_5$.

100 gms. H_2O dissolve 8.34 gm. $C_6H_{13}O_2N$ at 15.5°. (Fühner, 1924.)

LEUCINES $C_6H_{13}O_2N$

SOLUBILITY OF dl ISOLEUCINE, d ISOLEUCINE, dl LEUCINE l LEUCINE AND dl NORLEUCINE, EACH SEPARATELY IN WATER.

(Dalton and Schmidt, 1933, 1935.)

The following values were derived from solubility equations calculated in each case from a series of from 18 to 40 very careful determinations at 9 to 10 different temperatures between 0 and 70°.

t°	Gms. of each compound separately per 100 gms. H_2O				
	dl Leucine $(CH_3)_2CHCH_2CH$ $(NH_2)COOH$	l Leucine $(CH_3)_2CHCH_2CH$ $(NH_2)COOH$	dl Isoleucine $CH_3CH_2CH(CH_3)$ $CHNH_2COOH$	d Isoleucine $CH_3CH_2CHCH_3$ $CHNH_2COOH$	dl Norleucine $CH_3(CH_2)_3CH$ $(NH_2)COOH$
0	0.797(0.8812)	2.270	1.826(1.750)	3.791	0.843(0.9085)
5	0.823	2.281	1.884	3.830	0.890
10	0.856	2.301	1.952	3.883	0.943
15	0.894	2.332	2.031	3.947	1.003
20	0.939	2.374	2.123	4.025	1.071
25	0.991(1.181)	2.426	2.229(2.188)	4.117	1.149(1.182)
30	1.051	2.490	2.350	4.223	1.236
35	1.121	2.568	2.489	4:345	1.336
40	1.203	2.658	2.647	4.483	1.449
45	1.297	2.764	2.828	4.641	1.579
50	1.406(1.764)	2.887	3.034(3.020)	4.818	1.727(1.800)
55	1.531	3.028	3.270	5.017	1.895
60	1.678	3.189	3.539	5.240	2.088
65	1.848	3.374	3.848	5.488	2.309
70	2.046	3.584	4.201	5.765	2.566
75	2.276(2.840)	3.823	4.607(4.827)	6.076	2.861(2.881)
100	4.206(4.83)	5.638	7.802(9.04)	8.255	5.229(4.70)

The results in parentheses are by Dunn, Ross and Read, 1933.
The results of Pfeiffer and Würgler, 1916, and others agree fairly well with the above values for dl Leucine.
The results of Takahashi and Yaginuma, 1928, 1929, agree well with the above values for l Leucine.

The following specific gravity determinations at 25° are given by Dalton and Schmidt:

Compound	Gms. compound per:		Sp. Gr.
	100 gms. sat. sol.	100 gms. H_2O	
dl Leucine	1.029	1.039	0.99883
l Leucine	2.341	2.397	1.00146
" "	1.147	1.160	0.99917
dl Isoleucine	2.114	2.159	1.00115
" "	1.034	1.045	0.99903
d Isoleucine	4.341	4.538	1.00579
" "	3.328	3.442	1.00374
" "	2.259	2.312	1.00157
" "	1.289	1.306	0.99953
dl Norleucine	1.176	1.199	0.99908

100cc of cold saturated solution of l Leucine in aqueous sat. $Mg(ClO_4)_2$ solution contain 2.0 gms. $C_6H_{13}O_2$ N. (Duclaux and Durand-Gasselin, 1938.)

LEUCINES $C_6H_{13}O_2N$.

SOLUBILITY OF 1 LEUCINE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID.

(Takahashi and Yaginuma, 1929.)

Results at 15°				Results at 30°			
d. of sat. sol.	Gms. per 100 gms. sat. sol.		Solid Phase	d. of sat. sol.	Gms. per 100 gms. sat. sol.		Solid Phase
	HCl	$C_6H_{13}O_2N$			HCl	$C_6H_{13}O_2N$	
1.000	0.0	2.25	L	1.000	0.00	2.32	L
1.001	0.18	2.53	"	1.003	0.49	4.61	"
1.020	1.64	8.89	" + L_2.HCl	1.012	1.28	7.10	"
1.051	5.92	17.8	L_2.HCl	1.021	1.97	9.74	" + L_2.HCl
1.073	9.17	24.67	"	1.031	3.11	11.31	L_2.HCl
1.079	10.18	27.25	" + L.HCl.H_2O	1.061	8.12	23.81	"
1.078	11.90	19.99	L.HCl.H_2O	1.088	11.53	33.14	" + L.HCl.H_2O
1.108	15.73	11.43	"	1.092	12.03	28.39	L.HCl.H_2O
1.109	17.42	10.59	" + L.HCl	1.095	14.44	18.16	"
1.102	19.17	7.83	L.HCl	1.087	15.49	15.31	"
1.110	20.66	8.17	"	—	17.42	14.06	" + L.HCl
1.130	25.58	4.68	"	1.110	21.54	6.88	L.HCl
1.136	27.14	4.53	"	1.142	28.44	4.43	"
1.163	32.52	4.18	"	1.164	32.38	4.85	"
1.177	34.99	4.58	"	1.191	39.28	5.92	"

L = $C_6H_{13}O_2N$(1 Leucine).

SOLUBILITY OF *d. l.* LEUCINE IN WATER AND IN AQUEOUS SOLUTIONS OF SALTS AT 20°.

(Pfeiffer and Würgler, 1916.)

Gms. mols. salt per liter solvent	Gms. Leucine per liter sat. sol.	Gms. mols. salt per liter solvent.	Gms. Leucine per liter sat. sol.
0.0 (Water)	9.76	0.25 Mol. $BaCl_2$	10.61
1.27 Mol. LiCl	9.45	0.50 » »	11.28 (11.49)
2.28 » »	8.66	1.00 » »	11.17
2.54 » »	8.93	0.25 » $SrCl_2$	10.34
5.07 » »	9.85	0.50 » »	10.98 (11.49)
11.4 » »	9.13	1.0 » »	10.82
0.5 » NaCl	8.86	2.0 » »	10.34
1.0 » »	8.08	0.487 » $BaBr_2$	12.08
2.0 » »	6.70	0.457 » $Ba(ClO_4)_2$	13.15
4.0 » »	3.87	0.1 » HCl	22.19
Sat. sol. »	2.49	0.1 » » + 1.96 mol. LiCl	14.12
0.5 Mol. KCl	8.93	0.1 » » + 2.0 » KCl	18.29
1.0 » »	8.01	0.1 » » + 2.0 » KNO_3	20.04
2.0 » »	6.37	0.1 » NaOH	22.74
Sat. sol. »	3.55	0.1 » » + 2.06 mol. LiCl	21.25
2.0 Mol. KBr	7.02	0.1 » » + 2.0 » NaCl	19.11
2.0 » KI	8.01	0.1 » » + 2.0 » KCl	19.19
2.0 » KNO_3	9.19	0.1 » » + 2.0 » KBr	19.66
0.297 » $CaCl_2$	10.75	0.1 » » + 2.0 » KNO_3	20.59
0.571 » »	12.43	0.5 » »	14.41
0.594 » »	11.51	0.5 » » + 2.03 mol. LiCl	13.75
1.18 » »	12.68	0.5 » » + 2.0 » NaCl	13.41
2.37 » »	13.96	0.5 » » + 2.0 » $NaNO_3$	13.52

The above determinations were made by shaking the mixtures in a thermostat for 2 days and titrating the clear solution by the Sörensen method. A titration after an additional period of 1 day showed that complete saturation had been reached in all cases.

SOLUBILITY OF LEUCINE IN AQUEOUS SOLUTIONS OF DIFFERENT HYDROGEN ION CONCENTRATION AT 25°. (Sano, 1926.)

A large excess of leucine was shaken in a thermostat at 25° with the aqueous solvent. The saturated solution was filtered and a portion used for the determination of p_H by means of the hydrogen electrode and another portion for the determination of nitrogen by the micro Kjeldahl method using iodometric titration according to Bang.

Aq. solvent	p_H of sat. sol.	Gms. N per liter sat. sol.
0.333 *n* HCl	2.15	7.339
0.100 *n* "	2.49	4.719
0.02 *n* "	3.07	3.298
0.10 *n* CH_3COOH	3.51	2.915
0.01 *n* CH_3COOH ⎫ 0.2 *n* CH_3COONa ⎭	6.00	2.588
0.005 *n* NaOH	8.36	2.898
0.05 *n* "	9.12	3.742
0.10 *n* "	9.41	4.659
0.40 *n* "	9.81	7.137

The minimum solubility at the isoelectric point is 2.588 gms. N. or 24.24 gm. leucine per liter at 25°.

SOLUBILITY OF LEUCINE IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 21°.

(Pfeiffer and Angern, 1924.)

A saturated aqueous solution of the amino acid was prepared by constant shaking in a thermostat for 3 days. To five cc. portions of this sat. solution amounts of the salts to yield 0.02 molecular concentration were added and the shaking continued for another 3 days. The amino acid salted out was filtered, dried at 120-130° and weighed. That remaining in solution was calculated by difference.

Solvent	Gms. Leucine per liter sat. solution.
Water	22.24
Aq. 0.02 mol. CH_3COOK per liter	19.36
" 0.02 " $(NH_4)SO_4$ "	9.12
" 0.02 " NaCl "	13.94

One liter sat. solution of **d, l, leucine** in water contains 10.11 gms., and one liter sat. solution in Aq. 0.1 *n* HCl contains 13.16 gms. of the compound at 21°.
(von Euler and Rudberg 1924, 1925.)

SOLUBILITY OF ISOMERIC LEUCINES, EACH SEPARATELY, IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(Cohn, McMeekin, Edsall and Weare, 1934; McMeekin, Cohn and Weare, 1936.)

Vol. Percent C_2H_5OH in Aq. Solvent	Gm. Mols. of Each Isomer Separately per liter sat. solution							
	dl Leucine (dl α Amino isocaproic acid)		l Leucine (l-α Amino iso caproic acid)		— (ε-Amino Caproic acid; M.PT. 201-2°)		dl Norleucine (dl α Amino n caproic acid)	
0.0(= H_2O)	(0.9988)	0.0744	(1.0012)	0.171	(1.0895)	3.848	(0.9991)	0.0866
5	(0.9917)	0.0661	—	—	(1.0834)	3.733	(0.9920)	0.0781
10	(0.9854)	0.0575	—	—	(1.0794)	3.625	(0.9855)	0.0688
15	(0.9793)	0.0494	—	—	—	—	(0.9795)	0.0598
20	(0.9735)	0.0423	(0.9748)	0.0977	(1.0662)	3.439	(0.9726)	0.0516
40	(0.9467)	0.0264	(0.9469)	0.0620	(1.0326)	2.852	(0.9460)	0.0346
60	(0.9067)	0.0186	(0.9071)	0.0441	(0.9707)	1.909	(0.9060)	0.0271
80	(0.8560)	0.00848	(0.8569)	0.0204	(0.8742)	0.485	(0.8550)	0.0130
90	—	—	(0.8254)	0.00770	(0.8304)	0.0713	(0.8254)	0.00585
95	—	—	—	—	(0.80848)	0.0139	—	—
100	—	—	(0.7851)	0.00128	(0.7851)	0.00194	(0.7851)	0.00104

The figures in parentheses are densities.

SOLUBILITY OF dl LEUCINE AND OF dl NORLEUCINE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT SEVERAL TEMPERATURES.

(Dunn and Ross, 1938.)

Results for dl Leucine

t°	Vol. Percent C_2H_5OH in Solvent	d. of sat. sol.	Gms. dl Leucine per 100 gms. solvent
0	24.93	0.971	0.251
"	50.10	0.935	0.118
"	74.50	0.881	0.0693
"	95.14	0.819	0.0116
25	24.93	0.964	0.493
"	50.10	0.924	0.318
"	74.20	0.868	0.175
"	95.14	0.806	0.0258
45.2	24.93	0.958	0.853
"	50.10	0.912	0.633
"	74.5	0.856	0.323
"	95.14	0.795	0.0471
65.1	24.93	0.948	1.45
"	50.10	0.900	1.16
"	74.20	0.844	0.584
"	95.09	0.780	0.0844

Results for dl Norleucine

t°	Vol. Percent C_2H_5OH in Solvent	d. of sat. sol.	Gms. dl Norleucine per 100 gms. solvent
0	24.93	0.972	0.275
"	50.10	0.938	0.147
"	74.50	0.883	0.0995
"	95.14	0.819	0.0192
25.7	24.93	0.965	0.625
"	50.1	0.924	0.453
25.0	74.2	0.868	0.266
"	94.14	0.806	0.417
45.0	24.93	0.957	1.12
"	50.10	0.913	0.918
"	74.20	0.855	0.518
"	95.14	0.793	0.0759
65.2	24.93	0.948	2.02
"	50.10	0.902	1.76
"	74.20	0.842	0.941
"	95.14	0.780	0.134

DISTRIBUTION OF LEUCINE AND OF NORLEUCINE, EACH SEPARATELY, BETWEEN WATER AND BUTYL ALCOHOL AT 25°.

(England, Jr., and Cohn, 1936.)

Results for Leucine

Gm. Mols. Leucine per liter		$\frac{2}{1}$
H_2O layer(1)	Alcohol layer(2)	
0.023	0.0043	0.183
0.047	0.0088	0.187
0.101	0.0204	0.202

Results for Norleucine

Gm. Mols. Norleucine per liter		$\frac{2}{1}$
H_2O layer(1)	Alcohol layer(2)	
0.020	0.0061	0.310
0.067*	0.0204	0.328

* Excess solid present.

SOLUBILITY OF dl α AMINO n CAPROIC ACID (dl NORLEUCINE) IN SEVERAL SOLVENTS AT 258.

(McMeekin, Cohn and Weare, 1936.)

Solvent	d. of sat. solution	Gm. Mols $C_6H_{13}O_2N$ per liter sat. sol.
Water	0.9991	0.0866
Formamide	1.1309	0.0173
Methanol	0.7873	0.00854
Ethanol	0.7851	0.00104
Butanol	0.8067	0.000336
Acetone	0.7857	0.0000793

100 cc Butyric acid dissolve 0.024 gm. Leucine at 18°.

(v. Przylecki and Kasprzyk-Czaykowski, 1938.

Results for the solubility of methyl, ethyl and propyl Leucine hydro chlorides in methyl, ethyl and propyl alcohols at various temperatures are given by Takahashi and Yaginuma, 1930, and Yaginuma, 1930.

HEXANE *n* $CH_3(CH_2)_4CH_3$.

100 gms. sat. solution of hexane in water contain about 0.014 gm. C_6H_{14} at 15°.5.
(Fuhner, 1922.)

100 gms. aq. 0.4 n Sodium Oleate solution (= 10.8 gm. Na oleate per 100 gms. sol.) dissolve 2.4 gms. Hexane at 20° when dissolved directly and 7.3 gms. when mixed with oleic acid and the necessary amount of NaOH to neutralize the oleic acid is added.

100 gms. sat. solution of hexane in 92 wt. % alcohol contain 46.4 gm. C_6H_{14} at 15°.
(Ormandy and Craven. 1921.)

The critical solution temperature of hexane + methyl alcohol is at 42° and the mixture contains 80 per cent hexane. A mixture of equal weights of hexane and methyl alcohol has a mutual miscibility temperature of 35°.5. The effect of increasing amounts of water and of salts upon this temperature was studied.
(Howard and Patterson, 1926.)

SOLUBILITY OF HEXANE IN METHYL ALCOHOL.

(Rothmund, 1898.)

Determined by synthetic method, see p. 292

t°.	Gms. Hexane per 100 Gms. Alcoholic Layer.	Gms. Hexane per 100 Gms. Hexane Layer.	t°.	Gms. Hexane per 100 Gms. Alcoholic Layer.	Gms. Hexane per 100 Gms. Hexane Layer.
10	26.5	96.8	35	43.6	91.2
20	31.6	95.9	40	52.7	85.5
30	38.3	93.7	42.6	(crit. t.) 68.9	

EQUILIBRIUM IN THE SYSTEM n HEXANE, PHENOL AND WATER.

(Vondracek and Dostal, 1936.)

To mixtures of weighed amounts of phenol and water, weighed amounts of hexane were added and the temperature determined at which turbidity appeared. From the series of determinations the compositions corresponding to the temperatures 20° and 30° were ascertained by graphical interpolation.

Results at 20°

Gms. per 100 gms. sat. solution C_6H_{14} C H	Gms. per 100 gms. sat. solution C_6H_5OH	Gms. per 100 gms. sat. solution H_2O
10.03	85.69	4.28
8.55	85.48	5.97
7.39	84.20	8.41
6.57	83.44	9.99
5.66	82.03	12.31
4.76	79.39	15.85
3.77	74.05	22.18

Results at 30°

Gms. per 100 gms. sat. solution C_6H_{14}	Gms. per 100 gms. sat. solution C_6H_5OH	Gms. per 100 gms. sat. solution H_2O
11.74	84.06	4.20
10.00	84.12	5.88
8.69	83.02	8.29
7.75	82.38	9.87
6.80	81.05	12.15
5.68	78.62	15.70
4.51	73.48	22.01

CRITICAL SOLUTION TEMPERATURES OF MIXTURES OF HEXANE AND OTHER COMPOUNDS.

Mixture of Hexane and:-	C.S.t°	Wt. % C_6H_{14} in mixture	Authority
o Toluidine	21.1	64.0	Thiry, 1925.
o "	21.05	54.5	Hartenberg, 1926.
m "	21.3	52.3	Thiry, 1925.
m "	21.3	55.8	Dessart, 1926.
m Nitro Toluene	-30.0(calc.)	—	" "
Nitro benzene	19.0	—	" "
Aniline	70.0	—	" "

EQUILIBRIUM IN THE TERNARY SYSTEM HEXANE, NITROBENZENE AND RESORCINOL.

(Timofiew and Stachorski, 1928.)

The authors determined the temperatures of clouding, corresponding to the formation of two layers, in various mixtures of the three liquids.

Wt. Percent of Hexane mixed with Nitrobenzene	t° of clouding in final mixture containing: 0.0	0.05	0.10	0.15 Wt. percent Resorcinol
30.0	5.97	6.10	6.35	6.60
34.94	8.70	8.90	9.22	9.50
39.92	9.90	10.23	10.50	10.75
42.40	10.28	10.58	10.98	11.40
45.99	10.38	10.80	11.26	11.66
54.86	10.14	10.88	11.62	12.35
65.05	8.54	9.78	11.02	12.26
69.82	6.50	8.70	10.60	12.12

HEXANE

EQUILIBRIUM IN THE TERNARY SYSTEM HEXANE, NITROBENZENE AND o NITROPHENOL.

(Timofeiw and Stachorsky, 1928.)

Wt. Percent Hexane mixed with Nitrobenzene	t° of clouding in final mixture containing: 0.0	0.5	1.0	1.5 Wt. percent o nitrophenol
30.0	6.05	6.07	6.10	6.11
34.94	8.70	8.73	8.80	8.91
39.92	9.90	10.02	10.15	10.28
42.40	10.28	10.38	10.51	10.66
45.99	10.38	10.55	10.71	10.87
54.86	10.14	10.35	10.57	10.78
65.05	8.54	8.93	9.28	9.58
69.82	6.50	7.05	7.50	7.86

EQUILIBRIUM IN THE TERNARY SYSTEMS HEXANE, NITROBENZENE AND:

(Timofeiw and Stachorsky, 1928.)

Wt. Percent Hexane mixed with Nitrobenzene in each case	Benzoic acid t° of clouding in final mixtures containing 0.0	0.5	1.0	2.0 Wt. % Benzoic acid	Butyric acid t° of clouding in final mixtures containing: 0.5	1.0 Wt. % Butyric acid	Valeric acid t° of clouding in final mixtures containing: 0.5	1.0 Wt. % Valeric acid
30.0	6.20	5.82	5.42	4.93	5.22	4.44	4.78	3.80
34.85	8.70	8.44	8.16	7.53	7.82	6.90	7.50	6.50
39.9	10.0	9.88	9.66	9.22	9.06	8.22	8.92	7.92
46.4	10.4	10.34	10.17	9.60	9.56	8.74	9.47	8.57
54.86	10.14	—	—	—	9.32	8.47	9.28	8.37
59.91	9.83	9.74	9.42	8.81	—	—	—	—
64.93	8.5	8.50	8.36	7.75	7.75	6.44	7.70	6.9
69.96	6.45	6.40	6.26	5.77	5.73	4.90	5.77	4.97

THE MUTUAL SOLUBILITY OF HEXANE AND SULFUR DIOXIDE. (Seyer and Gill, 1924.)

Highly purified products were used. The mixtures were sealed in bulbs and the temperatures of appearance and disappearance of turbidity carefully determined.

t°.	Wt. per cent C_6H_{14} in mixture.	t°	Wt. per cent C_6H_{14} in mixture.	t°.	Wt. per cent C_6H_{14} in mixture.
—93.7	100.0	+3.0	69.3	8.6	7.3
—96 (Eutectic).		7.0	61.5	7.0	5.3
—31	88.8	7.1	57.3	—20.3	3.3
—30	88.4	10.0	41.0	—61.5	1.0
—28.1	88.0	10.1	32.4	—73.5 (Eutectic)	–
—19.0	84.1	9.9	18.5	—72.8	0.0
— 3.3	75.5	9.0	11.75		

Later determinations reported by Seyer and Todd, 1931, are as follows:

t^0	Wt. percent C_6H_{14} in mixture	t^0	Wt. Percent C_6H_{14} in mixture	t^0	Wt. percent C_6H_{14} in mixture
-53	86.0	10.6	43.6	3.8	10.8
-22	78.0	10.2(1)	34	2.5	9.8
-17	75.8	10.2	32.4	-10.0	4.6
+ 8	53.4	9.8	18.6	-20	3.3
9.9	49.3	6.5	13.0		

(1) Upper critical solution temperature.

The critical solution temperature of mixtures of Hexane and Sulfur Dioxide is 12° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 70 and 90 gm. mol. percent SO_4. (Leslie, 1934.)

2-METHYL PENTANE $(CH_3)_2CH(CH_2)_2CH_3$.

EQUILIBRIUM IN THE SYSTEM 2-METHYL PENTANE, PHENOL AND WATER.

(Vondracek and Dostal, 1936.)

To mixtures of weighed amounts of phenol and water, weighed amounts of 2-methyl pentane were added and the temperatures determined at which turbidity appeared. From this series of determinations the compositions corresponding to the temperatures 20° and 30° were ascertained by graphical interpolation.

Results at 20°			Results at 30°		
Gms. per 100 gms. sat. solution			Gms. per 100 gms. sat. solution		
C_6H_{14}	C_6H_5OH	H_2O	C_6H_{14}	C_6H_5OH	H_2O
4.30	9.61	86.09	4.21	11.53	84.26
8.43	7.23	84.34	8.31	8.47	83.22
12.26	5.87	81.87	12.11	7.01	80.88
15.85	4.76	79.39	15.69	5.75	78.56
19.15	4.14	76.71	19.00	4.85	76.15
22.21	3.62	74.17	22.07	4.75	73.68

The critical solution temperature of mixtures of 2-Methyl Pentane and Sulfur dioxide is 10° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 50 and 90 gm. mol. percent SO_4. (Leslie, 1934.)

Freezing-point data are given for mixtures of Hexane and:

Benzene(5)(8)	Iso pentane(9)	Nitro toluene(2)
Chloroform(8)	Methyl cyclohexane(9)	Phenol(4)
Cyclohexane(8)	Nitro benzaldehyde(7)	Toluidines(2)(4)
Di cetyl(dotria contane)(6)	Nitro benzene(1)(4)(7)	

(1) Deffet, 1938; (2) Dessart, 1926; (3) Campetti and Delgrosso, 1913; (4) Hartenberg, 1926; (5) Ormandy and Craven, 1926; (6) Seyer, 1938; (7) Timmermans, 1907, 1911; (8) Timmermans, 1928; (9) Timmermans, 1934.

HEXYL ALCOHOL *n* $CH_3(CH_2)_4CH_2OH$.

SOLUBILITY OF *n* HEXYL ALCOHOL IN WATER. (Fühner, 1924.)

The determinations were made by the synthetic method, and from the curve obtained the following results were read.

t°.	Gms. $C_6H_{14}O$ per 100 gms. sat. sol.	t°.	Gms. $C_6H_{14}O$ per 100 gms. sat. sol.	t°.	Gms. $C_6H_{14}O$ per 100 gms. sat. sol.
0	0.78	40	0.52	80	0.62
10	0.67	50	0.515	90	0.68
20	0.59	60	0.53	100	0.785
30	0.545	70	0.565	110	0.87

A saturated solution of n Hexyl alcohol in water, analyzed by interferometer readings, was found to contain 0.624 gm. C_6H_4O per 100 gms. sat. sol. at 25°. (Butler, Thomson and MacLennen, 1933.)

RECIPROCAL SOLUBILITY OF ISOMERIC HEXANOLS, EACH SEPARATELY, IN WATER.

(Ginnings and Webb, 1938.)

Hexanol	d. of pure hexanol	t°	Gms. $C_6H_{13}OH$ per 100 gms.			
			H_2O rich phase		Hexanol rich phase	
Diethyl methyl carbinol	0.8242	20	(0.9933)	4.82	(0.8498)	89.53
" " "	"	25	(0.9926)	4.26	(0.8454)	89.64
" " "	"	30	(0.9919)	3.81	(0.8410)	89.76
Dimethyl-i-propyl "	0.8118	20	(0.9934)	4.65	(0.8464)	89.06
" " "	"	25	(0.9929)	4.18	(0.8421)	89.12
" " " "	"	30	(0.9910)	3.76	(0.8372)	89.26
Dimethyl-n-propyl "	0.8053	20	(0.9935)	3.63	(0.8321)	89.87
" " "	"	25	(0.9929)	3.24	(0.8284)	89.95
" " "	"	30	(0.9921)	2.96	(0.8237)	89.99
t-Butyl methyl "	0.8157	20	(0.9955)	2.64	(0.8356)	92.74
" " "	"	25	(0.9946)	2.43	(0.8313)	92.71
" " "	"	30	(0.9936)	2.26	(0.8272)	92.67
i-Propyl ethyl "	0.8186	20	(0.9950)	2.24	(0.8331)	94.97
" " "	"	25	(0.9941)	2.01	(0.8288)	94.89
" " "	"	30	(0.9940)	1.82	(0.8249)	94.72
s-Butyl methyl "	0.8231	20	(0.9960)	2.09	(0.8190)	93.43
" " "	"	25	(0.9950)	1.94	(0.8156)	93.32
" " "	"	30	(0.9939)	1.79	(0.8116)	93.21
i-Butyl methyl "	0.8034	20	(0.9956)	1.79	(0.8186)	93.79
" " "	"	25	(0.9948)	1.64	(0.8149)	93.65
" " "	"	30	(0.9939)	1.52	(0.8114)	93.45
n-Propyl ethyl "	0.8143	20	(0.9952)	1.75	(0.8264)	95.34
" " "	"	25	(0.9951)	1.61	(0.8225)	95.14
" " "	"	30	(0.9939)	1.49	(0.8190)	94.93
n-Butyl methyl "	0.8108	20	(0.9965)	1.51	(0.8264)	93.50
" " "	"	25	(0.9954)	1.37	(0.8231)	93.38
" " "	"	30	(0.9942)	1.28	(0.8194)	93.25
t-Pentyl "	0.8498	20	(0.9971)	0.82	(0.8598)	98.28
" "	"	25	[illegible]	[illegible]	[illegible]	[illegible]

DI n PROPYL ETHER $(C_3H_7)_2O$

Reciprocal Solubility of Di n Propyl Ether and Water.

(Bennett and Philip, 1928.)

The determinations were made by the method of Hill, 1923, modified by reducing the scale of the apparatus to require only 4-5 cc of each liquid and adding a globule of Hg to hasten mixing.

t°	Wt. % $(C_3H_7)_2O$ in Aq. Phase	Wt. % H_2O in Ether Phase	t°	Wt. % $(C_3H_7)_2O$ in Aq. phase	Wt. % H_2O in Ether Phase
0	1.05	0.36	20	0.54	0.38
10	0.71	0.29	25	0.49	0.45
15	0.61	0.31			

The authors also give a series of determinations made by the synthetic method using both Di n Propyl Ether and n Propyl iso Propyl Ether.

Results for the Solubility in Water of:

Di n Propyl Ether

t°	Wt. % $C_6H_{14}O$ in Water
0	0.58
10	0.41
15	0.38
20	0.30
25	0.25

n Propyl iso Propyl Ether

t°	Wt. % $C_6H_{14}O$ in Water
0	1.0 +(?)
10	0.75
15	0.60
20	0.51
25	0.47

NOTE.—It seems probable that a mistake in recording the above results in the original paper was made and the values for the two isomeric ethers by the synthetic method should be interchanged.

Determinations of the reciprocal solubility of propyl ether and water and of propyl ether and aqueous sulphuric acid are reported with insufficient details by Gajendragad and Jotkar, 1935.

Mono **BUTYL GLYCOL ETHERS**, normal and iso $C_6H_{14}O_2$.

Mutual Solubility of Normal and of Iso Butyl Glycol Ether in Water.

(Cox and Cretcher, 1926.)

These systems give curves which are complete circles, consequently for each concentration of glycol ether there is an upper solution temperature and a lower solution temperature.

Results for *n* Butyl Ether.

(b. pt. = 170°.6; $d_{\frac{15}{15}} = 0.9011$)

Wt. % *n* Butyl Ether.	Lower solution temp.	Upper solution temp.
9.18	75.0	86.0
9.94	65.8	97.0
11.45	57.6	109.3
14.95	51.6	120.4
19.94	49.6	126.8
24.78	49.1	128.0
30.03	49.6	127.7
34.42	50.1	126.8
39.67	51.3	125.3
44.95	53.5	122.9
50.08	58.0	117.8
55.08	67.1	107.7

Results for *iso* Butyl Ether.

(b. pt. = 158°.8; $d_{\frac{15}{15}} = 0.8950$)

Wt. % of Iso Butyl Ether.	Lower solution temp.	Upper solution temp.
7.57	54.5	101.5
9.97	36.6	126.1
16.68	25.9	145.0
24.51	24.6	150.0
31.54	24.7	150.2
39.70	25.5	149.3
47.46	27.1	147.9
55.80	31.9	142.6
61.80	38.9	132.9
66.13	47.6	120.6
67.70	51.0	114.5
70.86	just on curve	

PROPYL ETHERS of PROPYLENE GLYCOL (Isomeric $C_6H_{14}O_2$)

RECIPROCAL SOLUBILITY OF THE ISOMERIC n PROPYL ETHERS OF 1,2 PROPYLENE GLYCOL, EACH SEPARATELY, IN WATER.

(Cox, Nelson and Fletcher, 1927.)

These systems give closed solubility curves

Results for:

1 - Propxy propane 2 ol
(d = 0.8886 b.pt. = 149.8-149° at 750mm.)

Wt. % Ether	Lower solution Temperature	Upper solution Temperature
19.7	75.0	125.5
13.1	57.7	145.0
14.9	49.8	154.0
20.0	39.5	165.5
24.8	35.9	170.0
35.5	34.5	173.7
45.2	35.0	171.2
55.0	36.6	168.0
60.4	39.1	162.0
65.2	44.7	155.5
69.7	49.1	144.0
74.7	71.0	134.0

2 Propoxy propane 1 ol
(d = 0.8875, b. pt. 150.5-151° at 750mm.)

Wt. % Ether	Lower solution Temperature	Upper solution Temperature
12.1	75.0	126.0
14.2	57.2	141.5
20.0	47.2	156.0
25.4	41.3	161.0
30.0	42.8	164.0
40.5	43.4	161.5
50.3	44.7	159.5
60.0	48.2	151.5
65.2	56.0	138.0
72.3	64.7	126.0

PINACOL (Pinacone) $C_6H_{12}(OH)_2 . 6H_2O$ and H_2O

SOLUBILITY IN WATER DETERMINED BY THE IMMERSING POINT METHOD.

(Fowler and Gleg..., 1933.)

t°	Wt. % $C_6H_{12}(OH)_2$	Solid Phase	t°	Wt. % $C_6H_{12}(OH)_2$	Solid Phase	t°	Wt. % $C_6H_{12}(OH)_2$	Solid Phase
[illegible] Eutec.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] $C_6H_{12}(OH)_2$
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] = $C_6H_{12}(OH)_2 . 6H_2O$ [illegible] = $C_6H_{12}(OH)_2 . H_2O$

MANNITOL $CH_2OH(CHOH)_4CH_2OH$

SOLUBILITY IN WATER.

[illegible]

t°	Gms. $CH_2OH(CHOH)_4CH_2OH$ per 100 Gms. H_2O	t°	Gms. $CH_2OH(CHOH)_4CH_2OH$ per 100 Gms. H_2O
0	[illegible]	40	[illegible]
10	[illegible] ([illegible])	[illegible]	[illegible]
20	[illegible] ([illegible])	60	[illegible]
25	[illegible]	[illegible]	[illegible]
30	[illegible]		

MANNITOL $CH_2OH(CHOH)_4CH_2OH$

SOLUBILITY OF MANNITOL IN WATER. (Braham, 1919.)

The determinations were made with the greatest care. The results were plotted on a large scale diagram and the following values for regular intervals of temperature were obtained.

t.°	Gms. $CH_2OH(CHOH)_4CH_2OH$ per 100 gms. H_2O.	Mol. fraction Mannitol in solution.	t°.	Gms. $CH_2OH(CHOH)_4CH_2OH$ per 100 gms. H_2O.	Mol. fraction Mannitol in solution.
— 1.019 (Eutec.)	9.942	0.0097	40.0	34.6	0.0331
0.0	10.36	0.0101	50.0	47.6	0.0450
5.0	11.9	0.0117	60.0	64.4	0.0598
10.0	13.7	0.0134	70.0	86.2	0.0785
15.0	16.0	0.0156	80.0	115.0	0.1019
20.0	18.6	0.0181	90.0	150.0	0.1294
25.0	21.6	0.0209	100.0	197.0	0.1633
30.0	25.2	0.0243			

SOLUBILITY OF MANNITOL IN WATER AT TEMPERATURES ABOVE 100°.

(Yokoda, 1929.)

t°	Gms. $C_6H_{14}O_6$ per 100 gms. sat. sol.
137.5	90
140	91
156	95
162.5	98.0
165	99.0

100 gms. sat. sol. of Mannitol in ordinary water (H_2O) contain 16.9 gms. $C_6H_{14}O_6$ at 19°.

100 gms. sat. sol. of Mannitol in heavy water (D_2O) contain 15.2 gms. $C_6H_{14}O_6$ at 19°. (Nachod, 1938.)

SOLUBILITY OF MANNITOL IN AQUEOUS SOLUTIONS OF BORIC ACID AND VICE VERSA AT 25°.

(Hermans, 1925.)

Gms. per 100 gms. sat. sol.		Solid Phase	Gms. per 100 gms. sat. sol.		Solid Phase
HBO_2	$C_6H_{14}O_6$		HBO_2	$C_6H_{14}O_6$	
0.0	17.7	$C_6H_{14}O_6$	5.52	22.5	H_3BO_3
2.28	20.8	"	5.28	20.0	"
5.13	24.7	"	5.07	17.2	"
5.40	25.4	"	4.68	11.5	"
5.68	25.4	"	4.25	5.43	"
5.70	25.1	" + H_3BO_3			

SOLUBILITY OF MANNITOL IN AQUEOUS ALCOHOL SOLUTIONS AT DIFFERENT TEMPERATURES. (Creighton and Klauder, Jr, 1923.)

Constant agitation in a thermostat was employed and equilibrium was approached both from above and below. The m. pt. of the mannitol was 165°.9.

	Gms. $CH_2OH(CHOH)_4CH_2OH$ per 100 gms. aq. Alcohol of					
t°.	0.0 Wt. % C_2H_5OH (= H_2O).	20 Wt. % C_2H_5OH.	40 Wt. % C_2H_5OH.	60 Wt. %. C_2H_5OH	80 Wt. % C_2H_5OH.	100 Wt. %. C_2H_5OH.
0	10.2	4.83	1.81	0.79	0.16	0.003
15	16.4	8.53	3.49	1.33	0.25	0.010
25	21.3	11.62	5.48	2.25	0.55	0.030
35	29.6	16.74	8.60	3.62	0.80	0.075
50	47.2	30.18	16.76	6.92	1.58	0.28
60	61.14	41.23	26.50	12.36	4.08	0.81

d-MANNITOL $CH_2OH(CHOH)_4CH_2OH$.

SOLUBILITY OF d MANNITOL IN SEVERAL SOLVENTS.

(Upson, Fluevog and Albert, 1936.)

The determinations were made by observing the temperatures at which the last crystal disappeared from mixtures of known amounts of solid and solvent contained in 3 to 15 cc sealed glass bulbs while being slowly heated

Results for the solubility in:

Methyl alcohol

t°	Gm. Mols. $C_6H_{14}O_6$ per 100 gm. mols. CH_3OH
47.0	0.0766
49.7	0.0874
60.8	0.136
66.0	0.173
69.7	0.210
72.9	0.256
77.3	0.316
80.5	0.367

Ethyl alcohol

t°	Gm. Mols. $C_6H_{14}O_6$ per 100 gm. mols. C_2H_5OH
53.6	0.0293
62.0	0.0463
69.6	0.0634
73.0	0.0768
77.2	0.0989
80.3	0.122
85.2	0.166
92.5	0.255

Normal Propyl alcohol

t°	Gm. Mols. $C_6H_{14}O_6$ per per 100 gm. mols. C_3H_7OH
58.8	0.0193
61.5	0.0236
67.3	0.0328
73.7	0.0474
78.6	0.0631
89.2	0.108
90.9	0.122
97.7	0.174

Iso Propyl alcohol

t°	Gm. Mols. $C_6H_{14}O_6$ per 100 gm. mols. C_3H_7OH
55.2	0.0180
59.5	0.0224
65.7	0.0318
69.5	0.0459
79.3	0.0775
81.5	0.0882

Normal Butyl alcohol

t°	Gm. Mols. $C_6H_{14}O_6$ per 100 gm. mols. C_4H_9OH
58.5	0.0131
65.8	0.0199
67.1	0.0207
77.0	0.0407
84.2	0.0648
89.4	0.0887
95.2	0.1337

Iso Butyl alcohol

t°	Gm. Mols. $C_6H_{14}O_6$ per 100 gm. mols. C_4H_9OH
57.5	0.0110
61.3	0.0149
67.4	0.0195
73.6	0.0300
83.3	0.0538
89.5	0.0754
101.8	0.1636

Secondary Butyl alcohol

t°	Gm. Mols. $C_6H_{14}O_6$ per 100 gm. mols. C_4H_9OH
53.5	0.0164
60.3	0.0227
66.1	0.0286
69.5	0.0356
73.0	0.0432
83.3	0.0772
100.8	0.1904

Tertiary Butyl alcohol

t°	Gm. Mols. $C_6H_{14}O_6$ per 100 gm. mols. C_4H_9OH
43.1	0.0203
46.3	0.0250
55.0	0.0391
62.7	0.0574
71.5	0.0845
79.7	0.1115
90.3	0.1487

Allyl alcohol

t°	Gm. Mols. $C_6H_{14}O_6$ per 100 gm. mols. C_3H_5OH
55.9	0.0296
59.4	0.0352
63.6	0.0460
69.3	0.0627
75.0	0.0854
79.7	0.112
84.7	0.141

100 gms. alcohol, Sp. Gr. 0.905, dissolve 1.56 gms. mannitol at 14°. (Krusemann, 1876.)

Data for the solubility of mannitol at high pressures are given by Cohen, Inouye and Euwen, 1910.

100 gms. sat. sol. in pyridine contain 0.47 gm. mannitol at 26°. (Holty, 1905.)

100 gms. aq. 50% pyridine dissolve 2.46 gms. mannitol at 20-25°. (Dehn, 1917.)

Data for the ternary systems mannitol + succinic acid nitrile + water and **mannitol** + triethylamine + water, are given by Timmermans, 1907.

MANNITOL

Freezing-point data are given for mixtures of:

Mannitol + Antipyrine (Pfeiffer and Seydel, 1928.)
" + Sarcosine anhydride (Pfeiffer and Seydel, 1928.)
" + Erythritol (Puschin and Dezelic, 1932.)
" + Palmitic acid " " " "
" + Stearic acid " " " "

SORBITOL etc. (Hexites) $C_6H_{14}O_6.\frac{1}{2}H_2O$

SOLUBILITY OF THE BENZALIC·COMPOUNDS OF SOME POLYATOMIC ALCOHOLS AT 16°–18°.

(de Bruyn and van Ekenstein, 1899.)

No details of the determinations are given. It is stated that the results are sufficiently exact for use in identifying hexites.

Name of Compound.	M.-pt.		Gms. Compd. Dissolved per 100 cc. Sat. Sol. in: Acetone.	Chloroform.	Alcohol.
Dibenzalerythritol	201	(Fischer)	0.34	3.64	0.02
Monobenzalarabitol	152	"	...	...	...
Dibenzaladonitol	165	"	0.64	1.36	0.14
Dibenzalxylitol	175	"	1.10	0.85	...
Dibenzalrhamnitol	203	"	0.70	2.55	1.10
Monobenzal-*d*-Sorbitol	175	(Meunier)	very easily soluble		
Dibenzal-*d*-Sorbitol	163	"	5.44	0.16	0.10
Tribenzalmannitol	213–8	(Fischer)	0.42	8.75	0.10
Tribenzal-*l*-iditol*	215–8	"	0.47	0.17	0.05
Tribenzal-*d*-talitol†	210	"	0.30	4.42	trace
Dibenzaldulcitol	215–20	"	0.42	0.83	trace
Dibenzalperseitol	230–5	"	0.04	trace	0.02

* Prepared from *l* idonic acid. † Prepared from *d* talonic acid.

HEXYL AMINE *n* $CH_3(CH_2)_4CH_2NH_2$.

DISTRIBUTION OF *n* HEXYL AMINE BETWEEN WATER AND XYLENE AT 25°.

(Smith, 1921, 1922.)

Millimols. per liter H_2O layer (C_1).	Millimols. per liter $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.	Millimols. per liter H_2O layer (C_1).	Millimols. per liter $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.225	0.5875	2.61	0.7775	3.225	4.17
0.425	1.3375	3.14	1.50	8.50	5.65
0.625	2.325	3.88	2.80	17.2	6.15

DiPROPYL AMINE $(C_3H_7)_2NH$.

DISTRIBUTION OF DIPROPYL AMINE AT 25° BETWEEN :

(Smith, 1921, 1922).

Water and Ether.

Millimols. $(C_3H_7)_2NH$ per liter of H_2O layer (C_1).	Millimols. $(C_3H_7)_2NH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.26	1.005	3.86
0.43	1.915	4.46
0.60	2.97	4.95
0.92	5.70	6.2
1.48	9.76	6.6

Water and Xylene.

Millimols. $(C_3H_7)_2NH$ per liter of H_2O layer (C_1).	Millimols. $(C_3H_7)_2NH$ per liter of Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.323	1.04	3.19
0.456	1.544	3.38
0.575	2.325	4.04
0.85	4.16	4.88
1.45	8.55	5.90
2.42	17.58	7.25

Acetone and Glycerol.

Millimols. $(C_3H_7)_2NH$ per liter of Acetone layer (A).	Millimols. $(C_3H_7)_2NH$ per liter of Glycerol layer (G).	$\frac{A}{G}$.
1.30	0.925	1.40
1.925	1.325	1.45
3.85	1.60	2.40
5.425	2.025	2.69
8.775	2.275	3.64
10.1	2.75	3.67

DISTRIBUTION OF DIPROPYL AMINE BETWEEN WATER AND:

(Herz and Stanner, 1927.)

Benzene			Toluene		
Gm. Mols. $(C_3H_7)_2NH$ per liter		$\frac{2}{1}$	Gm. Mols. $(C_3H_7)_2NH$ per liter		$\frac{2}{1}$
H_2O layer(1)	C_6H_6 layer(2)		H_2O layer(1)	$C_6H_6CH_3$ layer(2)	
0.0143	0.0755	5.29	0.0133	0.0653	4.92
0.0163	0.1237	7.57	0.0163	0.1286	7.87
0.0190	0.1898	10.00	0.0204	0.1829	8.96
0.0225	0.2571	11.45	0.0225	0.2347	10.45

DiPROPYL AMINE Acid Phthalate.

TriPROPYL AMINE Acid Phthalate.

DISTRIBUTION OF EACH SEPARATELY AT 25° BETWEEN ACETONE AND GLYCEROL

(Smith, 1921, 1922).

See Note under dimethyl amine acid phthalate, page 213.

Results for Dipropyl Amine Acid Phthalate

Millimols. acid phthalate per liter of		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer (G).	
0.600	1.45	0.413
0.8875	2.50	0.335
1.35	4.525	0.298
1.825	7.625	0.239
2.45	10.90	0.224

Results for Tripropyl Amine Acid Phthalate.

Millimols. acid phthalate per liter of		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer (G).	
1.400	1.375	1.020
2.125	2.55	0.843
3.125	4.45	0.702
4.25	6.80	0.625

Triethyl**SULFONIUM IODIDE** $S(C_2H_5)_3I$.

100 gms. H_2O dissolve 431 gms. $S(C_2H_5)_3I$ at 25°. (Peddle and Turner, 1913.)
100 gms. $CHCl_3$ dissolve 47.7 gms. $S(C_2H_5)_3I$ at 25°. (Peddle and Turner, 1913.)

Triethyl **PHOSPHINE SULFIDE** $(C_2H_5)_3PS$

Freezing-point data for mixtures of tri ethyl phosphine sulfide and triphenyl phosphine sulfide are given by Pascal, 1923.

Triethyl**AMINE** $N(C_2H_5)_3$.

SOLUBILITY IN WATER.*

(Rothmund, 1898.)

t°.	Gms. $N(C_2H_5)_3$ per 100 Gms.		t°.	Gms. $N(C_2H_5)_3$ per 100 Gms.	
	Aq. Layer.	Amine Layer.		Aq. Layer.	Amine Layer
18.6 (crit. temp.)	51.9		40	3.65	96.48
20	14.24	72	50	2.87	96.4
25	7.30	95.18	55	2.57	96.3
30	5.80	96.60	60	2.23	96.3
35	4.58	96.5	65	1.97	96.3

* Determinations made by "Synthetic Method," see Note, p. 292.

The lower critical solution temperature of a 34.0 percent solution of tri ethyl amine in ordinary water(H_2O) is 18.25°. (Timmermans and Hennaut-Roland, 1932.) The lower critical solution temperature of a 35.1 percent solution of tri ethyl amine in heavy water(D_2O) is 14.4°. The former increases 0.02° for each additional kilogram of pressure and the latter 0.023° for each additional kilogram of pressure between 10 and 70 kilograms. (Timmermans and Poppe, 1935.)

Freezing-point data for mixtures of tri ethyl amine and water are given by Guthrie, 1884, and Pickering, 1893. Data for the solubility of tri ethyl amine in water at high pressures are given by Kohnstamm and Timmermans, 1913.

SOLUBILITY OF TRIETHYLAMINE IN WATER AND IN AQ. ETHYL ALCOHOL AT DIFFERENT TEMPERATURES.*

(Meerburg, 1902.)

Water.		13.33% Alcohol.		28.98% Alcohol.		38.84% Alcohol.		60.16% Alcohol.	
t°.	Gm. $N(C_2H_5)_3$ per 100 Gms. Sol.	t°.	Gm. $N(C_2H_5)_3$ per 100 Gms. Sol.	t°.	Gm. $N(C_2H_5)_3$ per 100 Gms. Sol.	t°.	Gm. $N(C_2H_5)_3$ per 100 Gms. Sol.	t°.	Gm. $N(C_2H_5)_3$ per 100 Gms. Sol.
69.2	1.7	38.3	8.2	54.5	22.8	73.4	31.2	76–77	71.2
30.8	5.6	31.7	13.9	45	29.8	65.4	33.3	74–75	75
23.1	8.5	28	21.6	33.4	51.1	51.6	40.6	72–73	80
18.7	25.8	26.4	30.6	31.4	63.7	42.1	50.6		
18.7	37.2	24.9	40.5	30.3	68.5	40.9	54.7		
19.5	51.8	24.2	49.8	28.5	82.2	34.2	70.6		
20.5	68.6	24.1	60.7	35	91.8	33	77.5		
20.5	84	24	69.7			34.7	88		
20.5	89.7	23.5	76.6			40.5	91.3		
21.2	92.4	24	81.5						
25.8	95.5	24.2	87.4						
26.5	96.1	25	92						

NOTE. — Results for triethylamine, water and ethyl ether, and for triethylamine, water and phenol are also given by Meerburg.

100 gms. abs. methyl alcohol dissolve 57.5 gms. $NH(C_6H_5)_2$ at 19.5°.
100 gms. abs. ethyl alcohol dissolve 56 gms. $NH(C_6H_5)_2$ at 19.5°.

(de Bruyn, 1892.)

* Determinations made by "Synthetic Method," see Note, p. 292

Data for ternary systems composed of triethylamine, water and each of the following compounds: naphthalene, cane sugar, KCl, K_2CO_3, K_2SO_4 and KSCN, are given by Timmermans (1907).

DISTRIBUTION OF TRIETHYL AMINE AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $(C_2H_5)_3N$		
H_2O layer (C_1).	$CHCl_3$ layer (C_2)	$\frac{C_2}{C_1}$.
0.0375	0.490	13.0
0.0516	0.800	15.5
0.194	3.806	19.7
0.425	9.575	22.5

Water and Xylene.

Millimols. $(C_2H_5)_3N$		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_1}{C_2}$.
0.3125	0.9875	3.16
0.625	2.475	3.96
0.80	3.60	4.50
1.49	8.51	5.72
2.53	17.47	6.90

Acetone and Glycerol.

Millimols. $(C_2H_5)_3N$		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.470	0.865	1.70
2.875	1.175	2.44
6.35	1.65	3.85
13.20	2.25	5.87
25.80	3.20	8.06

DISTRIBUTION AT 25° OF : (Smith, 1921–1922.)

Diethyl Amine Acid Phthalate (See Note p. 212) Between Acetone and Glycerol.

Millimols. per liter		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.450	2.0375	0.221
0.775	4.15	0.187
1.05	6.65	0.158
1.325	9.975	0.133
1.65	12.80	0.129

Triethyl Amine Acid Phthalate (See Note p. 213 .) Between Acetone and Glycerol.

Millimols. per liter		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.70	2.35	0.398
1.10	4.075	0.270
1.45	5.60	0.259
2.00	9.35	0.214
2.70	12.775	0.2115

Ethyl Phenyl Amine Between Water and Xylene.

Millimols. per liter		
H_2O layer (C_1)	$C_6H_4(CH_3)_2$ layer (C_2)	$\frac{C_2}{C_1}$
0.1940	0.582	3.00
0.2380	0.763	3.20
0.3437	1.13	3.29
0.4125	1.51	3.64

DISTRIBUTION OF TRI ETHYL AMINE BETWEEN WATER AND AMYL ALCOHOL AT 25°.

(Herz and Fischer, 1904.)

Gms. $(C_2H_5)_3N$ per liter		Gm. Mols. $(C_2H_5)_3N$ per liter	
H_2O layer	Alcohol layer	H_2O layer	Alcohol layer
0.885	22.99	0.00875	0.2273
1.683	44.57	0.01664	0.4408
1.866	49.22	0.01846	0.4868
2.502	64.91	0.02474	0.6418

DISTRIBUTION OF TRIETHYL AMINE AT 25° BETWEEN:

(Kolossowski and Androshenko, 1934.)

Water and Benzene			Water and Toluene		
Gm. Mols. $(C_2H_5)_3N$ per liter			Gm. Mols. $(C_2H_5)_3N$ per liter		
H_2O layer(1)	C_6H_6 layer(2)	$\frac{1}{2}$	H_2O layer(1)	$C_6H_5CH_3$ layer(2)	$\frac{1}{2}$
0.0156	0.1794	0.087	0.0046	0.0249	0.14
0.0200	0.2356	0.085	0.0069	0.0579	0.12
0.0417	0.5280	0.079	0.0096	0.0792	0.12
0.0762	1.1233	0.068	0.1042	1.0804	0.10
0.1221	1.9211	0.064	0.1518	1.7490	0.09
0.2152	3.3049	0.065	0.2941	4.5160	0.065
0.2781	4.7167	0.059	0.3577	5.5440	0.065

DISTRIBUTION OF TRIETHYL AMINE BETWEEN WATER AND TOLUENE.

(Moore and Winmill, 1912.)

t°	Gm. Equiv. $(C_2H_5)_3N$ per liter aq. layer	Dist. Coef.
18	0.0190	0.131
25	0.0104	0.099
25	0.0131	0.099
32.35	0.0132	0.069

Similar data at other temperatures are given by Hantzsch and Sebaldt, 1899; and Hantzsch and Vagt, 1901.

Results for the total and partial vapor pressures at 20.5° of mixture of tri ethyl amine and methyl alcohol and of tri ethyl amine and ethyl ether are given by Joukovsky, 1934.

Freezing-point data for mixtures of tri ethyl amine and each of the following compounds: benzene, nitro benzene, formic acid and carbon disulfide, are given by Joukovsky, 1934.

TRI ETHYL AMINE HBr, HCl and HI

SOLUBILITY OF EACH SEPARATELY IN WATER AND IN CHLOROFORM.

(Peddle and Turner, 1913.)

Compound	Formula	Gms. compound per 100 gms. H_2O	Gms. compound per 100 gms. $CHCl_3$
Tri ethyl amine Hydrobromide	$(C_2H_5)_3N.HBr$	150.6	23.44
" " " Hydrochloride	$(C_2H_5)_3N.HCl$	137.0	17.37
" " " Hydriodide	$(C_2H_5)_3N.HI$	170.0	92.2

PENTA BROMO TOLUENE $C_6Br_5CH_3$.

100 cc Methyl Alcohol (d = 0.7975) dissolve 0.0108 gm. $C_6Br_5CH_3$ at 20°.
" " Ethyl " (96%) " 0.0104 " " " "

(Schulz, 1929.)

NITRO DICHLORO BENZOIC ACID (5) $NO_2(2,4)Cl_2C_6H_2COOH$.

Freezing-point data for mixtures of 5 nitro 2.4 dichloro benzoic acid and 5 nitro, 4-oxy, 2-chloro benzoic acid are given by Grimm, Günther and Titus, 1931.

TRI NITRO BENZOIC ACID 1.2.4.6 $C_6H_2(NO_2)_3COOH$.

SOLUBILITY OF TRINITRO BENZOIC ACID IN WATER AND ORGANIC SOLVENTS AT 25°.

(Desvergnes, 1931.)

Solvent	Gms. $C_6H_2(NO_2)_3COOH$ per 100 gms. solvent	Solvent	Gms. $C_6H_2(NO_2)_3COOH$ per 100 gms. solvent
H_2O	2.053 (23.5°)	C_6H_6	0.31
"	4.180 (50°)	$CHCl_3$	0.37
$CH_3COOC_2H_5$	21.05	$(C_2H_5)_2O$	14.07
$(CH_3)_2CO$	22.12	CS_2	0.14
96% C_2H_5OH	27.53	CCl_4	0.07
100% "	26.59	$C_6H_5CH_3$	0.38
CH_3OH_3	50.69		

DISTRIBUTION OF TRINITRO BENZOIC ACID BETWEEN WATER AND ETHYL ETHER AT 25°.

(Smith, 1921-2)

Gm. Mols. 1.2.4.6 $(NO_2)_3C_6H_2COOH$ per liter		$\frac{2}{1}$
H_2O layer(1)	$(C_2H_5)_2O$ layer(2)	
1.09	0.20	0.182
2.56	0.84	0.328
4.80	2.20	0.458
8.28	5.88	0.710

NITRO PHENYL CHLOROFORM $NO_2C_6H_4CCl_3$.

Freezing-point data for mixtures of o, m and p nitro phenyl, chloroform are given by Hollman, Vermeulen and de Mooy, 1914.)

Diiodo SALYCILIC ACID $I_2(3,5)C_6H_2COOH(1)OH(2)$.

One liter of water dissolves 0.166 gm. of the compound at 10° and 0.192 gm. at 25°.

(Cofman, 1920.)

SULFO BENZOIC ACID CHLORIDE $COCl.C_6H_4.SO_2Cl$.

Freezing-point data for mixtures of sulfo benzoic acid chlorides and benzene di sulfo chloride are given by Maarse, 1914.

BROMO NITRO BENZOIC ACID $NO_2.Br.C_6H_3COOH$.

Solubility of Nitrobromobenzoic Acids and of Nitrochlorobenzoic Acids in Water at 25°.

(Holleman, 1910.)

Acid.	Gms. Acid per 100 cc. Sol.	Acid.	Gms. Acid per 100 cc. Sol.
$C_6H_3COOH.NO_2.Br$ 1.2.3	0.033	$C_6H_3COOH.NO_2.Cl$ 1.2.3	0.047
$C_6H_3COOH.NO_2.Br$ 1.2.5	0.741	$C_6H_3COOH.NO_2.Cl$ 1.2.5	0.967

Holleman also gives data for the solubility of various mixtures of the above two bromo compounds and of the two chloro compounds and uses the results for estimating the quantity of each in an unknown mixture.

DI CHLORO BENZOIC ACIDS $Cl_2C_6H_3COOH$.

Freezing-point data are given for:

2.5 Dichloro benzoic acid + m chloro benzoic acid.
"   "   "   " + 2.3 Dichloro benzoic acid.
(Hope and Riley, 1923.)

CHELIDONIC ACID $C_7H_4O_6.H_2O$.

100 gms. sat. sol. of chelidonic acid in water contain 1.43 gms. $C_7H_4O_6$ at 25°. (Verkade, 1924.)

100 gms. sat. sol. of chelidonic acid in 0.5 molar aq. H_3BO_3 sol. contain 1.51 gms. $C_7H_4O_6$ at 25°. (Verkade, 1924.)

DI NITRO BENZOIC ACID 3.5$(NO_2)_2C_6H_3.COOH$.

Solubility of 3.5 Dinitro Benzoic Acid in Aqueous Solutions of Hydrochloric Acid at 25°.

(Knox and Richards, 1919.)

Gm. Equivalents per liter		Gm. Equivalents per liter	
HCl	$(NO_2)_2C_6H_3COOH$	HCl	$(NO_2)_2C_6H_3COOH$
0.0	0.00635	7.336	0.00841
1.565	0.00398	8.855	0.00965
2.908	0.00470	10.27	0.01095
4.594	0.00583	11.73	0.01240
5.657	0.00690		

DinitroBENZOIC ACIDS $C_6H_3(NO_2)_2COOH$. 1.3.5 and 1.2.4.

Solubility of 3.5 and of 2.4 Dinitrobenzoic Acids in Aqueous Solutions of Sodium Acetate at 25°.

(Philip and Garner, 1909.)

Gms. per 100 cc. Sat. Sol.		Gms. per 100 cc. Sat. Sol.	
CH_3COONa.	3.5$C_6H_3(NO_2)_2COOH$.	CH_3COONa.	2.4$C_6H_3(NO_2)_2COOH$.
0	0.1314	0	0.0572
0.0976	0.3392	0.0976	0.2050
0.2428	0.6720	0.2428	0.3434
0.4846	1.201	0.4846	0.5023
0.9718	2.115	0.9718	0.7440

SOLUBILITY OF 1.3.5 DINITROBENZOIC ACID IN WATER AT HIGH TEMPERATURES, DETERMINED BY THE SYNTHETIC METHOD.

(Flaschner and Rankin, 1910.)

t°.	Gms. Acid per 100 Gms. Sol.	t°.	Gms. Acid per 100 Gms. Sol.	t°.	Gms. Acid per 100 Gms. Sol.
123.8 crit. t.	...	123	66.5	160	90.9
113	4.4	125	72.7	180	95
120	9.3	130	79.3	200	99
121	14.5	140	85.7	206	100
122	40	150	89		

SOLUBILITY OF 1.3.5 DINITRO BENZOIC ACID IN AQUEOUS SOLUTIONS OF SALTS AT 25°.

(de Szyszkowski, 1914.)

Normality of aq. salt solution.	Gm. mols. 1.3.5 $(NO_2)_2C_6H_3.COOH$ per 1000 gms. sat. solution in aqueous KCl.	aqueous NaCl.	aqueous KNO_3.
0.0 (= H_2O).......	$6.168.10^{-3}$	$6.168.10^{-3}$	$6.344.10^{-3}$
0.033..............	6.397 »	–	–
0.05..............	6.471 »	–	–
0.10..............	6.581 »	6.412 »	–
0.143..............	6.546 »	–	–
0.25..............	6.540 »	6.305 »	7.499 »
0.50..............	6.470 »	6.161 »	8.095 »
1.00..............	6.147 »	5.389 »	8.913 »
1.75..............	–	–	9.970 »

SOLUBILITY OF 1.3.5 DINITRO BENZOIC ACID AT 25° IN:

(de Szyszkowski, 1914.)

Aqueous solutions of KCl in presence of C_6H_6.		C_6H_6 in presence of aqueous solutions of KCl.	
Normality of aq. KCl.	Gm. mols. 1.3.5 $(NO_2)_2C_6H_3.COOH$ per 1000 gms. sat. aq. sol.	Normality of aq. KCl in contact with C_6H_6.	Gm. mols. 1.3.5 $(NO_2)_2C_6H_3.COOH$ per 1000 gms. sat. sol. in C_6H_6.
0.0	$6.253.10^{-3}$	0.0	$8.676.10^{-3}$
0.1	6.622 »	0.1	8.470 »
0.25	6.697 »	0.25	8.447 »
0.50	6.589 »	0.50	8.352 »
0.75	6.491 »	0.75	8.320 »
1.00	6.323 »	1.00	8.268 »
2.00	5.611 »	2.00	8.085 »

DISTRIBUTION OF 1.3.5 DINITRO BENZOIC ACID BETWEEN:

(de Szyszkowski, 1914.)

Water and Benzene at 25°. Gm. mols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per 1000 gms.		Water and Benzene at 40°. Gm. mols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per 1000 gms.		Water and Chloroform at 25°. Gm. mols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per 1000 gms.	
H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.	H_2O layer.	$CHCl_3$ layer.
$1.009.10^{-3}$	$1.120.10^{-3}$	$2.059.10^{-3}$	$2.462.10^{-3}$	$1.245.10^{-3}$	$0.658.10^{-3}$
1.608 »	1.982 »	3.120 »	3.925 »	1.835 »	1.055 »
3.727 »	4.686 »	4.135 »	5.393 »	3.367 »	2.225 »
4.794 »	6.473 »	6.480 »	9.630 »	5.237 »	4.190 »
6.258 »	8.676 »*	7.536 »	11.610 »	6.273 »	5.158 »*
		10.150 »	17.940 »		

*Both layers were saturated with 1.3.5 Dinitro Benzoic Acid.

One liter of Benzene sat. with 1.3.5 Dinitro Benzene contains 0.00488 gm. mol. $(NO_2)_2C_6H_3COOH$ at 25°. (v. Szyszkowski, 1928.)

$C_7H_4O_6$

DISTRIBUTION OF 1.3.5 DINITRO BENZOIC ACID AT 25° BETWEEN :

(Smith, 1921-1922.)

Water and Chloroform.

Millimols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per liter of H_2O layer (C_1).	Millimols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.450	0.975	0.672
1.992	1.425	0.715
2.855	2.38	0.834
4.04	3.71	0.918

Water and Ethyl Ether.

Millimols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per liter of H_2O layer (C_1).	Millimols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.1325	1.0475	7.9
0.1850	1.815	9.8
0.225	2.655	11.8
0.295	3.885	13.2
0.365	6.395	17.5

Water and Xylene.

Millimols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per liter of H_2O layer (C_1).	Millimols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
1.53	1.11	0.72
2.40	2.10	0.875
3.15	2.95	0.936
4.05	4.50	1.11

DISTRIBUTION OF 1.2.4 DINITRO BENZOIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. 1.2.4 $(NO_2)_2C_6H_3COOH$ per liter of H_2O layer (C_1).	Millimols. 1.2.4 $(NO_2)_2C_6H_3COOH$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
6.78	0.40	0.059
7.85	0.55	0.070
8.65	0.70	0.0815
10.95	1.10	0.100

Water and Ethyl Ether.

Millimols. 1.2.4 $(NO_2)_2C_6H_3COOH$ per liter of H_2O layer (C_1).	Millimols. 1.2.4 $(NO_2)_2C_6H_3COOH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.67	0.68	0.91
1.15	1.69	1.47
1.45	2.51	1.73
1.79	4.08	2.28
2.49	7.78	3.12

Water and Xylene.

Millimols. 1.2.4 $(NO_2)_2C_6H_3COOH$ per liter of H_2O layer (C_1).	Millimols. 1.2.4 $(NO_2)_2C_6H_3COOH$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
6.78	0.40	0.059
7.85	0.55	0.070
8.60	0.70	0.0815
10.95	1.10	0.100

Dinitro *p* oxyBENZOIC ACID $C_6H_2OH(NO_2)_2COOH$.

SOLUBILITY OF MIXTURES OF DINITRO PARA OXYBENZOIC ACID AND OTHER COMPOUNDS IN ABSOLUTE ETHYL ALCOHOL AT 29.6°.

(Morgenstern, 1911.)

Dinitro *p* Oxybenzoic Acid + Phenanthrene.

Gms. per 100 gms. Sat. Sol. Acid.	Gms. per 100 gms. Sat. Sol. Phenanthrene.	Solid Phase.
2.0483	0.1333	Acid
2.0776	0.2796	"
2.1249	0.5267	"
2.2195	1.0311	"
2.2883	1.4310	"
1.2171	6.0092	Phenanthrene
0.8681	5.8300	"
0.6017	5.6890	"
0.3487	5.5619	"
0.2157	5.4890	"
0	5.3781	"

Dinitro *p* Oxybenzoic Acid + Fluorene.

Gms. per 100 Gms. Sat. Sol. Acid.	Gms. per 100 Gms. Sat. Sol. Fluorene.	Solid Phase.
2.0440	0.1242	Acid
2.0823	0.3484	"
2.1045	0.4824	"
2.1744	0.8060	"
2.2018	1.4308	"
1.0400	3.8618	Fluorene
0.8004	3.7566	"
0.5020	3.6532	"
0.3900	3.5811	"
0.2113	3.5024	"
0	3.4115	"

Dinitro *p* Oxybenzoic Acid + Retene.

Gms. per 100 Gms. Sat. Sol. Acid.	Gms. per 100 Gms. Sat. Sol. Retene.	Solid Phase.
2.0242	0	Acid
2.0434	0.1246	"
2.0944	0.4446	"
2.1276	0.5162	"
2.2446	1.0486	"
2.4044	1.4644	"
1.9664	4.4698	Retene
0.7840	4.0442	"
0.5507	2.9444	"
0.2740	2.8466	"
0	2.7493	"

MECONIC ACID $C_7H_4O_7.3H_2O$.

100 cc. sat. sol. of { Water contain 0.84 gm. $C_7H_4O_7$ at 15°.
Meconic acid in { Aq. 0.5 mol. H_3BO_3 solution contain 1.0 gm. $C_7H_4O_7$ at 25°.

(Verkade, 1924.)

TRI BROMO TOLUENES $Br_3C_6H_2CH_3$.

Freezing-point data for binary mixtures of isomeric tri bromo toluenes are given by Jaeger, 1904.

CYAN BENZENE C_6H_5CN.

Freezing-point data for mixtures of cyan benzene and chloro benzene are given by Pascal, 1913.

2-BENZO THIAZOLE THIOL $\underbrace{C_6H_4SC(SH):N}$.

Freezing-point data for mixtures of:

2-Benzo Thiazole thiol + Methylene aniline (Kojima and Nagai, 1931.)
" " " + Diphenyl guanidine (Minotoya, Kojima and Nagai, 1931.)

BENZOYL CHLORIDE C_6H_5COCl.

Freezing-point data for mixtures of benzoyl chloride and phenol are given by Tsakalotos and Guye, 1910.

NITRO BENZOIC ALDEHYDE m $(NO_2)C_6H_4CHO$.

Freezing-point data for mixtures of nitro benzoic aldehyde and benzoic acid are given by Passernii, 1924.

Brom, Chlor and Iodo**BENZOIC ACIDS.**

SOLUBILITY IN WATER AT 25°. (Paul, 1894; Löwenherz, 1898; Vaubel, 1895.)

Compound.	Formula.		Per 1000 cc. Aqueous Solution. Grams.	Per 1000 cc. Aqueous Solution. Gram Mol.
Brombenzoic Acid	$C_6H_4Br.COOH$	(ortho)	1.856	0.00924
Brombenzoic Acid	$C_6H_4Br.COOH$	(meta)	0.402	0.00200
Brombenzoic Acid	$C_6H_4Br.COOH$	(para)	0.056	0.00028
Chlorbenzoic Acid	$C_6H_4Cl.COOH$	(ortho)	2.087	0.01333
Iodobenzoic Acid	$C_6H_4I.COOH$	(ortho)	0.952	0.00384
Iodobenzoic Acid	$C_6H_4I.COOH$	(meta)	0.116	0.00047
Iodobenzoic Acid	$C_6H_4I.COOH$	(para)	0.027	(Koópal, 1912.)

The following results at 28°. (Sieger, 1912.)

Chlorobenzoic acid	$C_6H_4ClCOOH$	(ortho)	2.25	...
"	"	(meta)	0.45	...
"	"	(para)	0.093	...

MUTUAL SOLUBILITY OF BROMO AND CHLOROBENZOIC ACIDS AND WATER AT HIGH TEMPERATURES, DETERMINED BY SYNTHETIC METHOD. (Flaschner and Rankin, 1910.)

p Bromobenzoic Acid + Water. t° of Melting.	Gms. Acid per 100 Gms. Mixture.	*o* Chlorobenzoic Acid + Water. t° of Melting.	Gms. Acid per 100 Gms. Mixture.	*m* Chlorobenzoic Acid + Water. t° of Melting.	Gms. Acid per 100 Gms. Mixture.	*p* Chlorobenzoic Acid + Water. t° of Melting.	Gms. Acid per 100 Gms. Mixture.
170	(Crit. sol. temp.)	100.8	5.5	123	4.2	167	(crit. t.)
169	3	102.7	10	123.8	18.9	162	3
180	6.2	104	20	142.8(crit. t.)	34.3	170	5.4
190	10.5	126.2(crit. t.)	34.9	123.8	75.8	180	10
196	27	104	76	125	81.5	183	14.5
200	61	110	85.3	130	87.5	184	21.5
210	80	120	92	140	93.2	187	47
220	88.3	130	96.5	150	97.5	200	79.5
240	96.9	139.5	100	156	100	220	92

DISTRIBUTION OF o BROMO BENZOIC ACID AT 25° BETWEEN WATER AND CHLOROFORM.

(Smith and White, 1929.)

Gm. Mols. o Br C_6H_4COOH per liter		Gm. Mols. o Br C_6H_4COOH per liter	
H_2O layer(1)	$CHCl_3$ layer(2)	H_2O layer(1)	$CHCl_3$ layer(2)
0.00290	0.0205	0.00422	0.0422
0.00343	0.0282	0.00455	0.0493
0.00390	0.0365	0.00489	0.0567

Chloro BENZOIC ACIDS o, m and p $Cl.C_6H_4.COOH$.

SOLUBILITY OF CHLORO BENZOIC ACIDS IN WATER AT 25°.

Acid	Gms. $Cl.C_6H_4COOH$ per liter	
Ortho Chloro Benzoic Acid	2.13(1)	2.08(2)
Meta " " "	0.385	0.41
Para " " "	0.068	0.077

(1) Osol and Kilpatrick, 1933; (2) Reyer, 1923.

1000 gms. H_2O dissolve approx. 0.04 gm. p $Cl.C_6H_4.COOH$ (Microbic Acid). (Otto, 1917, 1925.)

SOLUBILITY OF CHLORO BENZOIC ACIDS IN AQUEOUS POTASSIUM CHLORIDE SOLUTIONS AT 25°.

(Osol and Kilpatrick, 1933.)

The experiments are concerned with the relation of the activity coefficients of the molecules of chloro benzoic acids and the "salting out" or "salting in" effect in aqueous salt solutions. In order to minimize the correction for the part present as ions, buffer solutions were used in all cases. These are characterized only in terms of molar concentrations of sodium salt.

Results for:

Gm. Mols. KCl per liter in each case	o Chloro benzoic acid in 0.01 molar sodium salt		m Chloro benzoic acid in 0.00212 molar sodium salt		p Chloro benzoic acid in 0.000342 molar sodium salt	
	d. of sat. sol.	Total gm. mol. o ClC_6H_4COOH per liter	d. of sat. sol.	Total gm. mol. m ClC_6H_4COOH per liter	d. of sat. sol.	Total gm. mol. p ClC_6H_4COOH per liter
0.1	1.002	0.01137	—	—	—	—
0.2	—	—	1.007	0.00199	—	—
0.3	1.012	0.01086	—	—	—	—
0.5	1.021	0.01014	1.020	0.00183	1.020	0.000331
0.75	—	—	1.031	0.00167	—	—
1.0	1.042	0.00861	1.042	0.00158	1.041	0.000273
1.5	—	—	1.064	0.00127	1.063	0.000235
2.0	1.087	0.00607	—	—	1.086	0.000206
2.5	—	—	—	—	1.107	0.000156

Results similar to the above are given for aqueous solutions of NaCl, LiCl, KBr, $NaClO_4$, CsCl, sodium chloro benzoates, sodium benzene sulfonate, sodium toluene sulfonate and Sodium β naphthalene sulfonate.

Solubility of Orthochlorobenzoic Acid in Aq. Solutions of Sodium Acetate, Sodium Formate and Potassium Formate at 25°. (Philip and Garner, 1909.)

In Aq. CH_3COONa. Grams per Liter.		In Aq. HCOONa. Grams per Liter.		In Aq. HCOOK. Grams per Liter.	
CH_3COONa.	$C_6H_4ClCOOH$.	HCOONa.	$C_6H_4ClCOOH$.	HCOOK.	$C_6H_4ClCOOH$.
1.009	3.599	0.843	3.381	0	2.128
2.484	6.181	2.102	5.258	1.025	3.396
5.027	15.60	4.196	7.637	2.563	5.226
10.07	18.27	8.410	11.02	5.124	7.543

Distribution of Ortho Chloro Benzoic Acid at 25° Between:
(Smith and White, 1929.)

Water and Chloroform Gm. mols. o ClC_6H_4COOH per liter		Water and Toluene Gm. mols. o ClC_6H_4COOH per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	$C_6H_5CH_3$ layer
0.00231	0.0108	0.00422	0.00931
0.00290	0.0152	0.00462	0.0110
0.0317	0.0176	0.00528	0.0143
0.0357	0.0207	0.00581	0.0172
0.0403	0.0264	0.00686	0.0238
0.0502	0.0365	0.00792	0.0319

Distribution of Meta Chloro Benzoic Acid at 25° Between:
(Smith and White, 1929.)

Water and Chloroform Gm. mol. m ClC_6H_4COOH per liter		Water and Toluene Gm. mol. m ClC_6H_4COOH per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	$C_6H_5CH_3$ layer
0.00028	0.0094	0.000924	0.01148
0.00035	0.0114	0.00099	0.0128
0.00042	0.0131	0.00119	0.0169
0.00056	0.0151	0.00139	0.0222
0.00070	0.0175	0.00152	0.0251

Distribution of Para Chloro Benzoic Acid at 25° Between:
(Smith and White, 1929.)

Water and Chloroform Gm. mol. p ClC_6H_4COOH per liter		Water and Toluene Gm. mol. p ClC_6H_4COOH per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	$C_6H_5CH_3$ layer
0.00021	0.0046	0.000416	0.00333
0.00025	0.0053	0.000455	0.00351
0.000364	0.0067	0.000520	0.00364
0.00049	0.0078	0.000585	0.00377
0.00066	0.0081	0.000660	0.00440

DISTRIBUTION OF ORTHO CHLORO BENZOIC ACID AT 25° BETWEEN :

(Smith, 1921-1922.)

Water and Chloroform. Millimols. oCl.C_6H_4COOH per liter of H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	Water and Ethyl Ether. Millimols. o Cl.C_6H_4COOH per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2)	$\frac{C_2}{C_1}$.	Water and Xylene. Millimols. o Cl.C_6H_4COOH per liter of H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.492	0.649	1.320	0.100	1.300	13.001	1.19	0.600	0.505
0.649	1.072	1.655	0.145	2.415	16.65	1.55	0.975	0 630
0.760	1.488	1.955	0.1925	3.7075	19.30	1.75	1.325	0.757
1.075	2.690	2.50	0.250	5.67	22.65	2.30	2.20	0.956
			1.360	9.68	26.80	4.55	7.45	1.63

SOLUBILITY OF ORTHO, META AND PARA CHLORO BENZOIC ACIDS IN BENZENE AND IN NORMAL HEPTANE.

(Sidgwick and Ewbank, 1921 *a*.)

Solvent.	Results for o COOH.C_6H_4.Cl. t°.	Gms. o COOH.C_6H_4.Cl per 100 gms. sat. sol.	Results for m COOH.C_6H_4.Cl. t°.	Gms. m COOH.C_6H_4.Cl per 100 gms. sat. sol.	Results for p COOH.C_6H_4.Cl t°.	Gms p COOH C_6H_4 Cl per 100 gms. sat. sol.
Benzene ...	140.3	100.0	154.5	100.0	241.5	100.0
" ...	129.5	90.9	142.5	94.2	232.5	92.2
" ...	113.9	70.4	125.3	71.15	212.7	72.9
" ...	99.6	50.08	108.0	49.0	194.0	52.5
" ...	82.7	29.81	93.7	30.1	172.5	30.5
" ...	57.7	9.91	65.5	9.67	137.4	10.3
" ...	44.8	5.15	51.2	4.96	119.4	5.3
" ...	26.0	1.98	35.8	2.25	93.6	1.98
n Heptane..	134.7	88.68	147.7	89.82	227.6	76.86
" ..	129.8	68.76	140.1	70.05	218.3	51.30
" ..	126.0	36.89	134.2	50.06	207.2	31.23
" ..	112.8	12.55	128.1	30.60	180.0	10.09
" ..	108.8	10.42	105.8	9.98	165.3	4.96
" ..	94.8	4.61	89.6	4.48	136.1	1.69
" ..	79.0	2.57	72.2	1.92		

MUTUAL SOLUBILITIES OF THE THREE CHLOROBENZOIC ACIDS.

(Johnston and Jones, 1928.)

Results for mixtures of:

o and m ClC_6H_4COOH t°	Mol. % o	Solid Phase	o and p ClC_6H_4COOH t°	Mol. % o	Solid Phase	m and p ClC_6H_4COOH t°	Mol. % m	Solid Phase
139.9	100	o	137.0	93.3	o	153.5	100	m
135.1	90.4	"	134.3	88.9	"	149.0	90.9	"
128.5	80.1	"	131.8	—	" + p	145.3	85.3	"
122.2	70.7	"	134.9	84.8	p	140.0	—	" + p
112.6	58.3	"	153.0	77.5	"	145.4	77.3	p
108.7	—	" + m	160.3	74.3	"	176.0	62.9	"
111.3	52.1	m	170.1	70.1	"	196.2	49.2	"
123.8	40.8	"	186.9	59.3	"	200.2	45.9	"
132.6	30.9	"	209.4	39.4	"	212.7	35.0	"
138.7	23.5	"	220.9	26.9	"	222.7	23.8	"
144.3	15.7	"	223.6	22.6	"	233.3	9.6	"
148.2	9.8	"	233.5	9.6	"	239.5	0.0	"
153.5	0.0	"	239.5	0.0	"			

SOLUBILITY OF CHLORO BENZOIC ACIDS IN SEVERAL SOLVENTS.

(Chapas, 1930.)

Results for Ortho Chloro benzoic acid

Solvent	t°	Gm. Mol. ClC_6H_4COOH per 100 gm. mols. sat. sol.
Chloro benzene	14	0.92
" "	32.2	2.09
o chloro toluene	18.4	1.04
" " "	32.0	1.96
p chloro toluene	19.4	1.11
" " "	32.2	1.97

Results for Meta Chloro benzoic acid

Solvent	t°	Gm. Mol. ClC_6H_4COOH per 100 gm. mols. sat. sol.
Chloro benzene	32.2	1.38
o chloro toluene	32.5	1.56
m " "	19.4	0.83
" " "	32.5	1.55

Fluoro **BENZOIC ACIDS** o, m and p F. $C_6H_4.COOH$.

SOLUBILITY OF FLUORO BENZOIC ACIDS IN WATER.

Acid	Gms. F. C_6H_4COOH per liter sat. sol: 25°(1)	32°(2)
Ortho Fluoro Benzoic Acid	7.23	8.82
Meta " " "	1.50	3.08
Para " " "	1.22	1.07

(1) Reyer, 1923; (2) Slothouwer, 1914.

SOLUBILITY OF CHLOROBENZOIC ACIDS IN SEVERAL SOLVENTS AT 14–16°.

(Bornwater and Holleman, 1912.)

Solvent.	Gms. per 100 cc. Sat. Solution. *o* $C_6H_4ClCOOH$.	*m* $C_6H_4ClCOOH$.	*p* $C_6H_4ClCOOH$.
Ligroin	0.07	0.084	trace
Carbon Tetrachloride	0.58	0.48	0.04
Benzene	0.92	0.66	0.017
Carbon Disulfide	0.52	0.62	0.016
75% Aq. Acetic Acid	6.22	...	0.32
Ethyl Ether	16.96	14	1.72
Acetone	28.42	...	2.58
Ethyl Acetate	13.20	...	1.64

Iodo**BENZOIC ACID** *p* C_6H_4ICOOH.

MUTUAL SOLUBILITY OF PARA IODOBENZOIC ACID AND WATER AT HIGH TEMPERATURES DETERMINED BY THE SYNTHETIC METHOD.

(Flaschner and Rankin, 1910.)

t° of Melting.	Gms. Acid per 100 Gms. Mixture.	t° of Melting.	Gms. Acid per 100 Gms. Mixture.	t° of Melting.	Gms. Acid per 100 Gms. Mixture.
175 crit. sol. t.		207	22	230	87.4
178	3	210	41	240	92.7
190	5.8	215	63.5	269	98.1
200	10	220	77	270	100

DISTRIBUTION OF ORTHO IODO BENZOIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. o I.C_6H_4.COOH per liter of H₂O layer (C_1).	Millimols. o I.C_6H_4.COOH per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.248	0.512	2.06
0.244	0.493	2.02
0.287	0.680	2.37
0.335	0.973	2.90
0.473	1.990	4.21

Water and Ethyl Ether.

Millimols. (o) I.C_6H_4.COOH per liter of H_2O layer (C_1).	Millimols. (o) I.C_6H_4.COOH per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.0238	0.505	21.2
0.0400	0.861	21.5
0.0602	1.400	23.2
0.1010	2.640	26.2

Water and Xylene.

Millimols. (o) I.C_6H_4.COOH per liter of H_2O layer (C_1).	Millimols. (o) I.C_6H_4.COOH per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.325	0.175	0.538
0.60	0.55	0.916
1.10	2.20	2.00

Freezing-point-data are given for mixtures of:

o, m and p Chloro benzoic acids(1)
o, m and p Iodo benzoic acids(3)
Bromo benzoic acid + Iodo benzoic acid(3)
Chloro " " + " " " (3)
" " " + Benzoic acid(1)(2)
" " " + 2.5 di chloro benzoic acid(2)
Iodo " " + Benzoic acid(3)
" " " + Methyl benzoic acid(3)
" " " + Oxy benzoic acid(3)
Fluoro " " + Benzoic acid(4)

(1) Bornwater and Holleman, 1912; (2) Hope and Riley, 1923; (3) Lettre and Lehmann, 1938; (4) Koopal, 1911.

Nitro **BENZAL CHLORIDE** (Nitro benzylidene chloride) $NO_2C_6H_4CHCl_2$.

Freezing-point data for mixtures of o, m and p nitro benzylidene chlorides are given by Holleman, 1914; Holleman, Vermeulen and de Mooy, 1914; and Vermeulen, 1914, 1928.

SACCHARIN (1, Benzosulfonazole, 2(1), one) $C_6H_4<\genfrac{}{}{0pt}{}{SO_2}{CO}>NH$.

$C_6H_4<\genfrac{}{}{0pt}{}{SO_2}{CO}>NH$

100 parts H_2O dissolve 0.4 part at 25° and 4.17 parts at 100°.
100 parts alcohol dissolve 4 parts at 25°. (U. S. P. VIII.)
100 gms. trichlorethylene dissolve 0.012 gm. saccharin at 15°. (Wester and Bruins, 1914.)

DISTRIBUTION OF SACCHARIN AT 25° BETWEEN:

Water * and Ether. (Marden, 1914.)

Gms. Saccharin per: 100 cc. H_2O Layer.	Gms. Saccharin per: 50 cc. Ether Layer.	Dist. Coef.
0.0290	0.0438	0.267
0.0458	0.0829	0.235
0.0719	0.1245	0.245

* Slightly acidified with HCl.

Water † and Amyl Acetate. (Marden, 1914.)

Gms. Saccharin per: 105 cc. Aq. Layer.	Gms. Saccharin per: 50 cc. Amyl Acetate Layer.	Dist. Coef.
0.0045	0.0700	0.0306
0.0065	0.0957	0.0322
0.0114	0.1724	0.0315

† Containing 5 cc. conc. HCl per 100 cc.

The amount of saccharin entering the ethereal layer is increased by addition of HCl to the aqueous layer. With 5 cc. conc. HCl per 100 cc. H_2O, the distribution coefficient is reduced to 0.0624.

SOLUBILITY OF SACCHARIN IN MIXTURES OF ALCOHOL AND QUINOLINE AT 20-25°. (Pucher and Dehn, 1921.)

Per cent quinoline in solvent......	0.0 (=C_2H_5OH)	10.0	23.2	55.0	70.0	80.0	90.0	100.0
Gms. saccharin per 100 gms. solvent.	2.0	2.5	3.3	6.0	7.01	8.05	8.8	10.1

NitroBENZALDEHYDES *o*, *m* and *p* $C_6H_4NO_2.CHO$.

SOLUBILITY OF ORTHO, META AND PARA NITROBENZALDEHYDES IN WATER.

(Sidgwick and Dash, 1922.)

The sealed tube method was used at the higher temperatures and the Beckmann apparatus at the lower. The temperatures of the triple points (tr. pt.) corresponding to solid aldehyde in contact with two liquid layers, were determined in separate experiments and the composition estimated by extrapolation on the plotted curves. S indicates solid nitrobenzaldehyde. The complete solubility curves were realized for the meta and para compounds but that for the ortho compound could not be taken above 100° on account of decomposition.

Results for Ortho Nitro benzaldehyde.

t°.	Wt. % *o* $C_6H_4NO_2.CHO$.
66.9......	0.70
103.1......	1.53
166.0......	4.75
—	—
161.7......	93.56
145.1......	94.80
113.5......	96.49
63.8......	99.00
43.5......	100.00
39.7 (tr. pt.)..	99.9

Results for Meta Nitro benzaldehyde.

t°.	Wt. % *m* $C_6H_4NO_2.CHO$.	t°.	Wt. % *m* $C_6H_4NO_2.CHO$.
40.5......	0.39 S	212........	(crit. sol. temp.)
75.1......	0.96	211.7......	56.23
111.9	1.95	195.3......	78.77
136.4......	3.01	179.3......	86.75
147.1.......	3.95	167.0......	90.18
157.3.......	4.92	152.0......	92.87
181.0.......	10.51	126.2......	95.67
191.4.......	14.03	85.2.	97.83
205.4.......	23.35	58.0......	100.00
211.8.......	39.62	51.0 (tr. pt.).	99.6

Results for Para Nitro benzaldehyde.

t°.	Wt. % *p* $C_6H_4NO_2.CHO$.	t°.	Wt. % *p* $C_6H_4NO_2.CHO$.	t°.	Wt. % *p* $C_6H_4NO_2.CHO$.
90.2.......	0.97 S	216....	(crit. sol. temp.)	164.6......	92.74
132.4.......	2.91	215.7..	51.92	134.2......	96.70
176.5.......	8.78	213.4..	63.19	106.5......	100.00
205.4.......	20.67	172.6..	90.65	97.1 (tr. pt.).	98.2
215.5.......	37.77				

100 gms. abs. Alcohol dissolve 22.14 gms. Nitro benzaldehyde at 20–25°. (Pucher and Dohn, 1921.)
» » Quinoline » 1.96 » » » » »
100 gms. equi-mol. mixture of Alcohol and Quinoline dissolve 7.07 gms. Nitro benzaldehyde at 20–25°.

Meta NitroBENZALDEHYDE *m* $C_6H_4NO_2.CHO$.

100 cc. H_2O dissolve 0.1625 gm. *m* $C_6H_4NO_2.CHO$ at 25° (Goldschmidt and Sunde, 1906.)
" 1 *n* HCl " 0.1813 " " " " "
" 1 *n* KCl " 0.1542 " " " " "
" 2 *n* KCl " 0.1417 " " " " "

Ortho NitroBENZALDEHYDE *o* $C_6H_4NO_2.CHO$.

SOLUBILITY IN WATER AND IN AQUEOUS SOLUTIONS AT 25°.

(Goldschmidt and Sunde, 1906.)

Solvent.	Gms. $C_6H_4NO_2$. CHO per 100 cc. Sat. Sol.	Solvent.	Gms. $C_6H_4NO_2$. CHO per 100 cc. Sat. Sol.	Solvent.	Gms. $C_6H_4NO_2$ CHO per 100 cc. Sat. Sol.
H_2O	0.2316	1 *n* NaCl	0.1899	1 *n* KNO_3	0.3199
0.5 *n* HCl	0.2391	2 *n* "	0.1390	2 *n* "	0.3419
1 *n* "	0.2466	0.5 *n* HNO_3	0.3207	0.5 *n* $NaNO_3$	0.3013
2 *n* "	0.2658	1 *n* "	0.3758	1 *n* "	0.3132
1 *n* KCl	0.2046	0.5 *n* KNO_3	0.3123	2 *n* "	0.3201
2 *n* "	0.1912				

SOLUBILITY OF ORTHO, META AND PARA NITROBENZALDEHYDES IN BENZENE

(Sidgwick and Dash, 1922.)

See remarks, preceding page. B = solid benzene.

Ortho Nitrobenzaldehyde

t°.	Wt. %. $o\ C_6H_4NO_2.CHO$.
5.1	1.17 B
4.7	2.47 B
4.4	3.51 B
3.9	4.98 B
2.7	10.12 B
1.2	15.18 B
— 0.4	20.09 B
— 1.5	25.23 B
— 1.7 (Eutec.)	26.50
— 1.2	26.85
+ 1.2	29.59
4.9	35.35
8.2	40.24
11.3	45.48
13.0	48.84
15.8	54.40
19.4	60.74
24.6	70.98
27.2	76.28
30.2	81.60
34.1	87.82
39.1	95.08
43.5	100.00

Meta Nitrobenzaldehyde

t°.	Wt. %. $m\ C_6H_4NO_2.CHO$
5.0	1.20 B
4.7	2.40 B
4.3	4.28 B
4.0	4.98 B
2.4	10.14 B
1.0	15.15 B
— 0.8 (Eutec.)	15.75
+ 0.9	16.16
2.8	17.55
4.9	19.03
9.8	23.55
14.7	28.43
18.5	33.77
21.7	38.91
25.6	47.68
29.4	54.53
33.0	62.30
36.3	68.87
39.2	74.35
41.2	78.36
43.9	83.23
47.7	88.80
51.7	94.49
58.0	100.00

Para Nitrobenzaldehyde

t°.	Wt. %. $p\ C_6H_4NO_2\ CHO$.
5.3	0.00 B
5.0	1.00 B
4.6	2.00 B
4.4	2.75 B
4.1	3.57 B
4.1 (Eutec.)	3.6
7.5	4.06
12.6	5.01
23.4	7.57
30.8	10.15
40.5	15.00
48.3	20.53
57.5	29.61
62.2	35.31
65.7	40.42
71.3	49.82
77.2	61.12
81.0	67.56
84.9	73.54
87.8	78.85
93.0	85.54
98.6	92.83

Freezing-point data are given for mixtures of o, m and p Nitrobenzaldehydes by Brady and Harris, 1923. Results are given for mixtures of Nitrobenzaldehydes and:

Acetic anhydride(1)(10)	Naphthol(2)(3)	Sulfuric acid(5)
Acenaphthene(4)	Nitro mannitol(9)	Tri chloracetic acid(6)
Benzene(7)	Nitrobenzene(8)	
Hexane(8)	Phenol(7)	

(1) Baume and others, 1914; (2) Dischendorfer, 1928; (3) Dischendorfer and Nesitka, 1928; (4) de Fazi, 1916; (5) Kendall, 1914; (6) Kendall and Gibbons, 1915; (7) Schmidlin and Lang, 1912; (8) Timmermans, 1907; (9) Urbanski, 1934; (10) Van der Beek, 1928.

Nitro BENZOIC ACIDS (o), (m) and (p) $NO_2.C_6H_4COOH$.

SOLUBILITY OF NITRO BENZOIC ACIDS IN WATER AT 25°.

Acid	Gms. $NO_2.C_6H_4COOH$ per liter sat. sol.		
Ortho Nitro Benzoic Acid	7.40(1)	7.85(2)	4.18(3)
Meta " " "	3.56(4)	3.57(2)	3.28(3)
Para " " "	—		0.57(3)

(1) Larsson, 1927; (2) Knox and Richards, 1919; (3) Reyer, 1923; (4) Collett and Lazzell, 1930.

Nitro **BENZOIC ACIDS** (*o*), (*m*) and (*p*) $NO_2.C_6H_4COOH$.

SOLUBILITY OF ORTHO, META AND PARA NITRO BENZOIC ACIDS IN WATER.

(Sidgwick and Ewbank, 1921*a*: Results below 43°, Tajnik, Jain and Nath, 1925.)

Results for Ortho Nitro Benzoic Acid.		Results for Meta Nitro Benzoic Acid.		Results for Para Nitro Benzoic Acid.	
t°.	Gms. *o* $NO_2.C_6H_4.COOH$ per 100 gms. sat. sol.	t°.	Gms. *m* $NO_2.C_6H_4COOH$ per 100 gms. sat. sol.	t°.	Gms. *p* $NO_2.C_6K_4COOH$ per 100 gms. sat. sol.
146.8...	100.0	141.4...	100.0	242.4...	100.0
110.4...	90.38	104.8...	89.76	184.8...	79.22
90.5...	79.32	85.4...	79.52	168.6...	59.21
79.5...	59.85	97.7...	60.85 (L)	163.5...	38.30
78.0...	39.92	108.4...	40.31 (L)	158.8...	18.50
77.5...	19.24	107.8...	19.85 (L)	153.0...	9.17
75.3...	9.48	99.3..	9.90 (L)	177.0...	0.88
49.5...	1.85	79.3...	4.57 (L)	42.0...	0.022
42.0...	2.28	42.0...	0.515	35.0...	0.025
35....	1.30	35.0...	0.418	25.0...	0.028
25....	0.75	25.0...	0.344		

(L) a second liquid phase separates. Crit. temp. for *m* nitrobenzoic acid, 109°.0 and tr. pt. 76°.8.

SOLUBILITY OF ORTHO NITROBENZOIC ACID IN WATER. (Noyes and Sammet, 1903.)

t°.	$C_6H_4NO_2COOH$ *o* per Liter Sol. Millimols.	$C_6H_4NO_2COOH$ *o* per Liter Sol. Grams.	t°.	$C_6H_4NO_2COOH$ *o* per Liter Sol. Millimols.	$C_6H_4NO_2COOH$ *o* per Liter Sol. Grams.
10	26.62	4.645	25	43.3	7.231
15	31.06	5.187	30	51.6	8.616
20	36.57	6.106			

Additional determinations by other investigators, in millimols $C_6H_4NO_2COOH$ *o* per liter at 25°, are: 46.5 (van Maarseveen, 1898); 44.19 (Paul, 1894); 42.3 (Holleman, 1898); 43.6 (Kendall, 1911).

SOLUBILITY OF ORTHO, META AND PARA NITROBENZOIC ACIDS IN WATER AT HIGH TEMPERATURES, DETERMINED BY THE SYNTHETIC METHOD.

(Flaschner and Rankin 1910.)

o $C_6H_4NO_2COOH+H_2O$.		*m* $C_6H_4NO_2COOH+H_2O$.			*p* $C_6H_4NO_2COOH+H_2O$.	
t° of Melting.	Gms. Acid per 100 Gms. Sat. Sol.	t° of: Melting.	t° of: Solution.	Gms. Acid per 100 Gms. Sat. Sol.	t° of Melting.	Gms. Acid per 100 Gms. Sat. Sol.
52 crit. t.	...	63.2	...	2	118 crit. t.	...
69	5	77.4	...	6	143	5
75	9.9	77.4	90	7	150	9
78	13.5	77.4	100	10.5	155	14.5
79	49.5	77.4	105	17	160	30
80	62	77.4	107.5 crit. t.	30	165	53.5
85	73.5	77.4	106	50	170	65.5
90	78.6	77.4	100	58.6	180	76.7
100	83.5	77.4	90	65.4	190	83.2
120	94	80	...	74	200	88
148	100	100	...	88.5	220	95.2
		120	...	96.8	237	100
		140.4	...	100		

Data for the solubility of mixtures of *o*, *m* and *p* nitrobenzoic acids in water at 24.4° are given by Holleman (1898).

SOLUBILITY OF ORTHO NITROBENZOIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC, FORMIC, MALONIC AND SALICYLIC ACIDS AT 25°. (Kendall, 1911.)

Solvent.	Normality of Solvent.	Gms. *o* $C_6H_4NO_2COOH$ per Liter Sat. Solution.	Solvent.	Normality of Solvent.	Gms. *o* $C_6H_4NO_2.COOH$ per Liter Sat. Solution.
HCl	0.0179	6.146	$CH_2(COOH)_2$	0	7.281
"	0.0357	5.661	"	0.0313	7.144
"	0.125	4.976	"	0.1001	6.934
"	0.250	4.997	"	0.2004	6.656
"	0.500	4.752	$C_6H_4(OH)COOH$	0.0094	7.276

SOLUBILITY OF ORTHO AND OF META NITRO BENZOIC ACID, EACH SEPARATELY, IN AQUEOUS SOLUTIONS OF HYDROCHLORID ACID AT 25°.

(Knox and Richards, 1919.)

Results for Ortho Nitro Benzoic Acid		Results for Meta Nitro Benzoic Acid	
Equiv. HCl	Normality per liter of: $\underline{o}\ NO_2 \cdot C_6H_4 \cdot COOH$	Equiv. HCl	Normality per liter of: $\underline{o}\ NO_2 \cdot C_6H_4 \cdot COOH$
0.00	0.0470	0.00	0.0214
1.314	0.0280	1.416	0.0175
2.607	0.0256	3.310	0.0178
3.909	0.0239	4.308	0.0183
5.013	0.0235	5.953	0.0205
6.509	0.0233	7.044	0.0225
7.795	0.0237	8.380	0.0256
9.080	0.0250	9.793	0.0293
10.30	0.0267	11.54	0.0368

SOLUBILITY OF ORTHO NITRO BENZOIC ACID IN AQUEOUS SOLUTIONS OF ACIDS AT 25°.

(Drucker, 1929.)

Results for aqueous solutions of:

Hydrochloric Acid		Nitric Acid		Sulfuric Acid		Picric Acid	
Gm. Equiv. per liter		Gm. Equiv. per liter		Gm. Equiv. per liter		Gm. Equiv. per liter	
HCl	$\underline{o}\ NO_2C_6H_4COOH$	HNO_3	$\underline{o}\ NO_2C_6H_4COOH$	H_2SO_4	$\underline{o}\ NO_2C_6H_4COOH$	$OHC_6H_2(NO_2)_3$	$\underline{o}\ NO_2C_6H_4COOH$
0.00545	0.04073	0.00636	0.04127	0.00598	0.04247	0.000	0.04325
0.01089	0.03970	0.01436	0.03891	0.01074	0.04100	0.00417	0.04096
0.02203	0.03555	0.02565	0.03587	0.02277	0.03772	0.00905	0.03987
0.04416	0.03287	0.05174	0.03308	0.03896	0.03528	0.01601	0.03900
0.11098	0.02861	0.0876	0.03372	0.1088	0.02885	0.04336	0.04028

SOLUBILITY OF ORTHO NITROBENZOIC ACID AND OF PARA NITROBENZOIC ACID, EACH SEPARATELY, IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25°.

(Hammett and Chapman, 1934.)

Results for Ortho Nitrobenzoic Acid				Results for Para Nitrobenzoic Acid			
Wt. % H_2SO_4 in aq. solvent	Gm. Mols. $\underline{o}\ NO_2C_6H_4COOH$ per 1000 gms. aq. solvent	Wt. % H_2SO_4 in aq. solvent	Gm. Mols. $\underline{o}\ NO_2C_6H_4COOH$ per 1000 gms. aq. solvent	Wt. % H_2SO_4 in aq. solvent	Gm. Mols. $\underline{p}\ NO_2C_6H_4COOH$ per 1000 gms. aq. solvent	Wt. % H_2SO_4 in aq. solvent	Gm. Mols. $\underline{p}\ NO_2C_6H_4COOH$ per 1000 gms. aq. solvent
0.0	0.0435	60.83	0.0088	0.0	0.00166	80.41	0.00540
11.28	0.0192	65.07	0.0095	31.23	0.00068	81.75	0.00708
19.79	0.0139	72.46	0.0141	52.01	0.00079	83.61	0.01197
31.23	0.0095	79.28	0.0310	72.46	0.00179	85.13	0.01908
41.90	0.0080	81.75	0.0469	77.40	0.00316	90.05	0.0983
46.74	0.0076	83.61	0.0737	79.28	0.00452		
52.01	0.0080	85.13	0.1017				

SOLUBILITY OF ORTHO, META AND PARA NITRO BENZOIC ACIDS IN AQUEOUS SOLUTIONS OF ELECTROLYTES AT 35°.

(Yajnik, Jain and Nath, 1925.)

Saturated solutions of the acids were prepared at 45° and 100 cc. portions placed in flasks containing accurately weighed quantities of the various electrolytes. These were kept in a thermostat at 35° but no mention is made of stirring or agitation during the period of attainment of equilibrium. The acid present was determined by titration with standard alkali. Nothing is said about the separation of the solid phase. This is especially regretable in the case of *p* nitro benzoic acid, which according to the authors' figures, is less soluble with increase of temperature. Also in some cases the reported increase in solubility with increase of concentration of electrolyte, is greater than the amount of acid which could have been present in a mixture made as described

	Results for Ortho Nitro Benzoic Acid.		Results for Meta Nitro Benzoic Acid.		Results for Para Nitro Benzoic Acid.	
Electrolyte used.	Gm. mol. electrolyte per 100 gms. H_2O.	Gm. *o* $NO_2.C_6H_4COOH$ per 100 gms. H_2O.	Gm. mol. electrolyte per 100 gms. H_2O.	Gm. *m* $NO_2.C_6H_4COOH$ per 100 gms. H_2O.	Gm. mol. electrolyte per 100 gms. H_2O	Gm. *p* $NO_2.C_6H_4COOH$ per 100 gms. H_2O.
$(NH_4)_2SO_4$.	0.0000	1.30	0.000	0.418	0.000	0.025
»	0.0016	1.245	0.0017	0.3105	0.0031	0.027
»	0.0030	1.222	0.0030	0.2593	0.0042	0.028
»	0.0050	1.191	0.0048	0.2616	0.0087	0.029
»	0.0067	1.163	0.0064	0.2554	0.0102	0.0295
»	0,0082	1.136	0.0097	0.2446	0.0125	0.029
Na_2SO_4	0.0014	1.295	0.0020	0.3235	0.0018	0.0269
»	0.0033	1.232	0.0032	0.2848	0.0040	0.0289
»	0.0053	1.154	0.0051	0.2771	0.0051	0.0306
»	0.0071	1.039	0.0073	0.2687	0.0076	0.0309
»	0.0078	0.072 (?)	0.0089	0.2616	0.0102	0.0315
K_2SO_4	0.0015	1.310	0.0016	0.3317	0,0017	0.0272
»	0.0020	1 254	0.0027	0.2987	0.0027	0.0281
»	0.0026	1.181	0.0039	0.2956	0.0047	0.0288
»	0.0045	1.098	0.0048	0.2910	0.0063	0.0295
»	0.0071	0.981	0.0063	0.2848	0.0084	0.0300
NH_4Cl	0.0046	1.256	0.0036	0.2043	0.0052	0.0346
»	0.0058	1.227	0.0060	0.1950	0.0084	0.0353
»	0.0079	1.199	0.0078	0.1895	0.0103	0.0352
»	0.0094	1.193	0.0100	0.1830	0.0137	0.0343
»	0.0117	1.171	0.0148	0.1672	0.0178	0.0320
Na Cl	0.0041	1 241	0.0070	0.2059	0,0065	0.0358
»	0.0058	1.186	0,0088	0.1903	0.0135	0.0355
»	0.0094	1.126	0.0125	0.1718	0.0152	0.0353
»	0.0131	1.068	0.0171	0.1485	0.0184	0.0347
»	0.0155	1.040	0.0237	0.1223	0.0257	0.0324
K Cl	0.0031	1.228	0.0033	0.2337	0.0035	0.0328
»	0.0053	1.213	0.0075	0.2213	0.0049	0.0342
»	0.0069	1.181	0.0116	0.2090	0.0079	0.0361
»	0 0088	1.149	0.0154	0.1981	0.0096	0.0359
»	0.0112	1.024	0.0197	0.1857	0.0143	0.0350
$CaCl_2$	0.0015	1.334	0.0023	0.2525	0 0027	0.0348
»	0.0028	1.364	0.0038	0.2368	0.0034	0.0352
»			0.0058	0.2291	0.0067	0.0323
»			0.0085	0.2229	0.0088	0.0283
»			0.0113	0.2403	0.0092	0.0278

$C_7H_5O_4$

Nitro BENZOIC ACIDS

SOLUBILITY OF ORTHO, META AND PARA NITRO BENZOIC ACIDS IN AQUEOUS SOLUTIONS OF ELECTROLYTES AT 25°. (cont.)

Electrolyte used.	Results for Ortho Nitro Benzoic Acid.		Results for Meta Nitro Benzoic Acid.		Results for Para Nitro Benzoic Acid.	
	Gm. mol. electrolyte per 100 gms H_2O.	Gm. o $NO_2C_6H_4COOH$ per 100 gms H_2O	Gm. mol. electrolyte per 100 gms H_2O.	Gm. m $NO_2C_6H_4COOH$ per 100 gms H_2O	Gm. mol. electrolyte per 100 gms. H_2O	Gm. p $NO_2C_6H_4COOH$ per 100 gms H_2O
$SrCl_2$.....	0.0052	1.878	0.0010	[illegible]	[illegible]	[illegible]
"	0.0059	1.332	0.0017	[illegible]	[illegible]	0.0356
"	0.0075	1.213	0.0023	[illegible]	[illegible]	[illegible]
"			0.0019	[illegible]	[illegible]	0.0349
"			0.0030	[illegible]	[illegible]	0.0298
$BaCl_2$....	0.0012	1.330 (1.388)	0.0013	[illegible]	[illegible]	0.0339
"	0.0021	1.365 (1.420)	0.0018	[illegible]	[illegible]	0.0363
"	0.0029	1.416 (1.485)	0.0024	[illegible]	[illegible]	0.0382
"	0.0040	1.464 (1.510)	0.0034	[illegible]	[illegible]	[illegible]
"	0.0051	1.419 (1.463)	0.0031	[illegible]	[illegible]	[illegible]
NH_4NO_3..	0.0028	1.313	[illegible]	[illegible]	[illegible]	[illegible]
" ..	0.0046	1.332	[illegible]	[illegible]	[illegible]	[illegible]
" ..	0.0062	1.337	[illegible]	[illegible]	[illegible]	[illegible]
" ..	0.0078	1.298	0.0069	[illegible]	[illegible]	[illegible]
" ..	0.0093	1.257	0.0082	0.1160	[illegible]	[illegible]
$NaNO_3$...	0.0026	1.318	[illegible]	[illegible]	[illegible]	[illegible]
" ...	0.0050	1.314	[illegible]	[illegible]	[illegible]	[illegible]
" ...	0.0077	1.297	[illegible]	[illegible]	[illegible]	[illegible]
" ...	0.0113	1.277	0.0078	[illegible]	[illegible]	[illegible]
" ...	0.0137	1.250	0.0101	[illegible]	[illegible]	[illegible]
KNO_3....	0.0028	1.391	0.0017	[illegible]	[illegible]	[illegible]
"	0.0052	1.355	[illegible]	[illegible]	[illegible]	[illegible]
"	0.0088	1.319	[illegible]	[illegible]	[illegible]	[illegible]
"	0.0139	1.271	0.0071	[illegible]	[illegible]	[illegible]
"	0.0181	1.241	[illegible]	[illegible]	[illegible]	[illegible]
$Ca(NO_3)_2$.	0.0017	1.715	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0027	1.688	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0042	1.649	0.0041	[illegible]	[illegible]	[illegible]
" .	0.0050	1.616	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0061	1.570	[illegible]	[illegible]	[illegible]	[illegible]
$Sr(NO_3)_2$.	0.0016	1.783	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0025	1.752	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0033	1.711	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0042	1.676	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0055	1.610	[illegible]	[illegible]	[illegible]	[illegible]
$Ba(NO_3)_2$.	0.0015	1.830	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0020	1.788	0.0018	[illegible]	[illegible]	[illegible]
" .	0.0024	1.754	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0033	1.677	[illegible]	[illegible]	[illegible]	[illegible]
" .	0.0045	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Solubility of Ortho Nitrobenzoic Acid in Aqueous Solutions of Sodium Butyrate, Acetate, Formate, and Salicylate at 26.4°.

(Philip, 1905.)

Original results in terms of $\frac{\text{Mols.}}{100}$ per liter.

Gms. Na Salt per Liter.	Gms. Ortho $C_6H_4COOH.NO_2$ per Liter of Solution in:			
	C_3H_7COONa.	CH_3COONa.	$HCOONa$.	$C_6H_4.OH.COONa$.
0	7.85	7.85	7.85	7.85
0.5	8.35	8.50	8.60	8.35
1.0	8.90	9.15	9.50	8.70
2	10.0	10.80	11.5	9.4
3	11.2	12.55	13.5	11.0
4	12.4	14.5	15.6	11.5
6	15.2	...	...	...

One liter Aq. 0.12 normal solution of Sodium Chlor acetate, sat. with Ortho nitrobenzene, contain 0.1099 gm. mols. (= 18.353 gms.) o $NO_2C_6H_4COOH$ at 25°. (Larsson, 1927.)

Solubility of Meta Nitrobenzoic Acid in Aqueous Solutions of Magnesium Sulfate at 25°.

(Randall and Failey, 1927.)

"Ionic Strength" of Aq. $MgSO_4$ Solution	Gm. Mols.(x2?) m $NO_2C_6H_4COOH$ per liter sat. sol.	"Ionic Strength" of Aq. $MgSO_4$ Solution	Gm. Mols. (x2?) m $NO_2C_6H_4COOH$ per liter sat. sol.
0.00	0.04415 (= 7.37 gms.)	0.400	0.05490
0.04792	0.04783	0.640	0.05633
0.100	0.05011	0.9836	0.05679
0.200	0.05241		

Solubility of Meta Nitrobenzoic Acid in Aqueous Solutions of Sodium Acetate, Sodium Formate, Sodium Monochloracetate and Potassium Formate at 25°.

(Philip and Garner, 1909.)

In CH_3COONa.		In $HCOONa$.		In $CH_2ClCOONa$.		In $HCOOK$.	
Gms per Liter.		Gms. per Liter.		Gms. per Liter.		Gms. per Liter.	
CH_3COONa.	m $C_6H_4NO_2COOH$.	$HCOONa$.	m $C_6H_4NO_2COOH$.	$CH_2ClCOONa$.	m $C_6H_4NO_2COOH$.	$HCOOK$.	m $C_6H_4NO_2COOH$.
0	3.424	0	3.424	0	3.424	0	3.424
1.009	5.144	0.843	4.776	1.375	4.075	1.025	4.742
2.484	7.932	2.102	6.380	3.426	4.876	2.563	6.446
5.027	12.61	4.196	8.616	6.839	5.861	5.124	8.551
10.07	20.77	8.410	11.90	13.710	7.264		

SOLUBILITY OF ORTHO NITROBENZOIC ACID IN AQUEOUS SOLUTIONS OF DEXTROSE, SODIUM CHLORIDE, AND OF SODIUM NITRATE.

Original results in molecular quantities. (Hoffman and Langbeck, 1905).

In Dextrose			In NaCl			In NaNO₃		
G. $C_6H_{12}O_6$ per 100 cc. Solution.	G.(o)$C_6H_4NO_2.COOH$ per 100 g. Solvent.		G. NaCl. per 100 cc. Solution.	G.(o)$C_6H_4NO_2.COOH$ per 100 g. Solvent.		G. $NaNO_3$ per 100 cc. Solution.	G.(o)$C_6H_4NO_2.COOH$ per 100 g. Solvent.	
	At 25°.	At 35°.		At 25°.	At 35°.		At 25°.	At 35°.
0.0	0.736	1.063	0.117	0.743	1.072	0.170	0.746	1.074
0.36	0.736	1.064	0.195	0.740	1.075	0.284	0.754	1.080
1.80	0.732	1.061	0.585	0.749	1.070	0.851	0.767	1.090
9.50	0.722	1.051	2.425	0.688	0.967	4.255	0.774	1.097
20.00	0.703	1.030	5.80	0.597	0.831	8.510	0.748	1.047

SOLUBILITY OF PARA NITRO BENZOIC ACID IN AQUEOUS SOLUTIONS OF ANILIN AND OF PARA TOLUIDIN AT 25°.

(Löwenherz—Z. physik. Chem. 25, 395, '94.)

In Anilin.				In p-Toluidin.			
G. Mols. per Liter.		Gms. per Liter.		G. Mols. per Liter.		Gms. per Liter.	
$C_6H_5NH_2$.	$C_6H_4.NO_2.COOH$.	$C_6H_5NH_2$.	$C_6H_4NO_2.COOH$.	$C_6H_4NH_2.CH_3$	$C_6H_4NO_2.COOH$	$C_6H_4NH_2.CH_3$	$C_6H_4NO_2.COOH$.
0.0	0.00164	0.0	0.274	0.0	0.00164	0.0	0.274
0.01	0.00841	0.91	1.406	0.01	0.0100	1.071	1.671
0.02	0.01379	1.82	2.304	0.02	0.0174	2.142	2.902
0.04	0.02172	3.64	3.629	0.03	0.0245	3.213	4.097
0.08	0.0347	7.29	5.798				

1000 cc. of sat. solution of para nitrobenzoic acid in aqueous 1 normal sodium para nitrobenzoate contain 0.0046 gm. mols. = 0.768 gm. $p C_6H_4NO_2COOH$ at 25°.

(Sidgwick, 1910.)

DISTRIBUTION OF ORTHO NITRO BENZOIC ACID AT 25° BETWEEN (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $o\ NO_2C_6H_4COOH$ per liter of H_2O layer (C_1).	Millimols. $o\ NO_2C_6H_4COOH$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
2.775	0.45	0.162
5.55	1.55	0.279
6.60	2.05	0.310
8.65	3.35	0.388

Water and Ethyl Ether.

Millimols $o\ NO_2C_6H_4COOH$ per liter of H_2O layer (C_1).	Millimols $o\ NO_2C_6H_4COOH$ per liter of $C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.379	0.661	1.74
0.543	1.413	2.60
0.790	3.013	3.83
0.200	6.96	5.80
0.830	13.08	7.11

Water and Xylene.

Millimols $o\ NO_2C_6H_4COOH$ per liter of H_2O layer (C_1).	Millimols $o\ NO_2C_6H_4COOH$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
3.94	0.425	0.1080
5.70	0.55	0.0965
7.60	0.70	0.0920
10.30	0.90	0.0874

DISTRIBUTION OF META NITRO BENZOIC ACID AT 25° BETWEEN (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $m\ NO_2C_6H_4COOH$ per liter of H_2O layer (C_1).	Millimols. $m\ NO_2C_6H_4COOH$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.4874	0.600	1.23
0.675	0.975	1.44
0.950	1.625	1.71

Water and Ethyl Ether.

Millimols. $m\ NO_2C_6H_4COOH$ per liter of H_2O layer (C_1).	Millimols. $m\ NO_2C_6H_4COOH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.073	1.220	16.7
0.095	1.825	19.2
0.135	2.955	22.0
0.180	4.160	23.1
0.240	6.815	28.4

Water and Xylene.

Millimols. $m\ NO_2C_6H_4COOH$ per liter of H_2O layer (C_1).	Millimols. $m\ NO_2C_6H_4COOH$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
1.140	0.800	0.701
1.620	1.395	0.860
2.200	2.110	0.955
4.000	4.45	1.11

DISTRIBUTION OF ORTHO NITROBENZOIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. o $NO_2C_6H_4COOH$ per liter: H_2O layer	$CHCl_3$ layer
0.00508	0.00185
0.00640	0.00251
0.00726	0.00297
0.00832	0.00357
0.01056	0.00528
0.01195	0.00634

Water and Toluene

Gm. Mols. o $NO_2C_6H_4COOH$ per liter: H_2O layer	$C_6H_5CH_3$ layer
0.00572	0.000898
0.00660	0.00106
0.00748	0.00125
0.00869	0.00145
0.00990	0.00165
0.0130	0.00222

DISTRIBUTION OF META NITROBENZOIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. m $NO_2C_6H_4COOH$ per liter: H_2O layer	$CHCl_3$ layer
0.00370	0.0162
0.00469	0.0242
0.00515	0.0290
0.00607	0.0396
0.00713	0.0523
0.00779	0.0614

Water and Toluene

Gm. Mols. m $NO_2C_6H_4COOH$ per liter: H_2O layer	$C_6H_5CH_3$ layer
0.00475	0.00748
0.00528	0.00880
0.00637	0.0121
0.00769	0.0167
0.00851	0.0196
0.00937	0.0231

DISTRIBUTION OF PARA NITROBENZOIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. p $NO_2C_6H_4COOH$ per liter: H_2O layer	$CHCl_3$ layer
0.00070	0.00224
0.00084	0.00264
0.000924	0.00297
0.00106	0.00343
0.00125	0.00409
0.00145	0.00484

Water and Toluene

Gm. Mols. p $NO_2C_6H_4COOH$ per liter: H_2O layer	$C_6H_5CH_3$ layer
0.000336	0.000336
0.000420	0.000448
0.000504	0.000530
0.000588	0.000630
0.000784	0.000812
0.00112	0.000980

DISTRIBUTION OF PARA NITROBENZOIC ACID AT 25° BETWEEN:

(Smith, 1921-22.)

Water and Chloroform

Millimols p $NO_2.C_6H_4.COOH$ per liter of H_2O layer(C_1)	$CHCl_3$ layer(C_2)	$\frac{C_2}{C_1}$
0.364	0.400	1.1
0.525	0.687	1.31
0.75	1.175	1.57
1.05	1.975	1.88

Water and Xylene

Millimols p $NO_2.C_6H_4.COOH$ per liter of H_2O layer(C_1)	$C_6H_4(CH_3)_2$ layer(C_1)	$\frac{C_2}{C_1}$
0.3325	0.1750	0.458
0.681	0.4530	0.665
0.725	0.4625	0.638
0.962	0.7375	0.767
1.10	0.950	0.864

DISTRIBUTION BETWEEN WATER AND BENZENE OF [illegible] ([illegible], 1915.)

Ortho Nitro Benzoic Acid at 25°. Gm. mols. ×10⁻³ $o(NO_2)C_6H_4COOH$ per 1000 gms.		Ortho Nitro Benzoic Acid at 40°. Gm. mols. ×10⁻³ $o(NO_2)C_6H_4COOH$ per 1000 gms.		Meta Nitro Benzoic Acid at 25°. Gm. mols. ×10⁻³ $m(NO_2)C_6H_4COOH$ per 1000 gms.		Meta Nitro Benzoic Acid at 40°. Gm. mols. ×10⁻³ $m(NO_2)C_6H_4COOH$ per 1000 gms.	
H_2O layer	C_6H_6 layer	H_2O layer	C_6H_6 layer	H_2O layer	C_6H_6 layer	H_2O layer	C_6H_6 layer
5.164	1.068	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.614	1.960	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.354
8.496	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.15
9.109	2.460	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20.53
11.23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14.03	4.58[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21.03	8.17[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25.12	10.70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40.72	[illegible]	[illegible]	[illegible]				
43.83	[illegible]	[illegible]	[illegible]				

SOLUBILITY OF ORTHO NITROBENZOIC ACID IN SEVERAL ALCOHOLS.

([illegible], 1894.)

Solvent.	t°.	Gms. Acid per 100 Gms. Sat. Sol.	Gms. Acid per 100 Gms. Solvent.	Solvent.	t°.	Gms. Acid per 100 Gms. Sat. Sol.	Gms. Acid per 100 Gms. Solvent.
CH_3OH	0	36.2	56.6	C_3H_7OH	0	17.7	21.5
"	22	52.2	109.1	"	22	31.2	45.5
C_2H_5OH	0	23.3	30.4	$(CH_3)_2CHCH_2OH$	[illegible]	9.65	10.7
"	22	42.7	74.5				

SOLUBILITY OF ORTHO NITROBENZOIC ACID IN SEVERAL SOLVENTS.

([illegible] and Lazzell, [illegible])

The determinations were made by the synthetic, sealed tube, method results were plotted and the following values read from the curves.

t°	Gm. Mols. o $NO_2C_6H_4COOH$ per 100 gms. mols. sat. solution in: $(CH_3)_2CO$	$(C_2H_5)_2O$	[illegible]	H_2O	CCl_4
10	—			[illegible]	—
20	—	9.0	0.7	0.20	—
30	[illegible]	11.4	1.0	0.35	0.01
40	26.7	15.5	1.2	0.55	0.10
50	30.1	20.2	1.6	0.70	0.20
60	34.4	25.0	3.5	0.80	0.25
70	37.3	30.2	4.7	1.2	0.35
80	41.7	35.5	8.4	2.2	0.40
90	46.8	41.1	7.7	4.1	0.45
100	52.8	47.7	19.8	9.4	0.5
110	59.8	55.5	34.0	24.1	0.6
120	68.2	64.6	52.6	46.7	1.9
130	77.7	76.4	69.1	68.5	—
140	89.4	89.2	85.1	84.5	—
147.7(m.pt.)	100.0	100.0	100.0	100.0	100.0

100 gms. sat. solution of o nitro benzoic acid in liquid ammonia contain 38 gms. o $NO_2C_6H_4COOH$ at [illegible] ([illegible], [illegible].)

Nitro**BENZOIC ACIDS** $C_6H_4.NO_2.COOH$. *o, m,* and *p.*

SOLUBILITY IN SEVERAL SOLVENTS.

(de Connick, 1894; for solubility in H_2O, see also Paul; Vaubel; Löwenherz; Goldschmidt, 1898; Holleman, 1898; Noyes and Sammet, 1903; Sidgwick, 1910.)

Solvent.	t°.	Gms. $C_6H_4.NO_2.COOH$ per 100 cc. Solvent.		
		Ortho.	Meta.	Para.
Water	15	0.625	0.238	0.0213
"	20	0.682 (0.645G.)	0.315	0.039
"	25	0.738 (0.779G.)	0.341	0.028 (0.045)
"	30	0.922 (0.922G.)	...	...
"	35	1.141 (1.054)	0.477	0.0419
Methyl Alcohol	10	42.72	47.34	9.6
Ethyl Alcohol	10	28.2	33.1 (11.7°)	0.9
" " (abs.)	15	37.58*	47.26*	19.71*
" " (33 Vol.%)	15	0.64 (11.8°)	0.52	0.055
Acetone	10	41.5	41.5	4.54
Benzene	10	0.294	0.795	0.017 (12.5°)
Carbon Disulfide	10	0.012	0.10 (8.5°)	0.007
Chloroform	10	0.455 (11°)	5.678	0.066
"	15	1.06†	3.45†	0.088†
"	25	1.13†	4.7†	0.114†
"	35	1.50†	6.31†	0.156†
Ether	10	21.58	25.175	2.26
Ligroïn	10	trace	0.013	0

* = Gms. acid per 100 cc. saturated solution. † = Gms. acid per 100 gms. solvent.

SOLUBILITY OF META NITROBENZOIC ACID IN SEVERAL ALCOHOLS.

(Timofeiew, 1894.)

Solvent.	t°.	Gms. Acid per 100 Gms.		Solvent.	t°.	Gms. Acid per 100 Gms.	
		Sat. Sol.	Solvent.			Sat. Sol.	Solvent.
CH_3OH	0	41.9	72.2	C_2H_5OH	21.5	43.9	89.8
"	19	53.7	116	C_3H_7OH	0	24.1	31.8
"	21.5	57.1	133.1	"	19	31	45
C_2H_5OH	0	33.6	50.6	"	21.5	32.5	48
"	19	42.3	73.2				

SOLUBILITY OF META NITROBENZOIC ACID IN SEVERAL SOLVENTS.

(Collett and Lazzell, 1930.)

t°	Gm. Mols. m $NO_2C_6H_4COOH$ per 100 gm. mols. sat. solution in:				
	$(CH_3)_2CO$	$(C_2H_5)_2O$	$CHCl_3$	C_6H_6	CCl_4
0	11.0	7.0	—	0.3	—
10	15.2	9.5	2.3	0.42	—
20	19.3	12.1	2.9	0.55	—
30	23.4	14.7	3.7	0.80	0.14
40	27.1	17.5	4.7	1.4	0.23
50	31.9	20.7	6.3	2.2	0.40
60	36.1	24.2	8.8	3.3	0.70
70	41.0	28.8	12.7	5.7	0.85
80	46.3	34.8	18.3	10.0	1.3
90	52.2	42.2	26.8	18.4	2.4
100	58.5	50.1	38.6	30.8	5.0
110	65.6	58.8	53.0	47.8	13.0
120	76.1	69.2	67.0	63.8	53.7
130	87.2	83.4	81.8	81.7	79.1
142.4m. pt.	100.0	100.0	100.0	100.0	100.0

SOLUBILITY OF PARA NITROBENZOIC ACID IN SEVERAL ALCOHOLS.

(Timofeiew, 1894.)

Solvent.	t°.	Gms. Acid per 100 Gms. Sat. Sol.	Gms. Acid per 100 Gms. Solvent.
CH_3OH	18.5	3.45	3.57
"	21	3.75	3.90
C_2H_5OH	18.5	3.25	3.36
"	19.5	3.16	3.26
C_2H_5OH	21	3.22	3.32
C_3H_7OH	18.5	2.12	2.17
"	19.5	1.85	1.90
"	21	2.29	2.34

SOLUBILITY OF PARA NITROBENZOIC ACID IN SEVERAL SOLVENTS.

(Collett and Lazzell, 1930.)

t°	Gm. Mols. p $NO_2C_6H_4COOH$ per 100 gm. mols. sat. solution in: $(CH_3)_2CO$	C_6H_6	CCl_4
10	1.9	—	—
20	2.2	0.01	—
30	2.7	0.08	0.01
40	3.3	0.17	0.07
50	3.8	0.24	0.13
60	4.7	0.33	0.20
70	5.5	0.41	0.25
80	6.6	0.50	0.30
90	7.9	0.60	0.36
100	9.6	0.70	0.40
110	11.4	0.85	0.48
120	13.2	1.1	0.54
130	16.3	1.3	0.60
140	19.3	1.6	0.70
150	22.9	2.2	0.90
160	27.0	3.5	1.5
170	31.5	6.2	2.1
180	35.9	10.7	2.8
190	—	17.5	4.6
200	—	26.3	7.3
210	—	46.4	12.7
239.9 m.pt.	100.	100.	100.0

Determinations at temperatures above 200° and even as low as 170° in some cases, were impossible on account of violent explosions. These occurred when ether, chloroform or carbon tetrachloride were used as solvents.

SOLUBILITY OF ORTHO, META AND PARA NITRO BENZOIC ACID IN BENZENE AND IN *n* HEPTANE.

(Sidgwick and Ewbank, 1921 *a*.)

Solvent.	Results for Ortho Nitro Benzoic Acid. t°.	Gms. *o* $NO_2C_6H_4COOH$ per 100 gms. sat. sol.	Results for Meta Nitro Benzoic Acid. t°.	Gms. *m* $NO_2C_6H_4COOH$ per 100 gms. sat. sol.	Results for Para Nitro Benzoic Acid. t°.	Gms. *p* $NO_2C_6H_4COOH$ per 100 gms. sat. sol.
Benzene....	128.3	81.0	121.0	79.6	222.0	82.1
"	113.0	50.25	105.0	55.5	201.6	54.8
"	105.8	28.32	89.5	30.54	196.5	31.42
"	90.5	10.0	65.2	9.87	183.4	21.1
"	78.6	5.03	48.0	4.95	164.5	9.45
"	63.0	2.1	33.0	1.95		
n Heptane..	135.0	1.37	123.4	2.07	179.0	1.04
" ..	130.5	1.37 (L)	103.0	1.03		
" ..	139.6 (tr. pt.)		135.0 (tr. pt.)		234.0 tr pt	

(L) a second liquid layer separates.

1000 gms. sat. solution of p nitro benzoic acid in dry ethyl ether contain 0.0413 gm. mol. $NO_2.C_6H_4COOH$ at 25°.

1000 gms. sat. solution of p Nitro benzoic acid in ethyl ether sat. with H_2O contain 0.1071 gm. mol. $NO_2.C_6H_4COOH$ at 25°. (de Szyszkowski, 1928.)

INFLUENCE OF VERY SLIGHT TRACES OF WATER UPON THE SOLUBILITY OF ORTHO NITRO BENZOIC ACID IN BENZENE AND IN CHLOROFORM AT 30°.5.

(Cohen and Miyake, 1926.)

Results for Benzene.

Thousandths of a Per cent of H_2O in C_6H_6.	Gms. *o* $NO_2C_6H_4COOH$ per 100 gms. sat. sol.
0.0	0.35
37.7	0.43
66.3	0.49
89.1	0.49–0.50
sat	0.50

Results for Chloroform.

Thousandths of a Per cent of H_2O in $CHCl_3$.	Gms. *o* $NO_2C_6H_4COOH$ per 100 gms. sat. sol.
0.0	0.45
25.6	0.51–0.52
130.2	0.56
sat	0.56

SOLUBILITY OF *o* NITRO BENZOIC ACID AND OF 1,3.5 DINITRO BENZOIC ACID IN WATER AND IN BENZENE AT 25°.

(de Szyszkowski, 1914-1915.)

Compound.	Gm. mols. cmpd. per 1000 gms. sat. solution in		
	Water.	Dry Benzene.	Benzene sat. with H_2O.
o Nitro benzoic Acid....	–	$1.984.10^{-2}$	$2.687.10^{-2}$
1.3.5 Dinitro benzoic Ac..	$6.344.10^{-3}(6.831.10^{-3})$	$4.880.10^{-3}$	$8.676.10^{-3}(9.135.10^{-3})$

1.3.5 dinitrobenzoic acid shows an exceptional tendency to supersaturation. The results in parentheses are for solutions in which the equilibrium was approached from above.

Results for the mutual solubility of Para Nitrobenzoic Acid and Para Toluic acid are given by Johnston and Jones, 1928.

Freezing-point data for mixtures of ortho nitrobenzoic acid and di methyl pyrone are given by Kendall, 1914a. Results for mixtures of meta nitrobenzoic acid and benzoic acid are given by Bakunin and Angrisani, 1915.

Nitro **SALICYLIC ACID** $NO_2(5)C_6H_3COOH(1)OH(2).H_2O$.

SOLUBILITY OF 5.NITRO SALICYLIC ACID IN WATER.

(Chattaway and Curjel, 1926.)

Constant agitation in a thermostat was employed. The saturated solutions were analyzed by titration with 0.01 *n* Na OH

t°.	Gms. $NO_2C_6H_3.OH.COOH$ per 100 gms H_2O.	Solid Phase.
14.95	0.061	$NO_2.C_6H_3OH.COOH.H_2O$
17.5	0.064	»
20.5	0.068	»
25.0	0.078	»
29.0	0.093	»
31.0	0.103	»
33.0	0.115	»
35.0	0.125	»
36.6	0.139	»

t°.	Gms. $NO_2C_6H_3.OH.COOH$ per 100 gms. H_2O.	Solid Phase.
40.1	0.169	$NO_2.C_6H_3OH.COOH.H_2O$
45.0	0.200	$NO_2.C_6H_5OH.COOH$
50.1	0.228	»
55.2	0.273	»
60.0	0.325	»
65.0	0.391	»
72.0	0.501	»
74.1	0.528	»
99.5	1.505	»

The transition temperature is 42°.5.

TRI NITRO PHENYL METHANE $C_6H_2(NO_2)_3CH_3$.

Freezing-point data for mixtures of trinitro phenyl methane and Sarcosine anhydride are given by Pfeiffer and Angern, 1926.

CHLORO NITRO TOLUENE SULFONYL CHLORIDES $CH_3C_6H_2Cl(NO_2)SO_2Cl$.

Freezing-points of mixtures of the 2.4 and 2.6 chloro nitro compounds are given by Davies, 1921.

TRI NITRO PHENYL METHYL NITRAMINE $C_6H_2(NO_2)_3.CH_3.N.NO_2$.

Freezing-point data are given for mixtures of Tri nitro phenyl methyl •nitramine and:

Nitro anilines(1)	Styphnic acid(1)
Nitro phenols(1)	Tri nitro cresol(1)(2)
Nitro toluene(1)(3)	Tri nitro toluene(4)(5)
Picric acid(1)	

(1) Jefremow and Tichomirowa, 1926; (2) Jefremow and Tichomirowa, 1927; (3) Giua, 1914; (4) Giua, 1924; (5) Jefremow and Bogojawleuski, 1926.

Trinitro**TOLUENE** 2,4,6 $C_6H_2.CH_3(NO_2)_3$.

100 gms. H_2O dissolve 0.021 gm. $C_6H_2.CH_3(NO_2)_3$ at 15° and 0.164 gm. at 100°.
100 gms. alcohol dissolve 1.6 gms. $C_6H_2CH_3(NO_2)_3$ at 22° and 10 gms. at 58°.
(Copisarow, 1915.)

SOLUBILITY OF α OR 2, 4, 6 TRINITRO TOLUENE (TNT) IN WATER.

(Taylor and Rinkenbach, 1923; also quoted in full by Desvergnes, 1924.)

Commercial Grade I trinitrotoluene was purified by recrystallization from hot benzene and from hot 95 % alcohol. Its setting point was 80°.6. The saturated solutions were prepared in triplicate by shaking frequently, during several hours, mixtures which had been heated to a temperature higher than that of the determination and afterwards kept in a thermostat. In some cases equilibrium was approached from below instead of above. About 30 to 50 grams of the saturated solution were weighed in a wagon pipet, the solvent evaporated by means of a current of warm dry air and the residue weighed after drying to constant weight. The determinations were plotted and the results for regular intervals of temperature were read from the curve.

t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. H_2O.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. H_2O.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. H_2O.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. H_2O.
0....	0.0100	30....	0.0175	55....	0.0570	80....	0.1075
10....	0.0110	35....	0.0225	60....	0.0675	85....	0.1175
15....	0.0120	40....	0.0285	65....	0.0775	90....	0.1275
20....	0.0130	45....	0.0360	70....	0.0875	95....	0.1375
25....	0.0150	50....	0.0475	75....	0.0975	100....	0.1475

SOLUBILITY OF α OR 2, 4, 6 TRINITRO TOLUENE (TNT) IN PYRIDINE.

(Taylor and Rinkenbach, 1923; also quoted by Desvergnes, 1924.)

As in the case of the solubility in aniline, a complex is formed with pyridine. It was found to have the composition $C_5H_5N.C_6H_2CH_3(NO_2)_3$ and m. pt. 40°-42°. The determinations were made in the same manner as described above. The approximate results obtained by the cooling curve method were corrected by means of accurate determinations of the saturation points of prepared mixtures. The authors' corrected values are as follows.

t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. C_5H_5N.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. C_5H_5N.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. C_5H_5N.
20..........	137	40..........	255	60..........	600
25..........	158	45..........	302	65..........	833
30..........	184	50..........	370	70..........	1250
35..........	215	55..........	462	75..........	2460

SOLUBILITY OF α OR 2, 4, 6 TRINITRO TOLUENE (TNT) IN ANILINE.

(Taylor and Rinkenbach. 1923; also quoted by Desvergnes, 1924.)

A large number of approximate determinations were made by the cooling curve method and four accurate determinations were made by the crystal growth method. These latter were used as fixed points for correcting the approximate curve. In the following table the results, showing grams per 100 grams sat. solution, were read from the authors diagram and the results showing grams per 100 grams of aniline were taken from his corrected table.

t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms.		Solid Phase.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms.		Solid Phase.
	sat. sol.	$C_6H_5NH_2$.			sat. sol.	$C_6H_5NH_2$.	
-6.0..	0.0	0.0	$C_6H_5NH_2$	75......	48.0	92.3	$C_6H_5NH_2.C_6H_2CH_3(NO_2)_3$
0...	5.0	5.0	$C_6H_5NH_2.C_6H_2CH_3(NO_2)_3$	80.....	56.0	130	»
10...	6.0	6.1	»	83.6m. pt..	68.0	–	»
20...	8.0	8.1	»	80......	80.0	–	»
25..	9.0	9.4	»	75......	86.0	595	»
30...	10.0	11.4	»	70......	89.0	807	»
40...	15.0	18.0	»	68 tr. pt..	90.0	–	»$+C_6H_2CH_3(NO_2)_3$
50...	22.0	28.7	»	70......	91.0	1043	$C_6H_2CH_3(NO_2)_3$
60...	30.0	44.5	»	75......	96.0	2074	»
70...	42.0	69.3	»	80.6....	100.0	∞	»

SOLUBILITY OF α OR 2, 4, 6 TRINITRO TOLUENE (TNT) IN SEVERAL SOLVENTS

(Taylor and Rinkenbach, 1923; also quoted by Desvergnes, 1924.)

The determinations were made as described on the previous page. The alcohol was 95.07 vol. % and $d_{15} = 0.816$. The results were plotted and the following values read from the curves.

t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. of each solvent.							
	Acetone.	Benzene.	95% C_2H_5OH.	CCl_4.	CS_2.	$CHCl_3$.	$(C_2H_5)_2O$.	Toluene.
0......	57	13	0.65	0.20	0.14	6	1.73	28
5......	66	24	0.75	0.25	0.20	8.5	2.08	32
10......	78	36	0.85	0.40	0.26	11	2.45	38
15......	92	50	1.07	0.50	0.35	15	2.85	45
20......	109	67	1.23	0.65	0.48	19	3.29	55
25......	132	88	1.48	0.82	0.63	25	3.80	67
30......	156	113	1.80	1.01	0.85	32.5	4.56	84
35......	187	144	2.27	1.32	1.13	45	–	104
40......	228	180	2.92	1.75	1.53	66	–	130
45......	279	225	3.70	2.37	2.02	101	–	163
50......	346	284	4.61	3.23	–	150	–	208
55......	449	361	6.08	4.55	–	218	–	272
60......	600	478	8.30	6.90	–	302	–	367
65......	843	665	11.40	11.40	–	442	–	525
70.....	1350	1024	15.15	17.34	–	–	–	826
75......	2678	2028	19 50	24.35	–	–	–	1685

100 gms. glycol diacetate ($CH_3CO\,O\,CH_2.CH_2\,O\,OC.CH_3$, b. pt. 188°-189°.6) dissolve 44.4 gms. $C_6H_2CH_3(NO_2)_3$ at 25°. (Taylor and Rinkenbach, 1926.)

SOLUBILITY OF TRINITRO TOLUENE IN CONCENTRATED SOLUTIONS OF SULFURIC ACID

(Hough, Savage and Van Marle, 1920.)

	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. sat. solution in						
t°.	70% H_2SO.	75% H_2SO.	80% H_2SO_4.	85% H_2SO_4.	90% H_2SO_4.	95% H_2SO_4.	100% H_2SO_4
0....	–	0.3	0.4	0.6	2.0	3.5	13.0
10....	–	0.3	0.45	0.75	2.2	4.0	13.5
20....	–	0.3	0.5	0.85	2.5	4.8	15.0
25....	–	0.32	0.55	0.95	2.6	5.2	15.5
30....	–	0.35	0.6	1.0	2.7	6.0	16.5
40....	0.2	0.4	0.65	1.3	3.0	7.0	18.0
50....	0.2	0.45	0.70	1.7	3.5	8.5	21.0
60....	0.22	0 5	1.0	2.3	5.2	11.0	24.8
70....	0.35	0.7	1.6	3.3	7.0	13.5	29.0
80....	0.6	1.3	2.4	4.8	10.0	18.0	36.5

The above approximate values were read from the authors chart.

Freezing-point data are given for mixtures of Tri nitro toluene and:

Acenaphthene(32)(10)
Amino azo benzene(14a)
Amino aceto phenone(11)(12)
Aniline(28)
Anthracene(30)(23)
Azobenzene(17)
Azoxy benzene(15)
Benzoic acid(42)
Camphor(11)
Carbazole(32)(35)
Cinnamylidene aceto phenone(11)
Diethyl diphenyl urea(15)
Dimethyl amino azobenzene (17)
Dimethyl pyrone(41)
Dinitro benzene(10)(22)((20)(21)
Dinitro toluene(3)(8)(9)(10)(13)(39)(20)(22)
Diphenyl amine(10)
Fluoranthene(40)
Hexa nitro diphenyl amine(10)
Hydroquinol dimethyl ether(16)
Naphthalene(18)(27)
Naphthol(16)
" methyl ether(16)
Nitro benzene(19)
Nitro erythritol(38)
Nitro glycerol(33)(36)
Nitro mannitol(38)
Nitro naphthalene(39)
Nitro penta mannitol(38)
Nitro toluene(1)(2)(3)(8)(9)(10)(13)(5)(7)
Oxy benzaldehyde(31)
Oxy benzoic acid(6)
Phenylene diamines(29)
Picric acid(37)
Picryl chloride(18)
Pyrene(40)
Retene(23)
Salicylic acid(6)
Styphnic acid(24)
Tetra nitro methyl aniline(10)(25)(34)
Tri nitro cresol(26)
Tri nitro glycerol(36)(33
Tri nitro phenol(11)(21)
Tri nitro phenyl methyl nitramine(14)
Tri nitro toluene(10)
Tri nitro xylene(4)(31)
Tri phenyl carbinol(28)
Fluorene(44)
Phenanthrene(44)

(1) Bell and Cordon, 1921; (2) Bell, Cordon, Spry and White, 1921; (3) Bell and Herty, Jr., 1919; (4) Bell and Sawyer, 1919; (5) Bell and Spry, 1921; (6) Crockford and Zurburg, 1930; (7) Bogoiaviensienski, 1918; (8) Giua, 1913; (9) Giua, 1914; (10) Giua, 1915; (11) Giua, 1916; (12) Giua, 1917; (13) Giua, 1920; (14) Giua, 1924; (14a) Giua, 1931; (15) Giua and Guastella, 1933; (16) Giua and Marcellino, 1920; (17) Giua and Reggiani, 1925; (18) Grimm, Gunther and Titus, 1931; (19) Hammick, Andrew and Hampson, 1932; (20) Hrynakowski, 1934; (21) Hrynakowski and Kapuscinski, 1933b; (22) Hrynakowski and Kapuscinski, 1934; (23) Jefremow, 1919; (24) Jefremow, 1919a; (25) Jefremow and Tichomirowa, 1926; (26) Jefremow and Tichomirowa, 1927; (27) Kremann, 1904, 1906; (28) Kremann, Hohl and Müller, II, 1921; (29) Kremann and Mauermann, 1923; (30) Kremann and Müller II, 1921; (31) Kremann and Pogantsch, 1923; (32) Kremann and Strzelba, 1921; (33) Kurita and Hagui, 1929; (34) Puschin and Marowitsch, 1914; (35) Rheinboldt, Henning and Kircheisen, 1925; (36) Tamburrini, 1927; (37) Taylor and Rinkenbach, 1923a; (38) Urbanski, 1933, 1934; (39) Wogrinz and Vari, 1919; (40) Shinomiya, 1940; (41) Kendall, 1914a; (42) Crockford and Hughs, 1930. (43) Kremann and Hofmeier, 1910; (44) Kremann, 1911.

Methyl**PICRIC ACID** $C_6H(CH_3)(OH)(NO_2)_3$, 1.3.2.4.6.

SOLUBILITY IN AQUEOUS SOLUTIONS AT 25°. (Kendall, 1911.)

Aq. Solvent.	Normality of Dissolved Methyl Picric Acid.	Aq. Solvent.	Normality of Dissolved Methyl Picric Acid.
Water	0.0100	0.01975 *n o* Nitrobenzoic Acid	0.0080
" +Ligroin	0.01019	0.00981 *n* Salicylic Acid	0.01063
" +Benzene	0.01059	0.01393 *n* " "	0.01072
0.00895 *n* HCl	0.00641	H_2O+Excess of Salicylic Acid	0.02613*
0.01593 *n* HCl	0.00487		
0.01013 *n* Picric Acid	0.00702		

* = normality of salicylic acid + methylpicric acid.

TRI NITRO CRESOL $(NO_2)_3C_6H(CH_3)OH$.

Freezing-point data are given for mixtures of 2.4.6 tri nitro meta cresol and:

Acenaphthene(2)
Anthracene(2)
Dinitrobenzene(2)
Fluoranthrene(6)
Fluorene(2)
Naphthalene(7)
Phenanthrene(2)
Picric acid(2)(5)
Pyrene(6)
Retene(2)
Styphnic acid(4)
Tetra nitro methyl aniline(1)(3)

(1) Jefremow and Tichomirowa, 1926; (2) Jefremow and Tichomirowa, 1927; (3) Jefremow and Tichomirowa, 1928; (4) Jefremow, 1934; (5) Quist, 1924; (6) Shinomiya, 1940; (7) Saposchinikow and Gelvich, 1903, 1904.

1.2.4.6 Trinitr**ANISOLE** $(NO_2)_3C_6H_2.OCH_3$ 1.2.4.6.

SOLUBILITY IN SEVERAL SOLVENTS.

(Desvergnes, 1924.)

Solvent.	t°.	Gms. $(NO_2)_3C_6H_2.OCH_3$ per 100 gms. solvent.	Solvent.	t°.	Gms. $(NO_2)_3C_6H_2.OCH_3$ per 100 gms. solvent.
Water	15	0.020	Benzene	15	94.98
"	50	0.137	"	50	597.90
"	100	0.389*	Chloroform	15	25.60
Ethyl acetate	15	89.44	"	50	334.50
" "	50	368.50 *	Ether (anhy.)	15	4.183
Acetone	15	194.00	"	34	7.86
"	50	813.22 *	Pyridine	15	40.35**
Ethyl alcohol (96°)	15	2.31	"	50	221.23
" "	50	17.79 *	CS_2	15	0.426
Ethyl alcohol (abs.)	15	2.37	"	36	1.11
" "	50	21.36 *	CCl_4	15	0.511
Methyl alcohol	15	5.24	"	50	3.65
" "	50	27.65 *	Toluene	15	86.49
			"	50	421.53

* Partial saponification to nitrophenol and isopicric acid occurs.

** A picrate of pyridine having the formula $C_6H_2OH(NO_2)_3.2C_5H_5N$ is formed.

Freezing-point data are given for mixtures of 2.4.6 tri nitro anisole and:

Amino acetophenone(3)
Bromo naphthylamine(5)
Dimethyl naphthylamine(4)
Diphenyl amine(5)
Fluoranthene(7)
Naphthylamine(5)
Nitraniline(3)
Pyrene(7)
Picryl sulfide(2)
Tetra nitro methyl aniline(6)
Tri nitro phenetol(1)

(1) Brady and Horton, 1925; (2) Chaumeil and Thomas, 1923; (3) Giua, 1931; (4) Hertel and van Clef, 1928; (5) Hertel and Römer, 1930; (6) Shinomiya, 1940.

Results for mixtures of Ethoxy and Benzyloxy Nitro Anisoles are given by Robinson and Smith, 1926 and Oxford and Robinson, 1926.

TETRYL (2.4.6 Tri nitro phenyl methyl nitramine or tetra nitro methyl aniline) $(NO_2)_3C_6H_2N(NO_2)CH_3$.

SOLUBILITY OF TETRYL IN WATER.

(Taylor and Rinkenbach, 1923. The determinations are quoted in full by Desvergnes, 1924.)

The sample of tetryl used was purified by recrystallizing a good commercial product. Its setting point was 128°.72.

The saturated solutions were prepared in triplicate and equilibrium was approached from above and below. Constant agitation was not employed. The mixtures were shaken frequently for several hours and then allowed to settle two hours before a sample was removed for analysis. About 30-50 grams of the saturated solution were weighed in a wagon-pipet, the solvent evaporated, and the residue weighed after drying to constant weight. The determinations were plotted and the results for regular intervals of temperature were read from the curve.

t°.	Gms. Tetryl per 100 gms. H_2O.	t°.	Gms. Tetryl per 100 gms. H_2O.	t°.	Gms. Tetryl per 100 gms. H_2O
0......	0.0050	35......	0.0094	70......	0.0535
5......	0.0058	40......	0.0110	75......	0.0663
10......	0.0065	45......	0.0140	80......	0.0810
15......	0.0072	50......	0.0195	85......	0.0980
20......	0.0075	55......	0.0270	90......	0.1220
25......	0.0080	60......	0.0350	95......	0.1518
30......	0.0085	65......	0.0440	100......	0.1842

SOLUBILITY OF TETRYL IN SEVERAL ORGANIC SOLVENTS.

(Taylor and Rinkenbach, 1923. The results are quoted in full by Desvergnes, 1924.)

The same method was employed as that used for the determinations in water

	Gms. Tetryl per 100 gms. of each Solvent.				
t°.	95 % alcohol	CCl_4.	$CHCl_3$	CS_2.	$(C_2H_5)_2O$.
0......	0.320	0.007	0.28	0.0090	0.188
5......	0.366	0.011	0.33	0.0120	0.273
10......	0.425	0.015	0.39	0.0146	0.330
15....	0.496	0.020	0.47	0.0177	0.377
20......	0.563	0.025	0.57	0.0208	0.418
25......	0.65	0.031	0.68	0.0244	0.457
30......	0.76	0.039	0.79	0.0296	0.493
35......	0.91	0.048	0.97	0.0392	
40......	1.12	0.058	1.20	0.0557	
45......	1.38	0.073	1.47	0.0940	
50......	1.72	0.095	1.78		
55......	2.13	0.124	2.23		
60......	2.64	0.154	2.65		
65......	3.33	0.193			
70......	4.23	0.241			

Freezing-point data are given for mixtures of Tetryl and:

Acenaphthene(3)
Chloro picrin(3)
Di nitro aniline(3)
Di nitro benzene(2)
Di nitro phenol(2)
Di nitro toluene(2)
Fluorene(3)
Naphthalene(3)
Nitro penta erythritol(5)
Nitro toluene(1)
Phenanthrene(3)
Picramide(3)
Picric acid(4)
Retene(3)
Tri nitro cresol(2)(3)
Tri nitro toluene(1)(2)(4)
Tri nitro xylene(3)

(1) Giua, 1914, 1915; (2) Jefremow and Tichomirowa, 1926; (3) Jefremow and Tichomirowa, 1928; (4) Taylor and Rinkenbach, 1923(a); (5) Urbanski, 1934.

DICHLORO TOLUENES $Cl_2.C_6H_3.CH_3$.

Freezing-point data for mixtures of the 2.4 and the 3.4 dichloro toluenes are given by Wahl, 1937.

BENZIMIDAZOLE $C_6H_4NHCH:N$.

Freezing-point data for mixtures of benzimidazole and pyramidon are given by Pfeiffer and Angern, 1926.

BENZALDEHYDE C_6H_5CHO.

100 gms. H_2O dissolve 0.3 gm. C_6H_5CHO at room temperature. (Flückinger, 1875; U.S.P.)

100 gms. aqueous 0.4 normal sodium oleate solution (= 10.8 gm. Na oleate per 100 gms. solution) dissolve 5.8 gms. C_6H_5CHO at 20°. (Smith, 1932.)

MUTUAL SOLUBILITY OF BENZALDEHYDE AND GLYCEROL.
(Mc Ewen, 1923.)

t° of solution.	Gms. C_6H_5CHO per 100 gms. sat. sol.	t° of solution.	Gms. C_6H_5CHO per 100 gms. sat. sol.	t° of solution.	Gms. C_6H_5CHO per 100 gms. sat. sol.
67.5	4.53	144.5	26.63	152.5	77.13
103.5	7.74	160.3*	49.22	127.5	90.10
123.5	12.42	160.7*	55.29	107.5	94.50
140.0	23.87	159.5	62.30	85.5	97.02

* = Critical opalescence.

100 gms. sat. solution of benzaldehyde in liquid ammonia contain about 82 gms. C_6H_5CHO at ? t°. (DeCarli, 1927.)

Freezing-point data are given for:

Benzaldehyde + Hydrocyanic acid (Peiker and Coffin, 1933.)
" + Nitric acid (Zukow and Kasatkin, 1909.)
" + Acetic acid anhydride (van der Beek, 1928.)
" + Tri chlor acetic acid (Kendall and Gibbons, 1915.)
" + Naphthols (Kremann and Zechner, 1925.)

o and *p* Chloro**FORMANILIDES** $Cl.C_6H_4NH.CHO$.

Freezing-point lowering data for mixtures of *o* and *p* chloroformanilide are given by King and Orton, 1911.

HydroxyBENZALDEHYDES *o*, *m* and *p* $C_6H_4OH.CHO$.

SOLUBILITY OF EACH IN WATER.

(Sidgwick and Allott, 1923.)

The determinations were made by the synthetic, sealed tube, method. The concentrations are in terms of Wt. %, that is, the grams of *o*, *m* or *p* $C_6H_4OH.CHO$ per 100 gms. sat. sol.

The points at which a second liquid phase separates are marked L. The unstable points are marked *.

Results for Ortho Hydroxybenzaldehyde.

t°.	Wt. %.
85.8...	1.68 L
136.5...	3.59 L
154.0...	5.34 L
....	....
....	....
....	....
....	....
146.3...	90.56 L
118.3...	93.20 L
67.4...	97.13 L

Results for Meta Hydroxybenzaldehyde.

t°.	Wt. %.
43.0...	2.73
57.8...	9.38
58.9...	11.0
63.5...	19.2 L
66.0...	29.2 L
66.1...	31.9 L
66.2...	40.1 L
65.6...	43.4
62.4...	53.9
60.4...	65.1
71.2...	83.3
81.1...	84.0
106.0...	100.0

Results for Para Hydroxybenzaldehyde.

t°.	Wt. %.	t°.	Wt. %.
30.5...	1.33	62.8 tr. pt.	27.4
52.0...	4.34	63.8....	42.2 L
59.2...	8.32	62.8 tr pt	46.2
61.9...	13.2	63.0....	49.8
52.8...	13.2*L	61.8....	49.8*L
62.8...	20.7	64.1....	60.0
60.5...	20.7*L	69.3....	76.6
62.8...	26.6	83.6....	88.8
62.4...	26.6*	116.0....	100.0

SOLUBILITY OF ORTHO, META AND PARA HYDROXYBENZALDEHYDES IN BENZENE.

(Sidgwick and Allott, 1923.)

The determinations were made by the synthetic, sealed tube method. Wt. % signifies the gms. of *o*, *m* or *p* C_6H_4OHCHO per 100 gms. sat. sol. In case of the results marked B benzene separates as the solid phase.

Ortho.		Meta.		Para.	
t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.
5.32..	0.0 B	61.3....	6.29	65.0. ..	3.64
3.65..	4.35 B	67.1....	10.42	81.4....	11.09
2.15..	8.23 B	71.2....	16.6	84.1....	20.0
1.00..	10.90 B	75.7....	27.1	86.7....	31.0
—0.60..	15.0 B	79.1....	40.0	89.5....	46.0
—3.35..	20.4 B	82.4....	52.5	93.5....	59.8
—5.40..	25.0 B	83.6....	59.5	100.6....	72.6
—8.20..	31.4 B	89.8....	77.2	116.0....	100.0
12.15..	39.2 B	106.0....	100.0		

Ortho Hydroxy BENZALDEHYDE (Salicylaldehyde) o $OH.C_6H_4.CHO$.

Freezing-point data are given by Kremann and Zechner, 1925 for mixtures of Salicylaldehyde and each of the following compounds: 1.2.4 Dinitro phenol, Hydroquinone, α and β Naphthols, o Nitrophenol Picric acid and Pyrogallol.

Meta Hydroxy **BENZALDEHYDE** m $OH.C_6H_4CHO$.

Freezing-point data are given for mixtures of meta hydroxy benzaldehyde and:

Benzoic acid(1)
Dinitro benzenes(1)
Dinitro phenol(1)(5)
Dinitro toluene(1)(2)
Hydroquinone(1)
Naphthols(1)
Nitro phenols(1)(5)
Phenol(1)(5)
Picric acid(1)(4)
Pyrogallol(1)
Resorcinol(1)
Salicylic acid(1)
Tri chlor acetic acid(3)
Tri nitro toluene(1)

(1) Kremann and Pogantsch, 1923; (2) Kremann and Mauermann, 1922; (3) Kendall and Gibbons, 1915; (4) Rheimboldt, Henning and Kircheisen, 1925; (5) Kremann and Zechner, 1926.

Para Hydroxy **BENZALDEHYDE** p.$OH.C_6H_4CHO$.

Freezing-point data are given for:

Para Hydroxy benzaldehyde	Dimethyl aniline	(Schmidlin and Lang, 1912.)
" " "	Phenol	" " "
" " "	Trichlor acetic acid	(Kendall and Gibbons, 1915.

BROMO NITRO TOLUENES $BrNO_2C_6H_3CH_3$.

Freezing-point data for binary mixtures of the several isomeric bromo nitro toluenes are given by Coffee, 1926 and Geerling and Wibaut, 1934.

NITRO BENZYL BROMIDE p $C_6H_5CH.NO_2.Br$.

Freezing-point data for mixtures of p nitro benzyl bromide and α benzal doxime are given by Brady and Klein, 1927.

Nitro**BENZYL CHLORIDE** *p* $C_6H_5CHNO_2.Cl$.

SOLUBILITY IN SEVERAL SOLVENTS AT 25°. (v. Halban, 1913.)

Solvent.	Gms. *p* $C_6H_5CH.NO_2Cl$ per 100 Gms. Solvent.	Sat. Sol.	Solvent.	Gms. *p* $C_6H_5CHNO_2.Cl$ per 100 Gms. Solvent.	Sat. Sol.
Methyl Alcohol	8.87	8.15	Nitrobenzene	57.8	36.4
Ethyl Alcohol	7.10	6.63	Ethylacetate	57.8	36.4
Propyl Alcohol	5.70	5.39	Ethylbenzoate	43.3	30.2
Amyl Alcohol	4.88	4.65	Ethylnitrite	51.2	33.9
Butyl Alcohol	21.5	17.7	Isoamylbromide	12.5	10.4
Acetic Acid	18.1	15.3	Brombenzene	32	24.2
Acetone	107	51.7	Chloroform	47.6	32.3
Acetophenone	63.1	38.7	Carbon Tetrachloride	6.05	5.69
Paraldehyde	24.9	19.9	Benzylchloride	45.3	31.2
Ether	23.1	18.8	α Bromnaphthaline	31.7	23.4
Acetonitrile	96.6	49.1	*n* Hexane	1.30	1.28
Nitromethane	68.8	40.8	Isopentane	0.49	0.49
o Nitrotoluene	51.1	33.8	Benzene	69.7	37.4

SOLUBILITY OF ORTHO, META, AND PARA NITROBENZYL CHLORIDES, EACH SEPARATELY IN SEVERAL SOLVENTS AT 30°.

(McCombie, Scarborough and Smith, 1927.)

Weighed amounts of the solute and solvents were sealed in small bulbs and the temperature determined at which solution was complete. Five determinations were made in each case and these were plotted and the value for 30° obtained from the curve.

Solvent	Gms. in each case per 100 gms. solvent:		
	Ortho $C_7H_6O_2ClN$	Meta $C_7H_6O_2ClN$	Para $C_7H_6O_2ClN$
Acetone	433	644	126.8
Benzene	304	—	74.2
Ethyl acetate	257	394	69.7
Nitro benzene	217	326	68.2
Ethyl benzoate	171.3	266	51.2
Ethyl alcohol	26.3	30.4	8.2

Freezing-point data are given for mixtures of :

o and m nitro benzal chloride (Holleman, 1914.)
o, m and p nitro benzal chloride (Holleman, Vermeulen and de Mooy, 1914.)

RICINOLEIC ACID $C_7H_6N_2O_2$ (m. pt. 295°).

100 gms. H_2O dissolve 0.072 gm. $C_7H_6N_2O_2$ at 18° and 0.87 gm. at 100°.
(Winterstein, Keller and Weinhagen, 1917.)

BENZOIC ACID C_6H_5COOH.

SOLUBILITY IN WATER.

(Bourgoin — Ann. chim. phys. [5] 15, 171, '78.)

t°.	Grams. C_6H_5COOH per 100 Gms. Water.	Grams. C_6H_5COOH per 100 Gms. Solution.	t°.	Grams. C_6H_5COOH per 100 Gms. Water.	Grams. C_6H_5COOH per 100 Gms. Solution.
0	0.170	0.170	40	0.555	0.551
10	0.210	0.209	50	0.775	0.768
20	0.290	0.289	60	1.155	1.142
25	0.345	0.343	80	2.715	2.643
30	0.410	0.408	100	5.875	5.549

100 grams saturated aqueous solution contain 0.25 gm. C_6H_5COOH at 15°; 0.3426 gram at 25°; 0.353 gram at 26.4°; 0.667 gram at 45°; 5.875 gms. at 100°.

(Paul, 1894; Noyes and Chapin, 1898; Greenish and Smith, 1903; Hoffman and Langbeck, 1905; Lumsden, 1905; Philip, 1905; see also Alexejew, 1886; Ost, 1878; Vaubel, 1895; Freundlich and Seal, 1912.)

SOLUBILITY OF MIXTURES OF LIQUID BENZOIC ACID AND WATER.

(Alexejew.)

Determinations by "Synthetic Method," see Note, p. 292 Figures read from curve.

t°.	Gms. C_6H_5COOH per 100 Gms. Aq. Layer.	Gms. C_6H_5COOH per 100 Gms. Benzoic Ac. Layer.	t°.	Gms. C_6H_5COOH per 100 Gms. Aq. Layer.	Gms. C_6H_5COOH per 100 Gms. Benzoic Ac. Layer.
70	6	83	100	12.0	69.0
80	7.5	79.5	110	18.0	59.0
90	8.5	76	116 (crit. temp.)	35	

SOLUBILITY OF BENZOIC ACID IN WATER.

t°	Gms. mols. C_6H_5COOH per liter.	Gms. C_6H_5COOH per liter.	Authority.
18	0.0246 (prob. high)	3.00	(von Euler and Löwenhamm, 1916.)
23.5	–	3.20	(Schilow and Lepin, 1922.)
25	0.0276	3.37	(Kendall and Andrews, 1921.)
25	0.02781	3.397	(Larsson, 1926.)
25	0.0280	3.42	(von Euler and Löwenhamm, 1916.)

Data for the solubility of benzoic acid in water (determined by the synthetic method), agreeing satisfactorily with the results of Alexejew, are given by Sidgwick and Ewbank, 1921 *a*.

SOLUBILITY OF BENZOIC ACID IN WATER.

(Ward and Cooper, 1930.)

t°	Gms. C_6H_5COOH per 100 gms. sat. sol.	Solid Phase	t°	Gms. C_6H_5COOH per 100 gms. sat. sol.	Solid Phase
24.6	0.334	C_6H_5COOH	98.6	7.190	2 liquid layers
25.15	0.3394(1)	"	109.4	11.19	" "
42.4	0.628	"	116.1	20.61	" "
57.8	1.093	"	117.2crit pt.	32.34	Homogeneous mixture
74.1	2.067	"	116.3	46.37	2 liquid layers
83.1	3.130	"	109.7	61.36	" "
88.3	3.966	"	101.1	69.01	" "
93.2	5.599	"	95.5	75.68	C_6H_5COOH
89.7	5.599	2 liquid layers	101.4	87.72	"
94.6	4.57	Inv. pt. 73.5% Acid	122.7	100.00	"
95.3	6.471	C_6H_5COOH			

(1) Gms. per 100 cc. sat. solution. (Kilpatrick and Chase, 1931.)

SOLUBILITY OF BENZOIC ACID IN WATER AND IN ETHYL ALCOHOL.

(Wright, 1927.)

Solvent	Gms. C_6H_5COOH per 100 gms. solvent at: 20°	25°	30°
Water	0.345	0.343(1)	0.42
Aq. 50 Wt. % C_2H_5OH	16.95	—	25.2
100% C_2H_5OH	52.5	—	65.8

(1) Fuhner, 1924.

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF MAGNESIUM SULFATE AT 25°.

(Randall and Failey, 1927.)

"Ionic Strength" of aq. $MgSO_4$ solution	Gm. Mols. C_6H_5COOH per liter sat. sol.	"Ionic Strength" of aq. $MgSO_4$ solution	Gm. Mols. C_6H_5COOH per liter sat. sol.
0.0	0.02793	0.2029	0.02796
0.02498	0.02828	0.4008	0.02723
0.04910	0.02837	0.7580	0.02578
0.1018	0.02818		

$C_7H_6O_2$

BENZOIC ACID

SOLUBILITY OF BENZOIC ACID AT 25° IN AQUEOUS SOLUTIONS OF:

(Kendall and Andrews, 1921.)

Hydrochloric Acid.				Nitric Acid			
Gm. mols. per liter		Gm. mols. per liter		Gm. mols. per liter		Gm. mols. per liter	
HCl.	C_6H_5COOH.	HCl	C_6H_5COOH	HNO_3	C_6H_5COOH	HNO_3	C_6H_5COOH.
0.0	0.0276	3.308	0.0153	0.0208	[illegible]	[illegible]	0.0271
0.2828	0.0254	4.410	0.0140	[illegible]	[illegible]	[illegible]	0.0272
0.6308	0.0235	5.238	0.0130	[illegible]	[illegible]	[illegible]	0.0275
1.180	0.0211	7.172	0.0114	[illegible]	[illegible]	[illegible]	0.0277
1.848	0.0185	9.522	0.0109	[illegible]	[illegible]	[illegible]	0.0284

One liter of aqueous solution simultaneously saturated with benzoic and salicylic acids at 18° contains 0.0235 gm. mols C_6H_5COOH and 0.0116 gm. mols. $C_6H_4.OH.COOH.1.2$. (von Euler and Löwenhamm, 1916.)

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF ACIDS AT 25°.

(Drucker, 1905.)

Results for aqueous solutions of:

Hydrochloric acid		Nitric acid		Sulfuric acid		Picric acid	
Gm. Equiv. per liter		Gm. Equiv. per liter		Gm. Equiv. per liter		Gm. Equiv. per liter	
HCl	C_6H_5COOH	HNO_3	C_6H_5COOH	H_2SO_4	C_6H_5COOH	$C_6H_2(OH)(NO_2)_3$	C_6H_5COOH
0.000	0.02805	0.00636	0.02709	0.00616	0.02755	0.00417	0.02675
0.00608	0.02709	0.02568	0.02635	0.02159	0.02689	0.00905	0.02679
0.02460	0.02586	0.05174	0.02631	0.03815	0.02579	0.01601	0.02819
0.04773	0.02536	0.08762	0.02625	0.1067	0.02558	0.04336	0.03174

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25°.

(Hammett and Chapman, 1934.)

Wt. % H_2SO_4 in Aq. Solvent	Gm. Mol. C_6H_5COOH per 1000 gms. Aq. Solvent	Wt. % H_2SO_4 in Aq. Solvent	Gm. Mol. C_6H_5COOH per 1000 gms. Aq. Solvent	Wt. % H_2SO_4 in Aq. Solvent	Gm. Mol. C_6H_5COOH per 1000 gms. Aq. Solvent
0.0	0.02760(= 3.36 gm.)	46.74	0.00517	70.37	0.01052
11.28	0.01610	48.72	0.00499	72.46	0.01371
19.79	0.01034	50.55	0.00500	74.59	0.01804
28.51	0.00708	52.76	0.00501	77.48	0.0593
35.82	0.00581	58.15	0.00541	81.75	0.0937
39.24	0.00530	60.83	0.00610	83.61	0.1020(1)
41.90	0.00505	64.30	0.00681	85.13	0.1258(1)
44.54	0.00496	67.38	0.00848	85.91	0.1356(1)

(1) At a concentration of sulfuric acid above 80 percent the solid phase changes from benzoic acid to a compound with sulfuric having a molecular ratio of 1:1 or higher.

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SALTS AT 25°.

(Larsson, 1928.)

Salt Solution.	Gms. mols C_6H_5COOH per liter	Salt Solution.	Gms. mols C_6H_5COOH per liter
0.01605 *n* Sodium Oxalate...	0.0370	0.025 *n* Sodium Fumarate	[illegible]
0.0321 " " " ...	0.0428	0.05 " " "	[illegible]
0.0642 " " " ...	0.0505	0.025 *n* Sodium (l) Malate	[illegible]
0.025 *n* Sodium Succinate .	0.0608	0.05 " " " . .	[illegible]
0.05 " " " ..	0.0857	0.025 *n* Sodium (d) Tartrate	[illegible]
		0.05 " " "	[illegible]

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF:

(Hoffman and Langbeck.)

Potassium Chloride at 25°.

Normality of Aq. KCl.	Gms. KCl. per Liter.	Dissolved C_6H_5COOH. Mol. Conc.	Dissolved C_6H_5COOH. Wt. per cent.
0.02	1.49	$5.0254-10^{-4}$	0.339
0.05	3.73	4.9801 “	0.333
0.20	14.92	4.7639 “	0.322
0.50	37.30	4.3632 “	0.295

Potassium Nitrate at 25°.

Normality of Aq. KNO_3	Gms. KNO_3 per Liter.	Dissolved C_6H_5COOH. Mol. Conc.	Dissolved C_6H_5COOH. Wt. per cent.
0.02	2.02	$5.0326-10^{-4}$	0.340
0.05	5.06	5.0421 “	0.341
0.20	20.24	5.0297 “	0.340
0.50	50.59	4.9400 “	0.334
1.00	101.19	4.7646 “	0.322

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF:

(Hoffmann and Langbeck.)

Sodium Chloride.

Normality of Aq. NaCl.	Gms. NaCl per Liter.	Gms. C_6H_5COOH per 100 Gms. Sol. at 25°.	Gms. C_6H_5COOH per 100 Gms. Sol. at 45°.
0.00	0.00	0.340	0.667
0.02	1.17	0.339	0.663
0.05	2.93	0.335	0.654
0.20.	11.70	0.336	0.617
0.50	29.25	0.282	0.546
1.00	58.50	...	0.449

Sodium Nitrate.

Normality of Aq. $NaNO_3$.	Gms. $NaNO_3$ per Liter.	Gms. C_6H_5COOH per 100 Gms. Sol. at 25°.	Gms. C_6H_5COOH per 100 Gms. Sol. at 45°.
0.02	1.70	0.340	0.666
0.05	8.51	0.339	0.663
0.20	17.02	0.333	0.647
0.50	42.54	0.319	0.613
1.00	85.09	0.294	...

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SALTS.

(Herz and Hiebenthal, 1929.)

Results for aqueous solutions of:

Potassium Chloride

Gm. Equiv. per liter KCl	Gm. Equiv. per liter C_6H_5COOH
0.11	0.028(= 3.4gm.)
0.22	0.028
0.48	0.025
0.79	0.023
1.57	0.017
2.13	0.013
4.12*	0.008

Potassium Bromide

Gm. Equiv. per liter KBr	Gm. Equiv. per liter C_6H_5COOH
0.00	0.028
0.20	0.028
0.35	0.027
0.66	0.025
1.18	0.022
2.09	0.018
4.68*	0.009

Sodium Chloride

Gm. Equiv. per liter NaCl	Gm. Equiv. per liter C_6H_5COOH
0.20	0.027
0.35	0.026
0.98	0.019
1.96	0.011
3.03	0.009
3.80	0.006
5.44*	0.003

Magnesium Chloride

Gm. Equiv. per liter $MgCl_2$	Gm. Equiv. per liter C_6H_5COOH
0.19	0.027
0.39	0.025
0.71	0.022
1.38	0.018
2.41	0.012
4.45*	0.05

* Solutions saturated with respect to both compounds.

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SODIUM BENZOATE AT 0.2°.

(Larsson, 1931.)

Gm. Mol. C_6H_5COONa per liter aq. solvent	Gm. Mol. C_6H_5COOH per liter sat. solution
0.010	0.01257
0.250	0.01297
0.50	0.01416
1.00	0.01744

Solubility of Benzoic Acid in Aqueous Solutions of Potassium Chloride and of Sodium Chloride with and without the Presence of Sodium Benzoate at 18°.

(Larsson, 1930.)

Composition of Aqueous Solvent in gm. mols. per liter	Gm. Mols. C_6H_5COOH per liter sat. sol.	Composition of Aqueous Solvent in gm. mols. per liter	Gm. Mols. C_6H_5COOH per liter sat. sol.
0.5 NaCl	0.01862	2.00 NaCl + 0.20 C_6H_5COONa	0.01124
1.0 "	0.01551	2.00 " + 0.30 "	0.01220
2.0 "	0.01040	2.00 " + 0.40 "	0.01320
3.0 "	0.00700	2.50 " + 0.0101 "	0.01963
0.1 KCl	0.02406	0.500 " + 0.0101 "	0.01782
0.25 "	0.02112	1.00 " + 0.0101 "	0.01453
0.50 "	0.01951	2.00 " + 0.0101 "	0.00974
1.00 "	0.01684	3.00 " + 0.0101 "	0.00655
2.00 "	0.01282	0.20 KCl + 0.0101 "	0.02099
1.00NaCl + 0.01 C_6H_5COONa	0.01450	0.25 " + 0.0101 "	0.02009
1.00 " + 0.10 "	0.01516	0.500 " + 0.0101 "	0.01859
1.00 " + 0.20 "	0.01612	0.500 " + 0.101 "	0.01916
1.00 " + 0.40 "	0.01817	1.00 " + 0.0101 "	0.01594
2.00 " + 0.01 "	0.00975	2.00 " + 0.0101 "	0.01179
2.00 " + 0.10 "	0.01019	3.00 " + 0.0101 "	0.00873

Solubility of Benzoic Acid in Aqueous Solutions of Sodium Benzoate Containing Increasing Amounts of Various Salts at 18°.

(Larsson, 1931a.)

The concentration of the sodium benzoate was 0.0101 gm. mols. per liter except in the two cases marked with an * where it was 0.10 gm. mol. per liter.

Gm. Mol. salt per liter aq. solvent	Gm. Mols. C_6H_5COOH per liter sat. sol.	Gm. Mol. salt per liter aq. solvent	Gm. Mols. C_6H_5COOH per liter sat. sol.	Gm. Mol. salt per liter aq. solvent	Gm. Mols. C_6H_5COOH per liter sat. sol.
0.250 LiCl	0.01921	0.100½($SrCl_2$)	0.02072	0.125½($Ca(NO_3)_2$)	0.02073
0.500 "	0.01744	0.200 "	0.02004	0.25 "	0.01999
1.00 "	0.01412	0.400 "	0.01869	1.50 "	0.01834
1.00 "*	0.01461	2.00 "	0.01588	0.50½($Sr(NO_3)_2$)	0.02066
0.50 RbCl	0.0195	0.250½($BaCl_2$)	0.01967	1.00 "	0.01968
1.00 "	0.0167	0.500 "	0.01821	2.00 "	0.01767
0.50 CsCl	0.0221	1.00 "	0.01757	0.20½($Ba(NO_3)_2$)	0.02134
1.00 "	0.0222	2.00 "	0.01144	0.50 "	0.02040
0.20 KBr	0.02192	3.00 "	0.00841	0.10 $NaClO_4$	0.02200
0.50 "	0.02041	0.208 $LiNO_3$	0.02036	0.20 "	0.02166
1.00 "	0.01832	0.417 "	0.02017	0.50 "	0.02070
0.20 KI	0.0216	0.833 "	0.01886	1.00 "	0.01956
0.50 "	0.0206	0.833 "*	0.01957	0.25 $CHCl_2COONa$	0.0228
1.00 "	0.0202	0.250 $NaNO_3$	0.02081	0.50 "	0.02258
0.267½($MgCl_2$)	0.02006	0.50 "	0.02017	1.00 "	0.02324
0.534 "	0.01762	1.00 "	0.01838	0.25 CCl_3COONa	0.02191
1.068 "	0.01444	2.00 "	0.01504	0.50 "	0.02247
2.14 "	0.00978	3.00 "	0.01188	1.00 "	0.02228
0.106½($CaCl_2$)	0.02072	0.25 KNO_3	0.02119	0.20 $C_6H_5(CO)_2Na$	0.02320

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SODIUM BENZOATE CONTAINING INCREASING AMOUNTS OF SODIUM AND OF POTASSIUM CHLORIDE.

(Larsson, 1931.)

The concentration of the aqueous sodium benzoate was 0.01 gm. mol. per liter in all cases.

t°	Gm. Mols. Salt per liter aq. solvent	Gm. Mol. C_6H_5COOH per liter sat. solution	t°	Gm. Mols. Salt per liter aq. solvent	Gm. Mol. C_6H_5COOH per liter sat. solution
0.2	0.0 NaCl	0.01257	0.2	0.0 KCl	0.01257
"	0.25 "	0.01134	"	0.25 "	0.01202
"	0.50 "	0.01006	"	0.50 "	0.01098
"	1.00 "	0.00838	"	1.00 "	0.00954
"	2.00 "	0.00574	"	2.00 "	0.00694
"	3.00 "	0.00368	"	3.00 "	0.00524
25.0	0.00 "	0.02718	25.0	0.0 "	0.02718
"	0.50 "	0.0220	"	0.5 "	0.02280
"	1.00 "	0.01800	"	1.0 "	0.01978
"	2.00 "	0.01215	"	2.0 "	0.01455

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SALT SOLUTIONS AT 35°.

(Goellen and Osol, 1937.)

Gm. Mol. salt per liter aq. solvent	Gm. Mol. C_6H_5COOH per liter sat. sol.	Gm. Mol. salt per liter aq. solvent	Gm. Mol. C_6H_5COOH per liter sat. sol.	Gm. Mol. salt per liter aq. solvent	Gm. Mol. C_6H_5COOH per liter sat. sol.
0.0 (= H_2O alone)	0.03873	1.0 NaBr	0.02661	0.4002 NaBr	0.03477
0.1139 LiCl	0.03578	1.5 "	0.02278	0.5022 "	0.03393
0.2068 "	0.03426	2.0 "	0.01927	1.0030 "	0.03079
0.3022 "	0.03278	0.1 KCl	0.03672	1.5020 "	0.02791
0.4016 "	0.03151	0.2 "	0.03527	2.0030 "	0.02492
0.5040 "	0.03042	0.3 "	0.03450	0.1 KI	0.03711
1.025 "	0.02460	0.4 "	0.03281	0.2 "	0.03674
1.5217 "	0.01996	0.5 "	0.03173	0.3 "	0.03624
2.0057 "	0.01635	1.0 "	0.02687	0.4 "	0.03596
0.1 NaCl	0.03595	1.5 "	0.02313	0.5 "	0.03527
0.2 "	0.03435	2.0 "	0.01979	1.0 "	0.03335
0.3 "	0.03324	0.1 KBr	0.03663	1.5 "	0.03139
0.4 "	0.03179	0.2 "	0.03560	2.0 "	0.02922
0.5 "	0.03057	0.3 "	0.03468	0.05 $BaCl_2$	0.03645
1.0 "	0.02494	0.4 "	0.03381	0.1 "	0.03489
1.5 "	0.02020	0.5 "	0.03288	0.15 "	0.03362
2.0 "	0.01644	1.0 "	0.02906	0.2 "	0.03241
0.1 NaBr	0.03594	1.5 "	0.02576	0.25 "	0.03133
0.2 "	0.03494	2.0 "	0.02271	0.5 "	0.02640
0.3 "	0.03351	0.1044 NaBr	0.03686	0.75 "	0.02231
0.4 "	0.03245	0.2051 "	0.03604	1.00 "	0.01896
0.5 "	0.03115	0.3060 "	0.03536		

BENZOIC ACID

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SALT SOLUTIONS.

(Bhagwat and Dhar, 1929.)

t°	Gm. Mol. (Equiv?) salt per liter	Gm. Mol. C_6H_5COOH per liter	t°	Gm. Mol. (Equiv?) salt per liter	Gm. Mol. C_6H_5COOH per liter
17	0.0	0.0220	25	0.00	0.03147
"	0.2536 NaH_2PO_2	0.0270	"	0.02678 KF	0.04076
"	0.4227 "	0.0300	"	0.04017 "	0.04231
"	0.5918 "	0.0320	30	0.000	0.03204
"	0.8454 "	0.0350	"	0.4764 KF	0.07442
"	0.4515 NaH_2PO_3	0.1710	"	0.7146 "	0.09680
"	0.7224 "	0.2490	"	0.9528 "	0.1168
"	0.9030 "	0.2930	"	1.191 "	0.1361
"	1.8060 "	0.4860	"	0.06531 $K_2Cr_2O_7$	0.06295
"	0.03117 Na_3VO_4	0.02350	"	0.0742 "	0.06812
"	0.06235 "	0.02450	"	0.09457 "	0.0774
"	0.09345 "	0.02600	"	0.1017 "	0.08152
"	0.1247 "	0.02825	"	0.1076 "	0.0841
18	0.0	0.0226	"	0.1155 "	0.08514
"	0.1 $Na_2B_4O_7$	0.18	"	0.1704 "	0.1145
"	0.2 "	0.38	"	0.02386 K_2MoO_4	0.04805
"	0.3 "	0.54	"	0.03284 "	0.05365
"	0.4 "	0.71	"	0.03978 "	0.05766
"	0.0025 $K_2H_2Sb_2O_7$	0.0230	"	0.06568 "	0.06967
"	0.0050 "	0.0234	"	0.07729 "	0.08038
"	0.0075 "	0.0237	"	0.0253 K_2WO_4	0.04738
"	0.010 "	0.0240	"	0.06072 "	0.06046
"	0.001375 K_2TiO_3	0.0230	"	0.08014 "	0.06646
"	0.00275 "	0.0232	"	0.09050 "	0.06935
"	0.004125 "	0.0234	"	0.09980 "	0.07207
"	0.000550 "	0.0240	"	0.1012 "	0.07287

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SALT SOLUTIONS AT 30°.

(Doosaj and Bhagwat, 1933; Bhagwat and Doosaj, 1933.)

In aqueous solutions of:

Sodium Formate		Sodium Acetate		Sodium Citrate		Sodium Salicylate	
Gms. per liter		Gms. per liter		Gms. per liter		Gms. per liter	
HCOONa	C_6H_5COOH	CH_3COONa	C_6H_5COOH	$C_3H_4OH(COONa)_3$	C_6H_5COOH	$C_6H_4OHCOONa$	C_6H_5COOH
0.0	4.033	2.232	5.75	0.0	4.033	9.422	4.174
4.054	6.399	4.464	7.48	5.376	7.509	13.909	4.252
6.086	6.964	8.928	10.00	7.927	8.794	26.553	5.029
12.172	8.404	14.510	12.33	15.134	12.41	46.681	5.759
24.477	9.838	23.761	16.17	27.746	17.29	58.417	6.634
28.636	10.920	33.661	19.56	33.295	19.21	73.021	7.213
42.954	12.297	58.036	25.92	55.492	25.02	97.361	10.17
84.018	16.348	100.982	33.61	83.238	30.20	146.042	13.73
112.024	17.885	134.643	38.64	110.984	34.08	194.722	22.03
168.036	20.325	201.964	48.17	116.475	39.38	292.084	33.72

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SODIUM BENZOATE(?) CONTAINING INCREASING AMOUNTS OF SEVERAL SALTS AT 25°.

(Osol and Kilpatrick, 1933.)

The concentration of the aqueous sodium salt (Benzoate ?) solution) was 0.01 gm. mol. per liter in all cases.

Gm. Mol. Salt. per liter aq. solvent	d. of sat. sol.	Gm. Mol. C_6H_5COOH per liter sat. sol.	Gm. Mol. Salt per liter aq. solvent	d. of sat. sol.	Gm. Mol. C_6H_5COOH per liter sat. sol.
0.2 CsCl	1.024	0.0256	0.2 p $C_6H_4CH_3OSO_2Na$	1.014	0.0305
0.5 "	1.062	0.0242	0.5 "	1.035	0.0378
1.0 "	1.124	0.0223	1.0 "	1.066	0.0620
			0.1 $C_{10}H_7OSO_2Na$	1.005	0.0313
			0.2 "	1.013	0.0385

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SODIUM BENZOATE AT 25°.

(Kolthoff and Bosch, 1932.)

Gm. mols. C_6H_5COONa per liter aq. solvent	Gm. Mols. C_6H_5COOH per liter sat. sol.	Gm. Mols. C_6H_5COONa per liter aq. solvent	Gm. Mols. C_6H_5COOH per liter sat. sol.
0.00(- H_2O alone)	0.02775	0.1	0.02757
0.01	0.02670	0.25	0.02934
0.02	0.02672	0.5	0.03398
0.03	0.02682	0.75	0.03933
0.05	0.02704	1.00	0.04623

SOLUBILITY OF BENZOIC ACID IN AQUEOUS 0.01 NORMAL SODIUM BENZOATE SOLUTIONS CONTAINING INCREASING AMOUNTS OF VARIOUS SALTS AT 25°.

(Kolthoff and Bosch, 1932.)

Normality of added salt	Normality of dissolved C_6H_5COOH	Normality of added salt	Normality of dissolved C_6H_5COOH	Normality of added salt	Normality of of dissolved C_6H_5COOH
0.0	0.02676	0.05 KNO_3	0.02658	0.061 $CaCl_2$	0.02608
0.09 KCl	0.02588	0.09 "	0.02640	0.339 "	0.02348
0.25 "	0.02456	0.25 "	0.02610	0.061 $SrCl_2$	0.02604
0.50 "	0.02166	0.50 "	0.02558	0.339 "	0.02346
1.00 "	0.01938	1.00 "	0.02432	0.06 $Ba(NO_3)_2$	0.02650
0.09 NaCl	0.02568	0.05 $NaNO_3$	0.02648	0.168 "	0.02608
0.25 "	0.02408	0.09 "	0.02634	0.333 "	0.02564
0.50 "	0.02170	0.25 "	0.02658	0.0608 $Ca(NO_3)_2$	0.02646
0.09 LiCl	0.02558	0.50 "	0.02452	0.169 "	0.02624
0.25 "	0.02395	0.05 $LiNO_3$	0.02642	0.338 "	0.02582
0.50 "	0.02160	0.09 "	0.02618	0.08 $Sr(NO_3)_2$	0.02640
0.09 KBr	0.02608	0.25 "	0.02552	0.223 "	0.02580
0.25 "	0.02562	0.50 "	0.02470	0.445 "	0.02506
0.50 "	0.02364	0.09 $NaClO_4$	0.02630	0.0597 $Mg(NO_3)_2$	0.02646
0.09 KI	0.02642	0.25 "	0.02590	0.166 "	0.02594
0.50 "	0.02528	0.50 "	0.02550	0.333 "	0.02534
0.06 K_2SO_4	0.02620	0.06 $BaCl_2$	0.02614	0.	
0.333 "	0.02412	0.50 "	0.02376		

BENZOIC ACID

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SALT SOLUTIONS AT 18°.

(Larsson, 1927.)

Gm. Mols. Salt per liter	Gm. Mols. C_6H_5COOH per liter	Gm. Mols. Salt per liter	Gm. Mols. C_6H_5COOH per liter	Gm. Mols. Salt per liter	Gm. Mols. C_6H_5COOH per liter
0.0 (= H_2O)	0.02257	0.50 HCOONa	0.0768	0.0546 $CH_2ClCOONa$	0.0283
0.5 NaCl	0.0188	1.00 "	0.0981	0.1092 "	0.0310
1.0 "	0.0158	0.05 CH_3COONa	0.0560	0.2730 "	0.0368
0.025 HCOONa	0.0310	0.10 "	0.0782	0.546 "	0.0428
0.05 "	0.0377	0.20 "	0.1121	1.092 "	0.0507
0.10 "	0.0451	0.25 "	0.1261	0.50 C_6H_5COONa	0.0268
0.25 "	0.0602	0.50 "	0.1808	1.00 "	0.0351
		1.00 "	0.2614		

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SODIUM ACETATE SOLUTIONS AT 25°.

(Larsson, 1927.)

Normality of aq. CH_3COONa	Gm. Mols. C_6H_5COOH per liter
0.00 (= H_2O)	0.0278
0.0493	0.0605
0.0985	0.0846

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SODIUM ACETATE, FORMATE, BUTYRATE, AND SALICYLATE.

(Noyes and Chapin — Z. physik. Chem. 27, 443, '98; Philip — J. Ch. Soc. 87, 992, '05.)

Grams Sodium Salt per Liter.	Grams C_6H_5COOH per Liter of Solution in:					
	CH_3COONa.		$HCOONa$.		C_3H_7COONa.	$C_6H_4OH.COONa$.
	At 25°.	At 26.4°.	At 25°.	At 26.4°.	At 26.4°.	At 26.4°.
0	3.41	3.53	3.41	3.53	3.53	3.53
1	4.65	4.75	4.25	4.35	4.50	3.62
2	5.70	5.85	4.75	4.85	5.40	3.70
3	6.70	6.90	5.20	5.30	6.15	3.80
4	7.60	7.85	5.60	5.70	6.90	3.87
6	...	...	...	...	8.40	4.00
8	...	...	...	...	...	4.10

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SODIUM MONOCHLORACETATE, SODIUM SUCCINATE AND POTASSIUM FORMATE AT 25°.

(Philip and Garner, 1909.)

In Aq. $CH_2ClCOONa$.		In Aq. $(CH_2COONa)_2$.		In Aq. HCOOK.	
Gms. per Liter Solution.		Gms. per Liter Solution.		Gms. per Liter Solution.	
$CH_2ClCOONa$.	C_6H_5COOH.	$(CH_2COONa)_2$.	C_6H_5COOH.	HCOOK.	C_6H_5COOH.
0	3.38	0	3.38	0	3.38
1.375	3.684	1.182	4.087	1.025	4.087
3.426	4.026	2.932	5.112	2.563	4.734
6.839	4.417	5.848	6.564	5.124	5.503
13.710	4.929	11.730	9.005		

The authors also obtained data for the solubility of benzoic acid in aqueous solutions of sodium acetate and sodium formate which agree closely with those quoted in the second table above.

BENZOIC ACID

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF SODIUM BENZOATE AND OF POTASSIUM BENZOATE AT 18°.

(Larsson, 1930a.)

Gm. Mols. Salt per liter	Gm. Mols. C_6H_5COOH per liter	Gm. Mols. Salt per liter	Gm. Mols. C_6H_5COOH per liter
0.00 (= H_2O)	0.02262	0.698 C_6H_5COONa	0.02946
0.01032 C_6H_5COONa	0.02185	0.930 "	0.0341
0.1032 "	0.02266	1.000 "	0.0351
0.2325 "	0.02383	0.0466 C_6H_5COOK	0.02243
0.465 "	0.02638	0.0932 "	0.02280
0.500 "	0.0268	0.233 "	0.02433

Results for the solubility of benzoic acid in saturated aqueous solutions of sodium benzene sulfonate, sodium xylene sulfonate and of sodium cymene sulfonate at various temperatures are given by Hauslick, 1935.

Results for equilibrium in the ternary system Benzoic Acid, Ortho Phthalic acid and water at various Temperatures are given by Ward and Cooper, 1930.

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF DIOXANE AT 25°.

(Herz and Lorentz, 1929.)

Vol percent Dioxane ($C_4H_8O_2$) in Aq. solvent	Gm. Equiv. C_6H_5COOH per liter sat. sol.
0.0	0.028
10.0	0.07
30.0	0.26
50.0	1.77
75.0	3.14
100.0	3.12

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF DEXTROSE.

(Hoffman and Langbeck.)

Normality of Aq. Dextrose.	Gms. $C_6H_{12}O_6$ "per Liter."	Dissolved C_6H_5COOH at 25°.		Dissolved C_6H_5COOH at 45°.	
		Mol. Conc.	Weight Per Cent.	Mol. Conc.	Weight Per Cent.
0.02	3.67	$5.0322 \cdot 10^{-4}$	0.34	$9.9088 \cdot 10^{-4}$	0.674
0.05	9.00	5.0403 "	0.34	9.9328 "	0.669
0.204	36.73	5.0303 "	0.34	9.9323 "	0.669
0.533	96.15	5.0321 "	0.34	10.0101 "	0.674
1.068	192.30	5.0443 "	0.341	10.0369 "	0.676

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF UREA AND OF THIO UREA.

(Hoffman and Langbeck.)

	Normality of Solution.	Gms. per Liter.	C_6H_5COOH Dissolved at 25°.	
			Mol. Conc.	Wt. per cent.
In Aqueous Urea	0.10	6.01 $CO(NH_2)_2$	$5.1876 \cdot 10^{-4}$	0.350
In Aqueous Thio Urea	0.20	15.23 $CS(NH_2)_2$	5.4994 "	0.372

Data for the system benzoic acid, succinic acid nitrile and water are given by Schreinemakers, 1898, and for the system benzoic acid, phenol and water by Timmermanns, 1907.

100 cc. 90% ethyl alcohol dissolve 36.1 gms. C_6H_5COOH at 15.5°. (Greenish & Smith, '03.)

100 cc. of a 1.0 *n* aqueous solution of aniline hydrochloride dissolve 0.537 gm. C_6H_5COOH at 25°. (Sidgwick, 1910.)

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(Seidell, 1908, 1910.)

Wt. % C_2H_5OH in Solvent.	Sp. Gr. of Sat. Sol.	Gms. per 100 Gms. Sat. Sol.		Wt. % C_2H_5OH in Solvent.	Sp. Gr. of Sat. Sol.	Gms. per 100 Gms. Sat. Sol.	
		C_2H_5OH.	C_6H_5COOH.			C_2H_5OH.	C_6H_5COOH.
0	1	0	0.367	60	0.943	45.72	23.80
10	0.985	9.94	0.60	70	0.940	49.21	29.70
20	0.970	19.66	1.70	80	0.934	52.8	34
30	0.959	28.83	3.90	90	0.922	57.6	36
40	0.951	36.36	9.10	100	0.908	63.1	36.9
50	0.946	41.50	17				

SOLUBILITY OF BENZOIC ACID IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.

(Halford, 1933.)

Wt. % C_2H_5OH in aq. solvent	Gms. C_6H_5COOH per 100cc sat. sol.	Wt. % C_2H_5OH in aq. solvent	Gms. C_6H_5COOH per 100cc sat. sol.
0.0	0.335	56.2	19.42
18.8	0.858	75.0	29.97
31.5	7.382	93.8	33.30

Data showing the effect of increasing amounts of several gum arabic sols upon the solubility of benzoic acid in water are given by Brintzinger and Beier, 1934.

DISTRIBUTION OF BENZOIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Chloroform.			Water and Benzene.		
Millimols. C_6H_5COOH per liter			Millimols. C_6H_5COOH per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	C_6H_6 layer (C_2).	$\frac{C_2}{C_1}$.
0.2380	0.5625	2.36	0.875	1.525	1.75
0.3025	0.732	2.42	0.925	1.95	2.11
0.396	1.054	2.66	1.300	3.35	2.57
0.599	1.84	3.07	1.725	5.50	3.19
0.675	2.125	3.15	2.80	11.90	4.25
1.137	4.55	3.96	4.00	19.75	4.93

Data showing the influence of temperature upon the distribution of benzoic acid between water and benzene are given by Wosnessensky, 1923.

DISTRIBUTION OF BENZOIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Ethyl Ether.			Water and Xylene.		
Millimols. C_6H_5COOH per liter			Millimols. C_6H_5COOH per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{(C_2)}{(C_1)}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$
0.0375	0.9125	24.30	0.737	0.678	0.92
0.065	1.625	25.00	0.794	0.819	1.03
0.095	2.385	25.15	0.842	0.865	1.03
0.1575	4.8625	30.85	1.568	2.90	1.85
0.270	8.130	30.15	4.19	17.4	4.15
0.370	13.75	37.80			

DISTRIBUTION OF BENZOIC ACID AT 25° BETWEEN:

(Smith and White, 1929.

Water and Chloroform

Gm. Mols. C_6H_5COOH per liter	
H_2O layer	$CHCl_3$ layer
0.00376	0.0354
0.00409	0.0414
0.00449	0.0475
0.00495	0.0559
0.00627	0.0845

Water and Toluene

Gm. Mols. C_6H_5COOH per liter	
H_2O layer	$C_6H_5CH_3$ layer
0.0057	0.0336
0.0072	0.0504
0.0096	0.0825
0.0120	0.1284
0.0135	0.1620

DISTRIBUTION OF BENZOIC ACID BETWEEN WATER AND BENZENE:

At 10°. (Hendrixon, 1897.) Gms. C_6H_5COOH per 100 cc.		At 20°. (Nernst, 1891.) Gms. C_6H_5COOH per 100 cc.		At 25°. (Farmer, 1903.) Gms. C_6H_5COOH per 100 cc.		At 40°. (Hendrixon, 1897.) Gms. C_6H_5COOH per 100 cc.	
H_2O. Layer.	C_6H_6 Layer.	H_2O. Layer.	C_6H_6. Layer.	H_2O Layer.	C_6H_6 Layer.	H_2O Layer.	C_6H_6 Layer.
0.0215	0.0725	0.0163	0.0535	0.2002 (0.1885*)	3.335	0.0238	0.0714
0.0412	0.2363	0.0244	0.099	0.2012 (0.1891*)	3.329	0.0404	0.1637
0.0562	0.4422	0.0452	0.273	0.2020 (0.1902*)	3.319	0.0837	0.5740
0.0890	1.0889	0.0788	0.737			0.1155	1.0269
0.1215	2.0272	0.1500	2.42			0.1715	2.1420
0.1409	2.7426	0.2890	9.70			0.2313	3.9167

* = unionized.

DISTRIBUTION OF BENZOIC ACID BETWEEN BENZENE AND AQUEOUS POTASSIUM BENZOATE SOLUTIONS AT 25°.

(Farmer, 1903.)

Gms. Mols. C_6H_5COOK per Liter Aq. Sol.	Gm. Mols. C_6H_5COOH per Liter.		Gms. C_6H_5COOK per Liter Aq. Sol.	Gms. C_6H_5COOH per liter.	
	Aq. Layer.	C_6H_6 Layer.		Aq. Layer.	C_6H_6 Layer.
0.0093	0.01587	0.2776	1.341	1.937	33.88
0.028	0.01597	0.2768	4.035	1.950	33.79
0.047	0.01603	0.2762	6.774	1.956	33.71

DISTRIBUTION OF BENZOIC ACID BETWEEN:

Water and Chloroform. (Hendrixon, 1897.) Water and CCl_4. (Seidell, 1910a.)

At 10° Gms. C_6H_5COOH per 100 cc.		At 40°. Gms. C_6H_5COOH per 100 cc.		At 25°. Gms. C_6H_5COOH per 100 cc.	
H_2O Layer.	C_6H_6 Layer.	H_2O Layer.	C_6H_6 Layer.	H_2O Layer.	CCl_4 Layer.
0.0208	0.0915	0.0258	0.0880	0.134	0.830
0.0269	0.1518	0.0432	0.2059	0.291	4.41
0.0327	0.2170	0.0885	0.6961		
0.1057	2.0930	0.1553	2.0435		

The coefficient of distribution of benzoic acid between olive oil and water at 25° is given by Boeseken and Waterman (1911) as 12.6.

DISTRIBUTION OF BENZOIC ACID AT 19° BETWEEN : (Schilow and Lepin, 1922.)

Water and Benzine. Gms. C_6H_5COOH per 100 cc.		Water and Benzene. Gms. C_6H_5COOH per 100 cc.		Water and Toluene. Gms. C_6H_5COOH per 100 cc.		Water and Xylene. Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	Benzine layer.	H_2O layer.	C_6H_6 layer.	H_2O layer.	$C_6H_5CH_3$ layer.	H_2O layer.	$C_6H_4(CH_3)_2$ layer.
0.0568	0.0376	0.0718	0.538	0.0844	0.658	0.1115	1.043
0.1015	0.0996	0.1078	1.146	0.1283	1.490	0.1720	2.300
0.1628	0.254	0.1560	2.285	0.1580	2.488	0.2240	4.425
0.237	0.568	0.2260	4.84	0.1840	4.019	0.2845	6.170*
0.329	0.998*	0.329	9.70*	0.2040	4.230		
				0.2720	6.490*		

Water and Anisol. Gms. C_6H_5COOH per 100 cc.		Water and Amyl Ether. Gms. C_6H_5COOH per 100 cc.		Water and Ethyl Ether. Gms. C_6H_5COOH per 100 cc.		Water and Phenetol. Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	$C_6H_5.OCH_3$ layer.	H_2O layer.	$(C_5H_{11})_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$C_6H_5.OC_2H_5$ layer.
0.0627	0.942	0.0634	0.717	0.0760	5.48	0.1064	1.[illegible]
0.1020	1.965	0.119	1.508	0.158	11.[illegible]	0.1744	4.51
0.1495	3.520	0.179	2.390	0.190	13.[illegible]	0.3110	9.49*
0.2330	7.600	0.341	5.17	0.268	[illegible]		
0.2870	11.15*			0.400	15.40*		

* = Solid C_6H_5COOH present.

DISTRIBUTION OF BENZOIC ACID AT 25° BETWEEN WATER AND ISO BUTYL ALCOHOL.

(de Kolossowsky and Bekturow, 1934; de Kolossowsky, Bulikow and Bekturow, 1936.)

Gm. Mols. C_6H_5COOH per liter H_2O layer(1)	Gm. Mols. C_6H_5COOH per liter Alcohol layer(2)	$\frac{1}{2}$	Gm. Mols. C_6H_5COOH per liter H_2O layer(1)	Gm. Mols. C_6H_5COOH per liter Alcohol layer(2)	$\frac{1}{2}$
0.00871	0.01989	0.438	0.0181	0.0763	0.237
0.00919	0.02250	0.408	0.0217	0.1235	0.170
0.0121	0.0351	0.345	0.0225	0.1505	0.150
0.0142	0.0446	0.318	0.0272	0.1929	0.141
0.0149	0.0525	0.284			

DISTRIBUTION OF BENZOIC ACID BETWEEN WATER AND BENZENE AND BETWEEN AQUEOUS 3.0 NORMAL SALT SOLUTIONS AND BENZENE AT 25°.

(Herz and Stanner, 1927.)

Aq. 3.0n Solution of:	Gm. Mols. C_6H_5COOH per liter Aq. layer	Gm. Mols. C_6H_5COOH per liter C_6H_6 layer	Aq. 3.0n Solution of:	Gm. Mols. C_6H_5COOH per liter Aq. layer	Gm. Mols. C_6H_5COOH per liter C_6H_6 layer
H_2O alone	0.0078	0.0784	NaBr	0.0045	0.1112
"	0.0147	0.2265	"	0.0058	0.2202
"	0.0186	0.3696	"	0.0073	0.3328
"	0.0268	0.7059	NaCl	0.0044	0.1128
KBr	0.0054	0.1075	"	0.0056	0.3463
"	0.0075	0.2269	"	0.0074	0.5863
"	0.0081	0.3313	NaI	0.0067	0.1111
KCl	0.0043	0.1132	"	0.0082	0.1731
"	0.0055	0.2247	"	0.0097	0.2276
"	0.0068	0.3378	$BaCl_2$	0.0045	0.1119
KI	0.0075	0.1146	"	0.0057	0.2216
"	0.0093	0.1724	"	0.0069	0.3358
"	0.0105	0.2709	$SrCl_2$	0.0041	0.1112
LiCl	0.0040	0.1129	"	0.0055	0.2236
"	0.0078	0.5612	"		

DISTRIBUTION OF BENZOIC ACID BETWEEN WATER AND PETROLEUM ETHER.

(Grossfield and Miermeister, 1931.)

cc 0.002 normal NaOH required for C_6H_5COOH per 25 cc of: H_2O layer (1)	Pet. Ether layer (2)	$\frac{1}{2}$
45.0	18.9	2.38
87.1	67.7	1.29
110.1	109.8	1.00
142.0	174.5	0.81

SOLUBILITY OF BENZOIC ACID IN 90% ALCOHOL, IN ETHER AND IN CHLOROFORM.

(Bourgoin.)

Solvent.	t°.	Gms. C_6H_5COOH per 100 Grams. Solvent.	Solution.
90% Alcohol	15	41.62	29.39
Ether	15	31.35	23.86
Chloroform	25	14.30	12.50

SOLUBILITY OF BENZOIC ACID IN SEVERAL ALCOHOLS. (Timofeiew, 1894.)

Alcohol.	t°.	Gms. C_6H_5COOH per 100 Gms. Sat. Sol.	Solvent.	Alcohol.	t°.	Gms. C_6H_5COOH per 100 Gms. Sat. Sol.	Solvent.
Methyl	−18	23.1	30	Propyl	−18	14.5	16.9
"	−13	24.3	32.1	"	−13	15.7	18.5
"	+ 3	33.5	50.4	"	+ 3	23.1	30
"	19.2	40.1	67.1	"	19.2	28.2	39.3
"	23	41.7	71.5	"	23	29.8	42.3
Ethyl	−18	20.3	25.4	Isopropyl	21.2	32.7	48.5
"	−13	21.2	26.9	Allyl	21.2	25.1	33.4
"	+ 3	28.8	40.4	Isobutyl	0	15.3	18
"	19.2	34.4	52.4	Isoamyl	18	20.2	25.4
"	23	35.9	55.9	Capryllic	21.2	22.7	28.7
				Ethyleneglycol	18	8	8.69

Additional data, agreeing closely with the above, are given by Timofeiew (1891) and Bourgoin (1878).

SOLUBILITY OF BENZOIC ACID IN ORGANIC SOLVENTS.

Solvent.	t°.	Gms. C_6H_5COOH per 100 cc. Sat. Sol.	Solvent.	t°.	d_{25} of Sat. Solution.	Gms. C_6H_5COOH per 100 Gms. Sat. Sol.
Aq. 75% Acetic Acid	14–16	10.92 (1)	Amyl Alcohol	25	0.875	32.37 (6)
Benzene	14–16	7.04 (1)	Amyl Acetate	25	0.912	22 (6)
Carbon Disulfide	14–16	4.24 (1)	Alcohol (Abs.)	25	0.908	58.40 (6)
Carbon Tetrachloride	14–16	4.50 (1)	Benzene	25	0.897	12.23 (6)
"	25	6.70 (2)	Chloroform	25	1.456	15.14 (6)
"	26	6.58 (3)	Carbon Tetrachloride	25	1.564	4.18 (6)
Chloroform	25	18.03 (2)	Carbon Disulfide	25	1.282	4.82 (6)
Ethyl Ether	14–16	39.80 (1)	Cumene	25	0.906	8.59 (6)
Glycerol	15–16	9.07*(4)	Ethyl Ether (Abs.)	25	. . .	46.74 (6)
Ligroin	14–16	0.72 (1)	Ligroin	25	0.720	1.75 (6)
Petroleum Ether †	26	0.98 (3)	Naphtha	25	0.730	2:65 (6)
Pentachlor Ethane	25	10.92 (2)	Nitrobenzene	25	1.225	10.05 (6)
Tetrachlor Ethane	25	15.17 (2)	Toluene	25	0.884	10.69 (6)
Tetrachlor Ethylene	25	8.06 (2)	Spts. Turpentine	25	0.859	5.09 (6)
Trichlor Ethylene	25	13.62 (2)	Water	25	1	0.368(6)
"	15	6.44*(5)	Xylene	25	0.877	9.71 (6)
Dichlor Ethylene	15	9.67*(5)				

* = Gms. C_6H_5COOH per 100 gms. sat. sol. † (B. pt. 30–70.)

(1) Bornwater and Holleman (1912); (2) Herz and Rathmann (1913); (3) de Jong (1909); (4) Ossendowski (1907); (5) Wester and Bruins (1914); (6) Seidell (1910).

One liter sat. sol. of benzoic acid in ethyl acetate contains 8 gms. at −6.5°, 37.7 gms. at 21.5° and 95.7 gms. at 75°. (Lloyd, 1918.)

One liter sat. solution of benzoic acid in benzene contain 77.6 gms.

SOLUBILITY OF BENZOIC ACID IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. C_6H_5COOH per 100 gms. solvent.	Authority.
Benzene sat. with H_2O	25	12.2	(de Szyszkowski, 1914-1915.)
Chloroform sat. with H_2O	25	15.6	"
Carbon tetrachloride sat. with H_2O	25	4.3	"
Benzine	23.3	1.4	(Schilow and Lepin, 1922.)
Ethyl ether	23.5	[illegible]	"
p Cymene (b. pt. 176°-176.5)	25	6.5	(Wheeler, 1920.)
Glycerol 86.5 % (d_{20} = 1.2326)	20	1.4	(Holm, 1921-1922.)
" 98.5 % (d_{20} = 1.2645)	20	2.2	"
Olive oil	25	3.96	(Verbeke, 1921.)
Cotton seed oil	25	4.22	"
Peanut oil I	25	4.78	"
" " II	25	4.98	"
Cocoanut oil	25	4.98	"
Linseed oil	25	4.47	"
Castor oil	25	14.20	"

SOLUBILITY OF BENZOIC ACID IN SEVERAL SOLVENTS. (Mortimer, 1923.)

t°.	Mols. C_6H_5COOH per 100 mols. of saturated solution in Acetone.	Acetophenone.	Phenol.	Nitrobenzene.	Toluene.	Carbon tetrachloride.
0	15.8	8.4		5.4	3.2	1.7
20	20.5	14.4		9.2	5.8	4.2
40	26.9	23.6	16.9	16.4	13.6	9.4
60	36.2	35.9	28.2	27.6	23.4	20.0
80		51.6	44.2	44.4	40.0	
100		71.6	67.0	66.0	64.6	

SOLUBILITY OF BENZOIC ACID IN BENZENE AND IN TOLUENE. (Chipman, 1924.)

An air jacketed test tube, provided with a stirrer and a thermometer, was used. Weighed amounts of benzoic acid and benzene were introduced and the mixture heated untill entirely homogeneous. It was then cooled with rapid stirring untill a cloud of minute crystals formed, and then warmed slowly with constant stirring untill the cloud of crystals disappeared. The results were plotted and the following values read from the smooth curve.

Results for Benzene.

t°.	Gms. C_6H_5COOH per 100 gms. sat. sol.
4.3 (Euler)	5.1
10.0	6.1
20.0	8.95
25.0	10.85
30.0	13.0
40.0	18.4
50.0	25.3
60	34.1
70	44.5
80	55.6
90	67.3
100	78.3
110	88.9
121.7	100.0

Results for Toluene.

t°.	Gms. C_6H_5COOH per 100 gms. sat. sol.
0.0	4.11
10.0	5.6
20.0	8.0
25	9.6
30	11.5
40	16.1
50	22.4
60	30.1
70	39.7
80	50.7
90	62.8
100	75.1
110	86.8
121.7	100.0

A series of results for the solubility of benzoic acid in benzene, agreeing satisfactorily with the above, is given by Sidgwick and Ewbank, 1921 a. Individual determinations by von Euler and Löwenhamm, and by de Szyszkowski, 1913-1915,

BENZOIC ACID

SOLUBILITY OF BENZOIC ACID IN SEVERAL SOLVENTS.

(Chapas, 1930.)

t°	Gm. Mol. C_6H_5COOH per 100 gm. mol. sat. solution in:				
	Chloro Benzene C_6H_5Cl	Toluene $C_6H_5CH_3$	o Chloro Toluene o $ClC_6H_4CH_3$	p Chloro Toluene p $ClC_6H_4CH_3$	Benzyl Chloride $C_6H_5CH_2Cl$
0	3.42	2.87	3.45	—	—
14.2	5.83	4.79 (13°)	5.89	5.41 (12.5°)	5.39 (17.4°)
25.0	—	7.61	—	—	—
31.8	11.12	9.67	11.05	10:92	—

SOLUBILITY OF BENZOIC ACID IN SEVERAL SOLVENTS AT 28°.

(Desai and Patel, 1935.)

Solvent	Gm. Mols. C_6H_5COOH per 100 gm. mol. sat. sol.	Solvent	Gm. Mols. C_6H_5COOH per 100 gm. mols. sat. sol.
Water	0.0005685	Nitrobenzene	0.1081
Hexane	0.01399	Chloroform	0.1495
CCl_4	0.0593	Methyl alcohol	0.1689
Benzene	0.08191	Ethyl alcohol	0.1882
Toluene	0.08553	n Propyl alcohol	0.1810
m Xylene	0.0889	n Butyl alcohol	0.1968
Chloro benzene	0.1047	Acetone	0.2141

Results for the solubility of Benzoic Acid in binary mixtures of the above solvents are given in the form of a series of diagrams by Desai and Patel, 1935a.

SOLUBILITY OF BENZOIC ACID IN SEVERAL SOLVENTS IN THE DRY STATE AND SATURATED WITH WATER AT 25°.

(v. Szyszkowski, 1928.)

Solvent	Gm. Mols. C_6H_5COOH per 1000 gms. sat. solution in:	
	Dry Solvent	H_2O saturated solvent
Ethyl Ether	1.538 (186.1)	2.771 (335.4)
Chloroform	1.079 (130.6)	1.108 (134.1)
Carbon tetra chloride	0.3287 (39.77)	0.3370 (40.78)
Benzene	0.8946 (108.2)	0.9222 (111.6)

The figures in parentheses are calculated in grams C_6H_5COOH per 1000 gms. sat. solution.

A method for the determination of the solubility of benzoic acid and other compounds in rubber is described by Morris, 1932.

SOLUBILITY OF BENZOIC ACID IN MIXTURES OF ORGANIC SOLVENTS AT 25°.

(Marden and Dover, 1916.)

Mixtures of Ether + Chloroform.		Mixtures of Acetone + Benzene.		Mixtures of Ethyl Acetate + Benzene.	
% $CHCl_3$* in Solvent.	Gms. C_6H_5COOH per 100 Gms. Solvent.	% C_6H_6 in Solvent.	Gms. C_6H_5COOH per 100 Gms. Solvent.	% C_6H_6 in Solvent.	Gms. C_6H_5COOH per 100 Gms. Solvent.
100	38.4	100	11.6	100	11.6
90	34	90	18.3	90	14
80	30.1	80	24.1	80	16.5
70	26.6	70	31	70	20
60	23.2	60	33.5	60	20.4
50	20.8	50	37	50	22
40	18.6	40	42.2	40	23.9
30	16.8	30	47	30	26.5
20	15.6	20	49	20	29
10	15.2	10	51.3	10	28.2
0	15.0	0	55.0	0	41.2

* This is probably a mistake in the original and should be %$(C_2H_5)_2O$ in Solvent.

SOLUBILITY OF BENZOIC ACID AT 25° IN MIXTURES OF:

(Herz and Levi. 1930.)

Benzene and Heptane		Carbon Tetra Chloride and Heptan	
Vol. % C_6H_6 in $C_6H_6 + C_7H_{16}$ mixture	Gm. Mols. C_6H_5COOH per liter sat. sol.	Wt. % CCl_4 in $CCl_4 + C_7H_{16}$ mixture	Gm. Mols. C_6H_5COOH per liter sat. sol.
100	0.803	100	0.521
80	0.648	80	0.402
60	0.489	60	0.295
40	0.344	40	0.216
20	0.197	20	0.146
0	0.099	0	0.099

100 gms. sat. solution of Benzoic Acid in liquid ammonia contain 46 gms. C_6H_5COOH at (?) t°. (DeCarli, 1927.)

Data for the reciprocal solubility of benzoic acid and sulfur are given by Hammick and Holt, 1927.

The critical solution temperature of mixtures of benzoic acid and α Chloro naphthalene is 95.5°.

The critical solution temperature of mixtures of benzoic acid and diphenyl is 87.5°. (Lecat, 1929.)

CHLORO NITRO TOLUENES $CH_3C_6H_3ClNO_2$.

Freezing-point data for binary mixtures of the isomeric chloro nitro toluenes are given by Wibaut, 1913; Holleman and Vander Arend, 1909.

NITRO BENZYL CHLORIDE o $C_6H_4(NO_2)CH_2Cl$.

Freezing-point data for mixtures of o nitro benzyl chloride and benzen are given by Schmidlin and Lang, 1912.

BENZOIC ACID

Freezing-point data are given for mixtures of Benzoic Acid and:

Acetanilide(9)(29)
Acetamide(14)
Acetic acid(13)
Aniline(1)(16)
Antipyrine(17)(8)
Azobenzene(18)
Benzamide(14)
Benzanilide(29)
Benzene(5)(28)
Benzil(30)
Camphor(11)(12)
Chlor acetic acid(13)
Chloro benzoic acids. (3)(26)
p Cresol(7)
Di-anisal acetone(23)
Di chlor acetic acid(13)
Di nitro toluene(6)
Di phenyl amine (1a)
Erythritol(24)
Ethyl urethan(29)
Iodo benzoic acid(19)
Naphthalene(4)
Naphthol(2)
Naphthylamines(1a)(16)(21)
Nitro benzoic aldehyde(30)
p Nitro toluene(6)
m Oxybenzaldehyde(15)
Phenacetine(31)
Phenol(20)
Phenylene diamines(24) (16)(29)
o Phthalic acid(25)
Piperonal(30)
Resorcinol(9a)(27)(29)
Salicylic acid + Antipyrine(8)
Quinoline (1a)
Sarcosine anhydride(10)
Toluene(5) (229
p Toluidine(16)
Tri chlor acetic acid(13)
Tri nitro toluene(6)
Urea(16)(27)

(1) Baskov, 1913; (1a) Baskov, 1918; (2) Bartholemew and Wark, 1926; (3) Bornwater and Holleman, 1912; (4) Bernouilli and Sarasin, 1930; (5) Chipman, 1918; (6) Crockford and Hughes, 1930; (7) Da Silva, 1934; (8) Hrynakowski, 1934; (9) Hrynakowski and Adamanis, 1933(a); (9a) Hrynakowski and Adamanis 1933b; (10) Hammick and Howard, 1932; (11) Jefremow, 1913, 1915; (12) Jouniaux, 1912; (13) Kendall, 1914; (14) Kremann, Mauerman and Ostwald, 1923; (15) Kremann and Pogantsch, 1923; (16) Kremann, Weber and Zechner, 1925; (17) Kremann and Marktl, 1920; (18) Kremann and Zechner, 1925; (19) Lettre and Lehmann, 1938; (20) Moerman, 1933; (21) Milone and Rossingnolli, 1932; (22) Pfeiffer, Angern, Wang, Seydel and Quehl, 1930; (23) Pfeiffer, Goebel and Angern, 1925; (24) Puschin and Dezelic, 1938; (25) Ward and Cooper, 1930; (26) Hope and Riley, 1922; (27) Hrynakowski and Szmyt, 1935b; (28) Roloff, 1895; (29 Puschin and Wilowitsch, 1925; (30) Passerini, 1924; (31) Kitran, 1924.

SALICYLIC ACID $C_6H_4.OH.COOH$ 1:2.

SOLUBILITY IN WATER.

(Average curve from the closely agreeing determinations of Walker and Wood, 1898; at 26.4°, Philip, 1905; at 25°, Paul, 1894; at 20°, Hoitsema, 1898a; Hoffman and Langbeck, 1905. For determinations not in good agreement with the following, see Alexejew, 1886; Bourgoin, 1878; Ost., 1878.)

t°.	Gms. $C_6H_4.OH.COOH$ per Liter Solution.	t°.	Gms. $C_6H_4.OH.COOH$ per Liter Solution.	t°.	Gms. $C_6H_4.OH.COOH$ per Liter Solution.
0	0.8	25	2.2	60	8.2
10	1.2	30	2.7	70	13.2
20	1.8	40	3.7	80	20.5
		50	5.4		

SOLUBILITY OF SALICYLIC ACID IN WATER.

(Savorro, 1914.)

t°.	Gms. $C_6H_4.OH.COOH$ per 1000 Gms. Sat. Sol.	t°.	Gms. $C_6H_4.OH.COOH$ per 1000 Gms. Sat. Sol.	t°.	Gms. $C_6H_4.OH.COOH$ per 1000 Gms. Sat. Sol.
0	1.24	35	3.51	70	13.70
5	1.29	40	4.16	75	17.55
10	1.35	45	4.89	80	22.08
15	1.84	50	6.38	85	27.92

SOLUBILITY OF SALICYLIC ACID (LIQUID) IN WATER.

Determinations by Synthetic Method. (See Note, p. [illegible].) The original data in each case were plotted and the following figures read from the curves.

t°.	(Alexejew.) Gms. $C_6H_4OHCOOH$ per 100 Gms.		t°.	(Flaschner and Rankin, 1910.) Gms. $C_6H_4OHCOOH$ per 100 Gms.	
	Aqueous Layer	Salicylic Acid Layer		Aqueous Layer	Salicylic Acid Layer.
60	7	68	60	4.5	68
70	8	64	70	6.5	62.5
80	12	58	80	10	54
90	19	49	85	15	46
95 crit. temp.	32		87 crit. temp.	30	

Data for the melting-point curve of mixtures of solid salicylic acid and water are also given by Flaschner and Rankin.

EQUILIBRIUM IN THE SYSTEM SALICYLIC ACID AND WATER. (Bailey, 1925.)

The author obtained the following results which agree with those of Walker and Wood, 1898, up to 30° and are slightly higher, above this temperature. He points out that the determinations of Savorro, 1914, are probably too high. His values for the metastable region differ slightly from those of Flaschner and Rankin, 1910.

t°.	Gms. $C_6H_4OHCOOH$ per 100 gms. sat. sol.
10	0.111
20	0.183
30	0.261
40	0.391
50	0.593
60	0.861

Results for the Metastable Region.

t°.	Gms. $C_6H_4OHCOOH$ per 100 gms.	
	H_2O layer.	Salicylic acid layer.
60	4.4	69.6
70	6.3	64.6
80	9.8	55.4
85	15.0	46.0
88	20.0	40.0

One liter of sat. solution of salicylic acid in water contains [illegible] gms., in 0.1 molar H_3BO_3 solution, 2.42 gms. and in 0.5 molar H_3BO_3 solution, 3.31 gms. OHC_6H_4COOH at 18°.

(Kolthoff, 1926.)

More recent determinations of the solubility of salicylic acid in water are as follows;

t°	Gms. o OHC_6H_4COOH per liter sat. sol.	t°	Gms. o OHC_6H_4COOH per liter sat. sol.
0	0.89 - 0.95* (2)(3)	25	2.44 (5)
14.5	1.667 (1)	25	2.26 (8)
18	1.72 (4)	25	2.478 (1)
20	2.2* (9)	30	2.743 (1)
25	2.21 - 2.26* (2)(3)	30	3.1* (9)
25	2.21 (6)	40	3.93* (3)
25	2.20 (7)	50	5.77* (3)
		75	6.78* (3)

* per 1000 gms. H_2O.

(1) Doosay and Bhagwat, 1933; (2) Cohen and Goedhart, 1931; (3) Cohen and Thonessen, 1932; (4) Kolthoff, 1927; (5) Herz and Hiebenthal, 1929; (6) Larsson, 1927; (7) Osol and Kilpatrick, 1933a; (8) Réyer, 1923; (9) Wright, 1927.

SALICYLIC ACID

SOLUBILITY OF SALICYLIC ACID IN WATER.

(Sidgwick and Ewbank, 1921a.)

The determinations were made by the synthetic method.

t° of solid - liquid equilibrium	Gms. o OH.C_6H_4COOH per 100 gms. sat. solution	t° of solid - liquid equilibrium	Gms. o OHC_6H_4.COOH per 100 gms. sat. solution
50	0.557	106.7(89.1)	34.02
56	0.717	107.2(86.4)	48.18
80	2.026	109.5(67.0)	65.4
97.9	5.27	119.5	80.0
101.4(77.3)	8.02	131.8	89.75
105.6(87.2)	16.82	159.0(m.pt.)	100.00

The figures in parentheses are points on the liquid-liquid curve. The critical solution point of this curve is at approximately 90° and 30 wt. percent salicylic acid.

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF ACIDS AT 25°.

(Kendall, 1911.)

Acid.	Gms. per Liter.			Acid.	Gms. per Liter.		
	Acid.		C_6H_4OH-COOH.		Acid.		C_6H_4OH-COOH.
Water alone	0		2.257	Formic Acid	230.15	HCOOH	2.370
Acetic Acid	37.52	CH_3COOH	2.335	"	460.30	"	2.901
"	75.05	"	2.409	Hydrochloric Acid	0.653	HCl	1.781
"	150.10	"	2.549	"	1.302	"	1.710
"	300.20	"	2.850	"	4.558	"	1.677
Formic Acid	2.38	HCOOH	2.114	"	9.117	"	1.649
"	4.59	"	2.035	"	18.235	"	1.551
"	11.05	"	2.114	Malonic Acid	3.253	$CH_2(COOH)_2$	2.051
"	21.17	"	2.035	"	10.49	"	1.944
"	28.76	"	2.049	"	20.84	"	1.880
"	57.53	"	2.066	Methyl Picric Acid	2.28	$C_7H_5O_7N_3$	2.115
"	115.07	"	2.121				

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.

Results of Knox and Richards, 1919.				Results of Kendall and Andrews, 1921.			
Equiv. normality		Equiv. normality		Equiv. normality		Equiv. normality	
HCl.	C_6H_4OHCOOH.	HCl.	C_6H_4OHCOOH.	HCl.	C_6H_4OHCOOH.	HCl.	C_6H_4OHCOOH.
0.000	0.01613	7.311	0.00656	0.000	0.0162	3.308	0.00777
1.459	0.00982	8.738	0.00666	0.500	0.0112	4.410	0.00732
3.057	0.00822	10.20	0.00710	1.180	0.0101	7.172	0.00692
4.374	0.00715	11.50	0.00794	1.848	0.00912	9.522	0.00721
6.164	0.00654	12.20	0.00856	2.498	0.00834	11.73	0.00768

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF NITRIC ACID AT 25°.

(Kendall and Andrews, 1921.)

Normality of HNO_3.	Normality of C_6H_4OHCOOH.
0.0109	0.0149
0.0420	0.0140
0.0807	0.0139

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SALT SOLUTIONS AT 25° AND AT 35°. (Hoffman and Langbeck, 1905)

Salt.	Normality of Salt Solution.	Gms. Salt per Liter.	$C_6H_4OH\cdot COOH$ Dissolved at 25°. Gms. per 1000 Gms. Sat. Sol.	Gm. Mol. Per cent.	$C_6H_4OH\cdot COOH$ Dissolved at 35°. Gms. per 1000 Gms. Sat. Sol.	Gm. Mol. Per cent.
KCl	0.020	1.49	2.24	$2.0216 \cdot 10^{-4}$	3.23	$4.2206 \cdot 10^{-4}$
"	0.100	7.46	2.25	2.0377 "	3.23	4.2203 "
"	0.492	36.73	2.02	2.0321 "	3.01	3.9268 "
"	1.004	74.92	1.89	2.4759 "	2.68	3.5003 "
KNO_3	0.020	2.02	2.25	3.0351 "	3.25	4.2490 "
"	0.100	10.12	2.30	3.0103 "	3.32	4.3334 "
"	0.504	51.10	2.38	3.1061 "	3.38	4.4123 "
"	1.004	101.60	2.39	3.1249 "	3.36	4.3848 "
NaCl	0.020	1.16	2.23	2.9110 "	3.22	4.2062 "
"	0.100	5.95	2.22	2.9027 "	3.20	4.1806 "
"	0.407	29.50	2	2.6128 "	2.85	3.7171 "
"	0.988	58.80	1.72	2.2487 "	2.43	3.1596 "

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SALT SOLUTIONS AT 25°.

(Herz and Hiebenthal, 1929.)

Gms. per liter KCl	Gms. per liter OHC_6H_4COOH	Gms. per liter KCl	Gms. per liter OHC_6H_4COOH	Gms. per liter NaCl	Gms. per liter OHC_6H_4COOH	Gms. per liter NaCl	Gms. per liter OHC_6H_4COOH
11	21.9	157	14.8	0.0	22.4	117	12.1
25	21.8	230	11.7	29	20.2	184	7.7
47	20.8	319*	8.4	71	15.9	319*	3.5
75	18.8						

* An excess of salt was present.

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF SODIUM SALICYLATE(?) CONTAINING INCREASING AMOUNTS OF SEVERAL SALTS AT 25°.

([illegible] and Kilpatrick, [illegible].)

The concentration of the aqueous sodium salt (Salicylate?) solution was 0.01 gm. mol. per liter in all cases.

Gm. Mol. added salt per liter	d. of sat. sol.	Gm. Mol. OHC_6H_4COOH per liter sat. sol.	Gm. Mol. added salt per liter	d. of sat. sol.	Gm. Mol. OHC_6H_4COOH per liter sat. sol.
0.2 KCl	1.008	0.01353	0.474 $NaClO_4$	1.034	0.01400
0.5 "	1.021	0.01252	0.500 "	1.038	0.01396
1.0 "	1.042	0.01096	1.00 "	1.076	0.01338
1.5 "	1.064	0.00945	1.103 "	1.082	0.01332
2.0 "	1.087	0.00833	1.861 "	1.141	0.01215
0.2 NaCl	1.005	0.01326	0.10 $C_6H_5SO_3Na$	1.005	0.01447
0.5 "	1.018	0.01188	0.25 "	1.015	0.01545
1.0 "	1.039	0.00984	0.50 "	1.033	0.01728
2.0 "	1.076	0.00666	1.00 "	1.070	0.02349
0.5 LiCl	1.010	0.01194	0.2 $pCH_3C_6H_4SO_3Na$	1.016	0.01677
0.673 "	1.014	0.01104	0.5 "	1.032	0.02191
1.198 "	1.025	0.00882	1.0 "	1.066	0.03903
2.067 "	1.047	0.00607	0.1 $C_{10}H_7SO_3Na$	1.005	0.01790

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SALT SOLUTIONS AT 25°.

(Larsson, 1927.)

Results for aqueous solutions of:

Sodium Formate

Gms. per liter	
HCOONa	OHC_6H_4COOH
0.0	2.21
3.40	6.336
6.80	9.332

Sodium Acetate

Gms. per liter	
CH_3COONa	OHC_6H_4COOH
0.0	2.21
6.80	8.283
13.61	14.081

Sodium Chloro Acetate

Gms. per liter	
$CH_2ClCOONa$	OHC_6H_4COOH
0.0	2.21
5.82	4.142
11.65	5.329

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SALT SOLUTIONS AT 25°.

(Philip, 1905; Philip and Garner, 1909.)

In Aq. Sodium Acetate.

Gms. per Liter.	
CH_3COONa.	$C_6H_4OHCOOH$.
1.01	3.60
2.48	5.93
5.03	9.56
10.07	16.81

In Aq. Sodium Formate.

Gms. per Liter.	
HCOONa.	$C_6H_4OHCOOH$.
0.81	3.40
1.63	4.42
4.06	7.11
8.14	10.44

In Aq. Sodium Monochlor Acetate.

Gms. per Liter.	
$CH_2ClCOONa$.	$C_6H_4OHCOOH$.
1.38	2.83
3.43	3.58
6.84	4.64
13.71	6.17

In Aq. Sodium Succinate.

Gms. per Liter.	
$C_2H_4(COONa)_2$.	$C_6H_4OHCOOH$.
1.18	2.97
2.93	4.34
5.85	6.56
11.73	10.82

In Aq. Potassium Formate.

Gms. per Liter.	
HCOOK.	$C_6H_4OHCOOH$.
0	2.265
1.03	3.38
2.56	4.93
5.12	7.13

In Aq. Sodium Butyrate at 26.4°.

Gms. per Liter.	
C_3H_7COONa.	$C_6H_4OHCOOH$.
1	3.3
2	4.5
4	6.85
5	8.1

One liter of 1 normal aqueous sodium salicylate solution dissolves 4.97 gms. salicylic acid at 25°.

(Sidgwick, 1910.)

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SALT SOLUTIONS:

(Doosaj and Bhagwat, 1933; Bhagwat and Doosaj, 1933.)

Results for aqueous solutions of:

Sodium Chloride at 25°

Gms. per liter		Gms. per liter	
NaCl	OHC_6H_4COOH	NaCl	OHC_6H_4COOH
0.0	2.478	19.6	2.075
1.176	2.229	29.40	2.000
5.88	2.219	39.20	1.901
11.76	2.150	58.80	1.719
14.70	2.125		

Sodium Benzoate at 14.5°

Gms. per liter		Gms. per liter	
C_6H_5COONa	OHC_6H_4COOH	C_6H_5COONa	OHC_6H_4COOH
0.0	1.667	34.612	4.189
1.7306	2.427	57.687	4.436
3.4612	3.393	86.530	4.285
6.9224	3.829	115.374	4.513
17.3061	4.171	173.061	5.460

Sodium Formate

Gms. per liter	
HCOONa	OHC_6H_4COOH
4.656	8.624
6.858	10.35
9.000	12.08
13.092	15.15
24.002	21.04
33.234	26.36

Sodium Acetate

Gms. per liter	
CH_3COONa	OHC_6H_4COOH
2.355	4.828
3.533	6.026
7.064	9.122
10.428	11.73
19.909	19.32
36.489	31.06

Sodium Citrate

Gms. per liter	
$C_3H_4OH(COONa)_3$	OHC_6H_4COOH
0.0	2.743
5.370	7.875
7.924	10.26
15.131	15.92
27.745	24.91
33.295	29.73

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF *o* NITROBENZOIC ACID AT 25° AND VICE VERSA.

(Kendall, 1911.)

Gms. per Liter. *o* $C_6H_4NO_2$-COOH.	Gms. per Liter. *o* C_6H_4-OHCOOH.	Solid Phase.	Gms. per Liter. *o* $C_6H_4.NO_2$-COOH.	Gms. per Liter. *o* $C_6H_4.OH$-COOH.	Solid Phase.
0	2.257	Salicylic Acid	7.188	2.243	*o* Nitrobenzoic Acid
2.615	1.974	"	7.213	1.873	
7.202	1.887	"	7.233	1.294	
7.283	1.885	" +Nitrobenzoic			

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF SODIUM SALICYLATE AT 20.1°.

(Hoitsema, 1898a.)

Gm. Mols. per Liter. C_6H_4OH-COOH.	Gm. Mols. per Liter. C_6H_4OH-COONa.	Sp. Gr. of Solutions.	Gms. per Liter. C_6H_4OH-COOH.	Gms. per Liter. C_6H_4OH-COONa.	Solid Phase.
0.0132	0	1.002	1.823	0	$C_6H_4OHCOOH$
0.0112	0.017	1.003	1.55	2.705	"
0.0124	0.113	1.009	1.71	17.98	"
0.0143	0.226	1.016	1.97	35.96	"
0.0164	0.344	1.024	2.26	54.74	"
0.0203	0.500	1.034	2.80	79.56	"
0.062	1.70	1.112	8.56	270.5	"
0.095	2.11	1.137	13.11	335.7	$C_6H_4OHCOOH.C_6H_4OHCOONa$ + $C_6H_4OHCOOH$
0.091	2.19	1.144	12.56	348.4	$C_6H_4OHCOOH.C_6H_4OHCOONa$
0.086	3.41	1.215	11.88	542.6	"
0.081	4.23	1.263	11.19	673	$C_6H_4OHCOOH.C_6H_4OHCOONa$ + $C_6H_4OHCOONa$
0.048	4.18	1.259	6.63	665.1	$C_6H_4OHCOONa$
0.021	4.12	1.258	2.90	665.5	"
0.	4.15	1.257	0	660.3	"

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS ALCOHOL AT 25°.

(Seidell, 1908, 1909, 1910.)

Wt. Per cent C_2H_5OH in Solvent.	d_{25} Sat. Sol.	Gms. $C_6H_4OHCOOH$ per 100 Gms. Sat. Sol.	Wt. Per cent C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_6H_4OHCOOH$ per 100 Gms. Sat. Sol.
10	0.984	0.38	60	0.943	18.30
20	0.970	0.80	70	0.941	24
30	0.959	2.20	80	0.937	28.30
40	0.951	5.90	90	0.930	31.40
50	0.945	12.20	100	0.919	33.20

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS ETHYL ALCOHOL.

(Wright, 1927.) (Halford, 1933.)

t°	Wt. % C_2H_5OH in solvent	Gms. OHC_6H_4COOH per 100 gms. solvent	t°	Wt. % C_2H_5OH in solvent	Gms. OHC_6H_4COOH per 100 gms. solvent
20	0.0	0.22	25	0.0	0.2112
"	50.0	11.8	"	19.8	0.537
"	100.0	51.5	"	37.57	4.57
30	0.0	0.31	"	56.2	14.72
"	50.0	17.95	"	75.0	24.90
"	100.0	57.25	"	93.8	30.27

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL, ISOBUTYL ALCOHOL, DEXTROSE, CANE SUGAR, AND OF LEVULOSE AT 25° AND AT 35°.

(Hoffmann and Langbeck, 1905.)

Aq. Solvent.	Conc. of Solvent.		$C_6H_4OH.COOH$ Dissolved at 25°.		$C_6H_4OH.COOH$ Dissolved at 35°.	
	Normality.	Gms. per Liter.	Gm. Mol. Per cent.	Gms. per 100 Gms. Sat. Sol.	Gm. Mol. Per cent.	Gms. per 100 Gms Sat. Sol.
C_2H_5OH	0.0249	1.146	$2.8966 . 10^{-4}$	0.222	$4.2044 . 10^{-4}$	0.322
"	0.0560	2.578	2.9150 "	0.223	4.2348 "	0.324
"	0.1747	8.04	2.9901 "	0.229	...	...
"	0.2399	11.05	...	...	4.4341 "	0.339
"	1.03	47.4	3.5279 "	0.270	5.2816 "	0.404
"	1.638	75.44	3.9253 "	0.300	...	...
C_4H_9OH (iso)	0.020	1.496	2.909 "	0.223	4.229 "	0.324
"	0.051	3.74	2.955 "	0.226	4.289 "	0.329
"	0.100	7.48	3.033 "	0.232	4.435 "	0.339
"	0.521	38.60	3.718 "	0.285	5.624 "	0.431
$C_6H_{12}O_6$	0.02	3.6	2.886 "	0.221	4.184 "	0.321
"	0.10	18	2.898 "	0.222	4.202 "	0.322
"	0.50	89.6	2.954 "	0.226	4.263 "	0.326
"	1	180	3.015 "	0.231	4.360 "	0.334
$C_{12}H_{22}O_{11}$	0.02	6.88	2.902 "	0.221	4.206 "	0.322
"	0.10	34.07	2.964 "	0.227	4.287 "	0.328
"	0.50	172	3.239 "	0.248	4.697 "	0.360
"	1.10	376.3	3.633 "	0.278	5.236 "	0.401
$C_6H_{12}O_6$	0.02	3.6	2.888 "	0.221	...	...
"	0.06	10.8	2.895 "	0.221	...	...
"	0.25	45	2.944 "	0.225	...	...

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF SACCHAROSE AT 18°.

(Kolthoff, 1927.)

Gm. Mols. per liter	
$C_{12}H_{22}O_{11}$	$\Omega\ OHC_6H_4COOH$
0.0	0.0125
0.5	0.0131
1.0	0.0134

SOLUBILITY OF SALICYLIC ACID IN AQUEOUS SOLUTIONS OF DIOXANE AT 25°.

(Herz and Lorentz, 1929.)

Vol. % Dioxane in Aq. Solvent	Gm. Equiv. $\Omega\ OHC_6H_4COOH$ per liter
10	0.03
30	0.22
70	2.73
80	3.06
100	3.05

Between 35 and 62% dioxane two layers are formed. The lower contains 2.29 gm. equiv. dioxane per liter and the upper 0.57 gm. equivalents.

Data showing the effect of increasing amounts of several gum arabic sols. upon the solubility of salicylic acid in water are given by

Distribution of Salicylic Acid at 25° Between: (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $C_6H_4OHCOOH$ per liter of H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.575	0.625	1.09
0.850	1.180	1.39
1.138	1.862	1.64
1.425	2.625	1.84
2.625	6.575	2.50

Water and Ethyl Ether.

Millimols. $C_6H_4OHCOOH$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.0666	1.3975	21.0
0.0850	2.415	28.4
0.125	3.855	30.8
0.195	7.645	39.2
0.295	14.825	50.3

Water and Xylene.

Millimols. $C_6H_4OHCOOH$ per liter of H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
1.038	0.550	0.530
1.350	0.862	0.638
1.785	1.238	0.692
3.075	3.075	1.000
4.675	5.675	1.215

Distribution of Salicylic Acid Between Water and Phenol at 25°.

(Bailey, 1925.)

Gms. $C_6H_4OHCOOH$ per liter of					
Aqueous layer.....	0.38	1.27	2.07;	4.57	5.28
Phenol layer......	5.36	19.07	32.93	77.72	93.34

The concentration in the aqueous layer was corrected for ionization.

Distribution of Salicylic Acid Between:

Water and Benzene. (Hendrixon, 1897.)

Results at 10°. Gms. Acid 100 cc. H_2O Layer.	C_6H_6 Layer.	Results at 40°. Gms. Acid per 100 cc. H_2O Layer	C_6H_6 Layer.
0.0264	0.0391	0.0260	0.0400
0.0377	0.0655	0.0710	0.1640
0.1200	0.4150	0.1220	0.3539
0.1292	0.4713	0.1563	0.5016
		0.2014	0.7625

Water and Chloroform. (Hendrixon, 1897.)

Results at 10°. Gms. Acid per 100 cc. H_2O Layer.	$CHCl_3$ Layer.	Results at 40°. Gms. Acid per 100 cc. H_2O Layer.	$CHCl_3$ Layer.
0.0293	0.0442	0.0335	0.0475
0.0457	0.0946	0.0819	0.1775
0.1172	0.5640	0.1580	0.5207
0.1220	0.6106	0.2687	1.3887
0.1236	0.6269	0.3053	1.7570

Similar data for the distribution between water and benzene at 18° are given by Nernst (1891).

DISTRIBUTION OF SALICYLIC ACID BETWEEN WATER AND BENZENE AT 25°.

(Szyzkowski, 1928; Szyzkowski and Skapski, 1928.)

Gm. Mols. o OHC_6H_4COOH per liter H_2O layer	C_6H_6 layer	Gm. Mols. o OHC_6H_4COOH per liter H_2O layer	C_6H_6 layer
0.002603	0.004401	0.00930	0.02904
0.002938	0.005245	0.01021	0.03396
0.003732	0.006345	0.01187	0.04079
0.004451	0.009543	0.01240	0.04617
0.005032	0.01149	0.01460	0.06150
		0.01610	0.07250

Szyzkowski and Skapski also give results for the distribution of Salicylic acid between benzene and aqueous solutions of NaCl, $NaClO_3$, $NaNO_3$, $BaCl_2$, Na_2SO_4, and $MgSO_4$ at 25°.

DISTRIBUTION OF SALICYLIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mol. o OHC_6H_4COOH per liter H_2O layer	$CHCl_3$ layer
0.00370	0.01055
0.00410	0.0123
0.00449	0.0146
0.00489	[illegible]

Water and Toluene

Gm. Mol. o OHC_6H_4COOH per liter H_2O layer	$C_6H_5CH_3$ layer
0.00550	0.00924
0.00660	0.0119
0.00770	0.0154

SALICYLIC ACID

DISTRIBUTION OF SALICYLIC ACID AT 25° BETWEEN BENZENE AND AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE. (De Szyszkowski, 1914.)

Normality of Aq. K Cl.	Gm. mols. C_6H_4OH COOH per 1000 gms.	
	C_6H_6 layer.	Aq. K Cl layer.
0.1...	$3.999 \cdot 10^{-3}$	$3.596 \cdot 10^{-3}$
0.1...	6.46 »	3.794 »
0.1...	10.68 »	5.252 »
0.1...	23.00 »	8.489 »
0.1...	44.20 »	12.29 »
0.1...	62.70 »	15.20 »
0.1...	72.44 »	16.34 »
0.25..	4.871 »	3.004 »
0.25..	7.12 »	3.896 »
0.25..	11.62 »	5.343 »
0.25..	25.09 »	8.57 »
0.25..	41.78 »	11.63 »
0.25..	62.801 »	14.76 »
0.5...	$4.728 \cdot 10^{-3}$	$2.744 \cdot 10^{-3}$
0.5...	7.466 »	3.837 »
0.5...	11.77 »	5.171 »
0.5...	27.96 »	8.702 «
0.5...	41.16 »	10.76 »
0.5...	56.01 »	12.93 »
0.75..	3.995 »	2.529 »
0.75..	6.572 »	3.504 »
0.75..	10.03 »	4.430 »
0.75..	21.09 »	7.021 »
0.75..	38.32 »	9.995 »
0.75..	56.59 »	12.45 »
1.0...	4.095 »	2.461 »
1.0...	29.30 »	7.818 »
1.0...	72.02 »	13.12 »

	Gm. mols. C_6H_4OH COOH at 25°.
1000 gms. Benzene in contact with aq. 0.1 *n* KCl contain...	$7.274 \cdot 10^{-2}$
» » » 1.0 *n* KCl » ...	7.202 »
» » » a large excess of H_2O » ...	7.370 »
» » previously sat. with H_2O « ...	6.321 »
« dry Benzene contain..................................	5.616 »

The mixtures were shaken in a thermostat for 3 to 7 days. (De Szyszkowski, 1914.

SOLUBILITY OF SALICYLIC ACID IN BENZENE AT 30°.5 AS INFLUENCED BY SMALL AMOUNTS OF WATER.

(Cohen and van Dobbenburgh, 1925; Cohen and Miyake, 1926.)

A special apparatus was devised and determinations of the highest accuracy were made.

Wt. % H_2O contained in C_6H_6 used.	Gms. C_6H_4OH COOH per 100 gms. sat. sol.
None (= dry C_6H_6).	1.001 to 1.021
0.0040............	1.015
0.0147............	1.050
0.0374............	1.095
0.0682............	1.190
0.1042........	1.309
0.1478........	1.348
0.2171........	1.351
0.3130..	1.352
Excess H_2O...	1.356

SOLUBILITY OF SALICYLIC ACID IN CARBON TETRACHLORIDE AND IN CHLOROFORM AT 30°.5 AS INFLUENCED BY VERY SMALL AMOUNTS OF WATER.

(Cohen and Miyake, 1926.)

Equilibrium was approached from above and below, by constant agitation of the mixtures in sealed flasks.

Carbon Tetrachloride.

Wt. % H_2O in CCl_4 used.	Gms. C_6H_4OH COOH per 100 gms. sat. sol.
None (= dry CCl_4).	0.35-0.36
0.0087............	0.35-0.37
0.0227............	0.36
0.0659............	0.36-0.37
Excess H_2O.......	0.36

Chloroform.

Wt. % H_2O in $CHCl_3$ used.	Gms. C_6H_4OH COOH per 100 gms. sat. sol.
None (= dry $CHCl_3$)	1.55–1.56
0.0354............	1.63–1.64
0.0608............	1.68–1.69
0.1081............	1.71–1.82
Excess H_2O	1.72–1.73

1000 gms. Carbon tetrachloride sat. with H_2O contain 0.01902 gm. mols. C_6H_4OH COOH at 25°.

1000 gms, Chloroform sat. with H_2O contain 0.1338 gm. mols. C_6H_4OH COOH at 25°. (De Szyszkowski, 1914.)

SOLUBILITY OF SALICYLIC ACID IN ALCOHOLS, IN ETHER AND IN ACETONE.

(Timofeiew, 1891; at 15°, Bourgoin, 1878; at 23°, Walker and Wood, 1898.)

Solvent.	t°.	Gms. $C_6H_4OHCOOH$ per 100 Gms. Solvent.	Gms. $C_6H_4OHCOOH$ per 100 Gms. Solution.	Solvent.	t°.	Gms. $C_6H_4OHCOOH$ per 100 Gms. Solvent.	Gms. $C_6H_4OHCOOH$ per 100 Gms. Solution.
CH_3OH	− 3	40.67	28.91	$C_3H_7OH(n)$	− 3	26.12	20.71
CH_3OH	+21	62.48	38.46	$C_3H_7OH(n)$	+21	37.60	27.36
C_2H_5OH	− 3	36.12	26.29	$(CH_3)_2O$	15	50.47	33.55
C_2H_5OH	+15	49.63	33.17	$(CH_3)_2O$	17	...	23.4*
C_2H_5OH	21	53.53	34.87	$(CH_3)_2CO$	23	...	31.3*
C_2H_5OH 90%	15	42.09	29.62				

* Gms. per 100 cc. sat. sol. instead of per 100 gms. sat. sol.

100 gms. sat. solution in methyl alcohol contain 39.87 gms. salicylic acid at 15°. (Savorro, 1914.)

SOLUBILITY OF SALICYLIC ACID IN MIXTURES OF ACETONE AND BENZENE AT 25°.

(Marden and Dover, 1917.)

Gms. per 100 Gms. Mixed Solvent. Acetone.	Salicylic Acid.	Gms. per 100 Gms. Mixed Solvent. Acetone.	Salicylic Acid.	Gms. per 100 Gms. Mixed Solvent. Acetone.	Salicylic Acid.
100	55	60	36.7	20	15
90	51.1	50	31	10	7.1
80	46.4	40	25.3	0	0.92
70	42.3	30	20		

Results for the solubility of Salicylic acid in benzene are given by Miyake, 1930.

SOLUBILITY OF SALICYLIC ACID IN BENZENE.

(Walker and Wood, 1898.)

t°.	Gms. C_6H_4-OHCOOH per 100 Gms. C_6H_6.	t°.	Gms. C_6H_4-OHCOOH per 100 Gms. C_6H_6.
11.7	0.460	34.6	1.261
18.2	0.579	36.6	1.430
25	0.78	49.4	2.380
30.5	0.991	64.2	4.40

(von Euler and Löwenhamn, 1916.)

t°.	Solvent.	Gms. C_6H_4-OHCOOH per 100 cc. Sat. Sol.
18	C_6H_6	0.525
25	C_6H_6	0.762
18	0.5*n* $CH_2ClCOOH$ in C_6H_6	1.608
18	0.5*n* C_6H_5OH in C_6H_6	0.746

SOLUBILITY OF SALICYLIC ACID IN MIXTURES OF BENZENE AND ETHYL ACETATE AT 25°.

(Marden and Dover, 1917.)

Gms. per 100 Gms. Mixed Solvent. Ethyl Acetate.	Salicylic Acid.	Gms. per 100 Gms. Mixed Solvent. Ethyl Acetate.	Salicylic Acid.	Gms. per 100 Gms. Mixed Solvent. Ethyl Acetate.	Salicylic Acid.
100	38	60	16.6	20	6.2
90	24.2	50	14.5	10	3.42
80	22.7	40	12.8	0	0.92
70	19.5	30	9.6		

SOLUBILITY OF SALICYLIC ACID IN SEVERAL SOLVENTS AT 25°.

(Herz and Rathmann, 1913.)

Solvent.	Gms. $C_6H_4OHCOOH$ per 100 cc. Sat. Sol.	Solvent.	Gms. $C_6H_4OHCOOH$ per 100 cc. Sat. Sol.
Chloroform	2.168	Tetrachlor Ethylene	1.105
Carbon Tetrachloride	0.4143	Tetrachlor Ethane	2.085
Trichlor Ethylene	1.519	Pentachlor Ethane	1.064

100 gms. dichlor ethylene dissolve 0.757 gm. salicylic acid at 15°. } (Wester and
100 gms. trichlor ethylene dissolve 0.28 gm. salicylic acid at 15°. } Bruins, 1914.)

100 gms. 86 5 % Glycerol (*d* = 1.2326) dissolve 0.97 gm. $C_6H_4OHCOOH$ at 20°.
» 98.5 » (*d* = 1.2645) » 1.63 » »

(Holm, 1921, 1921 *a*, 1922.

SOLUBILITY OF SALICYLIC ACID IN SEVERAL SOLVENTS.

(Sidgwick and Ewbank, 1921a.)

Results for:

Ethyl alcohol(99.0%)		n Butyl Alcohol		Benzene		n Heptane	
t°	Gms. o OHC_6H_4COOH per 100 gms. sat. sol.	t°	Gms. o OHC_6H_4COOH per 100 gms. sat. sol.	t°	Gms. o OHC_6H_4COOH per 100 gms. sat. sol.	t°	Gms. o OHC_6H_4COOH per 100 gms. sat. sol
41.0	40.6	24.0	24.36	44.3	1.92	92.2	2.09
85.2	60.4	38.0	28.88	65.0	5.27	112.4	5.37
125.2	81.2	85.6	48.9	98.5	20.8	134.3	20.15
		121.6	79.2	114.5	41.1	142.0	41.6
				131.5	64.5	149.5	81.4
				140.0	81.3		

SOLUBILITY OF SALICYLIC ACID IN SEVERAL SOLVENTS AT 28°.

(Desai and Patel, 1935.)

Solvent	Gm. Mol. o OHC_6H_4COOH per 100 gm. mol. sat. sol.	Solvent	Gm. Mol. o OHC_6H_4COOH per 100 gm. mol. sat. sol.
Water	0.0003118	Nitro benzene	0.02509
Hexane	0.00111	Chloroform	0.02679
CCl_4	0.003803	Methyl alcohol	0.1252
Benzene	0.005441	Ethyl alcohol	0.1479
Toluene	0.006052	n Propyl alcohol	0.1438
m Xylene	0.006554	n Butyl alcohol	0.1568
Chloro benzene	0.007903	Acetone	0.1906

Results in the form of diagrams are given by Desai and Patel, 1935a for the solubility of salicylic acid in binary mixtures of the above solvents.

SOLUBILITY OF SALICYLIC ACID IN SEVERAL OILS AT 23°.

(Verkade, 1921.)

Very carefully refined fatty oils were used.

Oil.	Gms. $C_6H_4OHCOOH$ per 100 gms. oil.	Oil.	Gms. $C_6H_4OHCOOH$ per 100 gms. oil.
Olive oil............	2.43 (2.59)	Cocoanut oil..........	3.18
Cotton seed oil.....	2.55	Linseed oil...........	3.42
Peanut oil I.........	2.82	Castor oil............	14.81
» II........	2.39		

The result in parentheses is by Watermann

SOLUBILITY OF SALICYLIC ACID IN OILS (Temp. not stated).

(Engfeldt, 1913.)

Oil of:	Gms. $C_6H_4OHCOOH$ per 100 Gms. Sat. Sol.	Oil of:	Gms. $C_6H_4OHCOOH$ per 100 Gms. Sat. Sol.
Phocae (Dog Fish Oil)	1.70	Sesami	2.61
Jecoris Aselli (Cod Liver Oil)	1.86	Cannabis	3
Arachidis (Peanut Oil)	1.88	Lini (Linseed Oil)	3.04
Amygdalarum	2.08	Juglandis (Walnut Oil)	3.15
Olivæ (Olive Oil)	2.14	Gossypii (Cottonseed Oil)	3.23
Rapæ (Rape Seed Oil)	2.17	Ricini (Castor Oil)	12.98
Papaveris (Poppy Seed Oil)	2.22	Paraffiniam Liquid	0

The ratio of the solubilities of salicylic acid in olive oil and in water (conc.

Solubility of Salicylic Acid in Mixtures of Benzene and Heptane at 25°.

(Herz and Levi, 1930.)

Vol. % C_6H_6 in C_6H_6 + C_7H_{16} Mixture	Gm. Mols. OHC_6H_4COOH per liter sat. sol.	Vol. % C_6H_6 in C_6H_6 + C_7H_{16} Mixture	Gm. Mols. OHC_6H_4COOH per liter sat. sol.
100	0.050	40	0.0422
80	0.0473	20	0.0371
60	0.0449	0	0.0279

Freezing-point data are given for mixtures of Salicylic Acid and:

Acetamide(12)(22)
Acetanilide + Antipyrine(9)
Acetanilide + Urea(9a)
Antipyrine + Benzoic Acid(6)
Antipyrine(13)
Azobenzene(16)
Benzoic Acid(23)
Benzoic Acid + Antipyrine(6)
Benzamide(12)
Caffeine(21)
Camphor(10)(17)(18)
Dimethyl pyrone(11)
Cineole(3)
Iodo benzoic acid(19)
Naphthalene(2)
Naphthol(1)(4)
Naphthylamines(15)(20)
Nitro toluene(5)
Oxy benzaldehyde(14)
Phenylene diamines(15)
Thymol(7)
Toluidine(15)(16)
Tri nitro toluene(5)
Urea(6)(16)(15)
Urea + Acetanilide(9a)
Urea + Urethan(8)

(1) Bartholomew and Wark, 1926; Bernouilli and Sarasin, 1930; (3) Bellucci and Grassi, 1913;(4)Castiglione,1937; (5) Crockford and Zurburg, 1930; (6) Hrynakowski, 1934; (7) Hrynakowski and Szmyt, 1935; (8) Hrynakowsky and Szmyt, 1935a; (9) Hrynakowski and Szmyt, 1935b; (9a) Hrynakowski and Szmyt, 1935c; (10) Jefremow, 1913; (11) Kendall, 1914a; (12) Kremann and Auer, 1918; (13) Kremann and Haas, 1919; (14) Kremann and Pogantsch, 1923; (15) Kremann, Weber and Zechner, 1925; (16) Kremann and Zechner, 1925; (17) Lajoux, 1917; (18) LeFevre and Tideman, 1931; (19) Lettre and Lehmann, 1938; (20) Milone and Rossignoli, 1932; (21) Regenbogen and Schoorl, 1924; (22) Rheinboldt, Henning and Kirscheisen, 1925; (23) Jaeger, 1907.

HYDROXY BENZOIC ACID *m* OHC_6H_4COOH.

Solubility of Meta Hydroxy Benzoic Acid in Water.

Average curve from the results of Walker and Wood, 1898; Savorro, 1914; Flaschner and Rankin, 1910; Sidgwick and Ewbank, 1921a.

t°	Gms. *m* OHC_6H_4COOH per 100 gms. sat. sol.	t°	Gms. *m* OHC_6H_4COOH per 100 gms. sat. sol.	t°	Gms. *m* OHC_6H_4COOH per 100 gms. sat. sol.
0	0.35	50	3.0	110	50.0
10	0.55	60	4.3	120	60.0
20	0.85	70	7.0	140	76.0
25	1.07	80	11.0	160	86.0
30	1.35	90	20.0	180	93.0
40	2.0	100	37.0	201m.pt.	100.0

Solubility of Meta Hydroxy Benzoic Acid in Aqueous 0.01 Molar Sodium Salt(?) Solutions Containing Increasing Amounts of Potassium Chloride at 25°

(Osol and Kilpatrick, 1933a.)

Gm. Mols. KCl per liter	d. of sat. sol.	Gm. Mol. m OHC_6H_4COOH per liter	Gm. Mols. KCl per liter	d. of sat. sol.	Gm. Mol. m OHC_6H_4COOH per liter
0.0	1.0000	0.0706(= 9.745 gms.)	1.0	1.044	0.0529
0.2	1.010	0.0657	1.5	1.067	0.0470
0.5	1.024	0.0606	2.0	1.088	0.0399

The coefficient of distribution of meta hydroxy benzoic acid between water and olive oil is 0.4. (Boeseken and Waterman, 1911.)

Solubility of Meta Hydroxy Benzoic Acid in Benzene.

(Walker and Wood, 1898.)

t°	Gms. m OHC_6H_4COOH per 100 gms. C_6H_6	t°	Gms. m OHC_6H_4COOH per 100 gms. C_6H_6
20	0.008	40	0.017
25	0.010	50	0.028
30	0.012	60	0.047

100 cc sat. solution of meta hydroxy benzoic acid in Acetone contain 26.0 gms. m OHC_6H_4COOH at 23°.

100 cc sat. solution of meta hydroxy benzoic acid in Ethyl Ether contain 9.73 gms. m OHC_6H_4COOH at 17°. (Walker and Wood, 1898.)

100 gms. sat. solution of m hydroxy benzoic acid in CH_3OH contain 53.58 gms. m OHC_6H_4COOH at 15°. (Savorro, 1914.)

100 gms. 95% formic acid dissolve 2.37 gms. m OHC_6H_4COOH at 20.8°. (Aschan, 1913.)

Solubility of Meta Hydroxy Benzoic Acid in Several Solvents.

(Sidgwick and Ewbank, 1921a.)

Solvent	t°	Gm. m OHC_6H_4COOH per 100 gms. sat. sol.	Solvent	t°	Gm. m OHC_6H_4COOH per 100 gms. sat. sol.
Ethyl Alcohol(99%)	65.0	39.6	Benzene	122.5	1.23
" "	132.0	61.3	"	141.0	2.95
" "	160.0	81.7	"	154.5	5.16
n Butyl Alcohol	36.5	20.7	"	162.0	10.54
" "	115.0	40.8	"	173.0	22.4
" "	151.2	59.2	"	182.5	41.6
" "	180.3	84.7	"	185.5	62.3
n Heptane "	176.0	0.86(liquid)	"	192.15	82.3
"	197.0(tr.pt.)	2.0 "			

Freezing-point data are given for mixtures of meta hydroxy benzoic acid and:

Benzamide (Kremann and Auer, 1918.)
Cineole (Bellucci and Grassi, 1913.)
Iodo benzoic acid (Lettre and Lehmann, 1938.)
Michler's ketone (Pfeiffer, 1924.)
Tetramethyl diamino benzophenone (Pfeiffer, Goebel and Angern

$C_7H_6O_3$

HYDROXY BENZOIC ACID p OHC_6H_4COOH.

SOLUBILITY OF PARA HYDROXY BENZOIC ACID IN WATER.

(Up to 50°, Walker and Wood, 1898; Above 50°, average curve from the closely agreeing results of Flaschner and Rankin, 1910 and Sidgwick and Ewbank, 1921a.)

t°	Gms. p OHC_6H_4COOH per 100 gms. sat. sol.	t°	Gms. p OHC_6H_4COOH per 100 gms. sat. sol.	t°	Gms. p OHC_6H_4COOH per 100 gms. sat. sol.
10	0.25	50	2.3	120	59.0
15	— (0.44)	60	4.2	130	67.0
20	0.50	70	7.0	140	73.0
25	0.64	80	12.0	160	82.5
30	0.81	90	20.0	180	90.5
35	1.00	100	33.3	200	97.0
40	1.23	110	47.8	213 m.pt.	100.0
50	2.07 (2.98)				

The results in parentheses are by Savarro, 1914.

Para hydroxy benzoic acid crystallizes with 1 H_2O and the triple point is at 62°. (Sidgwick and Ewbank, 1921a.)

One liter sat. solution of para hydroxy benzoic acid in water contain 0.0454 gm. mol. (= 6.267 gms.) p OHC_6H_4COOH at 25°. (Osol and Kilpatrick, 1933a.)

DISTRIBUTION OF PARA HYDROXY BENZOIC ACID BETWEEN WATER AND ETHYL ETHER AT 25° (Smith, 1921-1922.)

Millimols. *p* $OH.C_6H_4COOH$ per liter of			Millimols. *p* $OH.C_6H_4COOH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.3125	2.2625	7.23	0.875	7.425	8.50
0.400	3.250	8.13	1.40	12.8	9.15
0.575	5.025	8.72			

Freezing-point lowering data for mixtures of *m* hydroxy benzoic acid and Michler's ketone are given by Pfeiffer, 1924.

The coefficient of distribution of para hydroxy benzoic acid between water and olive oil is 0.6. (Boeseken and Waterman, 1911.)

SOLUBILITY OF PARA HYDROXY BENZOIC ACID IN BENZENE.

(Walker and Wood, 1898.)

t°	Gms. p OHC_6H_4COOH per 100 gms. C_6H_6	t°	Gms. p OHC_6H_4COOH per 100 gms. C_6H_6
10	0.0018	40	0.0082
20	0.0027	50	0.0162
25	0.0035	60	0.028
30	0.0045	80	0.066

100 cc sat. sol. of p hydroxy benzoic acid in Acetone contain 22.6 gms. at 23°.

100 cc sat. sol. of p hydroxy benzoic acid in ethyl ether contain 9.43 gms. at 17°. (Walker and Wood, 1898.)

100 gms. sat. sol. of p hydroxy

HYDROXY BENZOIC ACIDS

SOLUBILITY OF PARA HYDROXY BENZOIC ACID IN SEVERAL SOLVENTS.

(Sidgwick and Ewbank, 1921a.)

Solvent	t°	Gms. p OHC_6H_4COOH per 100 gms. sat. sol.	Solvent	t°	Gms. p OHC_6H_4COOH per 100 gms. sat. sol.
Ethyl Alcohol (99%)	67	38.75	Benzene	132.2	1.04
" "	136.5	60.9	"	156.9	3.04
" "	184.0	82.9	"	165.2	4.3
n Butyl "	32.5	19.5	"	178.0	10.3
" "	62.0	25.08	"	191.5	21.0
" "	116.1	39.45	"	195.7	40.6
" "	167.0	62.4	"	198.8	61.3
" "	193.8	85.5	"	206.0	83.0
"			n Heptane	197.0	1.6 (liquid)
				208.5 (tr.pt.)	1.8

Freezing-point data are given for mixtures of para hydroxy benzoic acid and:

Benzamide (Kremann & Auer, 1918.)
Cineole (Bellucci and Grassi, 1913.)
Iodo benzoic acid (Lettre and Lehmann, 1938.)
Sarcosine anhydride (Pfeiffer, Angern, Wang, Seydel and Quehl, 1930.)

RESORCYLIC ACID (Resorcinilic Acid).

DISTRIBUTION OF RESORCINILIC ACID AT 25° BETWEEN :

(Smith, 1921, 1922.)

Water and Ether.

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.1350	1.5950	11.81
0.2812	4.5187	16.00
0.3875	8.7125	22.50
0.50	12.75	25.50

Water and Xylene.

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of Xylene layer (C_2).	$\frac{C_2}{C_1}$.
19.2	0.50	0.0260
26.8	0.80	0.0298
40.5	1.50	0.037

NOTE. — The author describes the compound here studied as resorcinilic acid and gives no information which would permit its more accurate identification.

GENTISIC ACID (2.5 dihydroxy benzoic acid) 2.5 $(OH)_2C_6H_3COOH$.

DISTRIBUTION OF GENTISIC ACID AT 25° BETWEEN :

(Smith, 1921-1922.)

Water and Chloroform.

Millimols. per liter H_2O layer (C_1)	Millimols. per liter $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
15.20	0.32	0.0210
20.76	0.45	0.0217
38.40	0.90	0.0234

Water and Ether.

Millimols. per liter H_2O layer (C_1).	Millimols. per liter $(C_2H_5)_2O$ layer (C_2)	$\frac{C_2}{C_1}$.
0.31	1.205	3.89
0.41	2.07	5.05
0.60	3.98	6.64
0.83	7.65	9.22
1.12	11.92	10.65

Water and Xylene.

Millimols. per liter H_2O layer (C_1)	Millimols. per liter $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
23.55	0.40	0.017
30.50	0.61	0.020
37.50	0.95	0.024

DI NITRO TOLUENE 2,4 $CH_3.C_6H_3.(NO_2)_2$.

SOLBBILITY OF DINITRO TOLUENE IN WATER AND IN OTHER SOLVENTS.

(Desvergnes, 1925.)

Solvent	t°	Gms. $CH_3C_6H_3(NO_2)_2$ per 100 gms. solvent	Solvent	t°	Gms. $CH_3C_6H_3(NO_2)_2$ per 100 gms. solvent
Water	22	0.027	C_6H_6	15	60.64
"	50	0.037	$CHCl_3$	15	65.08
"	100	0.254	$(C_2H_5)_2O$	15	9.42
$CH_3COOC_2H_5$	15	57.93	C_5H_5N	15	76.80
$(CH_3)_2CO$	15	81.90	CS_2	15	2.31
CH_3OH	15	5.01	CCl_4	15	2.43
C_2H_5OH(96%)	15	1.92	$C_6H_5CH_3$	15	45.47
" (100%)	15	3.04			

100 gms. sat. solution of dinitro toluene in liquid sulfur dioxide contain 40 gms. $CH_3.C_6H_3(NO_2)_2$ at ? t°. (DeCarli, 1927.)

Freezing-point data are given for mixtures of Dinitro Toluenes and:

Acenaphthene(24)(26)(10)
Aniline(24)(21)
Anthracene(24)(25)
Azobenzene(14)
Azoxybenzene(13)
Benzene(22)
Benzoic acid(6)
Carbazole(28)
Diethyl diphenyl urea(13)
Dimethyl amino azo benzene(14)
Dinitro benzene(10)(16)(17)(18)
Dinitro toluenes(15)(9)(10),
Diphenyl amine(10)(31)
Fluoranthene(33)
Fluorene(24)
Hydroquinol dimethylic ether(12)
Naphthalene(20)(30)
Naphthylamines(24)(36)
Naphthol(12)
Naphthol methyl ether(12)
Nitro mannite(34)
Nitro penta erythrite(34)
Nitro toluenes(1)(2)(3)(8)(5)(9)(10)(15)
Oxy benzaldehyde(29)
Pyrene(33)
Picric acid(35)
Salicylic acid(7)
Toluidines(27)(24)
Trinitro toluenes(3)(8)(4)(11)(35)(9)(10
(16)(18)(5)(17)
Trinitro phenol(17)
Trinitro phenyl methyl nitramine(19)
Trinitro xylene(4)
Triphenyl carbinol(23)
Urea(27)(32)
Phenanthrene(37)(38)

(1) Bell and Cordon, 1921; (2) Bell, Cordon, Spry and White, 1921; (3) Bell and Herty Jr., 1919; (4) Bell and Sawyer, 1919; (5) Bogoiavlenslenski, 1918, 1928; (6) Crockford and Hughes, 1930; (7) Crockford and Zurburg, 1930; (8) Giua, 1913; (9) Giua, 1914; (10) Giua, 1915; (11) Giua, 1920; (12) Giua and Marcellino, 1920; (13) Giua and Guastalla, 1925; (14) Giua and Reggiani, 1925; (15) Gibson, Duckham and Fairbairn, 1922; (16) Hrynakowski, 1934; (17) Hrynakowski and Kapuscinski, 1933b; (18) Hrynakowski and Kapuscinski, 1934; (19) Jefremow and Tichomirowa, 1926; (20) Kremann, 1904; (21) Kremann, 1906; (22) Kremann, 1908; (23) Kremann, Hohl and Muller II, 1921; (24) Kremann, Hönigsberg and Mauermann, 1923; (25) Kremann and Müller II, 1921; (26) Kremann and Haas, 1919; (27) Kremann and Petritschak, 1917; (28) Kremann and Strzelba, 1921; (29) Kremann and Pogantsch, 1923; (30) Kremann and Rodinis, 1906; (31) Rheinboldt, 1926; (32) Rheinboldt and Kirscheisen, 1926; (33) Shinomiya, 1940; (34) Urbanski, 1934; (35) Wogrinz and Vari, 1919; (36) Kremann and Grasser, 1916.
(37) Kremann et. al., 1908. (38) Kremann and Hofmeier, 1910.

COEFFICIENTS OF DISTRIBUTION OF DIHYDROXY AND TRIHYDROXY BENZOIC ACIDS BETWEEN WATER AND OLIVE OIL.

(Boeseken and Waterman, 1911.)

Acid	Coef. of Distribution
2.4 Dihydroxy Benzoic Acid	1.0
2.5 " " "	0.3
3.4 " " "	0.05
3.4.5 Trihydroxy Benzoic Acid	0.025

Aminonitro**BENZOIC ACIDS** $C_6H_3.NO_2.NH_2.COOH$ *o*, *m* and *p*.

SOLUBILITY OF THE THREE ISOMERIC AMINONITROBENZOIC ACIDS:

In Ether.				In Ethyl Alcohol (90%).			
t°.	Gms. $C_6H_3.NO_2.NH_2.COOH$ per 100 cc. Ether.			t°.	Gms. $C_6H_3NO_2.NH_2.COOH$ per 100 cc. Alcohol.		
	Ortho.	Meta.	Para.		Ortho.	Meta.	Para.
2.7	10.84	1.70	6.41	3	8.13	1.79	8.4
5.8	16.05 (6.8°)	1.81	8.21	9.6	10.70	2.20	11.3

GALLIC ACID 3.4.5, $(OH)_3C_6H_2COOH.H_2O$.

SOLUBILITY IN AQUEOUS ETHYL ALCOHOL AT 25°.

(Seidell, 1910.)

Wt. Per Cent C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_6H_2(OH)_3COOH.H_2O$ per 100 Gms. Sat. Sol.	Wt. Per Cent C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_6H_2(OH)_3COOH.H_2O$ per 100 Gms. Sat. Sol.
0	1.002	1.15	60	0.957	16
10	0.992	2	70	0.946	18
20	0.983	4.2	80	0.933	19.9
30	0.977	7.5	90	0.919	21.2
40	0.972	10.6	95	0.911	21.6
50	0.965	13.4	100	0.902	22.2

100 gms. H_2O dissolve 0.95 gm. gallic acid at 15°. (Greenish and Smith, 1903.)

100 gms. H_2O dissolve 33.3 gms. gallic acid at 100°. (U. S. P. VIII)

DISTRIBUTION OF GALLIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Ether.			Acetone and Glycerol.		
Millimols. per liter			Millimols. per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G)	$\frac{A}{G}$.
2.82	1.27	0.451	0.8625	2.45	0.352
8.25	3.72	0.452	2.325	6.625	0.351
15.75	7.13	0.452	4.45	12.85	0.346
35.2	16.10	0.457	9.55	29.85	0.320
59.5	27.0	0.453			

SOLUBILITY OF GALLIC ACID IN ORGANIC SOLVENTS AT 25°.

(Seidell, 1910.)

Solvent.	Density of Solvent.	d_{25} of Sat. Solution.	Gms. $C_6H_2(OH)_3COOH.H_2O$ per 100 Gms. Sat. Sol.
Acetone	$d_{15} = 0.797$	0.941	25.99
Amylalcohol (iso)	$d_{20} = 0.817$	0.834	5.39
Amylacetate	$d_{20} = 0.875$	0.878	2.72
Benzene	$d_{25} = 0.873$	0.875	0.022
Carbon Disulfide	$d_{25} = 1.258$	1.262	0.042
Ether (abs.)	$d_{20} = 0.711$	0.718	1.370
Ethylacetate	$d_{25} = 0.892$	0.911	3.610

The amount of gallic acid dissolved by carbon tetrachloride, chloroform and

1.2.4 Dinitr**ANISOLE** $(NO_2)_2C_6H_3.OCH_3$ 1.2.4.

SOLUBILITY IN SEVERAL SOLVENTS.

Desvergnes, 1925

Commercial dinitranisole was dissolved in twice its weight of nitric acid (d = 1.40) and after 24 hours the crystals were washed with cold nitric acid, with water and finally with alcohol. The m. pt. was 94°.58.

Solvent.	t°.	Gms. $(NO_2)_2C_6H_3OCH_3$ per 100 gms. solvent.	Solvent.	t°.	Gms. $(NO_2)_2C_6H_3OCH_3$ per 100 gms. solvent.
Water............	15	0.0155	Chloroform	15	34.00
»	50	0.0136	(d_{15} = 1.4887)...	50	102.96
»	100	0.4780*	Ether (anhy.)	15	3.821
Ethyl acetate	15	35.07	(d_{15} = 0.7193)...	33	6.780
(d_{15} = 0.9048)...	50	78.63	Pyridine	15	73.51
Acetone	15	85.66	(d_{15} = 0.9805)...	50	198.98
(d_{15} = 0.7998)...	50	218.97	CS_2	15	0.356
Ethyl alcohol (96°)	15	1.887	(d_{15} = 1.2723)...	37	0.889
(d_{15} = 0.8112)...	50	6.448	CCl_4	15	0.356
Ethyl alcohol (abs.)	15	2.907	(d_{15} = 1.6012)...	50	1.196
(d_{15} = 0.7967)...	50	7.185	Toluene	15	16.63
Benzene	15	30.27	(d_{15} = 0.8733)...	50	79.57
(d_{15} = 0.8826)...	50	138.43			

* At this temperature water saponifies the dinitranisole yielding the corresponding dinitrophenol.

Freezing-point data for mixtures of 1.3.5 dinitro anisole with nitro mannite and with nitro erythrite are given by Urbański, 1933.

TRITOLYL ARSINE $As(C_6H_4CH_3)_3$.

Freezing-point data for mixtures of tritolyl arsine and iodo toluene are given by Peat, 1925.

BROMO, CHLORO etc. TOLUENES $BrC_6H_4CH_3$.

Freezing-point data are given for mixtures of:

Bromo toluene + Benzene(7)
" " + Chloro toluene(2)
" " + Bromo toluene(3)
" " + Di bromo benzene(1)
" " + Ethylene bromide(7)
" " + Ethyl succinimide(7)
" " + Phenol(7)
" " + Tri benzylamine(7)
" " + Thymol(7)
" " + Veratrol(7)
" " + Xylene(7)

Chloro toluene + Bromo benzene(8)
" " + Bromo toluene(2)
" " + Chloro benzene(4)(5)
" " + Chloro toluene(9)
" " + Di chloro benzene(8)
" " + Fluoro benzene(8)
" " + Fluoro toluene(2)
" " + Toluene
Fluoro toluene + Chloro toluene(2)
" " + Toluene(2)
Iodo toluene + Tri p tolylarsine(6)

(1) Borodowski and Bogojawlenski, 1904; (2) Janecke and Rahlfs, 1932; (3) Van der Laan, 1907; (4) Lisard, 1925; (6) Peat, 1925; (7) Paterno and Ampola, 1897; (8) Timmermans, 1934; (9) Wahl, Normand and Vermeylen, 1922.

BENZYL CHLORIDE $C_6H_5CH_2Cl$.

Freezing-point data f

DIBROMO ■ TOLUIDINES $Br_2.C_6H_2.CH_3.NH_2$.

Freezing-point data for mixtures of 2.6 di bromo and 4.6 di bromo meta toluidines are given by Olivier, 1925.

TOLUOL DIAZONIUM PHOSPHOR HEXA FLUORIDE $CH_3.C_6H_4.N_2.PF_6$.

100 gms. H_2O dissolve 0.013 gm. mol. $C_7H_7N_2PF_6$ at 0°. (Lange and Müller, 1930.)

BENZAMIDE $C_6H_5CONH_2$.

SOLUBILITY OF BENZAMIDE IN MIXTURES OF ALCOHOL AND WATER AT 25°.

(Holleman and Antusch — Rec. trav. chim. 13, 294, '94.)

Vol. % Alcohol.	Gms. $C_6H_5CONH_2$ per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	Gms. $C_6H_5CONH_2$ per 100 Gms. Solvent.	Sp. Gr. of Solutions.
100	17.03	0.830	70	23.87	0.925
95	21.12	0.856	60	18.98	0.939
90	24.50	0.878	50	13.74	0.949
85	26.15	0.895	40	8.62	0.958
83	26.63	0.900	31	5.33	0.967
80	26.43	0.907	15	2.28	0.982
75	25.41	0.917	0	1.35	0.999

See remarks under α Acetnaphthalide, p. 705.

100 gms. pyridine dissolve 31.23 gms. benzamide at 20°–25°. (Dehn, 1917.)
100 gms. aq. 50% pyridine dissolve 39.15 gms. benzamide at 20°–25°. "

The coefficient of distribution of benzamide between oil and water is 0.66 at 3° and 0.43 at 36°. (Meyer, 1901, 1909.)

100 gms. sat. solutionsof benzamide in liquid ammonia contain 35 gms. $C_6H_5CONH_2$ at ? t°.

100 gms. sat. solution of benzamide in liquid sulfur dioxide contain 17 gms. $C_6H_5CONH_2$ at ? t°. (DeCarli, 1927.)

BENZAMIDE $C_6H_5CONH_2$.

SOLUBILITY OF BENZAMIDE IN ETHYL ALCOHOL. (Speyers, 1902)

t°.	*d.* of sat. sol.	Gm. mol. $C_6H_5CONH_2$ per 100 G. M. sat. sol.	Gms. $C_6H_5CONH_2$ per 100 gms. C_2H_5OH.	t°.	*d.* of sat. sol.	Gm. mol. $C_6H_5CONH_2$ per 100 G. M. sat. sol.	Gms. $C_6H_5CONH_2$ per 100 gms. C_2H_5OH.
0.0..	0.833	3.1	8.35	40...	0.848	11.5	33.0
10.0..	0.832	4.2	11.5	50...	0.862	14.2	43.5
20.0..	0.833	6.2	16.0	60...	0.881	17.2	54.5
25.0..	0.835	7.4	19.0	70...	0.913	20.0	66.5
30.0..	0.838	8.8	23.0				

SOLUBILITY OF BENZAMIDE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms $C_6H_5CONH_2$ per 100 gms. solvent.	Authority.
Water..............................	12	0.58	(Oliveri-Mandala, 1926.)
10.2 % aq. sol. of Antipyrine..........	12	0.60	»
Absolute alcohol......................	20–25	17.03	(Pucher and Dehn, 1921)
Quinoline............................	»	6.27+	»
Equi. mol. mixture of C_2H_5OH + Quinoline.	»	18.55+	»

SOLUBILITY OF BENZAMIDE IN MIXTURES OF ETHYL ALCOHOL AND WATER.

(Pleuger, 1925.)

Wt. per cent C_2H_5OH in solvent.	Gms. $C_6H_5CONH_2$ per 100 gms. sat. solution at: 30°.	50°.	70°.	90°.	110°.
0.0 (= H_2O)		9.0	25.5	81.0	95.0
10.0	2.0	11.5	36.0	82.5	94.5
30.0	8.5	21.5	52.5	82.0	93.8
49.5	17.0	37.0	63.0	81.0	93.0
65.8	22.0	40.0	61.0	78.7	92.0
84.6	22.0	37.0	56.0	75.0	91.0
100.0	16.0	29.0	48.0	69.7	88.0

SOLUBILITY OF BENZAMIDE IN MIXTURES OF ETHYL ALCOHOL AND CARBON DISULFIDE.

(Pleuger, 1925.)

Wt. per cent C_2H_5OH in solvent.	Gms. $C_6H_5CONH_2$ per 100 gms. sat. solution at: 30°.	50°.	70°.	90°.	110°.	120°.
0.0 (= CS_2)					75.0	90.0
19.9	6.5	14.0	28.0	55.0	81.5	92.0
38.0	12.0	22.5	40.0	63.0	84.5	93.5
60.7	14.5	27.5	46.5	67.7	86.7	"
79.2	15.5	28.5	47.5	69.0	87.5	"
100.0	16.0	29.0	48.0	69.7	88.0	95.5

SOLUBILITY OF BENZAMIDE IN MIXTURES OF ETHYL ALCOHOL AND CARBON TETRACHLORIDE. (Pleuger, 1925.)

Wt. per cent C_2H_5OH in solvent.	Gms. $C_6H_5CONH_2$ per 100 gms. sat. solution at: 30°.	50°.	70°.	90°.	110°.	120°.
0.0 (= CCl_4)					45.0	85.5
19.8	5.0	10.0	20.5	41.5	75.5	90.0
40.2	9.0	18.0	33.5	56.0	81.0	92.5
60.7	12.0	23.0	40.0	64.0	84.5	93.5
80.0	14.5	26.5	45.0	67.5	86.5	94.5

Freezing-point data are given for mixtures of Benzamide and:

Acetic acid(3)
Acetic anhydride(3)
Benzoic acid(3)
Benzoic anhydride(3)
Dioxy benzenes(1)
Dioxy naphthalenes(2)
Naphthylamine(8)
Naphthols(1)
Nitro phenols(1)(7)
Nitroso dimethyl aniline(6)(7)
Oxy benzoic acids(1)
Phenol(4)
Pyrogallol(5)

(1) Kremann and Auer, 1918; (2) Kremann, Hemmelmayr and Reimer, 1922; (3) Kremann, Mauermann and Oswald, 1923; (4) Kremann and Wenzing, 1917, (5) Kremann and Zechner, 1924; (6) Kremann and Wlk, 1919; (7) Puschin and Rikovski, 1930; (8) Rheinboldt, Henning and Kirscheisen, 1925.

BENZAL DOXIMES $C_6H_5CH:NOH$.

Freezing-point data are given for mixtures of benzaldoximes by Cameron, 1898, Results for mixtures of benzaldoxime and di nitro chloro benzene are given by Brady and Truszkowski, 1924. Results for mixtures of α and β Nitro benzaldoximes are given by Beck, 1904. Results for mixtures of Hydroxy and Methoxy benzaldoximes with di nitro chloro benzene are given by Brady and Truskowski, 1924.

NITROSO TOLUENE $NOC_6H_4CH_3$.

Freezing-points of mixtures of nitroso toluene with nitroso benzene, nitroso mesitylene and nitroso m xylene are given by Hammick, Edwards, Illingworth and Snell, 1933.

NITROSO ANISOLE $NOC_6H_4OCH_3$.

Freezing-points of mixtures of nitroso anisole with bromo nitroso benzene, nitroso mesitylene and tri bromo nitroso benzene, are given by Hammick, Edwards, Illingworth and Snell, 1933.)

Nitro**TOLUENE** *o* $C_6H_4.CH_3.NO_2$.

Reciprocal Solubility of *o* Nitrotoluene and Water.

(Campetti and Delgrosso, 1913.)

The original results were plotted and the following figures read from the curve.

t°.	Gms. *o* Nitrotoluene per 100 Gms.		t°.	Gms. *o* Nitrotoluene per 100 Gms.	
	H_2O Rich Layer.	Nitrotoluene Rich Layer.		H_2O Rich Layer.	Nitrotoluene Rich Layer.
150	1	98	245	13	81
175	1.5	96	250	16	78
200	3	93	255	20	72
225	6.5	89	260	29	63
240	10.5	84	263.5 crit. t.	43	

100 gms. 95 per cent formic acid dissolve 13.25 gms. *p* $C_6H_4.CH_3.NO_2$ at 20.8°.
(Aschan, 1913.)

Solubility of o, m, and p, Nitro Toluenes, Each Separately, Water at 30°.

(Gross, Saylor and Gorman, 1933.)

Compound	m. pt.	Gms. Compound per 1000 gms. H_2O
Ortho Nitro toluene	9.55	0.652
Meta " "	15.44	0.498
Para " "	51.4	0.442

Solubility of Para Nitro Toluene in Water and Other Solvents.

(Desvergnes, 1925.)

Solvent	t°	Gms. p $NO_2C_6H_4CH$ per 100 gms. solvent	Solvent	t°	Gms. p $NO_2.C_6H_4.CH_3$ per 100 gms. solvent
Water	14.5	0.004	C_6H_6	15	127.64
"	50.0	0.0078	$(C_2H_5)_2O$	"	80.83
"	100.0	0.0116	$CHCl_3$	"	105.02
$CH_3COOC_2H_5$	15	91.13	C_5H_5N	"	90.27
$(CH_3)_2CO$	"	168.51	CS_2	"	72.57
CH_3OH	"	13.7	CCl_4	"	42.63
C_2H_5OH(96%)	"	8.58	$C_6H_5CH_3$	"	104.95

Nitro TOLUENE

100 gms. sat. solution of o nitro toluene in liquid sulfur dioxide contain 85 gm. o $NO_2C_6H_4CH_3$ at ? t°. (DeCarli, 1927.)

The calculated critical solution temperature of mixtures of meta nitro toluene and hexane is -30°. (Dessart, 1926.)

Freezing-point data are given for mixtures of Nitro toluenes and:

- Amino azo benzene(18)
- Aniline(24)
- Azo benzene(18)
- Benzene(12)(25)
- Benzoic acid(19)
- Benzo phenone + dibenzyl (27)
- Bromo nitro benzene(19)
- Chloro nitro benzene(19)
- Cyclohexane(12)(25)
- Dibenzyl + benzo phenone (27)
- Diethyl diacetyl tartrate (31)
- Diethyl diphenyl urea(17a)
- Dimethyl amino azobenzene (18)
- Dinitro benzenes(16)
- Dinitro toluenes(3)(6)(8)(13)(4)(16)(2)(21)(31)(14)(15)
- Diphenyl amine(16)
- Hexane(12)
- Methyl cyclohexane(12)
- Methylene dioxybenzal-aceto phenone(1)
- Naphthalene(24)(10)
- Nitro aniline(19)
- Nitro erythritol(28)
- Nitro mannitol(28)
- Nitro penta erythritol (28)
- Nitro phenol(10)
- Nitro toluenes(4)(5)(13)(3)(20)(22)
- Salicylic acid(11)
- Toluene(12)
- Toluidine(10)
- Tetra nitro methyl aniline(16)
- Tri methylene-tri nitramine(29)
- Tri nitro toluene(3)(6)(7)(16)(17)(2)
- Tri nitro phenyl-methyl nitramine(15)(23)
- Tri nitro m xylene(8)
- Urethan(26)

(1) Aschina, 1934; (2) Bogoiavienslenskii, 1918, 1928; (3) Bell and Cordon, 1912; (4) Bell, Cordon, Spry and White, 1921; (5) Bell and McEwen, 1922; (6) Bell and Herty, Jr., 1919; (7) Bell and Spry, 1921; (8) Bell and Sawyer, 1919; (9) Crockford and Hughes, 1930; (10) Crockford and Simmons, Jr., 1933; (11) Crockford and Zurburg, 1930; (12) Dessart, 1926; (13) Gibson, Duckham and Fairbairn, 1922; (14) Giua, 1913; (15) Giua, 1914; (16) Giua, 1916; (17) Giua, 1920; (17a) Giua and Guastalla, 1933; (18) Giua and Reggiani, 1925; (19) Grimm, Gunther and Titus, 1931; (20) Holleman, 1914; (21) Holleman, Vermeulen and de Mooy, 1914; (22) Holleman and van der Arend, 1909; (23) Jefremow, 1926; (24) Kremann, 1904; (25) Linard; (26) Mascarelli, 1908, 1909; (27) Malotaux and Sraub, 1937; (28) Urbanski, 1933; (29) Urbanski and Rabek-Gawronska, 1934; (30) Scheuer, 1910; (31) Vermeulen, 1928.

Amino**BENZOIC ACID** (*m*) $C_6H_4.NH_2.COOH$.

SOLUBILITY OF META AMINO BENZOIC ACID IN WATER AND IN OTHER SOLVENTS.

(de Coninck, 1893.)

In Water.

t°.	Gms. $C_6H_4.NH_2.COOH(m)$ per 100 cc. H_2O.
0	0.43
10	0.52
20	0.67
30	0.87
40	1.15
50	1.50
60	2.15
70	3.15

In Organic Solvents.

Solvent.	t°.	Gms. $C_6H_4.NH_2.COOH(m)$ per 100 cc. Solvent.
Ethyl Alcohol (95%)	12.5	2.92
Methyl Alcohol (pure)	10.5	4.05
Acetone	11.3	6.22
Methyl Iodide	10.0	0.04
Ethyl Iodide	0.0	0.02
Chloroform	12.0	0.07
Bromoform	8.0	trace

Amino**BENZOIC ACID** (*o*) $C_6H_4.NH_2.COOH$.

Solubility of *o* Aminobenzoic Acid in Water. (Lunden, 1905–06.)

t°	Sp. Gr. Sat. Sol.	Gms. $C_6N_4NH_2COOH(o)$ per 100 cc. Sat. Sol.	t°.	Sp. Gr. Sat. Sol.	Gms. $C_6H_4NH_2COOH(o)$ per 100 cc. Sat. Sol.
25	0.999	0.519	34.9	0.998	0.731
26.1	...	0.540	35	0.997	0.744
28.1	...	0.570	39.8	0.997	0.889

Mutual Solubility of Aminobenzoic Acids and Water at High Temperatures, Determined by the Synthetic Method.

(Flaschner and Rankin, 1910.)

Mixtures of *o* Acid and H_2O.		Mixtures of *m* Acid and H_2O.		Mixtures of *p* acid and H_2O.	
t° of Melting.	Gms. *o* Acid per 100 Gms. Mixture.	t° of Melting.	Gms. *m* Acid per 100 Gms. Mixture.	t° of Melting.	Gms. *p* Acid per 100 Gms. Mixture
83.6	4.8	66 crit. sol. temp.		47 crit. sol. temp.	
95.8	9.9	77.8	4.6	82.2	5
101.4	18.5	90	5.8	90	7.1
103.4	30.6	100	9.7	100	15.8
104.4	38	110	20.2	105	22
105	49.4	120	51.2	110	32.3
105.6	59.4	130	73.7	116	51.8
107.8	69.7	140	83.7	120	62
112	80	150	90.7	130	77
116.2	87.2	160	95.8	150	91.1
128.4	95	170	99.2	170	98
144.6	100	174.4	100	186	100

t° reading, for critical saturation and for separating, also given in the case of the *o* acid.

Solubility of Aminobenzoic Acid in Aqueous Salt Solutions at 25°.

(Lunden, 1905–06.)

Normality of Salt Solution.		Sp. Gr. Sat. Solution.	Gms. $C_6H_4NH_2COOH(o)$ per 100 cc. Sat. Solution.	Normality of Salt Solution.		Sp. Gr. Sat. Solution.	Gms. $C_6H_4NH_2$-$COOH(o)$ per 100 cc. Sat. Sol.
0.768	$\frac{1}{2}Ba(NO_3)_2$	1.080	0.634	2.633	KNO_3	1.155	0.501
0.507	"	1.052	0.603	1.372	"	1.083	0.544
0.3427	"	1.037	0.585	0.598	"	1.033	0.549
0.1780	"	1.018	0.555	1.853	KI	1.221	0.541
0.1545	"	1.015	0.549	0.946	"	1.114	0.559
				0.560	"	1.068	0.556

The author also gives additional data for aqueous salt solutions at 28.1°.

Additional data for the solubility of aminobenzoic acid in aqueous salt solutions are given by Euler (1916).

Amino **BENZOIC ACID** (*m*) $C_6H_4.NH_2.COOH$.

Solubility in Water and in Aqueous Solutions of Sodium Chloride and of Potassium Nitrate at 25°. (de Szyszkowski, 1914-1915.)

Normality of Aq. salt solution.	Gm. mols. *m* $C_6H_4.NH_2.COOH$ per 1000 gms. sat. sol. In- Aqueous NaCl.	Gm. mols. *m* $C_6H_4.NH_2.COOH$ per 1000 gms. sat. sol. In- Aqueous KNO_3.
0.0 (= water)	$5.565.10^{-2}$	$5.565.10^{-2}$
0.1		5.606 "
0.25	5.670 "	5.797 "
0.5	5.712 "	5.802 "
1.0	5.246 "	5.064 "

ANTHRANILIC ACID (*o* Aminobenzoic Acid) *o* $NH_2C_6H_4COOH$.

DISTRIBUTION OF ANTHRANILIC ACID BETWEEN:

(Smith, 1921-22.)

Water and Chloroform at 25°.

Millimols. *o* $NH_2C_6H_4COOH$ per liter. Water layer (C_1).	Millimols. *o* $NH_2C_6H_4COOH$ per liter. $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
4.50	0.60	0.133
6.62	0.96	0.145
10.00	1.54	0.154
16.10	2.87	0.178

Water and Ether at 25°.

Millimols. *o* $NH_2C_6H_4COOH$ per liter. Water layer (C_1).	Millimols. *o* $NH_2C_6H_4COOH$ per liter. Ether layer (C_2).	$\frac{C_2}{C_1}$.
0.52	0.56	1.075
1.00	1.05	1.05
1.86	2.21	1.19
3.57	4.04	1.13
6.04	6.80	1.125

Water and Acetone at 25°.

Millimols. *o* $NH_2C_6H_4COOH$ per liter. Glycerol layer (G).	Millimols. *o* $NH_2C_6H_4COOH$ per liter. Acetone layer (A).	$\frac{A}{G}$.
1.05	2.20	2.09
1.55	3.80	2.45
3.20	8.95	2.80
4.60	14.70	3.20

Data for the distribution of *o* aminobenzoic acid between water and benzene at 25° are given by Farmer and Warth (1904).

DISTRIBUTION OF ANTHRANILIC ACID BETWEEN WATER AND CHLOROFORM AT 25°.

(Smith and White, 1929.)

Gm. mols. *o* $NH_2C_6H_4COOH$ per liter H_2O layer	Gm. mols. *o* $NH_2C_6H_4COOH$ per liter $CHCl_3$ layer
0.01126	0.00176
0.01607	0.00306
0.02092	0.00479
0.02735	0.00766
0.03250	0.01038
0.04698	0.01996

100 gms. Cymene dissolve 0.747 gms. Anthranilic acid at 25°. (Wheeler, 1920.)

SOLUBILITY OF ORTHO AMINO BENZOIC ACID IN SEVERAL SOLVENTS.

(Lazzell and Johnston, 1928.)

The determinations at 25° were made by the analytical method and all others by the synthetic method. The results were plotted and the following results taken from the curves.

t°	Gm. Mol. *o* $NH_2C_6H_4COOH$ per 100 gm. mols. sat. solution in: $CH_3COOC_2H_5$	C_2H_5OH	CH_3OH	Butyl alc.	$CHCl_3$	C_6H_6
25	14.71	7.75	7.62	—	1.57	0.81
30	15.0	9.0	8.6	—	2.0	1.3
40	16.8	11.6	10.8	—	3.0	2.3
50	19.2	14.6	13.5	—	4.4	3.6
60	22.2	18.5	17.2	—	6.4	5.3
70	26.2	23.0	22.1	—	9.0	7.2
80	31.6	28.4	27.8	26.6	13.0	9.9
90	39.0	35.2	35.0	32.6	19.5	13.5
100	45.8	43.8	43.5	40.0	28.5	20.0
110	54.4	54.4	53.9	52.0	41.8	34.3
120	64.6	67.0	66.7	65.3	57.9	52.5
130	77.7	79.6	70.4	78.6	72.0	70.6
140	91.5	92.3	92.2	91.9	90.1	88.8

SOLUBILITY OF META AMINO BENZOIC ACID IN SEVERAL SOLVENTS.

(Lazzell and Johnston, 1928.)

t°	Gm. Mol. m $NH_2C_6H_4COOH$ per 100 gm. mol. sat. solution in:					
	CH_3OH	C_2H_5OH	$CH_3COOC_2H_5$	Butyl alc.	$CHCl_3$	C_6H_6
25	1.70	1.52	1.30	—	0.05	0.008
30	2.2	1.8	1.4	—	0.3	0.2
40	3.4	2.5	1.6	—	0.7	0.4
50	4.6	3.2	1.8	—	1.1	0.7
60	5.7	4.0	2.0	—	1.5	1.0
70	7.0	4.6	2.5	—	1.9	1.3
80	8.6	6.0	3.3	—	2.2	1.6
90	10.8	8.4	4.7	—	2.5	1.8
100	15.0	12.7	6.8	—	2.8	2.2
110	20.3	19.7	11.4	—	3.1	2.4
120	27.9	27.0	19.2	—	3.4	2.7
130	37.5	37.3	28.4	22.4	4.8	3.6
140	48.7	47.4	30.8	30.6	9.5	5.9
150	61.0	59.0	54.6	—	23.3	12.1
160	73.9	72.8	70.9	—	68.9	59.7
170	88.0	88.0	87.1	—	88.0	88.0

SOLUBILITY OF PARA AMINO BENZOIC ACID IN SEVERAL SOLVENTS.

(Lazzell and Johnston, 1928.)

t°	Gm. Mol. p $NH_2C_6H_4COOH$ per 100 gms. mol. sat. solution in:					
	CH_3OH	C_2H_5OH	$CH_3COOC_2H_5$	Butyl alc.	$CHCl_3$	C_6H_6.
25	5.94	4.97	5.1	—	0.13	0.04
30	6.6	5.4	5.4	—	0.2	0.2
40	8.2	6.5	6.0	—	0.4	0.3
50	9.6	7.8	7.0	—	0.7	0.4
60	11.4	9.5	8.1	—	1.0	0.6
70	13.4	11.8	9.7	—	1.2	0.7
80	15.8	14.8	11.7	—	1.5	0.8
90	19.0	18.4	14.3	—	1.8	1.0
100	22.9	22.4	17.7	—	2.1	1.2
110	27.7	27.3	22.0	—	2.4	1.4
120	33.8	33.1	27.8	—	2.6	2.0
130	41.1	40.4	35.4	28.7	3.0	3.0
140	49.8	49.7	44.4	39.3	7.2	5.0
150	59.6	59.9	54.8	51.1	18.3	10.0
160	70.1	70.8	66.3	63.7	38.0	30.3
170	80.9	81.6	78.8	76.7	73.8	68.4
180	97.0	92.4	91.3	90.3	92.3	90.0

Freezing-point data are given by Pfeiffer, Angern and Wang, 1927, for mixtures of ortho, meta and para amino benzoic acids, each separately with sarcosine anhydride.

SALICYLAMIDE $OH.C_6H_4CONH_2$.

DISTRIBUTION BETWEEN WATER AND OLIVE OIL.

(Meyer, 1901.)

t°.	Gms. $OHC_6H_4CONH_2$ per 100 cc.		Dist. Coef.
	H_2O Layer.	Oil Layer.	
3	0.056	0.126	2.25

PHENYL URETHAN $NH_2COOC_6H_5$.

Freezing-point data for mixtures of phenyl urethan and antipyrine are given by Mazetti, 1926.

CHLORO NITRO TOLUIDINES $ClNO_2C_6H_2CH_3NH_2$.

Freezing-point data for mixtures (6) Chloro (4) nitro meta toluidine and (6) Chloro (3) nitro para toluidine are given by Morgan and Challenor, 1921.

TOLUENE SULFONYL CHLORIDES $CH_3.C_6H_4.SO_2Cl$.

Freezing-point data for mixtures of ortho and para toluene sulfonyl chlorides are given by Holleman and Caland, 1911, and by Harding, 1921.

NITRO ANISOLES o and p $NO_2C_6H_4OCH_3$.

1000 gms. H_2O dissolve 1.69 gms. ortho anisole at 30°.
1000 gms. H_2O dissolve 0.589 gms. para anisole at 30°.
(Gross, Saylor and Gorman, 19

Freezing-point data are given for mixtures of p Nitro anisole and:

Diphenyl amine(4)(5)	Nitro penta erythritol(6)
Mercuric chloride(2)(3)	Tri methylene tri nitramine(7)
Nitro mannitol(6)	Urethan(2)(5)

Results for mixtures of Di nitro anisole and Di nitro phenetol are given by (1).

(1) Blanksma, 1914; (2) Mascarelli, 1908, 1909; (3) Mascarelli and Ascoli, 1907; (4) Puschin, 1926b; (5) Puschin and Grebenschukov, 1913, 1925; (6) Urbanski, 1933; (7) Urbanski and Radek-Gawronska, 1934.

AZOLITMINE $C_7H_7NO_4$.

100 gms. H_2O dissolve 39.5 gms. azolitmine at 20°-25°. (Dehn, 1917.)
100 gms. pyridine dissolve 0.05 gm. azolitmine at 20-25°. "
100 gms. aq. 50% pyridine dissolve 0.12 gm. azolitmine at 20°-25°. "

TOLUENE $C_6H_5CH_3$.

SOLUBILITY OF TOLUENE IN WATER.

t°.	Cc. $C_6H_5CH_3$ per 100 cc. H_2O.	Authority.	t°.	Cc. $C_6H_5CH_3$ per 100 cc. H_2O	Authority.
16.....	0.057	Führer, 1924	150.....	0.2	Jaeger, 1923
25 (?)...	0.063	Horiba, 1917	200.....	0.7	"
100.....	<0.10	Jaeger, 1923	350.....	2.8	"
			300	13.0	"

The determination of Führer was made by adding the toluene from a buret to a measured volume of water untill saturation was reached. The determinations of Jaeger were made in a large shaking autoclave of more than two liters capacity. A measured volume of the saturated solution was cooled and after it had separated into two layers the volume of toluene was measured.

100 gms. H_2O dissolve 0.057 gm. $C_6H_5CH_3$ at 30°. (Gross and Saylor, 1931.)

100 gms. H_2O dissolve 0.0368 gm. $C_6H_5CH_3$ at 10° and 0.0492 gms. at 25°. (Uspenski, 1929.)

Solubility of Water in Toluene.

The results of Tarassenkow and Poloshinzewa, 1932; Rosenbaum and Walton, 1930 and of Uspenski, 1929, were plotted and the following values read from the curve.

t°	Gms. H_2O per 100 gms. sat. sol.	t°	Gms. H_2O per 100 gms. sat. sol.	t°	Gms. H_2O per 100 gms. sat. sol.
−10	0.02(0.002)	25	0.050(0.045)	60	0.15
0	0.027(0.007)	30	0.057(0.052)	70	0.21
+10	0.035(0.020)	40	0.075(0.075)	80	0.275
20	0.045(0.035)	50	0.10	90	0.375

The results in parentheses and above 50° are by Tarassenkow and Poloshinzewa.

TOLUENE

100 gms. 0.4 normal aq. sodium oleate solution (= 10.8 gms. Na oleate per 100 gms. solution) dissolve 3.5 gms. $C_6H_5CH_3$ at 20°. When the oleic acid and toluene are mixed and the calculated amount of NaOH added to neutralize the oleic acid is added and the mixture diluted with water to 0.4 normality, the solubility of the toluene is 11.4 gms. $C_6H_5CH_3$ per 100 gms. sat. solution at 20°. (Smith, 1932.)

Reciprocal Solubility of Toluene and Sulfur.

(Alexejew, 1886.)

The synthetic method was used. The results were plotted and the following values read from the curve.

t°.	Gms. $C_6H_5CH_3$ per 100 Gms. S Layer.	Gms. $C_6H_5CH_3$ per 100 Gms. Toluene Layer.	t°.	Gms. $C_6H_5CH_3$ per 100 Gms S Layer.	Gms. $C_6H_5CH_3$ per 100 Gms Toluene Layer.
100	3	73	150	12.5	59
110	4	71	160	16	53
120	5	68	170	22	47
130	7	66	175	25	43
140	9.5	63	178 crit. temp.	34	

Freezing-point data are given for mixtures of Toluene and:

Aniline(7)(8)
Benzene(5)
Benzoic acid(2)
Chloro toluene(4)
Cyclohexane(7)
Chloroform(7)
Ethylene bromide(1)
Fluoro toluenes(4)
Ethylidene chlorides(9)
Nitro toluene(3)
Toluidine(3)
Xylene(6)

(1) Baud, 1912; (2) Chipman, 1918; (3) Dessart, 1926; (4) Klemm, Klemm and Schiemann, 1933; (5) Mitsukari and Nakatsuchi, 1926; (6) Nakatsuchi, 1926; (7) Timmermans, 1928; (8) Timmermans, 1930; (9) Timmermans, 1934.

Phenyl Thio**UREA** (Phenyl thiocarbamide) $CS.NH_2.NHC_6H_5$.

SOLUBILITY IN WATER.

(Rothmund, 1900; Biltz, 1903; Hollman and Antusch, 1894; Bogdan, 1902–03.)

One liter aq. solution contains 2.12 gms. $CS(NH_2).NHC_6H_5$ at 20° (B.), (R.) and 2.4 gms. at 25°. (H. and A.). Bogdan gives 2.547 gms. at 25°.

SOLUBILITY OF PHENYL THIOUREA AT 25° IN AQUEOUS SOLUTIONS OF.

Potassium Nitrate. (Bogdan, 1902–03.)			Sodium Nitrate. (Bogdan, 1902–03.)		
Gms. Mols. KNO_3 per 1000 Gms. H_2O.	Gms. per 1000 Gms. H_2O.		Gms. Mols. $NaNO_3$ per 1000 Gms. H_2O.	Gms. per 1000 Gms. H_2O.	
	KNO_3.	$CS(NH_2).NHC_6H_5$.		$NaNO_3$.	$CS(NH_2)NHC_6H_5$.
1.045	105.7	2.38	1.024	87.14	2.26
0.5123	51.84	2.48	0.5065	43.10	2.46
0.2026	20.50	2.54	0.2031	17.28	2.51
0.1007	10.19	2.56	0.0986	8.39	2.53
0.0503	5.09	2.55	0.0540	4.59	2.54
0.0333	3.36	2.55	0.0335	2.84	2.54

SOLUBILITY OF PHENYL THIOUREA IN AQUEOUS SALT SOLUTIONS AT 20°.

(Biltz, 1903; Rothmund, 1900.)

Salt Solution.	Millimols and the Equivalent Gms. $CS(NH_2)NHC_6H_5$ Dissolved per Liter of Aqueous Salt Solution of Concentration:							
	0.125 Normal		0.25 Normal		0.5 Normal.		1 Normal	
	Millimols.	Gms.	Millimols.	Gms.	Millimols.	Gms.	Millimols.	Gms.
$\frac{1}{3}AlCl_3$	12.95	1.97	12.82	1.96	12.03	1.83	10.69	1.61
NH_4NO_3	14.17	2.15	14.4	2.21	14.53	2.22	14.91	2.27
$\frac{1}{2}(NH_4)_2SO_4$	13.51	2.05	12.84	1.96	11.78	1.79	9.98	1.52
$\frac{1}{2}BaCl_2$	13.12	1.99	12.92	1.97	12.22	1.86	10.44	1.59
$\frac{1}{2}Ba(NO_3)_2$	13.98	2.13	13.98	2.13	13.90	2.12	...	...
$CsNO_3$	14.53	2.21	14.90	2.27	15.23	2.33	...	...
$LiNO_3$	13.96	2.13	13.96	2.13	13.93	2.12	13.73	2.10
$\frac{1}{2}MgSO_4$	13.40	2.04	12.78	1.95	11.54	1.75	9.43	1.43
$KC_2H_3O_2$	13.40	2.04	12.95	1.97	12.14	1.85	10.74	1.62
KBr	13.50	2.05	13.35	2.04	12.80	1.95	11.76	1.79
$KClO_3$	13.86	2.11	13.60	2.06	13.12	1.99	...	...
KCl	13.40	2.04	12.73	1.94	12.19	1.85	10.54	1.60
KI	14.12	2.15	14.48	2.21	14.31	2.18	14.60	2.23
KNO_3	13.89	2.12	13.85	2.11	13.52	2.05	12.82	1.96
KNO_2	14.52	2.21	14.65	2.23	13.80	2.11	12.51	1.92
$\frac{1}{2}K_2SO_4$	13.25	2.03	12.49	1.91	11.11	1.69	8.73	1.33
$RbNO_3$	14.22	2.16	14.44	2.19	14.39	2.18	14.22	2.17
$\frac{1}{2}Na_2CO_3$	13.29	2.04	12.52	1.91	11.05	1.68	8.58	1.32
$NaClO_3$	13.75	2.09	13.65	2.08	13.07	1.98	12.21	1.86
$NaClO_4$	14.15	2.15	14.05	2.14	13.58	2.06	12.56	1.92
$NaCl$	13.28	2.02	12.83	1.95	11.90	1.81	10.02	1.52
NaI	13.98	2.13	14.07	2.14	14.29	2.18	13.96	2.13
$NaNO_3$	13.94	2.12	13.77	2.10	13.32	2.04	12.57	1.92
$NaNO_2$	14.34	2.18	13.82	2.11	13.06	1.98	11.52	1.75

SOLUBILITY OF PHENYL THIOUREA IN ETHYL ALCOHOL SOLUTIONS OF SEVERAL SALTS AT 28°.

(Thorin, 1915.)

Salt.	Normality of Salt in C_2H_5OH.	Mols. $NH_2.CS.NHC_6H_5$ per 100 Gms. Sat. Sol.	Salt.	Normality of Salt in C_2H_5OH.	Mols. $NH_2.CS.NH.C_6H_5$ per 100 Gms. Sat. Sol.
None	(pure C_2H_5OH)	0.2065	NaI	0.043	0.2102
LiCl	0.168	0.2274	"	0.086	0.2148
"	0.337	0.2360	"	0.172	0.2198
"	0.673	0.2440	"	0.343	0.2271
"	1.346	0.2494	"	0.685	0.2359
$CaCl_2$	0.061	0.2101	NaBr	0.022	0.2098
"	0.122	0.2135	"	0.043	0.2194
"	0.244	0.2194	"	0.086	0.2165
"	0.487	0.2279	"	0.172	0.2257
"	0.975	0.2372			

SOLUBILITY OF PHENYL THIOUREA IN MIXTURES OF ETHYL ALCOHOL AND WATER AT 25°.

(Holleman and Antusch, 1894.)

Vol. per cent Alcohol.	Gms. $CS(NH_2)NHC_6H_5$ per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. per cent Alcohol.	Gms. $CS(NH_2)NHC_6H_5$ per 100 Gms. Solvent.	Sp. Gr. of Solutions.
100	3.59	...	65	3.40	0.9018
95	4.44	0.8200	60	2.80	0.9128
90	4.69	0.8389	50	1.87	0.9317
85	4.99	0.8544	40	1.13	0.9486
80	4.70	0.8679	25	0.56	0.9679
75	4.45	0.8810	15	0.38	0.9788
70	3.92	0.8915	0	0.24	0.9979

See remarks under α acetnaphthalide, p. 705

SOLUBILITY OF PHENYL THIOUREA IN AQUEOUS SOLUTIONS OF PROPYL AND OF ETHYL ALCOHOL AT 25°.

(Bogdan, 1902–03.)

In Aq. Propyl Alcohol.			In Aq. Ethyl Alcohol.		
G. Mols. C_3H_7OH per 1000 Gms. H_2O.	Gms. per 1000 Gms. H_2O.		G. Mols. C_2H_5OH per 1000 Gms. H_2O.	Gms. per 1000 Gms. H_2O.	
	C_3H_7OH.	$CS(NH_2)NHC_6H_5$.		C_2H_5OH.	$CS(NH_2)NHC_6H_5$.
1.035	62.10	3.587	1.1010	49.60	3.193
0.5448	32.688	3.124	0.5355	24.12	2.931
0.1059	6.354	2.643	0.1094	4.932	2.629
0.05526	3.316	2.599	0.05018	2.26	2.589
0.04854	2.912	2.586	0.03271	1.473	2.577
In Propyl Alcohol at 0°.					
1.000	60.06	1.21			
0.100	6.01	1.047			

SOLUBILITY OF PHENYL THIOUREA IN AQUEOUS SOLUTIONS OF ACETONE, MANNITOL, CANE SUGAR, DEXTROSE, AND UREA.

(Bogdan, 1902-03.)

Aqueous Non Electrolyte.	t°.	Gms. per 1000 Gms. H_2O		Aqueous Non Electrolyte.	t°.	Gms. per 1000 Gms. H_2O.	
		Non Electrolyte.	$CS(NH_2)NH.C_6H_5$.			Non Electrolyte.	$CS(NH_2)NHC_6H_5$.
$(CH_3)_2CO$	25	7.478	2.667	$C_6H_{12}O_6$	25	180 40	3.042
"	"	2.513	2.579	"	"	90.46	2.83
"	"	1.908	2.573	"	"	29.29	2.69
$C_6H_8(OH)_6$	"	182.11	3.04	"	"	18.01	2.654
"	"	91.05	2.78	"	"	9.554	2.603
$C_{12}H_{22}O_{11}$	25	338.6	3.457	$CO(NH_2)_2$	"	63.08	3.306
"	"	170.4	3.015	"	"	29.93	2.892
"	"	34.36	2.634	"	"	6.132	2.618
"	"	18.28	2.596	"	"	4.942	2.605
"	"	10.09	2.572	"	"	2.009	2.572
"	0	342.18	1.420	"	0	60.11	1.310
"	"	34.22	1.044	"	"	6.01	1.048

ANISOLE $C_6H_5OCH_3$.

SOLUBILITY OF ANISOLE IN AQUEOUS SODIUM OLEATE SOLUTION AT 20°.

(Smith, 1932.)

100 gms. 0.4 normal aq. sodium oleate solution (= 10.8 gm. Na oleate per 100 gms. solution) dissolve 2.1 gms. $C_6H_5OCH_3$. When the anisole and oleic acid are mixed and the calculated amount of NaOH to neutralize the acid is added, and the mixture diluted with water to 0.4 normality, the solubility of the anisole is 7.2 gms. $C_6H_5OCH_3$ per 100 gms. sat. solution.

RECIPROCAL SOLUBILITY OF ANISOLE AND GLYCEROL.

(Mc Ewen, 1923.)

t°. of solution.	Gms. $C_6H_5OCH_3$ per 100 gms. sat. sol.	t°. of solution	Gms. $C_6H_5OCH_3$ per 100 gms. sat. sol.
161.5	6.07	275.5	53.41
185.3	11 29	273.5	69.46
250.5	27.63	263.5	78.80
274.5	44.02	230.5	90.12

RECIPROCAL SOLUBILITY OF ANISOLE AND BENZYL CHLORIDE DETERMINED BY THE FREEZING-POINT METHOD.

(Wroczynski and Guye, 1910.)

t° of Melting.	Gms. $C_6H_5OCH_3$ per 100 Gms. Mixture.	Solid Phase.	t° of Melting	Gms. $C_6H_5OCH_3$ per 100 Gms. Mixture	Solid Phase.
−37.2	100	$C_6H_5OCH_3$	−72.8 Eutec.	46.1	$C_6H_5OCH_3+C_6H_5CH_2Cl$
−40	93.3	"	−60	28	$C_6H_5CH_2Cl$
−50	75.3	"	−50	13	"
−60	62.1	"	−41.1	0	"

BENZYL ALCOHOL $C_6H_5CH_2OH$

100 gms. H_2O dissolve 3.8 gms. $C_6H_5CH_2OH$ at 20°.

100 gms. aq. 0.4 normal sodium oleate solution (= 10.8 gm. Na oleate per 100 gms. solution dissolve 19.0 gms. $C_6H_5CH_2OH$ at 20°. (Smith, 193

CRESOLS $C_6H_4(OH)CH_3$ *o*, *m* and *p*.

Solubility of Each Separately in Water.

(At 20°, Vaubel, 1895; Sidgwick, Spurrell and Davies, 1915.)

Determinations by synthetic method; melting-point of *o* = 29.9°, of *m* = 4°, of *p* = 33.8°. Triple point for *o* = 87 and 2.5 gms. per 100 gms. sat. sol. at 8°; triple point for *p* = 86 and 2 gms. per 100 gms. sat. sol. at 8.7°.

t°.	Gms. per 100 Gms. Sat. Solution.			t°.	Gms. per 100 Gms. Sat. Solution.		
	o Cresol.	*m* Cresol.	*p* Cresol.		*o* Cresol.	*m* Cresol.	*p* Cresol.
20	2.45	2.18	1.94	120	6.22	7	6.58
40	3.08	2.51	2.26	130	6.70	8.86	9
50	3.22	2.72	2.43	140	7.67	12.3	15.9
60	3.40	2.98	2.69	143.5 crit. t.	...	...	∞
70	3.74	3.35	3.03	147 crit. t.	...	∞	
80	4.22	3.80	3.52	150	11.1		
90	4.80	4.43	4.16	160	23.7		
100	5.30	5.47	5.10	162.8 crit. t.	∞		
110	5.80	5.96	5.50				

100 gms. sat. solution of Meta cresol in water contain 2.38 gms. at 20°. (Traubmann, 1931; Lipetz and Rimskaja, 1931.)

Reciprocal Solubility of o, m and p Cresols and Water.

(Michels and ten Haaf, 1927.)

The determinations were made by the synthetic method. The m. pt. of the m cresol was 10.6° instead of 4° as previously found.

Results for:

Ortho cresol + water		Meta cresol + water		Para cresol + water	
t°	Gms. o $(OH)C_6H_4CH_3$ per 100 gms. sat. sol.	t°	Gms. m $(OH)C_6H_4CH_3$ per 100 gms. sat. sol.	t°	Gms. p $(OH)C_6H_4CH_3$ per 100 gms. sat. sol.
< 0	1.3	50.8	2.7	29.5	2.21
46.2	2.9	78.7	3.6	82.1	3.74
86.7	4.0	92.2	4.5	105.0	5.4
104.5	4.5	121.7	10.8	118.5	6.9
121.0	6.9	140.4	14.0	127.9	9.2
134.	8.7	147.5	23.2	138.0	16.4
157.9	17.5	148.7	29.7	142.5	32.3
167.3	36.4	148.8(Crit.t)	38.0	142.6(Crit.t)	36.0
168.9(Crit.t)	41.0	148.6	48.9	140.7	43.7
168.3	45.9	141.9	59.3	139.5	50.2
163.7	56.5	133.2	65.9	136.6	56.9
160.1	64.7	120	73.1	124.4	66.6
139.2	74.8	90.2	79.7	110.8	71.3
92.8	82.9	82.6	80.7	59.5	81.3
50.5	86.2	36.2	85.9	37.1	83.7

Reciprocal Solubility of Ortho Cresol and Water.

(v. Szelenyi, 1929.)

t°	Gms. o $OHC_6H_4CH_3$ per 100 gms. sat. sol.	t°	Gms. o $OHC_6H_4CH_3$ per 100 gms. sat. sol.	t°	Gms. o $OHC_6H_4CH_3$ per 100 gms. sat. sol.
106.4	4.90	168.9	29.65	164.85	60.33
141.75	7.70	169.25	35.51	152.3	67.70
155.35	10.93	169.7(Crit.t)	39.50	130.25	75.45

$C_7H_8O_1$

CRESOL

SOLUBILITY OF META CRESOL IN AQUEOUS SOLUTIONS OF ACIDS AND OF SALTS AT 25°.

(Carter and Hardy, 1928.)

In aqueous solutions of:

Acids

Gm. Equiv. per 1000 gm. mols. H_2O		Gms. per 100 gms. sat. solution	
Acid	$OHC_6H_4CH_3$	Acid	$OHC_6H_4CH_3$
0.0(= H_2O)	3.87	0.0	2.27
9.62 HCl	3.39	1.87	1.96
20.22 "	3.17	3.86	1.79
40.83 "	2.83	7.52	1.54
49.09 "	2.80	8.90	1.50
66.40 "	2.71	11.72	1.42
77.00 "	2.67	13.30	1.37
8.60 H_2SO_4	3.39	4.39	1.91
18.11 "	3.09	17.24	1.26
38.84 "	2.57	21.94	1.08
52.35 "	2.34	24.96	0.95
61.86 "	2.14	30.98	0.76
83.37 "	1.86		

Sodium Salts

Gm. Equiv. per 1000 gm. mols. H_2O		Gms. per 100 gms. sat. solution	
Salt	$OHC_6H_4CH_3$	Salt	$OHC_6H_4CH_3$
8.20 NaCl	3.03	2.55 NaCl	1.74
15.89 "	2.54	4.83 "	1.43
27.09 "	1.89	8.00 "	1.03
42.19 "	1.38	11.95 "	0.72
45.84 "	1.25	12.86 "	0.65
54.38 "	1.04	14.92 "	0.53
68.26 "	0.73	18.07 "	0.36
89.80 "	0.50	22.51 "	0.23
6.08 Na_2SO_4	3.08	4.50 Na_2SO_4	1.73
14.22 "	2.39	9.96 "	1.27
16.29 "	2.24	11.25 "	1.18
32.43 "	1.36	20.23 "	0.65
41.88 "	0.97	24.72 "	0.44
62.33 "	0.52	32.81 "	0.21

Magnesium Salts

Gm. Equiv per 1000 gm. mols. H_2O		Gms. per 100 gms. sat. sol.	
$MgCl_4$	$OHC_6H_4CH_3$	$MgCl_4$	$OHC_6H_4CH_3$
12.77	2.87	6.22	1.59
26.87	2.19	12.30	1114
42.65	1.59	18.26	0.77
55.49	1.28	22.55	0.59
61.95	1.11	24.55	0.50
66.59	1.04	25.92	0.46

Gm. Equiv. per 1000 gm. mols. H_2O		Gms. per 100 gms. sat. sol.	
$MgSO_4$	$OHC_6H_4CH_3$	$MgSO_4$	$OHC_6H_4CH_3$
6.86	3.13	4.31	1.76
14.22	2.58	8.56	1.39
24.23	1.97	13.79	1.01
29.97	1.69	16.55	0.84
47.74	1.00	24.08	0.45
80.44	0.37	34.91	0.14

A few determinations are also given of the solubility of meta cresol in aqueous solutions of phosphoric acid-sodium phosphate mixtures.

Data for equilibrium in the systems o, m and p cresols, Sodium Oleate and Water by Bailey, 1923, are given on p. 1188 of Vol. I, of this compilation.

100 gms. 0.4 normal aqueous sodium oleate solution (= 10.8 gm. Na oleate per 100 gms. solution) dissolve 37.6 gm. ortho cresol at 20°.

(Smith, 1932.)

EQUILIBRIUM IN THE SYSTEM ORTHO CRESOL, METHYL ALCOHOL AND WATER.

(Szelenyi, 1929.)

The determinations were made by the synthetic method. The results were plotted and the following values obtained for the iso thermal curves.

Gms. per 100 gms. homogeneous mixture

$OHC_6H_4CH_3$	CH_3OH	H_2O
Results at 45°		
5.5	14.46	80.04
6.75	17.36	76.90
25.0	20.0	55.0
40.0	20.07	39.93
73.5	8.86	17.64
78.5	5.89	15.61
Results at 55°		
6.5	14.3	79.2
9.75	16.8	73.45
31.3	18.80	49.86
46.7	17.96	35.34
68.5	10.54	20.96
77.5	6.17	16.33
Results at 70°		
5.08	10.92	84.00
9.8	13.8	76.4
15.8	15.64	68.56
40.8	16.23	42.97
74.0	7.13	18.87
81.2	3.49	15.31
82.2	2.72	15.08
85.0	0.66	14.34
Results at 85°		
4.0	4.22	91.78
8.9	10.5	80.6
15.00	13.0	72.0
25.0	13.94	61.06
51.0	13.49	35.51
66.2	9.22	24.53

Gms. per 100 gms. homogeneous mixture

$OHC_6H_4CH_3$	CH_3OH	H_2O
Results at 85° (Con.)		
77.2	5.34	17.46
78.0	3.36	18.64
82.5	0.77	16.73
83.5	0.14	16.36
Results at 95°		
5.0	4.62	90.38
11.5	10.20	78.30
20.0	12.23	67.77
34.2	13.26	52.54
73.3	4.96	21.74
75.02	3.82	21.16
82.5	2.13	16.37
81.06	0.46	17.94
Results at 110°		
5.0	0.0	95.0
7.0	4.07	88.93
17.8	9.47	72.73
34.2	10.07	55.73
64.2	6.16	29.60
70.8	4.47	24.73
76.4	2.74	20.86
79.0	0.92	20.08
50.2	9.26	40.54
Results at 120°		
5.5	0.0	94.5
8.9	3.95	87.15
28.2	8.27	63.53
48.0	7.96	44.04
65.0	5.35	25.66

Gms. per 100 gms. homogeneous mixture

$OHC_6H_4CH_3$	CH_3OH	H_2O
(Results at 120° (Con.)		
71.0	3.34	25.66
76.8	1.02	22.18
Results at 130°		
6.1	0.0	93.9
9.0	2.27	88.73
12.6	3.82	83.58
42.6	6.6	50.80
68.0	3.69	28.31
75.5	0.0	24.5
Results at 140°		
7.3	0.0	92.7
13.0	1.09	85.91
17.0	3.63	79.37
68.0	1.04	30.96
69.0	0.39	30.61
72.0	0.0	28.0
Results at 150°		
9.35	0.0	90.65
15.3	1.06	83.64
18.7	2.07	79.23
63.0	0.92	36.08
65.0	0.49	34.51
68.5	0.0	31.5
Results at 160°		
19.5	0.0	80.5
24.5	0.94	74.56
54.0	0.53	45.47
58.5	0.0	41.5

DISTRIBUTION OF CRESOL BETWEEN WATER AND ETHER. (Vaubel, 1903.)

Composition of Solvent.	Gms. Cresol in H_2O Layer.	In Ether Layer.
200 cc. H_2O+100 cc. Ether	0.0570	1.0760
200 cc. H_2O+200 cc. Ether	0.0190	1.1144

One liter aqueous 1 normal solution of the sodium salt of *o* cresol dissolves 7.57 gms. *o* cresol at 25°, 8.32 gms. at 40°, 9.84 gms. at 60° and 13.62 gms. at 80°. ([illegible], 1910.)

MISCIBILITY OF AQUEOUS ALKALINE SOLUTIONS OF *m* CRESOL WITH SEVERAL ORGANIC COMPOUNDS INSOLUBLE IN WATER.

(Scheuble, 1907.)

To 5 cc. portions of aq. KOH solution (250 gms. per liter) were added the given amounts of the aq. insoluble compound from a buret, and then the *m* cresol dropwise, until solution occurred. Temp. not stated.

Composition of Homogeneous Solution.		
cc. Aq. KOH.	Aq. Insol. Cmpd.	*m* Cresol.
5	2 cc. (1.64 gms.) Octyl Alcohol*	1.1 gms.
5	5 " (4.1 ") " "	1.8 "
5	2 " (1.74 ") Toluene	4.4 "
5	3 " (2.61 ") "	5.1 "
5	2 " (1.36 ") Heptane	6.4 "

* = the normal secondary alcohol, the so-called capryl alcohol, $CH_3(CH_2)_5CH(OH)CH_3$.

RECIPROCAL SOLUBILITY OF ORTHO CRESOL AND ETHYL ALCOHOL, DETERMINED BY THE FREEZING-POINT METHOD.

(Perrakis, 1925.)

t° of Crystallization.	Mol. per cent o $CH_3.C_6H_4OH$ in sat. sol.	t° of Crystallization.	Mol. per cent o $CH_3.C_6H_4OH$ in sat. sol.
29.05	100.00	1.20	71.10
22.60	91.31	-4.00	63.84
14.00	83.00	-17.30	56.49
8.30	76.89	-31.00	48.40

Freezing-point data for mixtures of o, m and p cresols are given by (4)(5)(7)(10) and (11). Results are given for mixtures of Cresols and:

Aniline(15)(18)
Benzene(8)(17)
Benzoic acid(3)
Benzylamine(22)
Carbamide(23)
Chlor acetic acid(13)(20)
Cineole(1)
Dichloro benzene(8)
Dimethyl aniline(23)
Dimethyl pyrone(13)
Diphenyl amine(25)
Di xylylamines(21)
Ethylene diamine(24)
Naphthalene(26)
Naphthalene diamine(23)
Naphthylamines(25)
Phenol(4)(6)(7)
Picric acid(14)
Piperidine(24)
Pyridine(24)(9)
Quinoline(24)
Styphnic acid(12)
Sulfuric acid(19)
Tri chlor acetic acid(13)
Toluidine(24)
Urea(16)(24)
Xylidines(21)

(1) Bellucci and Grassi, 1913; (2) Bramley, 1916; (3) Da Silva, 1934; (4) Dawson and Mountford, 1918; (5) Deffet, 1918; (6) Fincher and Gröppel, 1917; (7) Fox and Barker, 1918; (8) Glass and Madgin, 1934; (9) Hatcher and Skirrov, 1917; (10) Hill and Davis, 1926, (11) Hill and Mosbacker, 1925; (12) Jefremow, 1914; (13) Kendall, 1914; (14) Kendall, 1916; (15) Kremann, 1906; (16) Kremann, 1907; (17) Kremann and Borjanovics, 1916; (18) Kremann and Philip, 1903; (19) Kendall and Carpenter, 1914; (20) Mamelli,and Cocconi, 1923; (21) Morgan and Pettet, 1935; (22) Puschin and Rikovski, 1937; (23) Puschin and Sladovic, 1928; (24) Puschin and Sladovic, 1928a; (25) Puschin and Basara, 1927; (26) Rhodes and Hance, 1921

GUAIACOL (o) $CH_3OC_6H_4OH$.

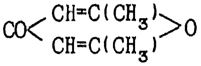
The critical solution temperature of mixtures of guaiacol and citronellal is at about 18°. (Lecat, 1928.)

Freezing-point data are given for mixtures of guaiacol and:

Aniline(13)
Benzene(9)(11)
Benzylamine(11)
Chlor acetic acid(7)(10)
Cineole(3)
Dimethyl aniline(9)(11)
Diphenyl amine(13)
Ethylene diamine(14)
Ethyl urethan(5)(13)
Melanine acids(1)
Menthol(2)(16)
Naphthalene(13)
Naphthylamine(8)(13)
Picric acid (15)
Phenylene diamine(4)
Phenyl hydrazine(9)(11)
Piperidine(11)
Pyridine(13)
Quinoline(9)(11)
Toluidines(13)
Urea(12)

(1) Adler, 1932; (2) Adamanis, 1933; (3) Bellucci and Grassi, 1913; (4) Dezelic, 1932; (5) Gilbert and Clarke, 1927; (6) Hrynakowski and Adamanis, 1933; (7) Mamelli and Coccini, 1923; (8) Puschin and Masarowtsch, 1914; (9) Puschin and Pinter, 1929; (10) Puschin & Rikovski, 1932; (11) Puschin & Rikovski, 1937; (12) Puschin & König, 1928; (13) Puschin and Vaic, 1926; (14) Puschin and Sladovich, 1928a. (15) Philip and Smith, 1915.

DIMETHYL γ PYRONE



$CO<\begin{matrix}CH{=}C(CH_3)\\CH{=}C(CH_3)\end{matrix}>O$

100 gms. Carbon tetrachloride dissolve 1.04 gms. dimethyl pyrone at 20°.
» Chloroform » 34.37 » » » »

(Pawlewski, 1914, 1926.)

Freezing-point data are given for mixtures of dimethyl pyrone and:

Acetic acid(2)
Benzoic acid(1)
Chlor acetic acid(2)
Cinnamic acid(1)
Cresols(1)
Dichlor acetic acid(1)
Dinitro phenol(2)
Formic acid(1)
Hydro cinnamic acid(1)
Naphthols(1)
Nitro phenols(2)
Phenol(2)
Salicylic acid(2)
Sulfuric acid(3)
Toluic acids(2)
Trichlor acetic acid(2)(4)
Trinitro benzene(5)
Trinitro toluene(2)

(1) Kendall, 1914; (2) Kendall, 1914a; (3) Kendall and Carpenter, 1914; (4) Plotnikow, 1911; (5) Sudborough and Beard, 1911.

NITRO TOLUIDINE m $NO_2(CH_3)C_6H_3NH_2$.

Freezing-point data for mixtures of m nitro toluidine and benzene are given by Dessart, 1926.

THEOBROMINE (3.7 Dimethyl Xanthine) $C_5H_2(CH_3)_2N_4O_2$.

SOLUBILITY IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $C_5H_2(CH_3)_2N_4O_2$ per 100 Gms. Solvent.	Authority.
Water	18	0.0305	(Paul, 1901.)
"	15-20	0.050	(Squire & Caines, 1905.)
Aq. 0.25 *n* HCl	18	0.047	(Paul, 1901.)
" 1 *n* HCl	18	0.083	"
" 0.1 *n* NaOH	18	1.78	"
" 0.25 *n* "	18	4.56	"
" 15.6 per cent $Na_3(PO_4)_2$.Sol.	15	3.69	(Brissemoret, 1898.)
92.3 Wt. % Alcohol	21	0.045	(Squire & Caines, 1905.)
90 Wt. % Alcohol	15-20	0.02	"
Dichlorethylene	15	0.005	(Wester & Bruins, 1914.)
Trichlorethylene	15	0.008	"
Carbon Tetrachloride	b. pt.	0.0215	(Göckel, 1897.)
Ether	b. pt.	0.032	"

SOLUBILITY OF THEOBROMINE IN SEVERAL SOLVENTS. (Wadsworth, 1920.)

The method of obtaining saturation and analysis of the solutions is not described.

Solvent.	Gms. Theobromine per 100 cc. sat. sol. at 15°.5.	b. pt.	Solvent.	Gms. Theobromine per 100 cc. sat. sol. at 15°.5.	b. pt.
Water...............	0.060	0.700	Benzene.............	0.005	0.010
Aq. 90 % ethyl alcohol.	–	0.390	Carbon tetrachloride...	0.020	0.040
Absolute » »	–	0.100	Chloroform..........	0.060	0.070
Acetylenetetrachloride.	0.090	0.870	Ethyl ether..........	0.003	0.003
Aniline..............	0.650	8.000	Trichlor ethylene....	0.020	0.030

100 gms. amyl alcohol dissolve 0.02 gm. theobromine at 15°. (Debourdeaux, 1917.)

DISTRIBUTION OF THEOBROMINE BETWEEN: (Aiello, 1921.)

Water and Olive Oil.

t°.	Gms. Theobromine per 100 cc. Aq. layer (*a*).	Oil layer (*o*).	$\frac{o}{a}$.
16...	0.041	0.059	1.45
17...	0.037	0.063	1.70

Horse Serum and Olive Oil.

t°.	Gms. Theobromine per 100 cc. Serum layer (*s*).	Oil layer (*o*).	$\frac{o}{s}$.
20...	0.153	0.057	0.37
20...	0.153	0.067	0.43

THEOPHYLLINE (1.3 Dimethyl Xanthine) $C_5H_2(CH_3)_2N_4O_2$.

100 gms. H_2O dissolve 0.52 gm. theophylline at 15-20°. (Squire & Caines, 1905.)
100 cc. 90 vol. % alcohol dissolve 1.25 gms. theophylline at 15-20°. " "

DISTRIBUTION OF THEOPHYLLINE BETWEEN: (Aiello, 1921.)

Water and Olive Oil.

t°.	Gms. Theophylline per 100 cc. Aq. layer (*a*).	Oil layer (*o*).	$\frac{o}{a}$.
18...	0.200	0.300	1.50
18...	0.363	0.637	1.75

Horse Serum and Olive Oil.

t°.	Gms. Theophylline per 100 cc. Serum layer (*s*).	Oil layer (*o*).	$\frac{o}{s}$.
19...	0.054	0.057	0.91
20...	0.065	0.044	0.67

TOLUENE SULFONIC ACIDS o and p $CH_3C_6H_4SO_3H$.

SOLUBILITY OF o AND p TOLUENE SULFONIC ACIDS, EACH SEPARATELY, IIN AQUEOUS SULFURIC ACID AT 18°.

(Weibel, 1930.)

Wt.% H_2SO_4 in aq. solvent	Gms. per 100 gms. sat. sol. o $CH_3C_6H_4SO_3H$	p $CH_3C_6H_4SO_3H$	Wt.% H_2SO_4 in aq. solvent	Gms. per 100 gms. sat. sol. o $CH_3C_6H_4SO_3H$	p $C_6H_3C_6H_4SO_3H$
35	19.2	17.5	60	0.45	6.9
40	9.9	10.1	65	0.46	8.6
45	4.6	4.8	75		

GUANIDINE PICRATE $HN : C(NH_2)_2.OHC_6H_2(NO_2)_3$.

100 gms. sat. solution in water contain 0.035 gm. picrate at 7°.5, 0.061 gm. at 21°, 0.09 gm. at 32°.5, 0.167 gm. at 48°, 0.502 gm. at 78° and 0.864 gm. at 92°.

100 gms. sat. solution in aq. 50 % ethyl alcohol contain 0.12 gm. at 8°, 0.191 gm. at 19°, 0.397 gm. at 37°, 0.883 gm. at 57° and 1.662 gm. at 74°. (Medes 1925, 1926.)

100 cc. H_2O dissolve 0.132 gm. **methyl guanidine picrate** at 10° and 0.178 gm. at 20°.
» 0.117 » **dimethyl guanidine picrate** » 0.162 »
» 0.697 » **ammonium picrate** » 1.03 »
(Greenwald, 1926.

2.4 Dimethyl **PYRIDINE** $C_5H_3(CH_3)_2N$.

RECIPROCAL SOLUBILITY OF 2.4 DIMETHYL PYRIDINE AND WATER.

(Jones and Speakman, 1921.)

The determinations were made by the Alexejeff synthetic method.

t° of lower solution point.	Wt. per cent H_2O in mixture.	t° of lower solution point.	Wt. per cent H_2O in mixture.
>150	15.99	27.2	55.11
>150	23.14	23.0	67.96
68.5	30.92	23.0	79.57
53.0	37.50	35.0	93.00
39.0	45.14	54.3	95.06

The minimum critical solution temperature is 22.5°.

Phenyl **METHYL AMINE HYDROCHLORIDE** $(CH_3)(C_6H_5)NH.HCl$.

100 gms. H_2O dissolve 378.8 gms. $(CH_3)(C_6H_5)NH.HCl$ at 25°. (Peddle and Turner, '13.)

METHYL ANILINE $C_6H_5NHCH_3$.

RECIPROCAL SOLUBILITY OF METHYL ANILINE AND GLYCEROL.

(Parvatiker and McEwen, 1924.)

t°	Gms. $C_6H_5NHCH_3$ per 100 gms. sat. sol.	t°	Gms. $C_6H_5NHCH_3$ per 100 gms. sat. sol.
197.5	89.5	223.5	51.66
220.0	73.5	222.5	40.60
223.0	66.42	219.0	30.26
224.5	59.48	190.5	14.60

CRITICAL SOLUTION TEMPERATURES OF MIXTURES OF METHYL ANILINE AND OTHER SOLVENTS.

(Thiry, 1925.)

Solvent	f. pt. of solvent	b. pt. of solvent	Critical solution temp. with methyl aniline	Gms. $C_6H_5NHCH_3$ per 100 gms. homogeneous mixture
Ethyl cyclopentane	-137.9	103.0	-49.4	24.0
Propyl " "	-120.3	131.4	-43.0	22.5
Methyl " "	-141.0	71.9	-47.4	22.5
Hexane	- 94.65	69.0	-18.6	27.5
Methyl 3 pentane	—	63.2	-17.25	26.0
Iso hexane	-137.1	60.18	-14.0	27.0
Tri methyl ethyl methane	-98.2	19.7	- 7.65	27.5

Freezing-point data for mixtures of methyl aniline and benzyl chloride are given by Wroczynski and Guye, 1910.

BENZYL AMINE $C_6H_5CH_2.NH_2$.

DISTRIBUTION OF BENZYLAMINE AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $C_6H_5CH_2NH_2$ per liter of H_2O layer (C_1).	Millimols. $C_6H_5CH_2NH_2$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.30	3.85	12.9
0.65	9.55	14.7
1.20	19.6	16.3

Water and Ethyl Ether.

Millimols. $C_6H_5CH_2NH_2$ per liter of H_2O layer (C_1).	Millimols. $C_6H_5CH_2NH_2$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.675	1.335	1.97
1.10	3.25	2.04
1.85	3.725	2.01
2.85	6.05	2.12
4.55	9.60	2.10

Water and Xylene.

Millimols. $C_6H_5CH_2.NH_2$ per liter of H_2O layer (C_1).	Millimols. $C_6H_5CH_2.NH_2$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.81	1.19	1.47
1.58	2.42	1.53
3.35	6.65	1.99
6.32	13.68	2.16

The coefficient of distribution at 25° of benzylamine between water and benzene at concentrations varying from 0.0162 to 0.0168 gm. mols. per liter in the aqueous phase is 4.03

The coefficient of distribution between water and heptane at a concentration of 0.0383 gm. mols. per liter of the aqueous phase is 0.614.

(Williams and Soper, 1930.)

F. pt. data for mixtures of benzylamine with cresol, phenol, chlor phenol and with guaiacol are given by Puschin and Rikovski, 1937.

BENZYLAMINE HYDROCHLORIDE $C_6H_5CH_2.NH_2.HCl$.

100 gms. H_2O dissolve 50.6 gms. of the compound at 25°. (Peddle and Turner, 1913.)

DiBENZYLAMINE HYDROCHLORIDE $(C_6H_5CH_2)_2NH.HCl$.

100 gms. H_2O dissolve 2.17 gms. of the compound at 25°. (Peddle and Turner, 1913.)
100 gms. chloroform dissolve 0.37 gm. of the compound at 25°. " "

TriBENZYLAMINE HYDROCHLORIDE $(C_6H_5CH_2)_3N.HCl$.

100 gms. H_2O dissolve 0.61 gm. of the compound at 25°. (Peddle and Turner, 1913.)
100 gms. chloroform dissolve 11.41 gms. of the compound at 25°. " "

TOLUIDINES $C_6H_4.CH_3.NH_2$, *o*, *m* and *p*.

SOLUBILITY IN WATER.
(Vaubel, 1895; Lowenherz, 1898.)

t°.	Gms. $C_6H_4CH_3.NH_2$ per 1000 Gms. H_2O.	Solid Phase.	t°.	Gms. $C_6H_4CH_3NH_2$ per 1000 Gms H_2O.	Solid Phase.
20	16.26	Liquid ortho T.	20.8	7.39	Para T
20	0.15	Ortho T.	26.7	9.50	"
20	6.54	Para T.	31.7	11.42	"

One liter sat. solution in water contains 15 gms. *o* toluidine at 25°.

One liter sat. solution in 1 *n* aq. *o* toluidine hydrochloride, contains 30 gms. *o* toluidine at 25°. (Sidgwick, 1910.)

The following results for *p* toluidine, differing considerably from the above, are given by Walker (1890).

t°.	22°	30°	36.7°	44°	57.5°	69°
Gms. *p* Toluidine per 100 Gms. Sat. Sol. in Water	19.6	26.9	35.4	44.5	51.4	58.9

Reciprocal Solubility of Ortho Toluidine and Water.

(Angelescu, 1925.)

The temperatures of clouding of mixtures of weighed amounts of the two constituents, contained in sealed tubes, were carefully determined.

	Gms. $C_6H_4CH_3.NH_2$ (o) per 100 gms.			Gms. $C_6H_4CH_3.NH_2$ (o) per 100 gms.	
t°.	Aqueous layer.	Toluidine layer.	t°.	Aqueous layer.	Toluidine layer.
0.....	1.68	97.65	198......	16.47	–
20.....	1.69	97.50	200......	–	79.77
122.....		93.13	207......	–	74.70
150.....	5.65		212......	–	66.80
163.....		88.46	215......	–	56.08
181.....		85.33	216 crit. t.	50.09	
185.....	12.46				

Solubility of Ortho Toluidine in Aqueous Solutions of Acetic Acid.

(Angelescu, 1925.)

The determinations were made by adding ortho toluidine drop by drop to water or aqueous acetic acid just to the appearance of clouding at a definite temperature. The quantities of the three constituents were determined by careful weighings.

Results at 0°.				Results at 20°.			
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$C_6H_4CH_3NH_2$ (o).	CH_3COOH.	$C_6H_4CH_3NH_2$. (o).	CH_3COOH.	$C_6H_4CH_3NH_2$ (o).	CH_3COOH.	$C_6H_4CH_3NH_2$ (o).	CH_3COOH.
1.68	0.00	38.54	19.42	1.69	0.00	23.21	20.51
2.36	0.56	41.26	19.48	2.79	1.19	27.67	21.13
4.16	2.05	45.58	19.46	3.72	2.47	31.19	21.36
5.13	3.51	50.99	19.33	4.37	3.63	34.33	21.77
6.15	5.37	57.44	18.71	5.14	5.17	38.22	21.44
7.41	7.10	64.74	17.31	5.86	6.50	39.89	21.41
9.09	9.76	70.54	15.56	6.84	8.25	46.93	21.27
11.23	12.50	75.19	13.80	7.66	9.86	50.12	21.03
13.63	14.54	80.74	11.28	8.60	11.34	57.59	19.99
17.79	16.72	85.06	8.85	9.49	12.75	65.51	18.00
22.02	17.94	89.27	6.22	10.35	14.02	73.92	14.79
27.29	18.79	94.21	2.75	11.62	15.26	82.11	10.57
32.13	19.17	97.65	0.00	12.81	16.33	89.36	6.03
35.29	19.32			15.02	17.80	93.55	2.96
				17.66	18.97	97.50	0.00
				20.33	19.85		

SOLUBILITY OF ORTHO TOLUIDINE IN AQUEOUS SOLUTIONS OF PROPIONIC ACID.

(Angelescu, 1928.)

Results at 0°				Results at 20°			
Gms. per 100 gms. sat. solution		Gms. per 100 gms. sat. solution		Gms. per 100 gms. sat. solution		Gms. per 100 gms. sat. solution	
o $CH_3C_6H_4NH_2$	C_2H_5COOH	o $CH_3C_6H_4NH_2$	C_2H_5COOH	o $CH_3C_6H_4NH_2$	C_2H_5COOH	o $CH_3C_6H_4NH_2$	C_2H_5COOH
1.68	0.0	32.44	33.78	1.69	0.0	33.45	33.31
3.26	1.71	37.76	34.65	4.28	5.80	38.59	33.81
5.69	6.50	41.01	34.42	6.50	12.18	45.59	32.74
8.15	13.40	48.56	32.37	8.56	16.59	54.38	29.51
10.30	18.67	57.30	28.38	10.52	19.36	63.25	24.87
15.03	23.07	66.22	23.23	15.54	24.09	72.52	19.17
20.01	27.01	75.93	16.87	20.36	27.27	81.92	12.34

Distribution of Acetic Acid at 20° Between Water and Ortho Toluidine.

(Angelescu, 1925.)

In connection with the results showing the solubility of ortho toluidine in aqueous solutions of acetic acid, a series of determinations of the distribution of acetic acid between water and toluidine was needed in order to ascertain the composition of those solutions in contact with each other at a given temperature. The results which were obtained are as follows.

Gms. CH_3COOH per 100 gms.		$\frac{C_1}{C_2}$.	Gms. CH_3COOH per 100 gms.		$\frac{C_1}{C_2}$.
H_2O layer (C_1).	Toluidine layer (C_2).		H_2O layer (C_1).	Toluidine layer (C_2).	
1.45	0.71	2.04	13.94	11.05	1.26
2.87	1.55	1.85	15.49	12.62	1.23
3.77	2.14	1.76	16.39	13.78	1.18
7.22	4.65	1.55	17.64	15.71	1.12
7.97	5.19	1.53	18.87	17.18	1.09
11.37	8.12	1.40	19.41	18.06	1.07

Angelesco, 1925, next determined the temperatures at which two layers are formed in solutions containing constant concentrations of acetic acid and variable percentages of water and ortho toluidine. For this purpose mixtures of toluidine and acetic acid and of water and acetic acid, containing in both cases the same weight per cent of acetic acid, were prepared. Variable mixtures of these two solutions yield in every case a ternary mixture containing a constant percentage of acetic acid. On gradually changing the temperature of such ternary mixtures, containing respectively 19.94, 21.84, 23.33 and 23.60 per cent of CH_3COOH, an upper and a lower point was found at which clouding occurs. Thus for these ranges of concentration, the systems yield closed curves of solubility having an upper and a lower critical temperature of solution. The following results were obtained.

Variation of the Temperature of Solution in a Ternary Mixture of Ortho Toluidine containing 19.94 per cent of Acetic Acid.

Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.	Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.	Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.
59.09	22.5	72.0	34.65	5.6	not. det.	19.38	22.4	not. det.
57.84	17.8	78.6	33.10	6.2	„	18.86	24.0	„
56.54	14.5	84.2	31.78	6.6	„	18.41	25.6	„
52.27	12.5	90.4	30.47	7.3	„	17.89	27.5	„
54.05	10.4	not. det.	29.35	7.9	„	17.45	29.5	„
53.13	8.8	»	28.23	8.7	„	17.00	31.8	„
52.09	7.6	»	27.23	9.5	„	16.62	33.6	„
50.67	6.7	»	26.26	10.4	„	16.24	35.5	„
49.43	6.0	»	25.39	11.4	„	15.85	37.4	„
47.74	5.2	»	24.20	12.9	„	15.40	41.2	„
46.12	4.9	»	23.47	13.8	„	15.05	43.5	„
44.53	4.6	»	22.78	15.0	„	14.72	47.0	„
42.93	4.6	„	22.08	16.3	„	14.36	51.0	90.0
41.29	4.6	„	21.43	17.5	„	14.17	54.0	86.5
39.69	4.6	„	20.63	19.2	„	13.97	63.0	80.5
37.98	4.8	„	20.20	20.1	„	13.68	68.0	76.0
36.23	5.1	„	19.75	21.5	„			

TOLUIDINES

VARIATION OF THE TEMPERATURE OF SOLUTION IN TERNARY ORTHO TOLUIDINE MIXTURES CONTAINING 21.84 PER CENT OF ACETIC ACID.

(Angelescu, 1925, Con.)

Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.	Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.	Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.
52.57	48.2	56.0	36.43	23.3	not. det.	21.21	37.0	not. de
51.55	39.0	67.5	34.79	23.3	»	20.48	39.0	»
50.71	35.5	73.5	32.74	23.5	»	19.80	41.6	»
49.83	33.0	77.5	30.58	24.2	»	19.07	45.5	»
49.02	31.0	81.0	29.00	25.1	»	18.54	48.5	»
48.20	29.0	83.5	27.60	26.2	»	18.06	51.4	89.7
47.34	28.4	86.0	26.15	27.5	»	17.76	55.0	86.5
46.27	27.4	89.0	24.88	29.3	»	17.61	57.0	84.5
44.25	25.6	not. det.	23.76	31.1	»	17.44	59.5	82.0
42.40	24.6	»	22.84	32.8	»	17.24	63.0	78.5
39.99	24.0	»	21.99	34.7	»	17.06	67.0	74.0
38.23	23.5	»						

VARIATION IN THE TEMPERATURE OF SOLUTION IN TERNARY ORTHO TOLUIDINE MIXTURES CONTAINING : (Angelescu, 1925, Con.)

23.33 per cent CH_3COOH.

Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.
39.15	52.5	71.0
38.26	51.2	75.5
37.15	49.6	78.5
36.12	48.2	81.0
34.95	47.2	83.0
33.73	46.3	85.8
32.02	45.7	87.8
30.66	45.6	88.5
29.47	46.0	89.3
28.22	47.6	89.5
26.82	49.0	88.8
25.25	52.2	87.2
23.95	56.0	84.5
22.83	61.7	78.5
22.32	69.0	74.0

23.6 per cent CH_3COOH.

Gms. $C_6H_4CH_3NH_2$ per 100 gms. sa.. sol.	Lower temp.	Upper temp.
37.45	57.5	69.0
36.80	55.0	75.5
36.11	53.5	76.0
35.28	51.0	78.5
34.28	50.5	80.5
33.34	50.0	82.5
32.27	49.5	84.5
30.68	49.0	85.5
29.69	49.5	86.0
28.86	50.5	85.8
27.86	51.2	85.5
26.60	53.4	84.8
25.73	55.0	83.7
25.01	57.0	82.0
24.63	58.5	80.7
24.23	61.0	79.0
23.83	64.0	77.0

With a concentration of acetic acid of 24.52 per cent, these is no longer formation of two liquid phases at any temperature.

DISTRIBUTION OF PARA TOLUIDINE BETWEEN WATER AND CARBON TETRACHLORIDE.

(Vaubel, 1903.)

Gms. *p* Toluidine Used.	Volumes of Solvents.	Gms. $C_6H_4(CH_3)NH_2$ *p* in: H_2O Layer.	Gms. $C_6H_4(CH_3)NH_2$ *p* in: CCl_4 Layer.
1	200 cc. H_2O + 100 cc. CCl_4	0.1406	0.8594
1	200 cc. H_2O + 200 cc. CCl_4	0.0666	0.9334

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND ORTHO TOLUIDINE AT 20°.

(Angelescu, 1928.)

These determinations were made in connection with the results showing the solubility of ortho toluidine in aqueous solutions of propionic acid.

Gms. C_2H_5COOH per 100 gms.		$\frac{1}{2}$
H_2O layer(1)	o Toluidine layer(2)	
0.25	0.26	0.962
0.92	1.22	0.754
2.15	3.49	0.616
3.12	5.29	0.597
4.96	9.22	0.538
6.03	11.40	0.525
8.11	16.74	0.484
8.56	17.94	0.477
9.09	19.27	0.472
11.36	24.84	0.457
12.71	27.84	0.457
13.58	29.28	0.464
14.45	30.52	0.473
17.42	33.73	0.516

The author also determined upper solution temperatures of mixtures containing 30.61, 32.07 and 34.10 percent propionic acid and percentages of o toluidine varying from about 25 to 50 percent.

100 gms. aqueous 0.4 normal sodium oleate solution (= 10.8 gms. Na oleate per 100 gms. solution) dissolve 13.5 gms. para $CH_3C_6H_4NH_2$ at 45°. (Smith, 1932.)

Results for the solubility of p toluidine in saturated aqueous solutions of sodium benzene, sodium xylene and sodium cymene sulfonates at various temperatures are given by Hauslick, 1935.

DISTRIBUTION OF *o*, *m* AND *p* TOLUIDINE BETWEEN WATER AND BENZENE AT 25°.

(Farmer and Warth, 1904.)

Base.	Dist. Coef. $\frac{\text{Conc. in } C_6H_6}{\text{Conc. in } H_2O}$.
o Toluidine	13.4
m "	19.1
p "	24.1

DISTRIBUTION OF PARA TOLUIDINE BETWEEN:

(Taubmann, 1932.)

Water and Benzene

Gm. mols. $CH_3C_6H_4NH_2$ per liter		$\frac{2}{1}$
H_2O layer(1)	C_6H_6 layer(2)	
0.0110	0.5570	50.6
0.0134	0.7382	55.1
0.0180	1.0710	59.5
0.0227	1.3510	59.5

Water and Hexane

Gm. Mols. $CH_3C_6H_4NH_2$ per liter		$\frac{2}{1}$
H_2O layer(1)	C_6H_{14} layer(2)	
0.0121	0.0415	3.4
0.0160	0.0723	4.5
0.0207	0.1143	5.5
0.0392	0.2260	5.8

CRITICAL SOLUTION TEMPERATURES OF TOLUIDINES IN SEVERAL SOLVENTS.

(Thiry, 1925.)

Solvent*.	Ortho Toluidine.		Meta Toluidine.		Para Toluidine.	
	Crit. sol. temp.	% $C_6H_4CH_3.NH_2(o)$ at C. s. t.	Crit. sol. temp.	% $C_6H_4CH_3.NH_2(m)$ at C. s. t.	Crit. sol. temp.	% $C_6H_4CH_3.NH_2(p)$ at C. s. t.
Methyl Cyclopentane..	−10.9	27.5	–	–	–	–
Ethyl » ..	− 8.3	40.0	–	–	–	–
Methyl Cyclohexane...	− 6.6	44.0	− 8.3	38.2	–	–
Hexane..............	+21.1	36.0	+21.3	47.7	–	–
Methyl 3 Pentane.....	–	–	–	–	+32.4	30.0
Isohexane...........	+25.5	42.5	–	–	+36.0	20.0

CRITICAL SOLUTION TEMPERATURES OF MIXTURES OF META TOLUIDINE AND OTHER SOLVENTS.

(Dessart, 1926.)

Solvent	Crit. sol. temp.
Hexane	+ 21
Cyclohexane	-18 (calc.)
Methyl hexane	8

The author also gives the curves of separation of mixtures of meta toluidine and methyl cyclohexane and of meta toluidine and hexane.

Freezing-point data are given for mixtures of Toluidines and:

Acetic acid(23)(18)
Amino phenols(12)
Aniline(22)
Allyl phenyl thiourea(32)
Arsenic tri chloride(28)
Benzene(5)(22)(6)
Benzoic acid(18)(1)(31)
Benzo phenone(16)
Camphor(8)
Catechol(26)
Chloro phenols(3)
Cinnamic acid(18)
Cresols(28a)
Cyclohexane(5)(7)(22)
Di chloro benzene(6)
Di methyl oxalate(21)
Di nitro benzenes(14)
Di nitro toluenes(13)(14)
Di phenyl amine(31)
Guaiacol(29)
Hexane(5)
Hydroquinone(26)
Menthol(24)
Methyl cyclohexane(5)(7)
Naphthalene(31)
Naphthylamines(31)
Naphthols(25)(31)(33)(34)
Nitro benzene(17)
Nitro phenols(14)(24)(25)
Nitro toluene(4)
Nitroso dimethyl aniline (2)(10)
Phenol(9)(11)(25)(27)
Phthalic anhydride(18)
Pyrogallol(20)
Quinone(17)
Resorcinol(26)(31)
Salicylic acid(18)
Toluene(5)
Tri phenyl carbinol(19)
Tri phenyl methane(15)

(1) Baskov, 1913; (2) Bernoulli and Veillon, 1932; (3) Burnham and Madgin, 1936; (4) Crockford and Simmons, 1933; (5) Dessart, 1926; (6) Glass and Madgin, 1934; (7) Hortenberg, 1926; (8) Jefremow, 1915, 1916; (9) Kitran, 1924; (10) Kremann, 1904; (11) Kremann, 1906; (12) Kremann and Hohl, 1920; (13) Kremann, Hönigsberg and Mauermann, 1923; (14) Kremann and Petritschek, 1917; (15) Kremann, Odelga and Zawodsky, 1921; (16) Kremann and Schadinger, 1918; (17) Kremann, Sutter, Sitte, Strzelba and Dobolsky, 1922; (18) Kremann, Weber and Zechner, 1925; (19) Kremann and Wlk, 1919; (20) Kremann and Zechner, 1918; (21) Kremann, Zechner and Drazil, 1924; (22) Linard, 1925; (23) O'Connor, 1924; (24) Pawlewski, 1893; (25) Philip, 1903; (26) Philip and Smith, 1905; (27) Puschin, 1926b; (28) Puschin and Hrustanovic, 1938; (28a) Puschin and Sladovic, 1928; (29) Puschin and Vaic, 1927; (30) Puschin and Zivadinovic, 1933; , (31) Vignon, 1891; (32) Schischokin, 1930; (33) Kremann and Strochschneider, 1918; (34) Kremann, Lupfer and Zawodsky, 1920.

SOLUBILITY OF PARA TOLUIDINE IN ETHYL ALCOHOL.
(Speyers, 1902.)

t°.	Wt. of 1 cc. sat. sol.	Mols. $C_6H_4CH_3NH_2$ per 100 mols. sat. sol.	Gms. $C_6H_4CH_3NH_2$ per 100 gms. C_2H_5OH.
0	0.8885	[illegible]	60.8
5	0.8982	26.0	82.0
10	0.9080	32.0	107.0
15	0.9180	38.6	143.0
20	0.9261	47.0	206.0
25	0.9360	56.0	430.0

100 gms. abs. alcohol dissolve 110.0 gms. *p* toluidine at 20-25°.
(Fischer and Dehn, 1921.)

100 gms. pyridine dissolve 126 gms. *p* toluidine at 20°-25°. (Dehn, 1917.)
100 gms. aq. 50% pyridine dissolve 96.1 gms. *p* toluidine at 20°-25°. "

100 gms. sat. solution of p toluidine in liquid ammonia contain 41
$CH_3C_6H_4NH_2$ at ? t°. (DeCarli, 1927.)

o ANISIDINE *o* $C_6H_4(OCH_3)NH_2$.

RECIPROCAL SOLUBILITY OF ORTHO ANISIDINE AND GLYCEROL.
(Parvatiker and McEwen, 1924.)

t° of Miscibility.	Gms. Anisidine per 100 gms. sat. sol.	t° of Miscibility.	Gms. Anisidine per 100 gms. sat. sol.
141.0	13.25	143.0	81.25
143.0	31.52	141.5	74.09
144.5	41.09		

p ANISIDINE $C_6H_4(OCH_3)NH_2$.

DISTRIBUTION BETWEEN BENZENE AND WATER AT 25°.
(Farmer and Warth, 1904.)

Gms. $C_6H_4(OCH_3)NH_2$ per 100 cc.	
C_6H_6 Layer.	H_2O Layer.
0.4350	0.0747
0.6602	0.1112
0.9010	0.1472

Freezing-point data are given by Aoyama and Morita, 1933, for mixtur
of ortho anisidine and chlor anilines.

1- PHENYL SEMI CARBAZIDE $H_2NCON(C_6H_5)NH_2$.

Freezing-point data for mixtures of 1 phenyl semi carbazide and sym.
diphenyl carbazide are given by Noller, 1930.

TOLUENE SULFONAMIDES o, m and p $CH_3.C_6H_4SO_2NH_2$.

SOLUBILITY OF EACH IN WATER AT 25°. (Holleman and Caland, 1911.)

Compound.	Gms. Compound per Liter Sat. Sol.
Amine of *o* Toluene Sulfonic Acid	1.624
" " *m* " " "	7.812
" " *p* " " "	3.156

Freezing-point data for mixtures of toluene sulfonamides are given b
Dobrjansky, 1920 and by McKie, 1918.

TOLYLENE DIAMINE m $CH_3.C_6H_3(NH_2)_2$.

Tri thio Carbon Di **LACTYL ACID** HOOC.CH.(CH_3)S.CS.S(CH_3)CH.COOH.

SOLUBILITY OF THE STEREOISOMERIC FORMS OF THIS ACID IN WATER AT 25°

(Holmberg, 1921.)

Compound.	M. pt.	Gms. cmpd. per liter sat. sol.
Meso Tri thio carbon di lactyl acid	104°–105°	27.4
Racem » » » »	154–155	3.03
Dextro » » » »	136–136.5	10.6
Laevo » » » »	–	10.6

LACTOSE (See Sugars, pages 711-715.)

XANTHOGEN SUCCINAMIDE.

SOLUBILITY OF THE STEREOISOMERIC FORMS OF β XANTHOGEN SUCCINAMIDE ACID, HO OC.CH ($CS.OC_2H_5$).CH_2 CO NH_2, IN WATER AT 25°.

(Holmberg and Leander, 1917.)

Isomeric Form.	M. pt.	Gm. mols. per liter.	Gms. per liter.
Inactive.......	125°–126°	0.0219	5.20
Dextro........	134°–135°	0.0190	4.50
Laevo.........	134°–135°	0.0190	4.50

METHYL CYCLO HEXANONE $C_7H_{12}O$.

100 gms. H_2O dissolve 2.2 gms. $C_7H_{12}O$ at 20°.

100 gms. 0.4 normal aq. sodium oleate solution (= 10.8 gms. Na oleate per 100 gms. solution) dissolve 22.5 gms. $C_7H_{12}O$ at 20°. The emulsions separate in 20 minutes. (Smith, 1932.)

HexahydroBENZOIC ACID $CH_2(CH_2.CH_2)_2.CH.COOH$.

100 gms. H_2O dissolve 0.201 gm. of the acid at 15°, *d.* saturated solution = 1.048.

(Lumsden, 1905.)

HYDANTOIN of dl LEUCINE $C_7H_{12}O_2N$.

SOLUBILITY OF HYDANTOIN OF dl LEUCINE IN AQUEOUS ETHYL ALCOHOL AT 25°.

(McMeekin, Cohn and Weare, 1935.)

Vol. % C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mols. $C_7H_{12}O_2N$ per liter sat. sol.	Vol. % C_2H_5OH in aq. solvent	d. of sat. sol.	Gm. Mols. $C_7H_{12}O_2N$ per liter sat. sol.
0.0	0.9972	0.0124	80.0	0.8610	0.162
20.0	0.9730	0.0186	90.0	0.8314	0.154
40.0	0.9470	0.0444	100.	0.7922	0.100
60.0	0.9107	0.0951			

PIMELIC ACID $(CH_2)_5(COOH)_2$.

DISTRIBUTION BETWEEN WATER AND ETHER AT 25°. (Chandler, 1908.)

Mols. $(CH_2)_5(COOH)_2$ per Liter. Aq. Layer, *a*.	Mols. $(CH_2)_5(COOH)_2$ per Liter. Ether Layer, *b*.	Dist. Coef. $\frac{a}{b}$	Dist. Coef. Corrected for Ionization.
0.00998	0.01407	0.7095	0.670
0.00702	0.00979	0.7170	0.670
0.00480	0.00667	0.7195	0.663
0.00284	0.00380	0.7480	0.663
0.00179	0.00253	0.7075	0.653

100 gms. benzene dissolve 0.0199 gm. $(CH_2)_5(COOH)_2$ at 25°. (Verkade and Coops, Jr., 1930.)

r β MethylADIPIC ACID $COOH(CH_2)_2CH.CH_2COOH$

100 gms. H_2O dissolve 4.47 gms. r β $COOH(CH_2)_2CHCH_2CO\,OH$ at 0°, and 14.43 gms. at 20°.

(Meurisse.

PROPYL SUCCINIC ACID $CH_2CH(C_3H_7)(COOH)_2$.

Freezing-point data for mixtures of the optically active isomers of propyl succinic acid and hexyl succinic acid are given by Timmermans and van der Haegen, 1933.

ETHYL MALONATE $CH_2(COOC_2H_5)_2$.

100 cc H_2O dissolve 2.08 gms. $CH_2(COOC_2H_5)_2$ at 20°. ([illegible] and Kahn, 1931.)

BUTYL MALONIC ACID (normal) $CH(C_4H_9)(COOH)_2$.

100 gms. H_2O dissolve 106.7 gms. $CH(C_4H_9)(COOH)_2$ at 25°.
100 gms. C_6H_6 dissolve 0.044 gms. " " "

(Verkade and Coops, Jr. 1930a.

TRI GLYCINE HYDANTOIC ACID $C_7H_{12}O_5N_4$.

SOLUBILITY IN WATER AND IN ETHYL ALCOHOL AT 25°.
(McMeekin, Cohn and Weare, 1936.)

Solvent	d. of sat. sol.	Gm. Mol. $C_7H_{12}O_5N_4$ per liter sat. sol.
Water	1.0011	0.0446
Ethyl alcohol	0.7851	0.000077

FORMYL LEUCINE $(CH_3)_2CHCH_2CH.(NHCHO)COOH$.

SOLUBILITY OF FORMYL LEUCINE IN AQUEOUS ETHYL ALCOHOL AT 25°.
(McMeekin, Cohn and Weare, 1936.)

Vol. % C_2H_5OH in solvent	d. of sat. sol.	Gm. Mol. $C_7H_{13}O_3N$ per liter sat. sol.	Vol. % C_2H_5OH in solvent	d. of sat. sol.	Gm. Mol. $C_7H_{13}O_3N$ per liter sat. sol.
0.0	1.0006	0.185	70	0.9574	2.113
20	0.9807	0.364	80	0.9385	2.156
40	0.9714	1.163	90	0.9183	2.070
60	0.9622	1.9363	100	0.8726	1.792

HEPTANE *n* $CH_3(CH_2)_5CH_3$.

100 gm. sat. solution of heptane in water contain about 0.005 gm. $CH_3(CH_2)_5CH_3$ at 15°.5.

(Fühner, 1924.)

100 gm. sat. solution of heptane in 92 wt. % alcohol contain 26.3 to 28.5 gms. $CH_3(CH_2)_5CH_3$ at 15°.

([illegible] and [illegible], 1931.)

EQUILIBRIUM IN THE SYSTEM NORMAL HEPTANE, PHENOL AND WATER.

(Vondracek and Dostal, 1936.)

The temperatures of appearance of opalescence in known mixtures were determined. The following values for 20° and 30° were obtained by graphical interpolation.

Results at 20°

Gms. per 100 gms. homogeneous mixture		
C_7H_{14}	C_6H_5OH	H_2O
8.77	86.89	4.34
6.22	85.27	8.51
4.82	82.78	12.40
3.96	80.06	15.98
3.37	77.22	19.30
2.96	74.68	22.36

TResults at 30°

Gms. per 100 gms. homogeneous mixture		
C_7H_{14}	C_6H_5OH	H_2O
10.29	85.44	4.27
7.27	84.32	8.42
5.59	82.12	12.29
4.60	79.53	15.86
3.84	76.95	19.21
3.39	74.35	22.27

The critical solution temperature of mixtures of normal heptane and liquid sulfur dioxide is 19° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 50 and 90 mol. percent SO_2. (Leslie, 1934.)

Freezing-point data are given for mixtures of normal Heptane and:

Benzene	(Ormandy and Craven, 1926.)
Phenol	(Campetti and Delgrosso, 1913.)
Tri methyl pentane	(Smittenberg, Hoog and Henkes, 1938.)

METHYL CYCLO HEXANE $C_6H_{11}CH_3$.

EQUILIBRIUM IN THE SYSTEM METHYL CYCLOHEXANE, PHENOL AND WATER.

(Vondracek and Dostal, 1936.)

The temperatures of appearance of opalescence in known mixtures were determined. The following values for 20° and 30° were obtained by graphical interpolation.

Results at 20°

Gms. per 100 gms. homogeneous mixture		
$C_6H_{11}CH_3$	C_6H_5OH	H_2O
21.14	75.11	3.75
17.31	77.29	5.40
13.74	78.43	7.83
10.18	78.12	11.70
8.40	76.36	15.24

Results at 30°

Gms. per 100 gms. homogeneous mixture		
$C_6H_{11}CH_3$	C_6H_5OH	H_2O
26.12	70.37	3.51
20.73	74.09	5.18
15.98	76.40	7.62
11.62	76.87	11.51
7.98	73.64	18.38

The critical solution temperature of mixtures of Methyl cyclo hexane and liquid Sulfur Dioxide is 15° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 40 and 90 mol. percent SO_2. (Leslie, 1934.)

Freezing-point data are given for mixtures of Methyl cyclo hexane and:

Carbon disulfide(5)
Cyclohexane(4)
Hydrobromic acid(3)
(Hexane(5)
Nitro toluene(1)
(Pentane(5)
Toluidine(1)(2)

OENANTHOL (Enanthaldehyde) $CH_3(CH_2)_5CHO$.

FREEZING-POINTS OF MIXTURES OF OENANTHOL AND WATER. (Noorduyn, 1919.)

t° of f. pt.	Mol. per cent $C_7H_{14}O$ in mixture	Solid Phase
−42.................	100	$C_7H_{14}O$
−42.5 (Eutec.)......	trace H_2O present	" + $C_7H_{14}O.H_2O$
+11.4...............	90	$C_7H_{14}O.H_2O$ + two liquid layers
+11.4...............	0.019	" " "
− 0.058 (Eutec.)....	0.016	$C_7H_{14}O.H_2O$ + Ice
0.0.................	0.0	Ice

The solubility of oenanthol in water at 11°.4 was found to be [illegible] gm. (= 0.019 gm. mol.) $C_7H_{14}O$ per 100 gms. sat. sol.

HEPTYL ALCOHOL *n* $CH_3(CH_2)_5CH_2OH$.

SOLUBILITY OF *n* HEPTYL ALCOHOL IN WATER. (Fühner, 1924.)

The determinations were made by the synthetic method and from the curve obtained, the following results were read.

t°............	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gms. $CH_3(CH_2)_5CH_2OH$ per 100 gm. sat. sol.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

An approximate determination at 18° gave 0.10 gm. per 100 gm. sat. sol.

100 gms. sat. solution of normal Heptyl alcohol in water contain 0.181 gms. $CH_3(CH_2)_5CH_2OH$ at 25°. (Butler, Thomson and Maclennan, 1933.)

DIPROPYL KETONE $(C_3H_7)_2CO$.

SOLUBILITY OF DIPROPYL KETONE IN WATER.

(Gross, Rintelen and Saylor, 1939.)

t°	Gm. Mols. $(C_3H_7)_2CO$ per 1000 gms. H_2O
0	0.0641
10	0.0466
30	0.0345
50	0.0288
75	0.0272

METHYL AMYL KETONE $(CH_3)(C_5H_{11})CO$.

100 gms. sat. sol. of methyl amyl ketone in water contain 1.95 gms. $CH_3(C_5H_{11})CO$ at 25°.

100 gms. sat. sol. of water in methyl amyl ketone contain 2.15 gms. H_2O at 25°.

(Park and Hofman, 1932.)

UREIDE OF GLUCOSE $CH_2OH.(CHOH)_4.CH : N.CO.NH_2$.

100 gms. absolute ethyl alcohol	dissolve	0.04	gm. ureide of	glucose at	25°.
" 85.6% "	"	0.73	"	"	"
" methyl alcohol	"	0.22	"	"	"

(Schoorl, 1903.)

AMYL ACETATES (normal and iso) $CH_3.COOC_5H_{11}$.

100 cc H_2O dissolve 0.2 cc normal amyl acetate at 20°.

100 cc H_2O dissolve 0.2 cc (1.2?) iso amyl acetate at 20°.

(Traube, 1884; Bancroft, 1895.)

100 cc H_2O dissolve 0.2 cc secondary amyl acetate at 25°. (Park and Hopk
1930.)

Reciprocal Solubility of Amyl Acetates, Ethyl Alcohol and Water.

(Pfeiffer, 1892.)

Results for Normal Amyl Acetate

Composition of Homogeneous Mixture		
cc $C_7H_{14}O_2$(n)	cc C_2H_5OH	cc H_2O
3.0	3.0	1.76
3.0	9.0	9.03
3.0	15.0	17.52
3.0	21.0	26.99
3.0	27.0	37.23
3.0	33.0	48.41

Results for Iso Amyl Acetate

Composition of Homogeneous Mixture		
cc $C_7H_{14}O_2$(iso)	cc C_2H_5OH	cc H_2O
0.41	5.0	7.0
0.7	5.0	6.0
1.31	5.0	5.0
3.0	5.0	3.61
4.0	5.0	3.01
5.0	5.0	2.60

PROPYL BUTYRATE $C_3H_7COOC_3H_7$.

100 gms. H_2O dissolve 0.162 gm. $C_7H_{14}O_2$ at 17°. (Fühner, 1924.)

Reciprocal Solubility of Propyl Butyrate Ethyl Alcohol and Water.

(Bancroft, 1895.)

Composition of Homogeneous Mixtures		
cc $C_7H_{14}O_2$	cc C_2H_5OH	cc H_2O
3.0	3.0	1.19
3.0	6.0	3.55
3.0	9.0	6.13
3.0	12.0	9.05
3.0	15.0	12.31
3.0	18.0	15.90

Composition of Homogeneous Mixtures		
cc $C_7H_{14}O_2$	cc C_2H_5OH	cc H_2O
3.0	21.0	19.68
3.0	24.0	23.72
3.0	30.0	32.10
3.0	36.0	41.55
3.0	42.0	51.60
3.0	48.0	62.40
3.0	54.0	73.85

n BUTYL PROPIONATE $C_3H_7COOC_3H_7$.

100 cc H_2O dissolve 0.2 cc n butyl propionate at 25°. (Park and Hopkins, 1930.)

ETHYL VALERATES (normal and iso) $C_4H_9COOC_2H_5$.

100 cc H_2O dissolve 0.3 cc ethyl valerate at 25°.
100 cc H_2O dissolve 0.2 cc ethyl iso valerate at 20°.
100 cc ethyl iso valerate dissolve 0.4 + cc H_2O at 20°.
(Pfeiffer, 1892; Bancroft, 1895.)

RReciprocal Solubility of Ethyl Valerates, Ethyl Alcohol and Water.

(Pfeiffer, 1892; Bancroft, 1895.)

Results for Ethyl Normal Valerate

Composition of Homogeneous Mixtures		
cc $C_7H_{14}O_2$(n)	cc C_2H_5OH	cc H_2O
3.0	3.0	1.42
3.0	15.0	14.13
3.0	27.0	31.62
3.0	39.0	53.13

Results for Ethyl Iso Valerate

Composition of Homogeneous Mixtures		
cc $C_7H_{14}O_2$(iso)	cc C_2H_5OH	cc H_2O
0.15	5.0	10
0.23	5.0	8
0.46	5.0	6
0.72	5.0	5

$C_7H_{14}O_2$

iso AmylACETIC ACID $C_5H_{11}CH_2COOH$.

DISTRIBUTION OF ISO AMYLACETIC ACID BETWEEN WATER AND XYLENE AT 25°.
(Smith, 1921-1922.)

Millimols. iso $C_5H_{11}CH_2COOH$ per liter of		
H_2O layer (c_1)	Xylene layer (c_2)	$\frac{c_2}{c_1}$
0.0792	0.858	10.85
0.212	2.170	10.24
0.375	3.625	9.67
0.85	7.96	9.37

ENANTHIC ACID (Heptoic, Heptylic) $CH_3(CH_2)_5COOH$.

100 gms. H_2O dissolve 0.241 gm. $CH_3(CH_2)_5COOH$ at 15°. (Lumsden, 1905.)
100 gms. H_2O dissolve 0.22 gm. $CH_3(CH_2)_5COOH$ at 20°. (Lipetz and Rimskaja, 1931.)

Results for the distribution of Enanthic acid between water and olive oil at 23° are given by Bodansky, 1928.

AMINO CAPROIC HYDANTOIC ACIDS, α and ε, $C_7H_{14}O_3N_2$.

SOLUBILITY OF EACH SEPARATELY IN WATER AND OTHER SOLVENTS AT 25°.
(McMeekin, Cohn and Weare, 1936.)

Solvent in each case	α Amino Caproic Hydantoic Acid m. pt. = 169-70°		ε Amino Caproic Hydantoic Acid m. pt. = 179-80°	
	d. of sat. solution	Gm. Mols. $C_7H_{14}O_3N_2$ per liter sat. sol.	d. of sat. solution	Gm. Mols. $C_7H_{14}O_3N_2$ per liter sat. sol.
Water	0.99727	0.0069	0.99728	0.0069
Formamide	1.13141	0.165	—	—
Methanol	0.79390	0.1124	—	—
80 % Ethanol	0.85947	0.0867	0.85690	0.0322
90 % Ethanol	0.82920	0.0803	0.82619	0.0228
100 % Ethanol	0.78885	0.0477	0.78649	0.00756
Butanol	0.80739	0.01786	0.80644	0.00278
Acetone	0.78588	0.00463	—	—

i BUTYL URETHAN $C_4H_9.NH.COOC_2H_5$.

100 gms. H_2O dissolve 2.042 gms. $C_7H_{15}O_2N$ at 15.5°. (Fuhner, 1924.)

2- METHYL HEXANE $(CH_3)_2CH(CH_2)_3CH_2CH_3$.

The critical solution temperature of mixtures of 2-Methyl Hexane and Sulfur Dioxide is 18° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 38 and 83 mol. percent SO_2. (Leslie, 1934.)

2,2,3-TRI METHYL BUTANE $CH_3C(CH_3)_2CH(CH_3)CH_3$.

Freezing-point data for mixtures of tri and tetra methyl butane are given by Smittenberg, Hoog and Henkes, 1938.

HEPTANE C_7H_{16}.

100 gms. H_2O dissolve 0.005 gm. C_7H_{16} at 15.5°. (Fuhner, 1924.)

n HEPTYL ALCOHOL

SOLUBILITY OF n HEPTYL ALCOHOL IN WATER.

(Fühner, 1924.)

t°	Gms. $C_7H_{16}O$ per 100 gms. H_2O	t°	Gms. $C_7H_{16}O$ per 100 gms. H_2O
18	0.10	100	0.285
70	0.125	110	0.355
80	0.17	120	0.430
90	0.225	130	0.515

100 gms. sat. solution of normal heptanol in water contain 0.18 gm. $C_7H_{16}O$ at 25°. (Butler, Thomson and Maclennon, 1933.)

RECIPROCAL SOLUBILITY OF ISOMERIC HEPTANOLS AND WATER.

(Ginnings and Hauser, 1938.)

Heptanol	b. pt. of heptanol	d. of heptanol	t°	Gms. heptanol per 100 gms. sat. sol. in H_2O	Gms. H_2O per 100 gms. sat. sol. in heptanol
2,3,3-Trimethyl butanol-2	130.3-.8	0.8380	40	2.20(0.8352)	5.28(0.9902)
3-Ethyl pentanol-3	143.1-.2	0.8402	20	1.91(0.8541)	5.75(0.9964)
" "	"	"	25	1.68(0.8502)	5.76(0.09957)
" "	"	"	30	1.50(0.8457)	5.79(0.9945)
" "	"	"	40	1.26(0.8366)	5.69(0.9921)
2,3-Dimethyl pentanol-3	139.6-.8	0.8365	20	1.87(0.8513)	5.89(0.9965)
" "	"	"	25	1.64(0.8470)	5.88(0.9961)
" "	"	"	30	1.43(0.8430)	5.88(0.9945)
2,3-Dimethyl pentanol-2	138.5-139.0	0.8307	20	1.69(0.8477)	6.31(0.9964)
" "	"	"	25	1.54(0.8441)	6.31(0.9955)
" "	"	"	30	1.40(0.8404)	6.29(0.9943)
2,4-Dimethyl pentanol-2	132.5-133.5	0.8100	20	1.50(0.8279)	6.51(0.9962)
" "	"	"	25	1.34(0.8240)	6.52(0.9954)
" "	"	"	30	1.22(0.8199)	6.51(0.9943)
3-Methyl hexanol-3	142.7-.9	0.8202	20	1.35(0.8348)	5.22(0.9967)
" "	"	"	25	1.19(0.8312)	5.25(0.9958)
" "	"	"	30	1.07(0.8272)	5.27(0.9946)
2-Methyl hexanol-2	143.0-.2	0.8093	20	1.08(0.8268)	6.22(0.9967)
" "	"	"	25	0.97(0.8233)	6.35(0.9958)
" "	"	"	30	0.87(0.8199)	6.44(0.9946)
2,2Dimethyl pentanol-3	134.7-135.1	0.8224	20	0.88(0.8329)	3.00(0.9971)
" "	"	"	25	0.82(0.8289)	3.06(0.9962)
" "	"	"	30	0.79(0.8253)	3.12(0.9950)
2,4Dimethyl pentanol-3	138.4-.9	0.8254	20	0.78(0.8351)	3.21(0.9974)
" "	"	"	25	0.70(0.8315)	3.32(0.9965)
" "	"	"	30	0.67(0.8271)	3.44(0.9955)

The figures in parentheses are densities of the saturated solutions.

$C_7H_{16}O_4$

SULFONAL $(CH_3)_2C(SO_2C_2H_5)_2$.

SOLUBILITY OF SULFONAL IN SEVERAL SOLVENTS. (Falck, 1919.)

Constant agitation was employed and equilibrium was approached from above and below. The aqueous saturated solutions were analyzed by extracting with chloroform, evaporating and weighing the residue.

Solvent.	t°.	Gms. $(CH_3)_2C(SO_2C_2H_5)_2$ per 100 gms. sat. sol.	Solvent.	t°.	Gms. $(CH_3)_2C(SO_2C_2H_5)_2$ per 100 gms. sat. sol.
Water	18.	0.236	Chloroform	20.	23.26
"	37.	0.448	Methylene chloride (CH_2Cl_2).	20.	26.13
"	100.	11.11	Benzene	17.	7.30
Aq. 2 % NaCl	18.	0.231	Ethyl Acetate	20.	6.77
Aq. 90 % Alcohol.	16.	1.642	Toluene	20.	4.93
Ether	15.	1.25	Carbon Tetrachloride	20.	0.90
"	17.	1.33	Carbon Disulfide	20.	0.26
"	19.	1.47	Aq. Urethan*	17.	1.57

*Composed of 1 part Urethan + 1 ½ parts Water, d = 1.0455

10 cc. of horse serum dissolve 0.015 gm. sulfonal at 20°. The distribution between horse serum in contact with olive oil was 0.0123 gm. sulfonal per 10 cc. of serum layer and 0.0027 gm. per 10 cc. of olive oil layer. (Aiello, 1921.)

100 gms. benzene dissolve 0.76(?) gms. Sulfonal at 25°. (Warren, 1933.)

100 gms. sat. sol. of Sulfonal in 95.2 Vol. % C_2H_5OH contain 14.41 gms. $C_7H_{16}O_4S_2$ at 25°.

100 gms. sat. sol. of Sulfonal in 94.9 Vol. % C_2H_5OH contain 13.36 gms. $C_7H_{16}O_4S_2$ at 25°. (Schnellbach and Rosin, 1941.)

Ethyl and Methyl Sulfon **METHANES**.

SOLUBILITY IN WATER AND IN 90% ALCOHOL.

Compound.	Formula.	t°.	Gms. Cmpd. per 100 cc. Water.	Gms. Cmpd. per 100 cc. 90% Alcohol.	Authority.
Sulfonal	$(CH_3)_2C(SO_2C_2H_5)_2$	15.5	0.22	1.75	(Greenish and Smith, 1903.)
Tetronal	$(C_2H_5)_2C(SO_2C_2H_5)_2$	15–20	0.18	8.33	(Squire and Caines, 1905.)
Trional	$(CH_3)(C_2H_5)C(SO_2C_2H_5)_2$	15–20	0.31	9.0	" " "

100 gms. petroleum ether dissolve 0.41 gms. Trional at 25°. (Warren, 1933.)

Freezing-point data for mixtures of Sulfonal and:

Acetanilide(2)(3)
  " + Phenacetine(2)
  " + Salipyrine(4)
Antipyrine(2)
  " + Phenacetine(2)
  " + Urea(5)
  " + Salipyrine(5)
β Naphthol(1)
Naphthol + Salol(1)

Phenacetine(2)(3)
  " + Acetanilide(2)
  " + Antipyrine(2)
  " + Urea(2)
  " + Resorcinol(2)
Resorcinol(2)(3)
  " + Phenacetine(2)
Salipyrine(3)
  " + Acetanilide(4)
  " + Urea(5)

Salol(6)
  " + β Naphthol(1)
Urea(2)(3)
  " + Antipyrine(5)
  " + Phenacetine(2)

(1) Bianchini, 1914; (2) Hrynakowski, 1934; (3) Hrynakowski and Adamanis, 1933a; (4) Hrynakowski and Staszewski, 1936, (5) Hrynakowski and Szmyt, 1938a; (6) Quercigh and Cariagnari, 1913.

HEPTYL AMINE *n* $CH_3(CH_2)_5CH_2NH_2$.

DISTRIBUTION OF HEPTYL AMINE AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether.

Millimols. per liter. H₂O layer (C_1).	Millimols. per liter. $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.120	1.41	11.75
0.200	3.105	15.5
0.275	5.145	18.7
0.385	8.00	20.8

Water and Xylene.

Millimols. per liter. H₂O layer (C_1).	Millimols. per liter. $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.083	0.917	11.0
0.152	1.848	12.3
0.270	3.730	13.8
0.438	9.562	21.8
0.445	9.565	21.5

TRI BROMO PHENOL ACETATE $CH_3COOC_6H_2Br_3$.

Freezing-point data for mixtures of Tribromo Phenol Acetate and s Tribromo phenol are given by Boeseken, 1912.

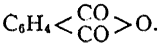
TRI FLUO TOLUIC ACID o $C_6H_4CF_3COOH$.

100 cc H_2O dissolve 0.48 gm. o $C_6H_4CF_3COOH$ at 25°. (Brouwer, 1930.)

PHTHALIMIDE *o* $C_6H_4<(CO)_2>NH$.

100 gms. H_2O dissolve 0.06 gm. phthalimide at 20–25°. (Dehn, 1917.)
" pyridine " 14.15 gms. " " "
" aq. 50% pyridine " 7.74 " " " "

PHTHALIC ANHYDRIDE



$C_6H_4<\begin{matrix}CO\\CO\end{matrix}>O$.

SOLUBILITY IN WATER.

(van der Stadt, 1902.)

All determinations, except first three, made by the Synthetic Method. See p. 292

t°.	Gms. $C_8H_4O_3$ per 100 Gms. Water.	Gms. $C_8H_4O_3$ per 100 Gms. Solution.	Mol. per cent $C_8H_4O_3$.	t°.	Gms. $C_8H_4O_3$ per 100 Gms Water.	Gms. $C_8H_4O_3$ per 100 Gms Solution.	Mol. per cent $C_8H_4O_3$.
0	0.00295	0.00295	0.00036	189.5	1076	91.66	56.73
25	0.6194	0.6150	0.0754	188.8	1265	92.68	60.63
50	1.630	1.604	0.198	187.1	1474	93.65	64.22
135.9	94.3	48.54	10.30	181.8	2332	95.88	73.95
165.4	210	67.75	20.36	176.2	3334	97.07	80.23
179.4	319.3	76.13	27.98	169.4	5745	98.28	87.49
186.2	449.6	81.81	35.37	130.9	37570	99.72	97.89
189.6	546.1	84.50	39.93	131	83010	99.86	99.02
191	821.5	89.19	50	131.2	∞	100	100
190.4	863.4	89.62	51.24				

SOLUBILITY OF PHTHALIC ANHYDRIDE IN CARBON DISULFIDE.

(Arctowski, 1895; Etard, 1894.)

t°.	Gms. $C_8H_4O_3$ per 100 Gms. Solution.	t°.	Gms. $C_8H_4O_3$ per 100 Gms. Solution.	t°.	Gms. $C_8H_4O_3$ per 100 Gms. Solution.
−112.5	0.013	+10	0.3	70	2.3
−93	0.013	20	0.7	90	3.7
−77.5	0.016	30	0.8	100	5
−40	0.03	40	1.2	120	8
−20	0.06	50	1.3	140	13.3
−10	0.10	60	1.7	160	20.7
0	0.20			180	30.2

100 gms. 95% formic acid dissolve 4.67 gms. phthalic anhydride at 19.8°. (Aschan, 1913.)

100 gms. pyridine dissolve 83.5 gms. phthalic anhydride at 20-25°. (Dehn, 1917.)

Freezing-point data are given for mixtures of:

Phthalic anhydride + Butyl phthalate (Lombaers, 1924.)
" " + Sec. Butyl alcohol " "
" " + Naphthylene (Monroe, 1919.)
" " + Phthalic acid " "
" " + p Toluidine (Puschin and Zwadinovic, 1933.)
" " + Phthalimide (Grimm, Gunther and Titus, 1931.)

-Active and Racemic Phthalic acid mono butyl esters. (Lombaers, 1924.)

PHTHALYL CHLORIDE $C_6H_4(COOCl)_2$.

Freezing-point data for mixtures of symetrical (m. pt. 15°-16°) and asymetrica (m. pt. 88°-89°) phthalyl chloride are given by Csanyi, 1919.

NitroPHTHALIC ACIDS *o* and *m* (Iso) $C_6H_3(NO_2)(COOH)_2$.

SOLUBILITY OF THE SEVERAL NITRO PHTHALIC ACIDS IN WATER AT 25°.

(Holleman and Huisinga, 1908.)

Acid.	M. pt.	Gms. Acid per 100 Gms. Sat. Solution.
α Nitro Ortho Phthalic Acid	220	2.048
β " " " "	164-166	very soluble
Symmetrical Nitro Iso Phthalic Acid (anhy.)	255-256	0.220
" " " " (hydrated)	255-256	0.157
Asymmetrical " " "	245	0.067
Vicinal " " "	300	0.216

The authors also give several tables showing the solubility of one of the above compounds in aqueous solutions of another. These data are made the basis of an ingenious solubility method for determining the composition of unknown mixtures of these compounds.

PENTA NITRO PHENYL ETHANE 2,4,6,2',4' $C_2H_3(NO_2)_2.C_6H_2(NO_2)_3$.

100 gms. H_2O dissolve 0.007 gm. penta nitro phenyl ethane at 27°, 0.017 gm. at 50° and 0.095 gm. at 100°. (Desvergnes, 1926.)

Ortho **PHTHALDEHYDE** $C_6H_4(CHO)_2$.

SOLUBILITY IN WATER BY DETERMINED THE FREEZING-POINT METHOD.

(Seekles, 1923.)

1st. f. pt.	2nd. f. pt.	Mol. % $C_6H_4(CHO)_2$.	1 st. f. pt.	2nd. f. pt.	Mol. % $C_6H_4(CHO)_2$
53.2	–	100	45.4	–	0.693*
46.9	45.1	63.97	35.0	–	0.68*
45.6	–	57.05	25.0	–	0.662*
45.4	45.0	54.10	15.0	(60)	0.637*
45.2	–	52.81	–	—0.61	0.64
45.0	–	51.45	—0.55	–	0.552
45.3	±57)	50.00	—0.44	–	0.463
45.2	45.0	48.45	—0.38	–	0.374
45.4	45.0	47.03	—0.30	–	0.285
45.4	(45.4)	45.68	—0.09	–	0.089
45.4	(45.4)	38.73	—0.05	–	0.036
45.4	(45.4)	33.33	0.0	–	0.0 (= H_2O)

The figures in parentheses show the temperatures of separation.

* These determinations were made by direct measurement of the solubility of the compound in water the results show the formation of the monohydrate $C_6H_4(CHO)_2.H_2O$.

PHTHALIDE $C_6H_4COOCH_2$.

Freezing-point data for mixtures of phthalide with acetamide and with tri phenyl guanidines are given by Lautz, 1913.

PHENYL Dichlor **ACETATE** $C_6H_5Cl_2C.COOH$.

Freezing-point lowering data are given for mixtures of phenyl dichlor acetate and phenyl chloro brom acetate by Crompton and Triffitt, 1921.

Aldehydo **BENZOIC ACIDS** $COOH.C_6H_4CHO$.

SOLUBILITY OF ORTHO, META AND PARA ALDEHYDO BENZOIC ACIDS IN WATER.

(Sidgwick and Clayton, 1922.)

Results for *o* $COOH.C_6H_4.CHO$.			Results for *m* $COOH.C_6H_4.CHO$.		Results for *p* $COOH.C_6H_4.CHO$.	
Temp. of solid-liquid equilibrium.	Temp. of liquid-liquid equilibrium.	Gms. *o* COOH. C_6H_4CHO per 100 gms. sat. sol.	Temp. of solid-liquid equilibrium.	Gms. *m* COOH. C_6H_4CHO per 100 gms. sat. sol.	Temp. of solid-liquid equilibrium.	Gms. *p* COOH C_6H_4CHO per 100 gms. sat. sol.
100.5	–	100.0	175.0	100.0	250:0	100
75.0	–	91.66	140.0	86.76	191.5	79.40
64.5	–	87.20	132.9	81.88	181.5	49.60
58.1	–	81.50	121.5	70.72	158.9	32.46
53.2	39.2	59.48	116.6	58.87	150.9	19.08
51.8	44.0	40.83	114.6	49.45	142.3	10.24
49.9	45.75	29.20	113.5	40.28		
48.92	43.3	20.00	112.3	29.97		
46.1	21.1	9.38	110.7	19.87		
			107.5	11.22		
			99.7	4.91		

SOLUBILITY OF ORTHO, META AND PARA ALDEHYDO BENZOIC ACIDS IN BENZENE.

(Sidgwick and Clayton, 1922.)

Results for *o* $COOH.C_6H_4CHO$.		Results for *m* $COOH.C_6H_4.CHO$.		Results for *p* $COOH.C_6H_4.CHO$.	
Temp. of solid-liquid equilibrium.	Gms. *o* $COOH.C_6H_4.CHO$ per 100 gms. sat. sol.	Temp. of solid-liquid equilibrium.	Gms. *m* $COOH.C_6H_4.CHO$ per 100 gms. sat. sol.	Temp. of solid-liquid equilibrium.	Gms. *p* $COOH.C_6H_4CHO$ per 100 gms. sat. sol.
84.0	81.4	175.0	100	250.0	100
77.8	64.09	154.5	73.36	196.0	2.40
75.7	49.50	149.9	56.98	131.9	1.41
73.9	35.88	149.7	43.84	110.0	0.96
72.3	21.87				
66.7	10.16				

PIPERONAL $CH_2 < O_2 > C_6H_3.CHO$.

100 gms. Carbon Tetrachloride dissolve 69.5 gms. $CH_2 < O_2 > C_6H_3.CHO$ at 20°.
» Chloroform » 200.8 » »

(Pawlowski, 1914, 1926.)

Freezing-point data are given for mixtures of piperonal and:

Acetic anhydride(2)
Aceto phenone(1)
Benzoic acid(3)(7)
Chlor acetic acid(3)(4)
Di phenyl amine(5)
Phosphorus acid(6)
Piperonylidene di acetate(2)
Tri chlor acetic acid(3)

Results are also given for Nitropiperonal + Tri chlor acetic acid(3)

(1) Fazi, 1916; (2) Jorissen and vander Beek, 1924; (3) Kendall and Gibbons, 1915; (4) Mameli and Mannessier, 1913; (5) Puschin and Zividanovi 1933; (6) Redfield and King, 1936; (7) Passerini, 1924.

BENZOYL FORMIC ACID $C_6H_5CO.COOH$.

100 gms. H_2O dissolve 318 gms. $C_6H_5CO.COOH$ at 0°. (Corson, Sanborn and Van Ess, 1930.)

PIPERONYLIC ACID $CH_2 < O_2 > C_6H_3.COOH$.

DISTRIBUTION OF PIPERONYLIC ACID AT 25° BETWEEN: (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $CH_2 < O_2 > C_6H_3COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.175	0.5812	3.32
0.2187	0.8125	3.71
0.250	1.0375	4.15

Water and Xylene.

Millimols $CH_2 < O_2 > C_6H_3COOH$ per liter of		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.3595	0.3142	0.875
0.660	0.779	1.182
0.865	1.14	1.32

PHTHALIC ACIDS $C_6H_4(COOH)_2$, *o*, *m* and *p*.

SOLUBILITY OF EACH IN WATER. (Vaubel, 1895, 1899.)

Acid.	t°.	Gms. per 100 Gms. Solution.
o Phthalic Acid	14	0.54
m = Isophthalic Acid	25	0.013
p = Terephthalic Acid	...	almost insoluble

MELTING TEMPERATURES OF MIXTURES OF *o* PHTHALIC ACID AND WATER.

(Flaschner and Rankin, 1910.)

(The determinations were made by the sealed tube method of Alexejew.)

Wt. % Acid	14.4	28.2	39.6	49.3	75	100
Saturation Temp.	97°	111.5°	121.2°	130°	162°	231°
Unstable boundary	...	...	...	27°	84°	

PHTHALIC ACID $C_6H_4(COOH)_2(o)$.

SOLUBILITY OF PHTHALIC ACID IN WATER AND IN AQUEOUS SODIUM SULFATE SOLUTIONS. (Mc Master, Bender and Weil, 1921.)

Saturation was secured by constant stirring and by approaching equilibrium from above and from below.

t.	Gms. $C_6H_4(COOH)_2(o)$ per 100 gms. saturated solution in Water.	Aq. 10 % Na_2SO_4.	Aq. 15 % Na_2SO_4.
25	0.7014	0.6440	0.5272
35	1.0125	0.9338	0.7575
45	1.446	1.341	1.080
55	2.168	1.858	1.639
65	3.246	3.018	2.445
75	4.926	4.373	3.748
85	7.687	6.461	5.533

SOLUBILITY OF ORTHO PHTHALIC ACID IN WATER, DETERMINED BY THE SYNTHETIC METHOD.

(Ward and Cooper, 1930.)

t°	Gms. o $C_6H_4(COOH)_2$ per 100 gms. sat. sol.	t°	Gms. o $C_6H_4(COOH)_2$ per 100 gms. sat. sol.	t°	Gms. o $C_6H_4(COOH)_2$ per 100 gms. sat. sol.
25.8	0.716	63.7	2.897	101.1	15.79
43.7	1.324	77.8	5.322	131.6	50.73
48.9	1.647	85.7	7.594	157.5	71.57
58.0	2.276	94.8	11.85	193.3	100.00

Results for equilibrium in the ternary system, ortho phthalic acid, benzoic acid and water are also given.

SOLUBILITY OF PHTHALIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AND OF NITRIC ACID AT 25°. (Knox and Richards, 1919.)

In Aq. Hydrochloric Acid.				In Aq. Nitric Acid.			
Equiv. Normalities.		Equiv. Normalities.		Equiv. Normalities.		Equiv. Normalities.	
HCl	$C_6H_4(COOH)_2$.	HCl	$C_6H_4(COOH)_2$.	HNO_3	$C_6H_4(COOH)_2$.	HNO_3	$C_6H_4(COOH)_2$.
0.00	0.0852	7.603	0.0135	0.00	0.0852	10.40	0.0325
1.729	0.0422	9.150	0.0120	2.077	0.0582	12.60	0.0356
3.113	0.0298	10.63	0.0128	4.077	0.0470	14.42	0.0420
4.693	0.0216	12.05	0.0137	6.718	0.0375	15.99	0.0577
6.100	0.0172			9.027	0.0331		

SOLUBILITY OF ORTHO PHTHALIC ACID IN AQUEOUS SOLUTIONS OF SALTS AT 25°.

(Herz and Hiebenthal, 1928.)

Results for aqueous solutions of:

Potassium Bromide		Potassium Chloride		Sodium Chloride		Magnesium Chloride	
Gms. per liter		Gms. per liter		Gms. per liter		Gms. per liter	
KBr	o $C_6H_4(COOH)_2$	KCl	o $C_6H_4(COOH)_2$	NaCl	o $C_6H_4(COOH)_2$	$MgCl_2$	o $C_6H_4(COOH)_2$
50.0	7.0	22.0	7.1	0.0	7.1	0.0	7.1
63.1	6.9	39.0	6.9	36.8	6.0	26.7	6.6
92.8	6.8	68.0	6.3	67.8	5.0	53.3	6.0
161.9	6.0	144.0	5.0	122.2	3.5	147.6	4.2
238.0	5.4	213.0	4.0	163.7	2.7	337.1	1.8
553.4	2.9	312.0*	2.8	311.6*	1.0	515.2	0.8

DISTRIBUTION OF PHTHALIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether.

Millimols. $C_6H_4(COOH)_2(o)$ per liter of. H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.9687	0.6687	0.690
1.5375	1.100	0.716
2.375	1.925	0.810
3.800	3.375	0.880
6.675	6.575	0.985

Water and Xylene.

Millimols. $C_6H_4(COOH)_2(o)$ per liter of. H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
14.45	0.35	0.0243
32.55	1.25	0.0384
38.60	1.70	0.0430

Acetone and Glycerol

Millimols. $C_6H_4(COOH)_2(o)$ per liter of. Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.9375	0.8750	1.07
1.775	1.5875	1.12
3.800	3.200	1.19
8.025	6.375	1.26

DISTRIBUTION OF n METHYL PIPERIDINE ACID PHTHALATE AND OF PIPERIDINE ACID PHTHALATE BETWEEN ACETONE AND GLYCEROL AT 25°.

(Smith, 1921, 1922.)

See note under trimethyl amine acid phthalate on p. 213

Results for Methyl Piperidine Acid Phthalate.

Millimols. Phthalate per liter of. Acetone layer (A).	Glycerol layer G.	$\frac{A}{G}$.
0.480	1.280	0.375
0.680	2.460	0.276
0.90	4.55	0.198
1.76	12.75	0.138

Results for Piperidine Acid Phthalate.

Millimols. Phthalate per liter. Acetone layer (A).	Glycerol layer G.	$\frac{A}{G}$.
0.250	0.356	0.702
0.369	0.79	0.467
0.482	1.85	0.261
0.700	3.86	0.181
1.475	10.31	0.143

100 gms. cymene (b. pt. 176°-176°.5) dissolve 0.024 gm. $C_6H_4(COOH)_2$ (*o*) at 25°. (Wheeler, 1920.)

DISTRIBUTION OF *o* PHTHALIC ACID AND OF *m* PHTHALIC ACID (ISOPHTHALIC) BETWEEN WATER AND ETHER AT 25°. (Chandler, 1908.)

Results for *o* Phthalic Acid,

Mols. *o* $C_6H_4(COOH)_2$ per Liter: H_2O Layer, *a*.	Ether Layer, *b*.	Ratio $\frac{a}{b}$.	Ratio for Unionized Acid.
0.0261	0.0322	0.809	0.637
0.0131	0.0150	0.873	0.645
0.0085	0.0091	0.932	0.667
0.0056	0.0056	1.006	0.635

Results for *m* Phthalic Acid.

Mols. *m* $C_6H_4(COOH)_2$ per Liter: H_2O Layer, *a*.	Ether Layer, *b*.	Ratio $\frac{a}{b}$.	Ratio for Unionized Acid.
0.000398	0.0485	0.0821	0.0359
0.000272	0.0288	0.0943	0.0352
0.000263	0.0279	0.0944	0.0350
0.000252	0.0266	0.0949	0.0341

Ratio of solubilities of Phthalic acids in olive oil and water at 25°. (Böeseken and Waterman, 1911, 1912.)

o Phthalic acid, solubility in oil ÷ solubility in H_2O = 0.01.

p Phthalic acid (Terephthalic), solubility in oil ÷ solubility in H_2O = 9.52.

100 gms. 95% formic acid dissolve 0.55 gm. *p* phthalic acid (Terephthalic) at 20.2°. (Aschan, 1913.)

SOLUBILITY OF *o* PHTHALIC ACID IN ALCOHOL AND IN ETHER AT 15°.

(Bourgoin, 1878.)

Solvent.	Gms. $C_6H_4(COOH)_2$ *o* per 100 Gms. Solution.	Solvent.
Absolute Alcohol	9.156	11.70
90 per cent Alcohol	10.478	10.08
Ether	0.679	0.684

SOLUBILITY OF *o* PHTHALIC ACID IN ALCOHOLS. (Timofeiew, 1894.)

Alcohol.	t°.	Gms. *o* $C_6H_4(COOH)_2$ per 100 Gms. Sat. Sol.	Alcohol.	t°.	Gms. *o* $C_6H_4(COOH)_2$ per 100 Gms. Sat. Sol.
Methyl Alcohol	− 2	15.1	Ethyl Alcohol	21.4	11.65
" "	+19	19.5	Propyl Alcohol	− 3	3.42
" "	+21.4	20.4	" "	+19	5.27
Ethyl Alcohol	− 2	8.2	" "		

PHTHALIC ACID

SOLUBILITY OF PHTHALIC ACID IN WATER AND IN OTHER SOLVENTS AT 28°.

(Desai and Patel, 1935.)

Solvent	Gm. Mol. $C_6H_4(COOH)_2$ per 100 gm. mols. sat. sol.	Solvent	Gm. Mol. $C_6H_4(COOH)_2$ per 100 gm. mols. sat. sol.
Water	0.08724(-8.04 gm.	Chloroform	0.0184
CCl_4	0.00244 per l.)	Methyl alcohol	5.125
Benzene	0.00447	Ethyl alcohol	4.265
Toluene	0.00469	n Propyl alcohol	2.732
m-xylene	0.00465	n Butyl alcohol	2.231
Chloro benzene	0.00577	Acetone	2.896
Nitro benzene	0.00898		

Freezing-point data are given for mixtures of:

Phthalic acid + Benzoic acid (Ward and Cooper, 1930.)
" " + Phthalic anhydride (Monroe, 1919.)

Sodium PHTHALATES $C_6H_4COOHCOONa$, $C_6H_4(COONa)_2$.

SOLUBILITY OF EACH SEPARATELY IN ETHYL ALCOHOL AT 23-25°.

(McDermott, 1940.)

Solvent	Gms. per 100 cc sat. solution	
	$C_6H_4COOHCOONa$	$C_6H_4(COONa)_2$
Aq. 72.3 Vol. % C_2H_5OH	—	2.48
" 79.2 " " "	2.86	—
" 95.0 " " "	0.28	0.06

METHYL DI NITRO BENZOATE 1,3,5 $(NO_2)_2C_6H_3COOCH_3$.

Freezing-point data for mixtures of methyl and ethyl di nitro benzoates are given by Caldwell and MacLean, 1933.

INDOL

$C_6H_4\left\langle\begin{matrix}CH\\NH\end{matrix}\right\rangle CH.$

100 gms. abs. Alcohol dissolve 35.85 gms. C_8H_7N at 20-25° (Pucher and Dehn, 1921.)
» Quinoline » 11.39 » »
» Equi. mol. mixture of alcohol and quinoline dissolve 12.0 gms. C_8H_7N at 20-25°.

Freezing-point data for mixtures of indol and sarcosine anhydride and for mixtures of oxindol and sarcosine anhydride are given by Pfeiffer, Angern and Wang, 1927.

DIBROM ACETANILIDE $Br_2C_6H_3NHCOCH_3$.

Freezing-point data are given for mixtures of:

2.4	dibromoacetanilide	+	2 chloro 4 bromoacetanilide	(Owen, 1923.)
4	chloro 2 bromoacetanilide	+	"	"
2.4	dibromoacetanilide	+	4 chloroacetanilide	"
2	chloroacetanilide	+	"	(Orion and Owen, 1924.)
1.2.4	chloronitroacetanilide	+	1.2.6 chloronitroacetanilide	(de Bruyn, 19
1.3.4	"	+	1.3.6 "	"
2.4	dibromoacetanilide	+	p bromoacdtanilide	(Sidgwick, 1915.)

DICHLOR ACETANILIDE 2,4-$Cl_2C_6H_3NHCOCH_3$.

SOLUBILITY IN AQUEOUS AND IN GLACIAL ACETIC ACID.

(Orton and King, 1911.)

Solvent	t°	Gms. $C_8H_7ONCl_2$ per 100 gms. sat. sol.
Aq. 50% acetic acid	16	0.83
Glacial Acetic acid	16	6.37

For other results for dibrom and dichlor acetanilides see chloroacetanilid

α CHLORO ACETOPHENONE $ClCH_2COC_6H_5$.

Freezing-point data for mixtures of α Chloro aceto phenone and 10, chloro 9, 10, dihydro phenarsazine (Adamsit) are given by Puschin and Hrustanovic, 1938.

METHYL Bromo, Chloro and Iodo BENZOATES.

Freezing-point data are given by Jaeger, 1906, for mixtures of p $BrC_6H_4COOCH_3$, p $ClC_6H_4COOCH_3$ and p $IC_6H_4COOCH_3$.

METHYL NITRO BENZOATE $NO_2C_6H_4COOCH_3$.

Freezing-point data are given for mixtures of methyl and ethyl nitro benzoates by Caldwell and Mac Lean, 1933.

OXANILIC ACID $C_6H_5.NH.CO.COOH$.

SOLUBILITY OF OXANILIC ACID IN AQUEOUS SOLUTIONS OF

SOLUBILITY OF OXANILIC ACID IN AQUEOUS SOLUTIONS OF ACIDS AT 25°.

(Drucker, 1929.)

Results for aqueous solutions of:

Hydrochloric acid		Nitric acid		Sulfuric acid		Picric acid	
Gm. Equiv. per liter		Gm. Equiv. per liter		Gm. Equiv. per liter		Gm. Equiv. per liter	
HCl	$C_8H_7O_3N$	HNO_3	$C_8H_7O_3N$	H_2SO_4	$C_8H_7O_3N$	$C_6H_3O_7N_3$	$C_8H_7O_3N$
0.002806	0.04854	0.000	0.04990	0.00577	0.04819	0.000	0.04990
0.00608	0.04756	0.00636	0.04711	0.01036	0.04575	0.00417	0.04396

DINITRO ACETANILIDE $CH_3CONHC_6H_3(NO_2)_2$.

Freezing-point data for mixtures of Dinitro Acetanilide and p Nitro Acetanilide are given by Holleman and Sluiter, 1906.

NITROPHENOL ACETATE o $CH_3COOC_6H_4NO_2$.

Freezing-point data for mixtures of o Nitro phenol acetate and o Nitro phenol are given by Boeseken, 1912.

NITRO METHYL BENZOIC ACIDS $NO_2(CH_3)C_6H_3COOH$.

SOLUBILITY OF 6,3 AND 2,3 NITRO METHYL BENZOIC ACIDS IN WATER AND OTHER SOLVENTS.

(Giacalone, 1935.)

Results for $6(NO_2)3(CH_3)C_6H_3COOH$

t°	Gms. $C_8H_7O_4N$ per 100 gms. H_2O	C_6H_6	$C_6H_5CH_3$
0	—	—	0.30
10	0.37	0.72	0.64
20	0.47	1.7 (1.4)	1.20
30	1.7	3.5 (2.8)	2.48
40	1.8	8.2 (5.6)	4.57
50	2.7	17.2 (11.2)	8.63
60	4.5	23.1	17.1
70	6.6	45.2	37.7
80	6.7 (100°)	88.8	66.2

Results for $2(NO_2)3(CH_3)C_6H_3COOH$

t°	Gms. $C_8H_7O_4N$ per 100 gms. H_2O	C_6H_6
20	0.04	0.032
40	0.16	0.22
60	0.42	0.41
80	0.58	0.45
100	0.6	—

The results in parentheses are calculated from the curve.

Freezing-point data for mixtures of p Nitro benzoic acid methyl ester and p Nitro benzoic acid ethyl ester are given by Caldwell and Mac Lean, 1933.

Trinitro *m* XYLENE $(NO_2)_3C_6H(CH_3)_2$ *m* (m. pt. 176°).

SOLUBILITY OF TRINITRO META XYLENE IN SEVERAL SOLVENTS. (Desvergnes, 1930.)

Solvent.		Density of solvent	B. pt. of solvent	Gms. $(NO_2)_3C_6H(CH_3)_2$ per 100 cc. solvent at 17°	50°	B. pt.
Ethyl alcohol (95 %)	d_{20}	= 0.8076	78.1	0.09		0.65
Amyl alcohol	d_{20}	= 0.8126	138.4	0.44	1.29	10.30
Acetone	d_{15}	= 0.8699	56.3	0.95		4.27
Ethyl acetate	d_{15}	= 0.9046	76.1	0.72		5.43
Acetic acid (glacial)	d_{20}	= 1.0527	115.3	0.40	5.30	15.03
Aniline	d_{15}	= 1.0341	179.5	3.87	34.38	..
Nitric acid (48°)	d_{15}	= 1.5006		5.51	51.10	..
Benzene	d_{20}	= 0.8792	80.15	0.92		10.00
Chloro benzene	$d_{15.5}$	= 1.1050	130.8	1.06	11.49	108.68
Nitro benzene	d_{15}	= 1.2058	206	2.56	19.60	—
Carbon tetrachloride	d_{15}	= 1.6008	75.4	0.08		0.96
m Xylene	d_{15}	= 0.8681	138.8	0.81	9.25	..
Xylene (essence)	d_{15}	= 0.8154	144.5	..		20.61

100 gms. glycol diacetate dissolve 0.8 gm. trinitro xylene at 25°. (Taylor and Rinkenbach, 1926.)

100 gms. 95% formic acid dissolve 0.71 gm. tri nitro m xylene (m. pt. 173°) at 18.5°. (Aschan, 1913.)

Freezing-point data are given for mixtures of Tri nitro xylenes and:

Acenaphthene(4)
Di nitro toluenes(3)(5)
Fluorene(4)
Nitro toluene(3)(5)
Naphthalene(4)
Phenanthrene(4)
Retene(4)
Styphnic acid(2)(3)
Tetra nitro methyl aniline(4)
Tri nitro toluene(3)(5)

(1) Bell and Sawyer, 1919; (2) Jefremow, 1918; (3) Jefremow, 1919a; (4) Jefremow and Tichomirowa, 1928; (5) Ross and Somerville, 1926.

Dinitro PHENETOL 1.2.4 $C_6H_3.OC_2H_5(NO_2)_2$.

Trinitro PHENETOL 1.2.4.6 $C_6H_2.OC_2H_5(NO_2)_3$.

SOLUBILITY OF EACH SEPARATELY IN SEVERAL SOLVENTS. (Desvergnes, 1924.)

Results for Dinitro Phenetol.

Solvent.	Gms. $C_6H_3OC_2H_5(NO_2)_2$ 1.2.4 per 100 gms. solvent at 15°.	50°.
Water	0.0030	0.0175 (1)
Ethyl acetate	44.30	137.08
Acetone	106.96	296.59
96 % alcohol	2.07	11.08
Abs. »	2.81	9.94
Methyl alcohol	4.02	18.63
Chloroform	63.89	186.40
Anhy. ether	5.13	9.36
Pyridine	95.29	253.79
Carbon disulfide	1.10	2.32 (34°)
Carbon tetrachloride	0.74	14.40
Toluene	43.04	183.21
Benzene	63.73	209.80

Results for Trinitro Phenetol.

Solvent.	Gms. $C_6H_2OC_2H_5(NO_2)_3$ 1.2.4.6 per 100 gms. solvent at 15°.	50°.
Water	0.011	0.044 (2)
Ethyl acetate	16.53	185.17
Acetone	1.20	410.31
96 % alcohol	1.20	7.82
Abs. »	1.67	9.32
Methyl alcohol	3.99	24.00
Benzene	49.21	297.25
Chloroform	20.79	174.71
Anhy. ether	3.79	7.66 (35°.5)
Pyridine	185.35	
»	33.87	327.92 (3)
Carbon disulfide	0.43	1.69
Carbon tetrachloride	0.667	0.43
Toluene	30.80	162.98

(1) The result given for 100° is 0.1678 but at both 50° and 100° saponification occurs.
(2) The result given for 100° is 0.351 but saponification occurs.
(3) In pyridine the double compound $C_6H_2OC_2H_5(NO_2)_3 \cdot 2C_5H_5N$ is formed.

Freezing-point data for mixtures of tri nitro phenetol and tri nitro anisole are given by

TRI NITRO PHENYL ETHYL NITRAMINE $2,4,6\text{-}(NO_2)_3.C_6H_2.N(C_2H_5)NO_2$.

100 gms. H_2O dissolve 0.006 gm. tri nitro phenyl ethyl nitramine at at 22°, 0.026 gm. at 50° and 0.271 gm. at 100°. (Desvergnes, 1926.)

ACETOPHENONE $CH_3COC_6H_5$.

100 gms. aq. 0.4 normal sodium oleate solution (= 10.8 gms. Na oleate per 100 gms. solution) dissolve 7.7 gms. aceto phenone at 20°. (Smith, 1932.)

MUTUAL SOLUBILITY OF ACETOPHENONE AND GLYCEROL. (Mac Ewen, 1923.)

The synthetic method of Alexejeff was used. The temperatures were determined at which separation of liquid phases occurred in mixtures of known amounts of acetophenone and glycerol.

t°.	Wt. per cent of $CH_3CO.C_6H_5$.	t°.	Wt. per cent of $CH_3CO.C_6H_5$.	t°.	Wt. per cent of $CH_3CO.C_6H_5$.
97.5....	4.38	184.0...	34.62	175.5...	75.07
136.5....	8.86	185.0*..	42.00	162.5...	83.42
164.0....	15.88	185.4*..	51.13	113.5...	95.30
174.5....	21.14	185.5*..	53.32	90.5...	97.13
		183.6...	61.90		

* Critical opalescence.

ACETOPHENONES

Freezing-point data are given for:

- Acetophenone +
  - Chlor acetic acid(7)
  - Dinitro phenols(7)
  - Hydroquinone(7)
  - Naphthols(7)
  - Nitro phenols(7)
  - Picric acid(7)
  - Phenol(7)
  - Pyrocatechol(7)
  - Pyrogallol(7).
  - Phosphorus acid(9)
  - Resorcinol(7)
  - Sulfuric acid(6)
- Amino Acetophenone +
  - Chloro dinitro benzene(5)
  - Trinitro toluene(3)
- Benzal Acetophenone +
  - Nitrophenols(1)
- Benzal Acetophone-β phenyl acrylophenone +
  - Naphthols(8)
- Ethoxybenzal Acetophenone +
  - Picric acid(1)
- Oxybenzal Acetophenone +
  - Picric acid(1)
- Cinnamylidene Acetophenone +
  - Acenaphthene(2)
  - Aminoaceto phenone(4)
  - Azo benzene(2)
  - Bromo dinitro benzene(4)
  - Bromo nitro benzene(4)
  - Chloro nitro benzene(4)
  - Dinitro benzene(4)
  - Diphenyl amine(3)
  - Ethyl ether(2)
  - Resorcinol(8)
  - Thymoquinone(4)
  - Trichlor acetic acid(7)
  - Trinitro toluene(2)
- Dimethyl aminobenzol Acetophenone +
  - Naphthols(8)
- Dimethyl amino benzol p methoxy Acetophenone + Naphthols(8)
- Methylene dioxybenzol Acetophenone +
  - Naphthol(1)
  - Nitro phenols(1)
  - Nitro toluene(1)
  - Picric acid(1)

(1) Asakina, 1934; (2) Giua, 1916; (3) Giua, 1917; (4) Giua, 1925; (5) Giua, Marcellino and Curti, 1920; (6) Kendall and Carpenter, 1914; (7) Kremann and Marktl, 1920; (8) Pfeiffer, 1924; (7) Kendall and Gibbons, 1915.

Brom ACETANILIDE $BrC_6H_4NHCOCH_3$(p).

Freezing-point data for mixtures of Brom acetanilide and dibrom acetanilide are given by Sidgwick, 1915.

Freezing-point data for mixtures of aceto-2-chloranilide and aceto-4-chlor anilide are given by Orton and Owen, 1924.

ChlorACETANILIDES, $Cl.C_6H_4NH.COCH_3$ *o*, *m* and *p*.

Solubility of Each in Water (Sidgwick and Rubie, 1924.)

Note. — The determinations were made by the synthetic method. Sealed bulbs of 2 or 3 cc. capacity were used at the higher temperatures and a Beckmann apparatus at the lower temperatures. Those points at which the solid phase separated are marked with an asterisk, the others show the composition of one of the two liquid layers which are formed. The triple point was determined in all cases but not the critical temperature of the liquid layers.

Ortho Chloracetanilide.		Meta Chloracetanilide.		Para Chloracetanilide.	
t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.	t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.	t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.
86.7....	100.0*	76.6....	100.0*	178.4....	100.0*
77.0....	97.4*	69.0....	98.0*	168.0....	97.38*
70.0....	95.0* tr.pt.	64.0....	96.82*	150.0....	93.16*
105.0....	92.87	59.5..	95.0* tr.pt.	148.0....	90.0* tr.pt.
150.0....	88.72	81.0....	94.41	142.0....	89.6
175.0....	85.12	123.0....	91.29	160.0....	88.08
182.0....	10.71	165.0....	86.86	178.0....	85.23
155......	6.63	176......	6.14	169.0....	3.85
142.....	5.13	138....	2.76	140......	1.87*
105......	2.94	130......	2.49	115......	0.837*
65......	0.692*	76......	0.743	97......	0.384*
15......	0.323*			65.5....	0.095*

Solubility of Halogen Substituted Acetanilides in Ethyl Alcohol at Different Temperatures. (Chattaway and Lambert, 1915.)

Gms. of Each Anilide per 100 Gms. of Each Sat. Solution.

t°.	*p* Chloro-acetanilide.	2.4 Dichloro-acetanilide.	*p* Bromo-acetanilide.	2.4 Dibromo-acetanilide.	4 Chloro-2 Bromo-acetanilide.	2 Chloro-4 Bromo-acetanilide.
5	.....	.....	4.244	2.480	...	...
10	3.278	3.008	4.847	2.876	4.334	2.575
15	3.777	3.564	5.561	3.382	5.088	2.961
20	4.366	4.192	6.390	4.002	5.986	3.466
25	5.040	4.962	7.300	4.714	7.043	4.095
30	5.828	5.864	8.440	5.615	8.328	4.891
35	6.700	6.937	9.715	6.686	9.844	5.820
40	7.728	8.276	11.156	7.914	11.586	6.887
45	8.918	9.750	12.767	9.357	13.718	8.186

(Results for unstable needle forms of *p* bromoacetanilide and 2.4 dibromoacetanilide are also given.)

SOLUBILITY OF ORTHO, META AND PARA CHLORACETANILIDES IN BENZENE.

(Sidgwick and Rubie, 1921.)

The synthetic method was used. A solid phase separated in each case.

Ortho Chloroacetanilide t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.	Meta Chloroacetanilide. t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.	Para Chloroacetanilide. t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.
84.8	97.45	76.6	100.0	178.4	100.0
80.0	92.16	70.0	92.74	172.0	93.62
69.5	79.53	61.0	81.20	162.0	78.50
61.4	68.22	51.5	68.17	154.5	69.67
50.5	52.06	46.0	59.51	144.2	55.86
45.2	41.69	39.5	47.31	134.5	37.80
37.8	30.65	29.2	32.81	125.2	21.14
31.4	21.77	15.4	20.04	122.4	18.16
20.2	13.50			107.5	6.63
10.0	9.56			96.5	4.21

100 cc. of water dissolve approx. 1.33 gms. *o* chloro, *o* nitroacetanilide at ord. temp.
» » 1.11 » *o* » *p* »
100 cc. of dil. acid* » 1.55 » *o* » *o* »
» » 1.55 » *o* » *p* »

* The dilute acid contained 14.4 cc. HNO_3 and 7.7 cc. CH_3COOH per 100 cc. (Franzel and Engel, 1921.)

N- CHLORO ACETANILIDE $CH_3CO.NCl.C_6H_5$.

SOLUBILITY OF N-CHLORO ACETANILIDE IN AQUEOUS ACID AND SALT SOLUTIONS AT 25°.

(Soper and Pryde, 1927.)

An excess of the N-chloro acetanilide was shaken with the aqueous solvent for 15 minutes and 10 cc of the sat. solution titrated for chloro amine by adding to acidified KI and titrating the liberated iodine with thio sulfate.

Ionic strength of Acid or Salt solution	Gm. Mols. C_8H_8ONCl per liter in Aq. HCl	HNO_3	KCl	KNO_3
0.0	0.01383	0.01383	0.01383	0.01383
0.1	0.01398	0.01418	0.01323	0.01350
0.4	0.01434	0.01511	0.01232	0.01275
0.7	0.01461	0.01680	0.01105	0.01275
1.0	0.01495	0.01935	0.00963	0.01243
1.5	0.1577	0.02295	0.00880	0.01178

Phenyl**ACETIC ACID** (α Toluic Acid) $CH_2(C_6H_5)COOH$.

SOLUBILITY IN WATER AND IN ALCOHOLS. (Timofeiew, 1894.)

Solvent.	t°.	Gms. $CH_2(C_6H_5)COOH$ per 100 Gms. Sat. Sol.	Solvent.	t°.	Gms. $CH_2(C_6H_5)COOH$ per 100 Gms. Sat. Sol.
Water	20	1.64	Ethyl Alcohol	0.0	50.7
Methyl Alcohol	−17	50.6	"	+19.4	64.4
"	−13	53.2	"	20.0	65.1
"	0	59.2	Propyl Alcohol	−17.0	29.4
"	+19.4	70.8	"	−13.0	32.3
"	20	71.8	"	0.0	40.9
Ethyl Alcohol	−17	39.7	"	+19.4	56.8
"	−13	41.5	"	20.0	57.2

One liter sat. solution of Phenyl acetic acid in water contain 17.3 gms. $CH_2(C_6H_5)COOH$ at 25°. (Reyer, 1923.)

PhenylACETIC ACID (α Toluic Acid) $CH_2(C_6H_5)COOH$.

SOLUBILITY IN WATER AND IN BENZENE, DETERMINED BY THE SYNTHETIC METHOD.

(Sidgwick and Ewbank, 1921 *a*.)

In Water.

t°.	Gms. $CH_2(C_6H_5)COOH$ per 100 gms. sat. sol.	Solid Phase.
76.7	100.0	$CH_2(C_6H_5)COOH$
48.5	80.96	"
45.5 tr. pt.	–	" + liquid layer
94.8	61.94	liquid layers
106.8	39.69	"
108.0 crit. t.	–	"
108.0	20.0	"
84.7	5.65	"

In Benzene.

t°.	Gms. $CH_2(C_6H_5)COOH$ per 100 gms. sat. sol.	Solid Phase.
59.0	81.03	$CH_2(C_6H_5)COOH$
42.0	61.28	"
29.0	42.98	"
13.0	28.00	"
3.0	19.93	"
2.2	16.30	C_6H_6
3.2	13.04	"
4.6	6.22	"

SOLUBILITY OF PHENYACETIC ACID AND OF DIPHENYLACETIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Results for Phenylacetic Acid.

Gm. mols. per liter HCl.	Gm. mols. per liter $CH_2(C_6H_5)$.COOH.	Gms. mols. per liter HCl.	Gms. mols. per liter $CH_2(C_6H_5)$.COOH.
0.0	0.01310	7.175	0.0756
1.417	0.0984	8.580	0.0815
2.890	0.0833	9.988	0.0916
4.313	0.0763	11.36	0.1099
5.770	0.0739		

Results for Diphenylacetic Acid.

Gm. mols. per liter HCl	Gm. mols. per liter $CH(C_6H_5)_2$.COOH.	Gm. mols. per liter HCl.	Gm. mols. per liter $CH(C_6H_5)_2$ COOH.
0.0	0.00060	7.349	0.00041
1.620	0.00047	8.889	0.00042
2.913	0.00040	10.27	0.00046
4.512	0.00036	11.74	0.00053
5.973	0.00038		

SOLUBILITY OF PHENYL ACETIC ACID IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25°.

(Hammett and Chapman, 1934.)

Wt. % H_2SO_4 in aqueous solvent	Gm. Mols. $C_8H_8O_2$ per 1000 gms. solvent	Wt. % H_2SO_4 in aqueous solvent	Gm. Mols. $C_8H_8O_2$ per 1000 gms. solvent	Wt. % H_2SO_4 in aqueous solvent	Gm. Mols. $C_8H_8O_2$ per 1000 gms. solvent
0.0	0.1267 (=17.24 gms.)	48.89	0.0259	68.03	0.0431
11.28	0.0801	50.55	0.0258	70.27	0.0530
28.51	0.0330	52.76	0.0275	72.46	0.0630
37.61	0.0283	58.67	0.0287	74.54	0.0904
46.74	0.0260	64.30	0.0343	77.40	0.1947

DISTRIBUTION OF PHENYLACETIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $CH_2(C_6H_5)COOH$ per liter of: H_2O layer (C_1).	Millimols. $CH_2(C_6H_5)COOH$ per liter of: $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.280	0.475	1.70
0.425	0.785	1.845
0.518	1.010	1.95
0.715	1.542	2.16

Water and Ether.

Millimols. $CH_2(C_6H_5)COOH$ per liter of: H_2O layer (C_1).	Millimols. $CH_2(C_6H_5)COOH$ per liter of: $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.085	1.255	14.7
0.17	2.47	14.5
0.26	3.82	14.7
0.44	7.44	16.9
1.08	16.12	15.0

DISTRIBUTION OF PHENYLACETIC ACID BETWEEN WATER AND XYLENE AT 25°.

(Smith, 1921-1922.)

Results using :

1 vol. H_2O to 1 vol. Xylene.			1 vol. H_2O to 2 vols Xylene.			2 vols. H_2O to 1 vol. Xylene.		
Millimols. $CH_2(C_6H_5)COOH$ per liter of			Millimols. $CH_2(C_6H_5)COOH$ per liter of			Millimols. $CH_2(C_6H_5)COOH$ per liter of		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
1.26	0.5750	0.456	1.400	1.275	0.910	1.18	0.175	0.148
1.60	0.7750	0.484	2.250	2.400	1.068	1.75	0.35	0.200
2.60	1.5375	0.592	2.875	3.325	1.16	2.58	0.85	0.330
3.50	2.473	0.708	3.575	4.825	1.35	4.90	3.05	0.623
5.00	5.00	1.00						

DISTRIBUTION OF PHENYL ACETIC ACID AT 25° BETWEEN WATER AND:

(Kolossowski, Kulikow and Bekturow, 1933; Kolossowski and Bekturow, 1935.)

Nitro benzene $C_6H_5NO_2$			Toluene $C_6H_5CH_3$			Iso Amyl Alcohol $(CH_3)_2CHCH_2CH_2OH$		
Gm. Mols. $C_8H_8O_2$ per liter		$\frac{1}{2}$	Gm. Mols. $C_8H_8O_2$ per liter		$\frac{1}{2}$	Gm. Mols. $C_8H_8O_2$ per liter		$\frac{1}{2}$
H_2O layer (1)	$C_6H_5NO_2$ layer (2)		H_2O layer (1)	$C_6H_5CH_3$ layer (2)		H_2O layer (1)	$C_5H_{11}OH$ layer (2)	
0.0067	0.0335	0.200	0.012	0.032	0.375	0.0039	0.016	0.246
0.0105	0.069	0.152	0.017	0.051	0.353	0.0071	0.059	0.120
0.0267	0.267	0.100	0.020	0.063	0.317	0.0070	0.137	0.051
0.043	0.564	0.0760	0.027	0.111	0.243	0.0099	0.221	0.045
0.053	0.785	0.0675	0.063	0.551	0.114	0.011	0.267	0.041
0.061	1.060	0.057	0.067	0.700	0.096	0.015	0.404	0.031
0.068	1.262	0.054	0.079	0.996	0.079	0.016	0.457	0.035
0.076	1.571	0.048	0.091	1.168	0.078	0.029	0.808	0.036
0.084	1.899	0.044	0.103	1.340	0.077	0.038	1.052	0.036
0.091	2.249	0.040	0.130	1.960	0.066	0.051	1.372	0.037
0.096	2.470	0.039	0.130	2.135	0.061	0.066	1.818	0.033
0.107	2.783	0.038				0.069	2.059	0.033

DISTRIBUTION OF PHENYL ACETIC ACID AT 25° BETWEEN WATER AND:

(Smith and White, 1929.)

Chloroform		Benzene		Toluene	
Gm. Mols. $C_8H_8O_2$ per liter		Gm. Mols. $C_8H_8O_2$ per liter		Gm. Mols. $C_8H_8O_2$ per liter	
H_2O layer	$CHCl_3$ layer	H_2O layer	C_6H_6 layer	H_2O layer	$C_6H_5CH_3$ layer
0.00148	0.0050	0.0043	0.00761	0.00509	0.00381
0.00194	0.00735	0.0058	0.01233	0.01139	0.02591
0.00237	0.00994	0.00732	0.01812	0.01349	0.03435
0.00389	0.0213	0.00935	0.02795	0.01667	0.05089
0.00572	0.0412	0.01102	0.03682	0.01990	0.07080
0.00796	0.0739	0.01364	0.05992		
0.01010	0.1089	0.01626	0.07454		

SOLUBILITY OF PHENYLACETIC ACID IN SEVERAL SOLVENTS AT 25°.

(Herz and Rathmann, 1913.)

Solvent.	Gms $CH_2(C_6H_5)COOH$ per 100 cc. Sat. Sol.	Solvent.	Gms. $CH_2(C_6H_5)COOH$ per 100 cc. Sat. Sol.
Chloroform	60.17	Tetrachlorethylene	21.19
Carbon Tetrachloride	25.07	Tetrachlorethane	61.45
Trichlorethylene	44.89	Pentachlorethane	44.26

CRITICAL SOLUTION TEMPERATURES OF MIXTURES OF PHENYL ACETIC ACID AND OTHER COMPOUNDS.

(Lecat, 1929.)

Mixtures of Phenyl Acetic Acid and:

	Crit. sol. temp.		Crit. sol. temp.
Acenaphthene	62.8	Di phenyl	61.0
iso Amyl benzoate	30.0	Di phenyl methane	40.6
iso Amyl oxalate	46.0	iso Eugenol methyl ether	48.5
α Bromo naphthalene	55.3	Phenyl ether	30.6
α Chloro naphthalene	36.0		

Freezing-point data are given for mixtures of phenyl acetic acid and:

Benzyl phenyl acetate(1)
Chlor acetic acid(5)
Di anisol acetone(3)
Di benzyl acetone(3)
Di chlor acetic acid(5)
Di methyl pyrone(6)
Ethyl phenyl acetate(1)
Hydro cinnamic acid(4)
Lithium phenyl acetate(1)
Methyl phenyl acetate(1)
Michler's ketone(3)
Picric acid(8)
Sulfuric acid (7)
Tetra methyl phthalan(2)
Tetra methyl di amino benzo phenone(9)
Tri chlor acetic acid(5)
Also for mixtures of Ethyl phenyl acetate + Sodium phenyl acetate(1)

(1) Bakunin and Vitale, 1935; (2) Bennett and Wain, 1936; (3) Pfeiffer, 1924; (4) Salkowski, 1885; (5) Kendall, 1914; (6) Kendall, 1924a; (7) Kendall and Carpenter, (8) Kendall, 1916; (9) Pfeiffer, Goebel and Angern, 1925.

Hydroxy **TOLUALDEHYDES** $C_6H_3.CHO\ OH.CH_3$, 1, 2, 5; 1, 4, 5 and 1, 4, 6.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Sidgwick and Allott, 1923.)

The determinations were made by the synthetic, sealed tube, method. The concentrations are in terms of wt. %, that is, grams of each compound per 100 gms. sat. solution. The points at which a second liquid layer separated are marked L. The unstable points are marked with an asterisk.

Results for $C_6H_3.(1)CHO.(2)OH.(5)CH_3$.

t°.	Wt. %.
99.1	2.52 L
156.5	5.47 L
137.1	92.73 L
87.7	96.09 L
55.1	100.00

Results for $C_6H_3.(1)CHO.(4)OH.(5)CH_3$.

t°.	Wt. %.	t°.	Wt. %.
67.3	1.69	87.2	56.0 L
55.9	1.69 L*	79.5^b	56.0
99.3	5.45 L	79.6	59.9
127.0	16.5 L	80.3	73.3
133.5	23.5 L	91.2	86.8
136.8^a	35.4 L	117.4	100.0
127.0	52.5 L		

^{a} Crit. t. ^{b} Tr. pt.

Results for $C_6H_3.(1)CHO.(4)OH.(6)CH_3$

t°.	Wt. %.	t°.	Wt. %.
56.8	5.78	69.1^b	50.6
85.8	7.95 L	69.2	51.0
116.3	14.3 L	69.4	59.5
125.0^a	34.0 L	69.9	69.5
124.5	44.6 L	75.9	82.7
121.1	48.5 L	108.9	100.0
78.8	50.3 L		

SOLUBILITY OF HYDROXY TOLUALDEHYDES, EACH SEPARATELY, IN BENZENE.

(Sidgwick and Allott, 1923.)

Results for $C_6H_3.(1)CHO.(2)OH.(5)CH_3$.	
t°.	Wt. %.
5.32	0.0 B
3.45	5.56 B
1.30	11.50 B
−0.60	17.0 B
−2.40	21.5 B
−3.0 Eutec.	23.3
+0.15	27.4
6.05	34.0
11.5	41.7
21.6	55.4
28.0	64.4
31.8	71.0
46.0	90.9

Results for $C_6H_3.(1)CHO.(4)OH.(5)CH_3$.	
t°.	Wt. %.
37.2	2.27
66.7	7.08
72.4	11.7
76.0	18.8
79.8	26.9
83.7	38.6
85.8	48.4
92.1	63.0
98.2	73.9
117.4	100.0

Result for $C_6H_3.(1)CHO.(4)OH.(6)CH_3$.	
t°.	Wt. %.
54.7	4.94
67.5	8.19
72.9	17.5
75.7	33.2
81.8	53.3
86.7	67.5
89.1	71.5
108.9	100.0

B indicates that solid benzene separated.

XYLOQUINONE (*p*) (Phlorone) $C_6H_2O_2(CH_3)_2$.

100 gms. abs. alcohol dissolve 1.12 gms. $C_6H_2O_2(CH_3)_2$ at 20°–25°.
» quinoline » 3.02 » »
» équi. mol. mixture of alcohol and quinoline dissolve 4.69 gms. $C_6H_2O_2(CH_3)_2$ at 20°–25°. (Pucher and Dehn, 1921.)

METHYL BENZOATE $C_6H_5COOCH_3$.

EQUILIBRIUM IN THE SYSTEM METHYL BENZOATE, METHYL ALCOHOL AND WATER.

(Gilbert and Lauer, 1927.)

Results at 15°		Results at 25°		Results at 35°	
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
CH_3OH	$C_8H_8O_2$	CH_3OH	$C_8H_8O_2$	CH_3OH	$C_8H_8O_2$
0.0	0.1	0.0	0.4	0.0	0.5
52.0	10.7	39.9	1.1	47.0	8.9
52.4	14.5	43.6	2.2	48.3	11.3
52.6	17.3	46.5	4.4	49.2	15.2
50.6	23.1	50.3	9.5	48.6	18.0
47.4	29.9	50.6	11.7	47.8	21.7
45.1	34.5	50.6	14.0	44.9	28.0
39.3	44.0	49.8	17.8	42.7	32.7
29.3	60.0	48.0	23.9	39.1	39.8
19.4	75.0	45.4	30.0	35.7	45.8
16.1	79.4	39.4	41.3	32.3	51.7
0.0	99.8	31.7	54.4	26.9	59.9
		24.5	65.8	25.0	62.4
		19.2	74.1	20.9	68.3
		12.4	83.8	0.0	98.8
		0.0	99.4		

Freezing-point data for mixtures of methyl benzoate and tri chloro acetic acid are given by Kendall and Booge, 1916.

TOLUIC ACIDS (Monomethyl Benzoic Acids) $CH_3.C_6H_4.COOH$.

SOLUBILITY OF TOLUIC (METHYL BENZOIC) ACIDS IN WATER AT 25°.

(Paul, 1894.) (Vaubel, 1896.) (Fühner, 1924.)

	$CH_3C_6H_4COOH$ per liter		Gms. $CH_3C_6H_4COOH$ per 1000 gms. sat. sol.	Gms. $CH_3C_6H_4COOH$ per 1000 gms. H_2O
	Gms.	Gm. Mols.		
Ortho Toluic Acid	1.182	0.008683	1.18	1.183
Meta " "	0.980	0.007207	0.98	0.981
Para " "	0.345	0.002540	0.35	0.345

One liter sat. solution in water contains 0.42 gram *p* toluic acid at 25°. One liter sat. solution in 1 *n* aq. sodium *p* toluate contains 0.735 gm. *p* toluic acid at 25°. (Sidgwick, 1910.)

SOLUBILITY OF TOLUIC ACIDS (EACH SEPARATELY) IN WATER AT VARIOUS TEMPERATURES.

(Sidgwick, Spurrell and Davies, 1915.)

The determinations were made by the synthetic method, see p. 16; melting-point of *o* toluic acid = 102.4°, of *m* acid = 110.5° and of *p* acid = 176.8°. The triple point (solid phase present) for the *o* acid, is at 93.5° and the concentration of acid in the two layers is 2.5 and 91.2 gms. respectively per 100 gms. sat. solution. The tr. pt. for the *m* acid is at 91.8° and concentrations are 1.6 and 90.5; the tr.-pt. for the *p* acid is at 142° and concentrations, 5 and 74.

t°.	Gms. per 100 Gms. Sat. Sol.			t°.	Gms. per 100 Gms. Sat. Sol.		
	o Toluic Acid.	*m* Toluic Acid.	*p* Toluic Acid.		*o* Toluic Acid.	*m* Toluic Acid.	*p* Toluic Acid.
80	2.03*	1.16*	...	140	9.25	5.77	4.30*
90	2.42*	1.54	...	150	13.7	8.40	9.33
100	2.97	1.98	1.16*	159.1 crit t.	...	...	∞
110	3.71	2.52	1.36*	160	30	19.4	
120	5.10	3.24	1.75*	161.1 crit. t.	∞	...	
130	6.93	4.30	2.50*	162.2 crit. t.	...	∞	

* Indicates that a solid phase is present.

Additional data for the solubility of the above compounds in water, determined by the synthetic method, are given by Flaschner and Rankin (1910).

SOLUBILITY OF META TOLUIC ACID IN AQUEOUS SOLUTIONS OF MAGNESIUM SULFATE AT 25°.

(Randall and Failey, 1927.)

Ionic Strength of $MgSO_4$ in Aq. Solvent	Gm. Mols. m $CH_3C_6H_4COOH$ per liter sat. sol.	Ionic Strength of $MgSO_4$ in Aq. solvent	Gm. Mols. m $CH_3C_6H_4C$ per liter sat. sol
0.0 (= H_2O)	0.008783	0.2000	0.009126
0.04792	0.009044	0.6400	0.009015
0.1000	0.009124	0.9836	0.008653

DISTRIBUTION OF ORTHO TOLUIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. $C_8H_8O_2$ per liter	
H_2O layer	$CHCl_3$ layer
0.00211	0.1123
0.00257	0.1470
0.00290	0.1700
0.00370	0.2330
0.00449	0.3100

Water and Toluene

Gm. Mols. $C_8H_8O_2$ per liter	
H_2O layer	$C_6H_5CH_3$ layer
0.00257	0.0565
0.00277	0.0640
0.00304	0.0748
0.00330	0.0870
0.00356	0.0990

DISTRIBUTION OF PARA TOLUIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform'

Gm. Mols. $C_8H_8O_2$ per liter	
H_2O layer	$CHCl_3$ layer
0.00070	0.0418
0.00084	0.0547
0.00098	0.0641
0.00119	0.0871
0.00132	0.1008

Water and Toluene

Gm. Mols. $C_8H_8O_2$ per liter	
H_2O layer	$C_6H_5CH_3$ layer
0.00145	0.0255
0.00159	0.0301
0.00172	0.0355
0.00185	0.0405
0.00198	0.0466
0.00211	0.0528

RATIO OF THE SOLUBILITIES OF TOLUIC ACIDS (SEPARATELY DETERMINED) IN WATER AND IN OLIVE OIL AT 25°.

(Boeseken and Waterman, 1911, 1912.)

The solubilities of each acid in water and in olive oil was separately determined and the ratio considered to correspond to the distribution coefficients in each case. The concentrations of the dissolved acids are not given.

Acid.	Ratio of $\frac{\text{Solubility in Olive Oil}}{\text{Solubility in Water}}$.
o Toluic Acid	40.5
m " "	21
p " "	29.5

100 gms. 95% formic acid dissolve 2.99 gms. *o* toluic acid at 20.8°. (Aschan, 1913.)

SOLUBILITY OF ORTHO, META AND PARA TOLUIC ACIDS ($C_6H_4.CH_3.COOH$), EACH SEPARATELY, IN ORTHO, META AND PARA XYLENE, AT 14°.

(Chapas, 1922.)

Each solvent was saturated with the given acid at the temperature of the water bath and the mixture allowed to cool to room temperature, while being agitated from time to time. The dissolved acid was determined by agitating a weighed amount of the saturated solution with an excess of 0.1 *n* Na OH and titrating with 0.1 *n* H Cl, using phenolphthalein as indicator.

Compound.	Formula.	Gms. compound dissolved per 100 gms.		
		o Xylene.	*m* Xylene.	*p* Xylene.
Ortho toluic acid.....	$C_6H_4.CH_3.COOH$ (*o*)	7.11	5.78	7.39
Meta »	» (*m*)	8.63	8.57	10.32

SOLUBILITY OF ORTHO, META AND PARA TOLUIC ACIDS, EACH SEPARATELY, IN CHLORO BENZENE AND TOLUENES.

(Chapas, 1930.)

Solvent	t°	Per 100 gm. mols. sat. solution		
		Gm. Mols. o Toluic acid	Gm. Mols. m Toluic acid	Gm. Mols. p Toluic acid
Chloro Benzene	0	3.12	3.97	—
" "	14.1	6.19	7.08	—
" "	31.8	12.73	14.07	1.76
o Chloro Toluene	0	3.16	3.95	—
" "	14.2	6.24	6.88	—
" "	31.9	13.40	13.61	1.70
p Chloro Toluene	0	—	—	—
" "	14.1	6.15	7.05	0.81
" "	31.8	13.1	13.72	1.74

Freezing-point data are given for mixtures of Toluic Acids and:

Acetyl di phenyl(7)
Azo benzene(7)
Benzoic acid(2)
Chlor acetic acid(2)
Di chlor acetic acid(2)
Di methyl pyrone(3)
Iodo benzoic acid(6)
Methoxy anthra quinone(7)
Picric acid(4)
Sarcosine anhydride(7)
Sulfuric acid(5)
Tetra methyl phthalan(1)
Tri chlor acetic acid(2)

(1) Bennett and Wain, 1936; (2) Kendall, 1914; (3) Kendall, 1914a; (4) Kendall, 1916; (5) Kendall and Carpenter, 1914; (6) Lettre and Lehmann, 1938; (7) Pfeiffer, Angern, Wang, Seydel and Quehl, 1930.

ANISALDEHYDE $CH_3OC_6H_4CHO$.

100 gms. sat. solution of anisaldehyde in liquid ammonia contain about 70 gms. $CH_3OC_6H_4CHO$ at ? t°. (De Carli, 1927.)

Freezing-point data for mixtures of anisaldehyde and tri chlor acetic acid are given by Kendall and Gibbons, 1915.

ANILINE TRI CHLOR ACETATE $C_6H_5NH_2CCl_3COOH.H_2O$.

100 gms. sat. solution of aniline tri chlor acetate in water contain 3.28 gms. $C_6H_5NH_2CCl_3COOH$ at 15° and 33.21 gms. at 55°. (Florence, 1927.)

RICININE $C_8H_8N_2O_2$.

SOLUBILITY OF RICININE IN SEVERAL SOLVENTS.

(Winterstein, Keller and Weinhagen, 1917.)

Solvent.	Gms. Ricinine dissolved per 100 cc. sat. sol.	
	cold.	hot
Water	0.345	10.35
95 % alcohol	0.345	4.67
Chloroform	0.755	
Benzene	0.030	0.16
Pyridine	2.050 (10 gms at 34°)	34.00 (at 115°-116°)
Methyl acetate		1.72

SOLUBILITY IN SEVERAL SOLVENTS OF THE COMPOUND, $NH_2CO.C_6H_4.N = N.CO.NH_2$, FORMED BY THE ACTION OF IODINE UPON META BENZAMIDO-SEMICARBAZIDE (M. PT. 186°). (Doucet, 1923.)

Solvent.	Gms. cmpd. per 100 gms. solvent at 15°.	b. pt.
Water	0.07	3.25
95 % Ethyl alcohol	0.70	2.20
Acetone	0.80	-

VANILLIN $C_6H_3.CHO.OCH_3.OH$, 1.3.4.

100 gms. H_2O dissolve 1 gm. vanillin at 20–25°. (Dehn, 1917.)
100 gms. pyridine dissolve 316 gms. vanillin at 20–25°. "

DISTRIBUTION OF VANILLIN BETWEEN WATER AND ETHER AT 25°.
(Marden, 1914.)

Gms. Vanillin per 100 cc. H_2O Layer.	Ether Layer.	Dist. Coef.
0.0164	0.1294	0.108
0.0242	0.1854	0.110
0.0403	0.3310	0.104

100 gms. sat. solution of Vanillin in 95.2% Ethyl Alcohol (d=0.8063) contain 48.42 gms. $CH_3O(OH)C_6H_3CHO$ at 25°. (Schnellbach and Rosin, 1931.)

SOLUBILITY OF VANILLIN IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL
(Mange and Ehler, 1924.)

The temperatures were determined at which weighed amounts of vanillin just dissolved in measured amounts of solvent. The results were plotted and the following table constructed from the diagram.

Per cent C_2H_5OH in solvent.	Gms. $C_6H_3CHO.OCH_3.OH$ per 100 cc. solvent. at 4°.4.	at 15°.6.	at 23°.9
0 (=H_2O...	0.30	0.52	0.90
5	0.40	0.60	1.10
10	0.45	0.75	1.35
15	0.50	1.00	1.90
20	0.60	1.35	2.80
25	0.90	2.00	4.70
30	1.40	3.30	

100 gms. abs. alcohol dissolve 67.22 gms. vanillin at 20-25° (Pucher and Dehn, 1921.)
100 gms. quinoline » 5.51 » » » » » » »
100 gms. equi. mol. mixture of alcohol and quinoline dissolve 64.30 gms. vanillin at 25°.

Solubility of Vanillin in Aqueous Solutions of Glycerol.

(Mango and Ehler, 1924.)

The determinations could not be made at temperatures below 30° by the method used with alcohol solutions, due to the failure of vanillin to separate from the viscous glycerol mixtures, even on being supercooled by as much as 20°. An arbitrary method, which resembles the procedure used by flavor manufacturers in making vanillin solutions, was employed. This consisted in preparing, for each concentration of glycerol, a series of tubes in which different amounts of vanillin were dissolved by warming. These were kept at a nearly constant temperature (25° in one case and 13° in another) and shaken occasionally, during a period of one month. The mixtures which remained clear were seeded with a few crystals of vanillin in order to detect super saturation. Those which had been kept at 13° were nearly all supersaturated. The results were plotted and the following table was prepared. It shows the maximum amount of vanillin which will remain in solution under the usual conditions of preparing and storing commercial vanillin solutions.

Per cent Glycerol in solvent.	Gms. $C_6H_3CHO.OCH_3.OH$ per 100 cc. solvent at		
	25°.	13° (without seeding).	13° (after seeding).
0 (=H_2O)...	1.30	1.05	0.75
10...........	1.50	1.30	0.82
20...........	1.70	1.50	0.90
30...........	2.00	1.90	1.00
40...........	2.40	2.10	1.20
50...........	2.80	2.50	1.35
60...........	3.30	2.90	1.70
70...........	4.00	3.40	2.25

100 cc. glycerol saturated by being agitated with excess of vanillin at 25°, and analyzed by extraction with ether, contained from 3.9 to 5.1 gms. $C_6H_3CHO.OCH_3.OH$. (Taylor and Beble, 1924).

Solubility of Vanillin in Aqueous Solutions of Glycerol at Temperatures Between 0°.2 and 60°

(de Groote, 1920.)

The determinations were made by the method described under Coumarin on page 1190.

Per cent 95 % Glycerol in solvent.	Gms. Vanillin dissolved per 100 cc. sat. solution at					
	0°.2.	20°.	30°.	40°.	50°.	60°.
0.0 (= H_2O)......	0.68	1.25	1.50	2.65	4.80	5.05
5.0...............	0.70	1.50	1.60	3.00	4.90	5.20
10.0...............	0.75	1.75	1.80	3.40	5.50	6.50
15.0...............	0.85	1.95	2.35	4.00	6.25	7.20
20.0...............	0.95	2.30	2.50	4.20	7.50	8.25
25.0...............	1.10	2.50	2.70		8.75	11.20
30.0...............	1.25	2.95	3.00	5.3	10.0	12.8
40.0...............	1.50	3.50	3.80	6.0	12.0	15.0
50.0...............	2.06	4.50	5.00	7.4	14.8	20.0

Fusion-point data for mixtures of vanillin and orthovanillin are given by Noelting (1910). Qualitative solubilities of orthovanillin in a number of solvents are also reported. Data for the sintering, melting and clear liquid points for mixtures of vanillin and an extensive series of compounds are given by Lehmann (1914).

Freezing-point data for mixtures of vanillin and acenaphthene are given by Fazi, 1916, and for mixtures of vanillin with chlor acetic acid and with tri chlor acetic acid by Kendall and Gibbons, 1915.

METHOXY BENZOIC ACID o $CH_3O.C_6H_4COOH$.

DISTRIBUTION OF ORTHO METHOXY BENZOIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mol. o $C_8H_8O_3$ per liter H_2O layer	Gm. Mol. o $C_8H_8O_3$ per liter $CHCl_3$ layer
0.00244	0.0886
0.00330	0.1150
0.00370	0.1325
0.00416	0.1520
0.00475	0.1690
0.00548	0.1870

Water and Toluene

Gm. Mol. o $C_8H_8O_3$ per liter H_2O layer	Gm. Mol. o $C_8H_8O_3$ per liter $C_6H_5CH_3$ layer
0.0077	0.0222
0.0097	0.0297
0.0110	0.0345
0.0125	0.0398
0.0141	0.0460
0.0156	0.0537
0.178	0.0620

Freezing-point data for mixtures of o methoxy benzoic acid and sarcosine anhydride are given by Pfeiffer, Angern, Wang, Seydel and Quehl, 1930.

ANISIC ACID (*p*-Methoxybenzoic Acid) $CH_3O.C_6H_4COOH$.

1000 cc. sat. aqueous solution contain 0.2263 gm. acid at 25°. (Paul, 1894.)

MUTUAL SOLUBILITY OF ANISIC (p METHOXY BENZOIC) ACID AND WATER, DETERMINED BY THE SYNTHETIC METHOD.

(Flaschner and Rankin, 1910.)

t°	Gms. $C_8H_8O_3$ per 100 gms. mixture	t°	Gms. $C_8H_8O_3$ per 100 gms. mixture
138.2	(Crit. temp.)	146	59.4
140	9.0	150	73.3
142	12.0	160	89.8
144	18.0	170	95.6
145	30.0	184	100.0

SOLUBILITY OF ANISIC ACID IN SEVERAL ALCOHOLS.

(Timofeiew, 1894.)

t°.	In Methyl Alcohol. Gms. per 100 Gms. Sat. Sol.	In Methyl Alcohol. Gms. per 100 Gms. Solvent.	In Ethyl Alcohol. Gms. per 100 Gms. Sat. Sol.	In Ethyl Alcohol. Gms. per 100 Gms. Solvent.	In Propyl Alcohol. Gms. per 100 Gms. Sat. Sol.	In Propyl Alcohol. Gms. per 100 Gms. Solvent.
0	51.1	104.5	46.7	87.6	35	53.8
16.5	64.9	183.5	53.6	115.5	43	75.5

Data for the distribution of anisic acid between water and olive oil at 25° are given by Boëseken and Waterman (1911, 1912).

ANISIC ACID (*p* Methoxy Benzoic Acid) $CH_3O.C_6H_4.COOH$.

DISTRIBUTION OF ANISIC ACID BETWEEN : (Smith, 1921-1922.)

Water and Xylene at 25°.

Millimols Anisic Acid per liter of H₂O layer (C_1).	Millimols Anisic Acid per liter of Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.243	0.195	0.802
0.381	0.494	1.30
0.467	0.700	1.50
0.682	1.50	2.20

Water and Chloroform at 25°.

Millimols Anisic Acid per liter of H₂O layer (C_1).	Millimols Anisic Acid per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.125	0.625	5.00
0.162	0.875	5.38
0.206	1.206	5.85
0.225	1.75	6.36

DISTRIBUTION OF ANISIC ACID AT 25° BETWEEN:
(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. $C_8H_8O_3$ per liter H_2O layer	Gm. Mols. $C_8H_8O_3$ per liter $CHCl_3$ layer
0.000924	0.0233
0.00106	0.0268
0.00119	0.0306
0.00139	0.0361
0.00158	0.0418
0.00178	0.0478

Water and Toluene

Gm. Mols. $C_8H_8O_3$ per liter H_2O layer	Gm. Mols. $C_8H_8O_3$ per liter $C_6H_5CH_3$ layer
0.000924	0.00370
0.001056	0.00449
0.00119	0.00528
0.00132	0.00607
0.00158	0.00818
0.00172	0.00950

Freezing-point data for mixtures of anisic acid and sarcosine anhydride are given by Pfeiffer, Angern, Wang, Seydel and Quehl, 1930.

METHYL p OXY BENZOATE $OHC_6H_4COOCH_3$.

Freezing-point data for mixtures of p oxy benzoic methyl ester with antipyrine, with pyramidon and with sarcosine anhydride are given by Pfeiffer and Seydel, 1928b.

METHYL SALICYLATE $C_6H_4OH.COOCH_3$.

100 cc. H_2O dissolve 0.074 gm. $C_6H_4OH.COOCH_3$ at 30°. (Gibbs, 1908)
100 cc. 0.1 *n* H_2SO_4 dissolve 0.077 gm. $C_6H_4OH.COOCH_3$ at 30°. "

SOLUBILITY OF METHYL SALICYLATE IN AQUEOUS ALCOHOL AT 25°. (Seidell, 1910)

Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_6H_4OH.COOCH_3$ per 100 Gms. Sat. Sol.	Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_6H_4OH.COOCH_3$ per 100 Gms. Sat. Sol.
0	1	0.12	60	0.923	18.60
30	0.958	0.60	65	0.929	30.50
40	0.940	2.30	70	0.943	39.40
50	0.925	6.20	75	0.974	58.50
55	0.922	10	80	1.050	72

SOLUBILITY OF METHYL SALICYLATE IN AQUEOUS ALCOHOL AT DIFFERENT TEMPERATURES. (Seidell, 1910.)

Wt. % C_2H_5OH in Solvent.	Gms. $C_6H_4OH.COOCH_3$ per 100 cc. Solvent at: 15°.	20°.	25°.	30°.
0	(about) 0.1	0.1	0.1	0.1
30	0.3	0.4	0.5	0.6
40	0.8	1.1	1.4	1.8
50	2.4	3.5	5	6
55	4.2	6	7.8	9.5
60	7.7	10	12.5	15.5
65	13	16.5	20.2	24.5
70	22	28	33	40
75	43	52	62	72
80	92	135	180	230

SOLUBILITY OF METHYL SALICYLATE AT 20° IN AQUEOUS 50 WT. PER CENT ETHYL ALCOHOL SATURATED WITH VARIOUS SALTS. (Wright, 1926.)

Solvent.	Gms. $C_6H_4OH.COOCH_3(o)$. per 100 gms. sat. sol.	Gms. Salt. per 100 gms. sat. sol.
Aq. 50 Wt. % C_2H_5OH	.... 6.2	0.0
" + excess NaCl	.... 8.2	10.2 (NaCl)
" + " $NaNO_3$	.... 8.1	20.4 ($NaNO_3$)
" + " KCl	.... 7.2	6.2 (KCl)
" + " KNO_3	.... 6.9	3.8 (KNO_3)
" + " KBr	.... 7.9	17.3 (KBr)

Freezing-point data for mixtures of methyl salicylate and cineole are given by Bellucci and Grassi, 1913.)

MANDELIC ACID (Phenyl Glycolic Acid) $C_6H_5.CHOH.COOH$.

100 cc sat. sol. of Mandelic acid in H_2O contain 12.65 gms. $C_6H_5CHOH.COOH$ at 19°.

100 cc sat. sol. of Mandelic acid in C_6H_6 contain 0.0746 gms. $C_6H_5CHOH.COOH$ at 19°.

SOLUBILITY OF DEXTRO AND OF LAEVO MANDELIC ACIDS IN WATER.

Acid	t°	Gms. $C_8H_8O_3$ per 100 gms. H_2O	Authority
Dextro Mandelic Acid	15	7.26	Kortium, 1931.
Laevo " "	15	7.24	" "
Dextro " "	25	11.36	Campbell and Garrow, 1930
Laevo " "	25	10.98	" " "

FREEZING-POINTS OF MIXTURES OF ACTIVE MANDELIC (PHENYL GLYCOLIC) ACID AND WATER.

(Timmermans and Motiuk, 1932.)

t°	Gms. $C_8H_8O_3$ per 100 gms. H_2O	t°	Gms. $C_8H_8O_3$ per 100 gms. H_2O
-0.24	1.84	-0.70	5.75
-0.46	3.69	-0.84	7.14
-0.60	4.85	-0.93	7.99

SOLUBILITY OF MANDELIC ACID AT 25° IN AQUEOUS SOLUTIONS OF:

(Knox and Richards, 1919.)

Acetic Acid.

Equiv. Normality of CH_3COOH.	Equiv. Normality of $C_8H_8O_3$.
0.870	1.808
1.338	2.312
1.860	2.664
2.618	3.186
3.644	3.444
4.249	3.472
4.738	3.487
6.485	3.509
8.60	3.234
9.85	2.996
12.30	2.178

Formic Acid.

Equiv. Normality of $HCOOH$.	Equiv. Normality of $C_8H_8O_3$.
0.0	1.191
2.268	1.768
4.340	2.180
6.320	2.380
8.09	2.430
10.38	2.434
12.20	2.555
13.41	2.750
13.78	3.357

Hydrochloric Acid.

Equiv. Normality of HCl.	Equiv. Normality of $C_8H_8O_3$.
0.0	1.191
1.202	0.691
2.481	0.488
3.753	0.387
5.017	0.345
6.271	0.307
7.503	0.302
8.748	0.316
9.937	0.351
10.35	0.375

Sulfuric Acid.

Equiv. Normality of H_2SO_4.	Equiv. Normality of $C_8H_8O_3$.
0.00	1.191
2.695	0.484
5.390	0.278
8.294	0.186
11.05	0.180
13.62	0.180
16.5	0.16
18.89	0.23
21.17	0.27

SOLUBILITY OF RACEMIC (r) MANDELIC ACID IN AQUEOUS SOLUTIONS OF METAL MANDELATES AT 25°.

(Ross and Morrison, 1936; Ross, Morrison and Johnstone, 1938.)

Gm. Equiv. per 1000 gms. H_2O (r) Mandelate		Gm. Equiv. per 1000 gms. H_2O (r) Mandelic Acid
0.0	(= H_2O	1.34
0.02	$C_8H_7O_3Cs$	1.138
0.06	"	1.51
0.13	"	1.72
0.22	"	2.04
0.05	$C_8H_7O_3K$	1.44
0.16	"	1.65
0.22	"	1.91
0.415	"	2.36
0.10	$C_8H_7O_3Li$	1.413
0.20	"	1.491
0.25	"	1.555
0.014	$C_8H_7O_3Tl$	1.35
0.06	"	1.44
0.112	"	1.583
0.177	"	1.79
0.209	"	2.09

Gm. Equiv. per 1000 gms. H_2O (r) Mandelate		Gm. Equiv. per 1000 gms. H_2O (r) Mandelic Acid
0.171	$C_8H_7O_3NH_4$	1.598
0.366	"	2.05
0.476	"	2.33
0.062	$(C_8H_7O_3)_2Ba$	1.45
0.03	$(C_8H_7O_3)_2Mg$	1.34
0.130	"	1.407
0.05	$C_8H_7O_3Rb$	1.44
0.143	"	1.652
0.210	"	1.851
0.113	$C_8H_7O_3Na$	1.442
0.213	"	1.584
0.277	"	1.690
0.031	$(C_8H_7O_3)_2Sr$	1.38

DISTRIBUTION OF MANDELIC ACID AT 25° BETWEEN:

(Smith, 1921, 1922.)

Water and Ethyl Ether.

Millimols. $C_6H_5CHOH.COOH$ per liter of H_2O layer (C_1).	Millimols. $C_6H_5CHOH.COOH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$
0.885	1.175	1.330
1.070	1.475	1.380
2.100	2.95	1.405
3.225	4.825	1.495
5.225	8.525	1.63

Acetone and Glycerol.

Millimols. $C_6H_5CHOH.COOH$ per liter of Acetone layer (A).	Millimols. $C_6H_5CHOH.COOH$ per liter of Glycerol layer (G).	$\frac{A}{G}$.
4.225	2.075	2.04
8.65	4.25	2.04
16.45	8.25	1.99
23.0	11.6	1.98

SOLUBILITY OF LAEVO (-) MANDELIC ACID IN AQUEOUS SOLUTIONS OF METAL MANDELATES AT 25°.

(Ross, Morrison and Johnstone, 1938.)

Gm. Equiv. per 1000 gms. H_2O		Gm. Equiv. per 1000 gms. H_2O	
(-) Metal Mandelate	(-) Mandelic Acid	(-) Metal Mandelate	(-) Mandelic Acid
0.0(= H_2O)	0.738	0.120 $(C_8H_7O_3)_2Ba$	0.763
0.112 $C_8H_7O_3Cs$	0.777	0.166 "	0.815
0.210 "	0.857	0.198 "	0.840
0.310 "	0.971	0.186 $(C_8H_7O_3)_2Mg$	0.758
0.193 $C_8H_7O_3K$	0.803	0.294 "	0.792
0.384 "	0.970	0.100 $C_8H_7O_3Rb$	0.766
0.146 $C_8H_7O_3Li$	0.756	0.200 "	0.837
0.186 "	0.766	0.300 "	0.922
0.246 "	0.788	0.400 "	1.035
0.030 $(C_8H_7O_3)_2Ca$	0.747	0.059 $C_8H_7O_3Na$	0.737
0.063 "	0.755	0.112 "	0.755
0.075 "	0.776	0.292 "	0.853
0.153 $C_8H_7O_3Tl$	0.874	0.341 "	0.877
0.222 "	0.915	0.616 "	1.008
0.325 "	1.084	0.157 $C_8H_7O_3NH_4$	0.757
0.104 $(C_8H_7O_3)_2Sr$	0.776	0.358 "	0.884
0.140 "	0.812	0.581 "	1.068

The authors also give results at 25° for the solubility of racemic and of dextro Mandelic Acids in aqueous 0.05 molecular solutions of the respective metal mandalates to which increasing amounts of various metal chlorides and nitrates were added. Their results for equilibrium in systems composed of metal mandelates, mandelic acid and water will be found in Vol. I under the respective metals as follows: Ba mandelate p. 145, Ca mandelate p, 258, Cs mandelate p, 453, K mandelate p. 712, Li mandelate p. 906, NH_4 mandelate p. 1061, Na mandelate p. 1178, Rb mandelate p. 1431 and Tl mandelate, p. 1540.

DISTRIBUTION OF MANDELIC ACID AT 19° BETWEEN :

(Schilow and Lepin, 1922.)

Water and Benzene.

Gms. $C_6H_5CHOH.COOH$ per 100 cc.		
H_2O layer (C_1).	C_6H_6 layer (C_2).	$\frac{C_1}{C_2}$.
1.46	0.0165	89
2.99	0.0336	89
4.22	0.0468	90
6.74*	0.0746*	90

*Excess mandelic acid present.

Water and Anisole.

Gms. $C_6H_5CHOH.COOH$ per 100 cc.		
H_2O layer (C_1).	Anisole layer (C_2).	$\frac{C_1}{C_2}$.
1.05	0.189	5.6
1.383	0.258	5.4
4.00	0.752	5.3
4.56	0.852	5.4
6.325	1.178	5.4
7.16*	1.325*	5.4

DISTRIBUTION OF MANDELIC ACID AT 2[illegible]° BETWEEN WATER AND CHLOROFORM.

(Smith and White, [illegible].)

Gm. Mols. $C_8H_8O_3$ per liter H$_2$O layer	CHCl$_3$ layer	Gm. Mols. $C_8H_8O_3$ per liter H$_2$O layer	CHCl$_3$ layer
0.0218	0.00106	[illegible]	[illegible]
0.0348	0.00165	[illegible]	[illegible]
0.0396	0.00185	[illegible]	[illegible]
0.0458	0.00211		

Experiments on the distribution of Mandelic acid between water and d Carvon are given by Schroer, 1932.

SOLUBILITY OF MANDELIC ACID IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $C_6H_5CHOH.COOH$ per 100 Gms. Sat. Sol.		Authority.
Water	20	15.93	inactive acid	(Ginsberg, 1900.)
"	20	10.17	dextro acid	"
Methyl Alcohol	0	51.1	inactive acid	(Timofeiew, 1894.)
" "	16.5	64.0	"	"
Ethyl Alcohol	0	46.7	"	"
" "	16.5	53.6	"	"
Propyl Alcohol	0	35	"	"
" "	16.5	43	"	"
95% Formic Acid	19	40	"	(Aschan, 1913.)

SOLUBILITY OF DEXTRO AND OF RACEMIC PHENYL GLYCOLIC ACID IN CHLOROFORM.

(Holleman, 1898.)

t°.	Gms. Dextro Acid per 100 Gms. CHCl$_3$	t°.	Gms. Racemic Acid per 100 Gms. CHCl$_3$
15	0.052	15	0.877
25	1.328	25	1.07
35	1.050	35	1.60

Freezing-point data are given for mixtures of:

d + l Mandelic acid (Adriani, 1900.)
r + l " " " "
r + l Mandelic acid methyl esters (Centnerszwer, 1899.)
r + l " " iso butyl esters " "
l + d " " menthyl esters (Findlay and Hickmans, 1907.)
r Mandelic acid + dimethyl pyrone (Kendall, 1914.)
Mandelic acids + Aspariginic acid + H_2O (Timmermans and Motiuk, 1932.)
" " + Chloro succinic acid + H_2O " " "
" " + Malic acid + H_2O " " "
" " + Phenyl amino acetic acid + H_2O " " "
" " + Tartaric acid + H_2O " " "
" " + Lactamide (Timmermans, van Lancker and Jaffe, 1939.)

Nitro**ACETANILIDES** $NO_2C_6H_4NHCOCH_3$, *o*, *m* and *p*.

SOLUBILITY OF EACH IN WATER. (Sidgwick and Rubie, 1921.)

The synthetic method was used. Both the triple points and the critical solution temperatures, for the two liquid layerers which separate, were determined. Asterisks indicate that a solid phase is present.

Ortho Nitroacetanilide.

t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.
93.4	100.0*
92.4	99.38*
83 2	97.11*
81.0	96.0* tr. pt.
99.0	94.54
110.2	93.65
173.1	83.47
188.0	76.28
195.0	65.04
198.0	50 crit. temp.
197.0	41 16
191 2	24.06
179.2	11 97
157.6	8.04
120.0	3.97

Meta Nitroacetanilide.

t°.	Gms. $NH_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.
154.5	100.0*
129.2	93.57*
124.2	91.72
118.5	90.0* tr. pt.
149.2	81.18
166.4	73.74
175.7	66.08
180.0	50 crit. temp.
176.9	31.13
163.5	14.52
130.0	5.21

Para Nitroacetanilide.

t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.
215.9	100.0*
192.2	95.2*
163.6	81.84*
161.5	80.0* tr. pt.
171.7	65.84
176.6	54.93
178.0	50 crit. temp.
177.4	42.65
172.8	25.62
164.2	14.36
156.5	7.08*
145.1	2.94

SOLUBILITY OF ORTHO, META AND PARA NITROACETANILIDES IN BENZENE.

(Sidgwick and Rubie, 1921.)

Ortho Nitroacetanilide.

t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.
81.2	87.58
76.4	79.08
71.5	67.97
68.0	54.97
58.5	31.49
46.8	16.44
39.0	10.26

Meta Nitroacetanilide.

t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.
154.5	100.0
135.3	83.07
126.8	65.27
121.2	35.13
115.0	13.47
102.0	5.04

Para Nitroacetnailide.

t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.
197.4	87.48
186.5	72.62
180.3	54.78
179.4	49.93
177.5	37.75
172.6	17.47
150.6	5.23

SOLUBILITY OF ORTHO AND OF PARA NITROACETANILIDE IN WATER AND IN AQUEOUS SOLUTIONS OF ACETIC AND NITRIC ACIDS AT ORDINARY TEMPÉRATURE.

(Franzol and Engel, 1921.)

	Acetanilide.	Solvent.		Gms. Acetanilide per 100 cc. solvent.
o	Nitroacetanilide	Water		0,22
o	»	Water containing	9.1 cc. CH_3COOH per 100 cc	1.04
o	»	»	15.9 cc. HNO_3 per 100 cc	0.96
o	»	»	7.7 cc. acetic + 14.4 cc. HNO_3 per 100 cc.	0.89
p	»	Water		0.22
p	»	Water containing	7.7 cc. acetic + 14.4 cc. HNO_3 per 100 cc.	0.89

SOLUBILITY OF PARA NITRO ACETAMIDE IN AQUEOUS AND IN GLACIAL ACETIC ACID.

(Orton and King, 1911.)

Solvent	t°	Gms. p $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.
Aq. 50% Acetic Acid	16	0.38
Glacial Acetic Acid	16	0.83

Freezing-point data are given for mixtures of:

o Nitracetanilide	+ o nitraniline	(Jaeger, 1906.)
p "	+ acetanilide	(Kuster, 1891.)
p "	+ di nitro acetanilide	(Holleman and Sluiter, 1906.)

Hydroxy TOLUIC ACIDS

$C_6H_3COOH.OH.CH_3$, 1,2,3; 1,2,4; 1,2,5; 1,3,4 and 1,4,3.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Sidgwick and Ewbank, 1921 a.)

The determinations were made by the synthetic method and all details for accurate work were carefully observed. The results are expressed in wt. % that is, in grams of acid per 100 grams of saturated solution. L indicates that a second liquid layer separated. The position of the substituent groups in the several acids are numbered in the order, CO OH, OH and CH_3. Thus the 1, 2, 3 acid is C_6H_3.(1) CO OH.(2) OH.(3) CH_3, the 1.2.4 acid is C_6H_3.(1) CO OH.(2).OH (4) CH_3, the 1, 2, 5 acid is C_6H_3.(1) CO OH.(2) OH.(5) CH_3, the 1, 3, 4 acid is C_6H_3.(1) CO OH.(3) OH.(4) CH_3 and the 1, 4, 3 acid is C_6H_3.(1) CO OH.(4) OH.(3) CH_3.

Results for the 1, 2, 3 Acid.

t°.	Wt. %.
167.0...	100.00
147.5...	90.07
134.5...	80.50
134.1...	79.68
129.8...	69.52
120.3...	— L
148.0...	59.73 L
151.3...	50.51 L
153.5 cr.	— L
153.3...	29.81 L
149.3...	10.18 L
131.8...	5.07 L
129.2 tr.	—
119.1...	2.20
80.7...	0.364

Results for the 1, 2, 4 Acid.

t°.	Wt. %.
177.8...	100.00
147.8...	89.68
138.3...	79.68
132.6...	67.68
139.4...	54.40 L
144.6...	41.46 L
145.2 Cr.	L
144.6...	19.89 L
138.4...	9.75 L
131.0 tr.	—
129.4...	5.53
125.3...	L
80.7...	0.412

Results for the 1, 2, 5 Acid.

t°.	Wt. %.
152.5...	100.00
126.4...	89.71
112.0...	79.66
109.5...	77.05
117.7...	69.29 L
120.2...	67.91 L
131.5...	59.85 L
135.6...	55.16 L
142.0...	38.85 L
142.8 Cr.	— L
142.5...	24.55 L
138.5...	10.21 L
117.5...	4.53 L
107.8 tr.	—
85.0...	0.92
80.7...	0.73

Results for the 1, 3, 4 Acid.

t°.	Wt. %.
208.5...	100.00
154.0...	76.98
143.0...	66.07
131.4...	48.67
124.2...	30.23
113.1...	10.33
98.8...	4.03

Results for the 1, 4, 3 Acid.

t°.	Wt. %.
172.4...	100.00
146.8...	84.12
132.4...	65.52
124.1...	47.07
118.8...	30.87
109.0...	9.61
105.8...	6.52
103.4...	5.77
99.5 t.h.	5.01
96.6...	3.70
92.6...	2.77
84.4...	1.83

Cr. = Critical Solution Temp.
tr. = Triple point.
t. h. = Transition point of hydrate.

SOLUBILITY OF HYDROXY TOLUIC ACIDS IN BENZENE. (Sidgwick and Ewbank, 1921 *a*.

1, 2, 3 Acid.		1, 2, 4 Acid.		1, 2, 5 Acid.		1, 3, 4 Acid.		1, 4, 3 Acid.	
t°.	Wt. %	t°.	Wt. %	t°.	Wt. %	t°.	Wt. %	t°.	Wt. %
155.4...	90.33	167.6...	91.6	142.0...	91.10	202.5...	91.7	166.0...	90.7
138.3...	69.92	150.3...	71.7	124.7...	70.36	192.0...	72.7	152.8...	71.7
123.0...	49.18	135.1..	50.7	110.6...	52.05	183.7...	50.0	145.0...	52.6
107.2...	29.96	117.6...	29.33	93.3...	29.98	176.5...	29.8	139.5...	29.8
79.....	9.67	90.2...	9.74	68.0...	10.53	160.5...	9.8	126.2...	10.11
62.4...	5.23	71.7...	4.96	48.8...	4.73	147.4...	4.87	116.7...	4.78
45.2...	2.01	48.8...	2.02	30.0...	1.76	131.6...	2.18	109.5...	2.78

SOLUBILITY OF HYDROXY TOLUIC ACIDS IN *n* HEPTANE. (Sidgwick and Ewbank, 1921 *a*.)

1, 2, 3 Acid.		1, 2, 4 Acid.		1, 2, 5 Acid.		1, 3, 4 Acid.		1, 4, 3 Acid.	
t°.	Wt. %	t°.	Wt. %	t°.	Wt. %	t°.	Wt. %	t°.	Wt. %
154.3...	88.95	166.7...	79.29	145.9...	189.9	180.0...	0.94	163.8...	1.40
146.6...	70.04	162.2...	61.03	138.7...	69.9			156.0...	1.40L
141.9...	52.03	156.6...	36.28	135.5..	50.0			157.3...	1.02
140.9...	47.63	147.1...	20.15	131.1..	30.38			135.0...	1.02L
132.9...	24.77	135.6...	10.00	116.2...	10.42	202.0 tr.		168.0 tr.	
119.0...	9.95	116.7...	4.51	97.1..	4.59				
101.0...	4.86	100.6...	2.22	79.0 ..	1.84				
81.0...	1.89								

DI NITRO p XYLENES $(NO_2)_2C_6H_2(CH_3)_2$.

Freezing-point data for mixtures of 2.3 and 2.6 di nitro p xylenes are given by Blanksma, 1913.

Results for mixtures of 2.6 di nitro xylene and acenaphthene are given by Hertel and Kleu, 1930.

TRI NITRO ETHYL ANILINE 2,4,6-$(NO_2)_3C_6H_2NH.C_2H_5$.

100 gms. H_2O dissolve 0.010 gm. $C_8H_8O_6N_4$ at 19°, 0.031 gm. at 50° and 0.140 gm. at 100°. (Desvergnes, 1926.)

NITROSO META XYLENE (4) $NOC_6H_3(CH_3)_2$.

Freezing-point data for mixtures of Nitroso meta xylene with o nitroso toluene and with nitroso mesitylene are given by Hammick, Edwards, Illingworth and Snell, 1933.

ACETANILIDE $C_6H_5NH.COCH_3$.

SOLUBILITY OF ACETANILIDE IN WATER. (Schoorl and de Weerd, 1922.)

t°.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. sat. sol.	Solid Phase.
—0.03 (Eutec.)	0.5	Ice + $C_6H_5NH.COCH_3$
15.......	0.5 (0.4)*	$C_6H_5NH.COCH_3$
20.......	0.52(0.45)	"
30.......	0.63(0.51)	"
40.......	0.86(0.65)	"
50.......	1.25(0.81)	"
60.......	2.0	"
70.......	3.0	"
80.......	4.5	"
83.2.....	5.2 Quad. pt.	" + liquid layers
83.2.....	87.0	" "
85.......	91.0	$C_6H_5NH.COCH_3$
90.......	94.5	"
95.0.....	96.5	"
100.0.....	98.0	"
114.0.....	100.0 m. pt.	"

The liquid layers which separate above 83°.2 have the following composition.

	Gms. $C_6H_5NH.COCH_3$ per 100 gms.	
t°. *	H_2O rich layer.	$C_6H_5NH.COCH_3$ rich layer.
83.2....	5.2	87.0
90.0....	5.8	82.5
100.0....	6.5	80.5
120.0....	13.0	79.0
130.0....	18.0	73.0
135.0....	22.0	69.0
140.0....	28.0	63.0
142.0....	30.0	60.0
144.0 (crit. t.)	45.0	

* These results, which are probably low, are given by Oliveri-Mandala and Forni, 1925.

SOLUBILITY OF ACETANILIDE IN WATER AND ETHYL ALCOHOL.

(Wright, 1927.)

Solvent	Gms. $C_6H_5NH.COCH_3$ per 100 gms. solvent at: 20°	30°
Water	0.525	0.71
Aq. 50 Wt. % C_2H_5OH	11.9	18.8
Pure C_2H_5OH	28.8	40.5

SOLUBILITY OF ACETANILIDE IN MIXTURES OF ETHYL ALCOHOL AND WATER.

	Results at 25°. (Holleman and Antush, 1894.)		Results at 30°. (Seidell, 1907.)	
Wt. Per Cent C_2H_5OH in Solvent.	Sp. Gr. of Sat. Solution.	Gms. $C_6H_5NH.COCH_3$ per 100 Gms. Sat. Solution.	Sp. Gr. of Sat. Solution.	Gms. $C_6H_5NH.COCH_3$ per 100 Gms. Sat. Solution.
0	0.997	0.54	1.000	0.69
10	0.985	0.93	0.984	1.00
20	0.973	1.28	0.970	2.20
30	0.962	2.30	0.956	4.80
40	0.950	4.85	0.945	9.40
50	0.939	8.87	0.934	15.40
60	0.928	14.17	0.926	22.00
70	0.918	19.84	0.917	27.60
80	0.907	25.17	0.907	31.20
85	0.899	26.93	0.900	31.70
90	0.890	27.65	0.893	31.60
95	0.874	26.82	0.885	30.80
100	0.851	24.77	0.876	29.00

(See remarks under α Acetnaphthalide, page 705.)

SOLUBILITY OF ACETANILIDE IN MIXTURES OF WATER AND ALCOHOLS AT 20°.

(Gregg-Wilson and Wright, 1928.)

Results for mixtures of:

Water and Methyl Alcohol		Water and Ethyl Alcohol		Water and Propyl Alcohol	
Wt. % CH_3OH in Aq. Solvent	Gms. C_8H_9ON per 100 gms. Solvent	Wt. % C_2H_5OH in Aq. Solvent	Gms. C_8H_9ON per 100 gms. Solvent	Wt. % C_3H_7OH in Aq. Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	0.52	0.0	0.52	0.0	0.52
25.4	1.75	26.3	2.15	16.3	1.8
49.8	7.25	52.5	13.7	34.5	9.3
71.7	23.15	74.8	29.0	54.2	18.6
86.6	37.5	84.2	33.1	85.0	33.75
93.5	42.1	90.4	32.3	90.0	35.4
96.2	43.6	95.2	31.3	95.3	28.4
100.0	46.0	100.0	28.8	100.0	22.6

SOLUBILITY OF ACETANILIDE IN AQUEOUS SOLUTIONS OF ACETIC ACID.

(Bradfield and Williams, 1929.)

The determinations were made by gradually heating mixtures of known weights of the solute and solvent and noting the temperature at which the last trace of solid disappeared. The results were plotted and the values for selected temperatures obtained from the curve.

Gms. CH_3COOH per 100 gms. Aq. Solvent	Gms. $CH_3CONH.C_6H_5$ dissolved per 100 gms. solvent at: 20°	25°	30°	35°
0.0 (= H_2O)	0.504	0.563	0.665	0.808
26.9	2.23	2.70	3.28	4.05
52.4	9.82	12.2	15.3	19.2
76.8	31.5	38.2	46.6	56.9
85.0	40.4	47.6	56.7	67.9
91.3	45.4	52.5	61.2	71.6
99.0	46.2	52.9	60.9	70.7

SOLUBILITY OF ACETANILIDINE IN AQUEOUS SOLUTIONS OF ANTIPYRINE AND OF PYRAMIDONE. (Oliveri-Mendala and Forni, 1925.)

Results for Antipyrine solutions at 10°. Gms. per 100 gms. sat. sol.		Results for Antipyrine solutions at 20°. Gms. per 100 gms. sat. sol.		Results for Pyramidone solutions at 14°. Gms. per 100 gms. sat. sol.		Results for Pyramidone solutions at 25° Gms. per 100 gms. sal, sol.	
Antipyrine.	Acetanilide.	Antipyrine.	Acetanilide.	Pyramidone.	Acetanilide.	Pyramidone.	Acetanilide.
0.5	0.45	0.5	0.526	0.5	0.43	0.5	0.699
1.0	0.50	1.0	0.597	1.0	0.45	1.0	0.715
2.0	0.55	2.0	0.712	2.0	0.49	2.0	0.750
4.0	0.77	4.0	0.900	2.495	0.51	2.495	0.761
5.0	1.03	5.0	1.043	4.0	0.57	4.0	0.908
10.0	1.64	10.0	1.690				

100 cc. of aqueous 10.1 per cent sodium salicylate solution dissolve 0.848 gm. acetanilide, and 100 cc. of aqueous 13.9 per cent solution dissolve 0.92 gm. at 20°.
(Olivori-Mandala. 1926.)

SOLUBILITY OF ACETANILIDE IN SEVERAL SOLVENTS.

Solvent.	t°.	Sp. Gr. of Sat. Solution.	Gms. $C_6H_5NH.COCH_3$ per 100 Gms. Sat. Solution.	Authority.
Water	16	...	0.47	(Greenish and Smith, 1903.)
"	25	0.997	0.54	(Holleman and Antush, 1894.)
"	30	1.000	0.69	(Seidell, 1907.)
Ether	25	...	2.8	(Marden and Dover, 1926.)
Formic Acid (95%)	16.8	1.121	56.74	(Aschan, 1913.)
Acetic Acid (99.5%)	21.5	...	33.21	(Seidell, 1907.)
Acetone	30-31	0.902	31.15	"
Amyl Acetate	"	0.882	10.46	"
Amyl Alcohol	25	...	14.00	"
Aniline	30-31	1.034	19.38	"
Benzene	"	0.875	2.46	"
Benzaldehyde	"	1.068	18.83	"
Toluene	25	0.862	0.50	"
Xylene	32.5	0.847	1.65	"
Pyridine	20-25	...	32.7	(Dehn, 1917.)
50% Aq. Pyridine	"	...	35.7	"
Petroleum Ether	about 20	...	0.03	(Salkower, 1916.)

100 gms. Carbon tetrachloride dissolve 0.102(0.120) gm. acetanilide at 25°. (Warren, 1933.)

SOLUBILITY OF ACETANILIDE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. solvent.	Authority.
Glycerol (Density 1.2326)...............	20	0.93	(Holm, 1921, 1922.)
» (» 1.2645)...............	20	1.15	»
Paracymene (b. pt. 176-176.5)..........	30	7.23	(Wheeler, 1920.)
Ethylalcohol (com. absolute)	20-23	21.3	(Pucher and Dehn, 1921.)
Quinoline..............................	»	12.67	»
» $+C_2H_5OH$ (Equimol. mixture).	»	23.69	»

SOLUBILITY IN METHYLALCOHOL, ETHYLALCOHOL AND IN CHLOROFORM.

(Speyers, 1902)

	In CH_3OH.		In C_2H_5OH.		In $CHCl_3$.	
t°.	Sp. Gr. of sat. solution.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. CH_3OH.	Sp. Gr. of sat. solution.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. C_2H_5OH.	Sp. Gr. of sat. solution.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. $CHCl_3$
0...	0.860	24.0	0.842	15.5	1.503	3.9
10...	0.864	30.0	0.844	20.0	1.475	7.5
20...	0.875	42.0	0.850	28.0	1.440	13.0
30...	0.892	62.0	0.860	38.0	1.398	20.0
40...	0.911	90.0	0.874	54.0	1.354	29.0
50...	0.932	137.0	0.895	78.0	1.314	43.0
60...	0.957	215.0	0.920	120.0	1.272	65.0

SOLUBILITY OF ACETANILIDE IN PHENOL, URETHAN AND IN TOLUENE. (Mortimer, 1923.)

t°.	In Phenol.		In Urethan.		In Toluene.	
	Mol. % $C_6H_5NHCOCH_3$ in sat. sol.	Gms. $C_6H_5NHCOCH_3$ per 100 gms. C_6H_5OH.	Mol. % $C_6H_5NHCOCH_3$ in sat. sol.	Gms. $C_6H_5NHCOCH_3$ per 100 gms. $NH_2CO_2C_2H_5$.	Mol. % $C_6H_5NHCOCH_3$ in sat. sol.	Gms. $C_6H_5NHCOCH_3$ per 100 gms. $C_6H_5CH_3$.
0...	....	.....	....	.....	0.15	0.22
20...	....	.....	....	.....	0.37	0.54
40...	42.7	107.0	14.8	26.3	1.1	1.63
60...	50.1	144.2	27.4	57.2	5.6	8.69
80...	60.5	220.1	46.8	133.2	33.8	74.85
100...	79.5	557.2	75.7	472.1	70.8	355.50

SOLUBILITY OF ACETANILIDE IN MIXTURES OF ALCOHOLS AT 20°.

(Gregg-Wilson and Wright, 1928.)

Results for Mixtures of:

Methyl and Ethyl Alcohols		Ethyl and Propyl Alcohols		Normal and Iso Propyl Alcohols	
Wt. % CH_3OH in Solvent	Gms. C_8H_9ON per 100 gms. Solvent	Wt. % C_2H_5OH in Solvent	Gms. C_8H_9ON per 100 gms. Solvent	Wt. % n C_3H_7OH in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	28.8	0.0	21.8	0.0	25.9
17.7	31.4	19.9	23.9	24.7	25.5
33.7	34.2	40.7	25.4	46.2	24.9
50.3	37.2	59.1	26.4	71.2	23.4
71.4	40.6	79.4	27.6	83.3	22.9
83.0	42.5	90.0	27.9	100.0	21.8
100.0	46.2	100.0	28.8		

SOLUBILITY OF ACETANILIDE IN MIXTURES OF BENZENE AND ALCOHOLS AT 20°.

(Gregg-Wilson and Wright, 1928.)

Results for Mixtures of:

Benzene and Methyl Alcohol		Benzene and Ethyl Alcohol		Benzene and Propyl Alcohol	
Wt. % C_6H_6 in Solvent	Gms. C_8H_9ON per 100 gms. solvent	Wt. % C_6H_6 in Solvent	Gms. C_8H_9ON per 100 gms. Solvent	Wt. % C_6H_6 in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	46.2	0.0	28.8	0.0	22.6
21.8	52.8	20.0	33.3	18.8	27.6
42.5	54.5	41.7	35.7	42.0	29.6
62.8	50.1	63.8	31.75	58.0	28.2
81.5	35.1	83.8	21.1	83.0	17.5
100.0	1.08	100	1.08	100.0	1.08

SOLUBILITY OF ACETANILIDE IN MIXTURES OF SOLVENTS AT 25°.

(Mahieu, 1936.)

Results for mixtures of:

$(CH_3)_2CO + C_6H_6$

Wt. % C_6H_6 in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0	39.89
31.4	32.5
52.6	24.96
75.1	16.38
100.0	1.40

$CS_2 + C_6H_5NO_2$

Wt. % $C_6H_5NO_2$ in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	0.23
27.5	2.98
52.2	8.49
74.1	9.73
87.0	8.86
100.0	7.60

$C_6H_5NH_2 + C_6H_5NO_2$

Wt. % $C_6H_5NH_2$ in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	7.60
22.2	22.1
48.9	23.4
67.2	22.5
100.0	21.07

$C_6H_5NH_2 + C_6H_{12}$ (50°)

Wt. % $C_6H_5NH_2$ in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	0.33
24.6	3.02
53.1	39.4
78.2	54.7
100.0	46.8

$CS_2 + (CH_3)_2CO$

Wt. % $(CH_3)_2CO$ in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	0.23
23.7	18.9
49.1	36.3
74.0	38.6
100.0	39.89

$(C_2H_5)_2O + CHCl_3$

Wt. % $(C_2H_5)_2O$ in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	20.48
24.4	7.40
51.5	4.17
74.9	3.15
100.0	2.45

$H_2O + C_3H_7OH$

Wt. % H_2O in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	26.93
13.1	38.4
34.4	36.05
53.8	18.05
75.6	5.99
100	0.61

$CS_2 + CH_3OH$

Wt. % CH_3OH in Solvent	Gms. C_8H_9ON per 100 gms. Solvent
0.0	0.23
23.8	50.3
46.8	76.7
79.4	67.5
100.0	54.8

100 gms. sat. solution of Acetanilide in liquid Ammonia contain 48 gms. C_8H_9ON at ? t°. (De Carli, 1927.)

SOLUBILITY OF ACETANILIDE IN MIXTURES OF ETHER AND CHLOROFORM AND OF ACETONE AND BENZENE AT 25°. (Marden and Dover, 1916.)

Results for Ether-Chloroform Mixtures.		Results for Acetone-Benzene Mixture.	
Wt. Per Cent $CHCl_3$ in Mixed Solvent.	Gms. $C_6H_5NH.COCH_3$ per 100 Gms. Mixed Solvent.	Wt. Per Cent C_6H_6 in Mixed Solvent.	Gms. $C_6H_5NH.COCH_3$ per 100 Gms. Mixed Solvent.
100	17.7	100	1.36
90	11.7	90	6.78
80	8.2	80	13.0
70	6.2	70	20.0
60	4.95	60	29.2
50	4.25	50	30.0
40	3.8	40	30.5
30	3.5	30	33.0
20	3.25	20	36.0
10	3.05	10	45.7
0	2.9	0	39.4

DISTRIBUTION OF ACETANILIDE BETWEEN IMMISCIBLE SOLVENTS AT 25°.

Conc. $C_6H_5NH.COCH_3$ in Benzene layer ÷ Conc. in H_2O layer = 1.65. (Farmer and Warth, 1904.)

" " " Chloroform " ÷ Conc. in H_2O layer = 7.75. (Marden, 1914.)

" " " Ether " ÷ Conc. in H_2O layer = 2.98. (Marden, 1914.)

Freezing-point data are given for mixtures of Acetanilide and:

Aniline + Allyl phenyl thio urea(13)
Antipyrine(2)(5a)
" + Phenacetine(5)
" + Salicylic acid(8)
Benzoic acid(12)(5a)
Chloral hydrate(1)
Dinitro benzene(3)
Diphenyl amine(5a)
Ethyl Urethan(5a)
Hydroquinone(5a)
" + Resorcinol(8)
Naphthol + Urea(9)
Nitraniline(3)
Nitro acetanilide(11)
Naphthylamine(5a)
Menthol(5a)
Phenacetine(10)(1)(5a)
" + Antipyrine(5)
" + Resorcinol(5)
Dinitro phenol(3)(14)
Phenacetine + Sulfonal(5)
" + Urea(5)
Phenol(1)
Propioanilide(4)(14)
Pyramidon(1)
Quinine(5a)
Resorcinol(1)
" + Hydroquinone(8)
" + Phenacetine(5)
Salicylic acid + Antipyrine(8)
" " + Urea(9)
Salipyrine(5a)
" + Sulfonal(6)
Salol(5a)
Sulfonal(5a)
Thymol(1)(7)
Urea(5a)
" + Naphthol(9)
" + Phenacetine(5)
" + Salicylic acid(9)

(1) Angeletti, 1927; (2) Comanducci, 1912; (3) Crompton and Whiteby, 1895; (4) Gilbert and Clark, 1927; (5) Hrynakowski, 1934; (5a) Hrynakowski and Adamanis, 1933a; (6) Hrynakowski and Staszewski, 1936; (7) Hrynakowski and Szmyt, 1935; (8) Hrynakowski and Szmyt, 1935b; (9) Hrynakowski and Szmyt, 1935c; (10) Kitran, 1924; (11) Küster, 1891; (12) Puschin and Wilowitsch, 1925; (13) Schischokin, 1930; (14) Tammann and Betschvar, 1926.

PHENYL AMINO ACETIC ACID $CH(NH_2)(C_6H_5)COOH$.

The eutectic temperature of a mixture of active phenyl amino acetic acid and water is 0.07°. That for a mixture of the inactive compound compound and water is 0.13°. (Timmermans and Motiuk, 1932.)

Results are also given for the freezing-points of ternary mixtures composed of phenylamino acetic acid + phenyl glycolic acid + water.

METHYL ANTHRANILIC ACID $(CH_3)NHC_6H_4COOH$.

DISTRIBUTION OF METHYL ANTHRANILIC ACID AT 25° BETWEEN:
(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. $C_8H_9O_2$ per liter	
H_2O layer	$CHCl_3$ layer
0.00099	0.0125
0.00108	0.0143
0.00119	0.0162
0.00132	0.0191
0.00145	0.0218
0.00158	0.0257

Water and Toluene

Gm. Mols. $C_8H_9O_2$ per liter	
H_2O layer	$C_6H_5CH_3$ layer
0.000924	0.00317
0.00112	0.00370
0.00132	0.00436
0.00158	0.00502
0.00185	0.00580
0.00240	0.00682

AMINO ACETOPHENONE $CH_3COC_6H_4NH_2$.

Freezing-point data are given for mixtures of p amino aceto phenone and:

1.2.4 Chloro di nitro benzene (Giua, Marcellino and Curti, 1920); Cinnamylidene aceto phenone (Giua, 1925); Tri nitro anisole (Giua, 1931); and 2.4.6-Tri nitro toluene (Giua, 1917.)

METHYL AMINO BENZOATE m and p $NH_2C_6H_4COOCH_3$.

Freezing-point data are given for mixtures of:

Methyl amino benzoates + Antipyrine (Pfeiffer and Seydel, 1928b.)
" " " + Pyramidon " " "
" " " + Sarcosine anhydride (Pfeiffer and Seydel, 1928b;) and Pfeiffer, Angern and Wang, 1927.)

BROMO,CHLORO NITRO DI METHYL ANILINES $BrNO_2(CH_3)_2C_6HNH_2$.

Freezing-point data for mixtures of Bromo nitro di methyl anilines and for mixtures of Chloro nitro di methyl anilines are given by Clemo and Smith, 1928.

ANIS ALDOXIMES $CH_3OC_6H_4CH:NOH$.

Freezing-point data for mixtures of the cis and trans anis aldoximes are given by Skau and Saxton, 1933.

NITRO PHENETOL $NO_2C_6H_4OC_2H_5$.

Freezing-point data for mixtures of nitro phenetol with nitro

XYLENE $C_6H_4(CH_3)_2$.

SOLUBILITY OF XYLENE IN WATER.

The solubility of xylene in water is given by Horiba, 1917, as 0.018 but the isomer used, the temperature or the terms in which the result is expressed, are not defined.

Determinations of the solubility of xylene (Isomer?) in superheated water were made by Jaeger, 1923. A large shaking autoclave of more than two liters capacity was used. A measured volume of the saturated solution was cooled and after it had separated into two layers, the volume of xylene was measured.

t°.	150°.	200°.	250°.
Cc. Xylene per 100 cc. H_2O	0.1	0.35	1.1

RECIPROCAL SOLUBILITY OF XYLENE AND WATER.

(Uspenski, 1929.)

t°	Gms. $C_6H_4(CH_3)_2$ per 100 gms. sat. sol. in H_2O	Gms. H_2O per 100 gms. sat. sol. in $C_6H_4(CH_3)_2$
10	0.0076	0.0185
25	0.0130	0.0384

100 gms. sat. solution of commercial xylene in 92 wt. per cent ethyl alcohol contain 83.4 gms. xylene at 15°. (Ormandy and Craven, 1921.)

100 gms. sat. solution of *hexahydro xylene* in 92 wt. per cent ethyl alcohol contain 26.4 gms. of the compound at 15°. (Ormandy and Craven, 1921.)

Results for the reciprocal solubility of Xylene and Sulfur are given by Hammick and Holt, 1927.

Freezing-point data for mixtures of *m* and *p* xylene are given by Nakatsuchi, 1926.

Freezing-point data are given for mixtures of Xylenes and:

Acetic acid(3)
Benzene(2)(3)
Bromo toluene(3)
Ethyl bromide(3)
Ethyl succinimide(3)
Phenol(3)
Resorcinol(1)
Toluene(2)
Veratrole(3)

(1) Campetti, 1917; (2) Nakatsuchi, 1926; (3) Paterno and Ampola, 1897.

XYLENOL 1.3.4, $C_6H_3.(CH_3)_2.OH$.

MISCIBILITY OF AQUEOUS ALKALINE SOLUTIONS OF XYLENOL WITH SEVERAL ORGANIC COMPOUNDS, INSOLUBLE IN WATER.

(Scheuble, 1907.)

To 5 cc. portions of aq. KOH solution (250 gms. per liter) were added the given amounts of the aq. insoluble compound from a buret and the xylenol, dropwise, until solution occurred. Temperature not stated.

Composition of Homogeneous Solution.		
cc. Aq. KOH.	cc. Aq. Insol. Cmpd.	Gms. Xylenol.
5	2 (= 1.64 gms.) Octyl Alcohol (1)	1
5	5 (= 4.10 ") "	1.7
5	2 (= 1.74 ") Toluene	4.1
5	3 (= 2.61 ") "	5

(1) The normal secondary octyl alcohol, *i.e.*, the so-called capryl alcohol, $CH_3(CH_2)_5.CH(OH)CH_3$.

Freezing-point data are given for mixtures of Xylenols and:

Cineole	(Morgan and Pettet, 1935.)
Tetra methyl phthalan	(Bennett and Wain, 1936.)
Xylidenes	(Morgan and Pettet, 1935.)

ETHYL BENZENE $C_6H_5C_2H_5$.

100 gms. sat. solution of ethyl benzene in H_2O contain 0.014 gm. $C_6H_5C_2H_5$ at 15°. (Fühner, 1924.)

ETHYL PHENOLS o and p $C_2H_5C_6H_4OH$.

Freezing-point data for mixtures of ethyl phenols with cineole and xylidenes are given by Morgan and Pettet, 1935.

CARBAMIDES (Ureas) $C_8H_{10}ON_2$.

Solubility in Several Solvents. (Walker and Wood, 1898)

as Methyl phenyl carbamide (m. pt. 82°), benzyl carbamide (m. pt. 149°). *o* tolyl carbamide (m. pt. 185°) and *p* tolyl carbamide (m. pt. 173°).

Solvent.	t°.	Gms. Each Carbamide Separately per 100 cc. Sat. Solution.			
		as Methyl Phenyl.	Benzyl.	*p* Tolyl.	*o* Tolyl
Water	45	74	1.71	0.307	0.251
Acetone	23	29.4	3.10	2.66	0.462
Ether	22.5	2.28	0.053	0.062	0.0162
Benzene	44.2	12.4	0.0597	0.043	0.0155

Acetyl **PHENYLENE DIAMINES** *o*, *m* and *p* $C_6H_4NH_2.NHCOCH_3$.

Solubility of Each Separately in Water. (Sidgwick and Neill, 1923.)

The determinations were made by the synthetic method.

Results for the Ortho compound.		Results for the Meta compound.		Results for the Para compound.	
t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*o*) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*m*) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*p*) per 100 gms. sat. sol.
7.2.....	3.40	48.7.....	9.05	56.8.....	6.50
22.0.....	12.05	82.9.....	18.12	86.3.....	18.63
33.5.....	22.32	110.1.....	28.20	92.1.....	27.63
42.1.....	31.95	132.9.....	44.13	93.7.....	34.27
50.4.....	41.64	144.2.....	53.34	96.5.....	42.82
59.1.....	51.73	156.3.....	63.56	98.6.....	49.16
69.9.....	64.10	167.0.....	71.10	103.2.....	60.15
78.2.....	71.72	181.9.....	79.34	107.1.....	69.35
88.1.....	79.22	204.4.....	86.73	112.6.....	76.50
99.0.....	85.80	235.8.....	94.15	119.2.....	81.74
115.4.....	92.23	279.0.....	100.0	144.0.....	94.13
144.8.....	100.0			160.5.....	100.00

SOLUBILITY OF *o*, *m* AND *p* MONOACETYL PHENYLENE DIAMINES IN BENZENE.

(Sidgwick and Neill, 1923.)

Ortho compound.

t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*o*) per 100 gms. sat. sol.
29.9.....	4.13
53.6.....	11.21
73.5.....	20.24
84.2.....	27.36
92.4.....	35.27
99.8.....	43.04
106.7.....	51.50
117.8.....	65.12
127.5.....	77.76
135.2.....	88.05
144.8.....	100.00

Meta compound.

t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*m*) per 100 gms. sat. sol.
56.5.....	3.13
107.1.....	6.72
163.2.....	12.24
228.5.....	22.75 L
263.4.....	39.10 L
265.5.....	44.31 L
266 crit. t....	–
265.1.....	49.23 L
257.6.....	57.03 L
227.8.....	68.90 L
201.9.....	74.65 L
193.4.....	76.17 L
188.4.....	76.86 L
184.9 tr. pt..	77.5 L + S
185.4.....	77.55
187.1.....	78.61
190.0.....	80.12
203.1.....	85.50
221.9.....	91.06
279.0.....	100.00

Para compound.

t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*p*) per 100 gms. sat. sol.
116.2.....	7.15
180.8.....	17.36 L
187.8.....	30.12 L
188 crit. t...	–
186.3.....	41.23 L
181.3.....	51.70 L
170.0.....	59.95 L
163.5.....	63.07 L
155.9.....	67.66 L
150.1.....	71.05 L
147.1.....	72.71 L
146.8.....	73.90 L
146.8 tr. pt..	74.0 L + S
147.3.....	74.62
148.2.....	76.85
148.7.....	78.41
149.8.....	80.70
152.0.....	86.19
156.8.....	93.82
160.5.....	100.00

L, indicates two liquid layers.

S, indicates solid phenylene diamine.

NITROSO ETHYL ANILINE p $NOC_6H_4NH(C_2H_5)$.

Freezing-point data for mixtures of p nitroso ethyl aniline and p nitro ethyl aniline are given by Jaeger and van Kregten, 1912.

NITROSO DIMETHYL ANILINE $NO.C_6H_4N(CH_3)_2$.

Freezing-point data are given for mixtures of Nitroso dimethyl aniline +

Acetamide(4)
Acridine(4)
Aniline(3)
Benzamide(4)(5)(6)
Naphthylamine(3)(4)(6)
Nitro nitroso benzene(2)
Phenol(1)(3)
Phenylene diamines(4)
Pyridine(4)
Quinoline(4)
Toluidine(1)(3)
Xylidene(3)

(1) Bernoulli and Veillon, 1932; (2) Hammick, Edwards, Illingsworth and Snell, 1933 ; (3) Kremann, 1904; (4) Kremann and Wlk, 1919; (5) Puschin and Rikovski, 1930; (6) Rheinboldt, Henning and Kircheisen, 1925.

VERATROLE $C_6H_4(OCH_3)_2$1,2.

Freezing-point data for mixtures of Veratrole with bromo toluene and p xylene are given by Paterno and Ampola, 1897.

DIMETHOXY BENZENE $C_6H_4(OCH_3)_2$1.4.

Freezing-point data for mixtures of 1.4 Dimethoxy benzene and:

m Di nitro benzene	(Giua and Marcellino,		1920.)
1.2.4-Di nitro toluene	"	"	"
2.4.6-Tri nitro phenol	"	"	"
2.4.6-Tri nitro toluene	"	"	"
Nitro mannitol	(Urbanski, 1934.)		

p NITRO DIMETHYL ANILINE $NO_2C_6H_4N(CH_3)_2$.

Results for the solubility of p Nitro dimethyl aniline and of 4:4' Bis methyl nitroso amino diphenyl methane in aqueous solutions of hydrochloric acid at 0°, determined by a precipitation method, are given by Donald and Reade, 1935.

p NITRO ETHYL ANILINE $NO_2C_6H_4NH(C_2H_5)$.

Freezing-point data for mixtures of p Nitro ethyl aniline and nitroso ethyl aniline are given by Jaeger and van Kregten, 1912.)

CAFFEINE $C_5H(CH_3)_3N_4O_2.H_2O$.

SOLUBILITY IN WATER.

(Average curve from results of Zalai, 1910; Pellini, 1910, and U.S.P., 8th Ed.)

t°.	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 Gms. H_2O.	t°.	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 Gms. H_2O.
0	0.6	40	4.64
15	1.0	50	6.75
20	1.46	60	9.7
25	2.13	70	13.5
30	2.8	80	19.23

SOLUBILITY OF CAFFEINE IN WATER.

(Chambon, Bouvier, and Duron, 1937.)

t°	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 gms. H_2O
2	0.735
37	3.85
57	11.29
85	37.6
90	83.5

(Oliveri-Mandala and Irrera, 1930.)

t°	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 gms. sat. sol.
15	1.230
25	2.122
35	3.560

CAFFEINE $C_5H(CH_3)_3N_4O_2.H_2O$.

EQUILIBRIUM IN THE BINARY SYSTEM CAFFEINE-WATER, DETERMINED BY THE THERMIC METHOD.

(Kremann and Janetzky, 1923.)

The equilibrium temperatures in known mixtures of the two constituents were determined either by the freezing-point method, by observation of the appearance or disappearance of the last crystals, or by means of the points of arrest or change of direction in time-cooling curves.

t° of primary crystallization.	Wt. Per cent of $C_5H(CH_3)_3N_4O_2$ in mixture.	Solid Phase.	t° of primary crystallization.	Wt. Per cent of $C_5H(CH_3)_3N_4O_2$ in mixture	Solid Phase.
− 0.2	0.5	Ice	54.5	20.0	$C_5H(CH_3)_3N_4O_2.H_2O$
− 0.3	1.9	»	58.5	25.0	»
− 0.4 (Eutec.)	4.0	»+$C_5H(CH_3)_3N_4O_2.H_2O$	61.0	31.0	»+$C_5H(CH_3)_3N_4O_2$
+13.0	4.5	$C_5H(CH_3)_3N_4O_2.H_2O$	67.2	35.5	$C_5H(CH_3)_3N_4O_2$
32.5	7.2	»	73.0	40.0	»
40.5	9.6	»	81.5	45.6	»
49.5	15.0	»	100.0	59.0	»

100 gms. sat. solution of caffeine in water contain 1.224 gms. caffeine at 15° and 2.119 gms. at 25°. (Oliveri-Mandala, 1926.)

100 cc. sat. solution of hydrated caffeine in water contain 2.071 gms. caffeine at 25°. (Emery and Wright, 1921.

SOLUBILITY OF CAFFEINE IN AQUEOUS SOLUTIONS OF SALTS AT 22°.

(Zipf, 1930.)

Aq. Solvent 0.1 normal solution of:	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 gms. sat. sol.	Aq. Solvent 0.1 normal solution of:	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 gms. sat. sol.
Lithium hexophane	5.652	Sodium toluene p sulfonate	2.634
Sodium Salicylate	4.392	Sodium benzoate	2.616
Sulfo salicylic acid	2.943	Sodium Iodide	1.976
Sodium sulfo salicylate	2.595	Sodium Rhodanate	1.992
Potassium guaiacol sulfonate	3.047	Hydrochloric acid	1.669
Toluene p sulfonic acid	2.73	Sodium Chloride	1.474

The author also gives the distribution coefficients of caffeine between the above aqueous solutions and chloroform.

SOLUBILITY OF CAFFEINE IN AQUEOUS SOLUTIONS OF SODIUM BENZOATE.

(Chambon, Bouvier, and Duron, 1937.)

t°	Gms. per 100 gms. H_2O		Solid Phase	t°	Gms. per 100 gms. H_2O		Solid Phase
	$C_5H(CH_3)_3N_4O_2$	C_6H_5COONa			$C_5H(CH_3)_3N_4O_2$	C_6H_5COONa	
37	3.85	0.0	$C_5H(CH_3)_3N_4O_2.H_2O$	83	37.64	0.0	$C_5H(CH_3)_3N_4O_2.H_2O$
"	11.85	7.25	"	"	46.34	8.35	"
"	58.1	78.92	"+C_6H_5COONa	87	51.04	0.0	"
"	0.0	59.9	C_6H_5COONa	"	52.3	9.17	"
57	11.29	0.0	$C_5H(CH_3)_3N_4O_2.H_2O$	90	83.5	0.0	"
"	22.6	7.5	"	"	64.0	7.4	"
"	34.4	15.8	"	"	93.2	99.4	"+C_6H_5COONa
				"	[illegible]	[illegible]	[illegible]

SOLUBILITY OF CAFFEINE IN AQUEOUS SOLUTIONS OF ANTIPYRINE.

(Oliveri-Mandala and Irrera, 1930.)

Results at 15°		Results at 25°		Results at 35°	
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol..		Gms. per 100 gms. sat. sol.	
Antipyrine	Caffeine	Antipyrine	Caffeine	Antipyrine	Caffeine
4.824	2.130	4.824	3.140	4.824	4.632
9.814	2.482	9.814	3.844	9.814	6.871
13.675	3.173	13.675	4.767	13.675	8.279

SOLUBILITY OF CAFFEINE IN AQUEOUS SOLUTIONS OF CHLORAL HYDRATE.

(Oliveri-Mandala, 1926.)

Results at 15°.		Results at 25°.	
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$CCl_3.CH(OH)_2$.	$C_5H(CH_3)_3N_4O_2$.	$CCl_3.CH(OH)_2$.	$C_5H(CH_3)_3N_4O_2$
5.216	2.173	5.216	3.228
7.124	2.992	7.124	5.236
8.924	4.096	8.924	4.897

100 gms. of sat. solution of caffeine in 6.667 % aqueous sodium benzoate solution contain 8.321 gms. caffeine at 25°. (Oliveri Mandala, 1926.)

SOLUBILITY OF HYDRATED CAFFEINE IN VARIOUS AQUEOUS SOLUTIONS AT 25°.

(Emery and Wright, 1921.)

Aqueous solution.	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 cc. sat. sol.	Aqueous solution.	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 cc. sat. sol.
1.0 Normal sulfuric acid........	0.3356	1.0 Normal sodium salicylate..	2.222
1.0 » citric acid..........	0.6412	0.1 » » ..	0.492
1.0 » potassium bromide..	0.2136	1.0 » sodium benzoate..	1.528
2.5 » » » ..	0.2036	0.1 » » » ..	0.342

100 gms. Glycerol of *d* =1.2326 (86.5 %) dissolve 0.59 gms. caffeine at 20°. (Holm, 1921-1922.)
100 gms. » *d* =1.2645 (98.5 %) » 0.47 » » »

DISTRIBUTION OF CAFFEINE BETWEEN WATER AND CHLOROFORM. (Marden, 1914.)

Grams Caffeine in:		Ratio of Caffeine in Equal Vols. H_2O and $CHCl_3$.
105 cc. H_2O Layer.	50 cc. $CHCl_3$ Layer.	
0.0090	0.0563	0.0456
0.0180	0.1048	0.0492
0.0291	0.1770	0.0470

DISTRIBUTION OF CAFFEINE AT 25° BETWEEN :

(Emery and Wright, 1921.)

Water and Chloroform.		1.0 Normal Aq. H_2SO_4 and $CHCl_3$.		1.0 Normal Aq. KBr and $CHCl_3$.	
Gms. Caffeine per 100 cc.		Gms. Caffeine per 100 cc.		Gms. caffeine per 100 cc	
Aq. layer.	$CHCl_3$ layer.	Aq. layer.	$CHCl_3$ layer.	Aq. layer.	$CHCl_3$ layer.
0.0084	0.1916	0.0186	0.1814	0.0067	0.1933
0.0172	0.3828	0.0384	0.3618	0.0164	0.3836
0.0538	0.9472	0.1060	0.8940	0.0496	0.9504
0.1260	1.8740	0.2264	1.7736	0.118	1.8820
0.44	4.56	0.693	4.307	0.433	4.567
1.35	8.65	1.834	8.166	1.329	8.671

DISTRIBUTION OF CAFFEINE AT 25° BETWEEN :

(Emery and Wright, 1921.)

0.1 Normal Sodium Salicylate and Chloroform.		0.1 Normal Sodium Benzoate and Chloroform.	
Gms. Caffeine per 100 cc.		Gms. Caffeine per 100 cc.	
Aq. layer.	$CHCl_3$ layer.	Aq. layer.	$CHCl_3$ layer.
0.0292	0.1708	0.0144	0.1856
0.0608	0.3392	0.0304	0.3696
0.1624	0.8376	0.0848	0.9152
0.3412	1.6588	0.1872	1.8128
0.9830	4.017	0.625	4.375
2.367	7.633	1.751	8.249

The authors also give data upon the effect of temperature, small amounts of alcohol, acid, and other substances in solution, upon the distribution of caffeine between water and chloroform. Although the results are expressed in terms of percentage of recovery by extracting caffeine from aqueous solutions with chloroform, they can all be calculated, as have the above, to the form here shown.

DISTRIBUTION OF CAFFEINE AND OF ETHOXY CAFFEINE BETWEEN WATER OR SERUM AND OLIVE OIL. (Aiello, 1921.)

Immiscible solvents.	Results for :	t°.	Gms. Caffeine or of Ethoxy Caffeine per 100 cc.		$\frac{o}{a}$.
			Aq. layer (a).	Oil layer (o).	
Water and olive oil......	Caffeine	15	0.651	0.349	0.53
" "	"	16	0.695	0.315	0.44
" "	"	17	0.725	0.275	0.37
" "	Ethoxy Caffeine	?	0.107	0.193	1.80
" "	"	?	0.111	0.189	1.70
Horse serum and olive oil.	Caffeine	18	1.150	0.292	0.25
" "	"	20	1.358	0.145	0.10
" "	Ethoxy Caffeine	19	0.135	0.036	0.26
" "	"	20	0 151	0.029	0.19

100 cc. Horse serum dissolve 1.442 gms. caffeine at 18° and 1.503 gms. at 20°.
" " " 0.171 gms. ethoxy caffeine at 19° and 0.180 gms. at 20°.

SOLUBILITY OF CAFFEINE IN ORGANIC SOLVENTS.

Solvent.	t°.	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 Gms. Solvent.	Solvent.	t°.	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 Gms. Solvent.
Ethyl Alcohol	25	1.32 (2)	Carbon Tetrachloride	18	0.09 (4)
" "	25	1.88 (1)		20	0.26 (6)
" "	60	5.85 (1)		b.pt.	0.70 (4)
Methyl "	25	1.14 (2)	Chloroform	17	12.9 (5)
Amyl "	25	0.50 (3) (d_{25} = 0.810)	"	25	12.3 (1)
Amyl Acetate	30.5	0.72 (3) (d_{30} = 0.862)	"	25	11.92 (2)
Acetic Acid (99.5%)	21.5	2.6 (3)	"	b.pt.	15.63 (4)
Acetone	30.5	2.32 (3) (d_{30} = 0.832)	Ether	18	0.12 (4)
Aniline	30.5	29.4 (3) (d_{30} = 1.080)	"	25	0.27 (1)
Benzaldehyde	30.5	13.1 (3) (d_{30} = 1.087)	"	b.pt.	0.30 (4)
Benzene	18.0	0.91 (4)	Trichlorethylene	15	0.76 (7)
"	25.0	1.16 (2)	Dichlorethylene	15	1.82 (7)
"	30.5	1.23 (3) (d_{30} = 0.875)	Pyridine	20-25	34.39 (8)
"	b.pt.	5.29 (4)	50% Aq. Pyridine	"	11.12 (8)
Carbon Disulfide	17	0.06 (5)	Toluene	25	0.58 (3) (d_{25} = 0.861)
			Xylene	32.5	1.13 (3) (d_{32} = 0.847)

(1) = U. S. P.; (2) = Schaefer, 1913; (3) = Seidell, 1907; (4) = Göckel, 1898; (5) = Commaille, 1875 (6) = Gori, 1913; (7) = Wester and Bruins (1914); (8) = Dehn, 1917.

Data for the solubility of caffeine in mixtures of alcohol and chloroform and alcohol and benzene are given by Schaefer (1913).

Freezing-point data are given for mixtures of:

Caffeine and antipyrine (Kremann and Janetzky, 1932.)

SOLUBILITY OF CAFFEINE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. Caffeine per 100 gms. solvent	Authority.
Abs. alcohol	20-25	1.88	(Pucher and Dehn, 1921.)
Quinoline	»	3.56	»
Equi. mol. mixture of alcohol + quinoline.	»	3.93	»
Para cymene (b. pt. 176-176.5)	25	0.76	(Wheeler, 1920.)
»	30	1.10	»
»	100	1.74	»
»	175	15.58	»

PICRATE OF NITRO PHENYL DIMETHYL SULFONIUM (and Selenium) $C_8H_{10}O_2NS$.

SOLUBILITY OF THE ISOMERIC SULFONIUM AND SELENIUM COMPOUNDS, EACH SEPARATELY, IN WATER AT 13°.

(Baker and Moffitt, 1930.)

Isomer	Gms. per 100 cc sat. solution	
	$C_8H_{10}O_2NS$	$C_8H_{10}O_2NSe$
Para compounds	0.161	0.076
Meta "	0.050	0.050
Meta + Para compounds	0.165	0.105

BENZENE Sulfonic Acid Ethyl Ester, $C_6H_5SO_2.OC_2H_5$.

SOLUBILITY IN WATER AND IN SEVERAL AQUEOUS SOLUTIONS AT 25°.

(Karlsson, 1925.)

Solvent.	Gms. mols. $C_6H_5SO_2.OC_2H_5$ per liter sat. sol.	Solvent	Gms. mols. $C_6H_5SO_2.OC_2H_5$ per liter sat. sol.
Water	0.00739	0.5 *n* aq. NaCl	0.00452
0.15 *n* aq. NaOH	0.00624	0.1 »	0.00664
0.30 »	0.00514	0.02 *n* aq. Na acetate	0.00702
0.49 »	0.00481	0.05 »	0.00664
0.97 »	0.00367	0.02 » + 0.2 *n* CH_3COOH	0.00712
1.51 »	0.00260	0.0187 *n* aq. $C_6H_5SO_3H$	0.00737
1.58 »	0.00229	0.0378 *n* »	0.00734
2.06 »	0.00208		

XYLENE m $C_6H_5(CH_3)_2$.

Freezing-point data for mixtures of m and p xylene and for mixtures of m xylene with benzene and with toluene are given by Nakatsuchi, 1926.

DI METHYL ANILINE $C_6H_5N(CH_3)_2$.

Reciprocal Solubility of Dimethyl Aniline and Glycerol.

(Parvatiker and McEwen, 1924.)

t°	Gms. $C_6H_5N(CH_3)_2$ per 100 gms. sat. sol.	t°	Gms. $C_6H_5N(CH_3)_2$ per 100 gms. sat. sol.
197.5	92.40	287.0	50.06
245.0	86.00	284.0	35.68
282.0	68.02	273.0	21.71
286.0	58.54	218.5	9.18

Freezing-point data for mixtures of Dimethyl aniline and:

Acetic acid(3)(7)
Benzene(6)
Benzhydrol(6)
Chloro phenol(1)
Cresol(5)
Guaiacol(4)
Phenol(1)(2)
Tetramethyl diamino benzo phenone(6)

(1) Bramley, 1916; (2) Kremann, 1906; (3) Puschin and Rikovski, 1932a; (4) Puschin and Rikovski, 1937; (5) Puschin and Sladovic, 1928; (6) Schmidlin and Lang, 1912; (7) O'Conner, 1924.

ETHYL ANILINE $C_6H_5NH(C_2H_5)$.

Critical Solution Temperatures of Ethyl Aniline and Other Solvents.

(Thiry, 1925.)

Solvent	Crit. sol. temp.	Gms. $C_6H_5NHC_2H_5$ per 100 gms. mixture at c.s.t.
Hexane	-47.8	40.0
Iso hexane	-40.8	40.0
Tri methyl ethyl methane	-33.7	40.0

Freezing-point data are given by Yaginama and Hayakawa, 1932, for mixtures of Ethyl Aniline; di ethyl aniline and aniline.

XYLIDINES $(CH_3)_2C_6H_3NH_2$, 1, 3, 4 and 1, 4, 3.

Distribution of Xylidines at 25° Between Water and Xylene.

(Smith, 1921, 1922.)

Results for the 1, 3, 4 Compound.

Millimols. per liter H_2O layer (C_1).	Millimols. per liter Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.1070	1.200	11.2
0.1385	1.525	11.0
0.2875	3.3125	11.5

Results for the 1, 4, 3 Compound.

Millimols. per liter H_2O layer (C_1).	Millimols. per liter Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.0740	1.100	14.9
0.1420	2.150	15.1
0.2875	4.462	15.5

100 gms. sat. solution of m Xylidine in water contain 0.66 gm. m $(CH_3)_2C_6H_3NH_2$ at 20°. (Lipetz and Rimskaja, 1931.)

Freezing-point data for mixtures of xylidines with cresols, phenol, ethyl phenol and xylenols are given by Morgan and Pettet, 1935. Results for mixtures of m xylidine and phenol are given by Kremann, 1906.

BENZYL METHYL AMINE $C_6H_5CH_2.NHCH_3$.

DISTRIBUTION OF BENZYL METHYL AMINE AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Ethyl Ether.

Millimols. $C_6H_5CH_2NHCH_3$ per liter of H_2O layer (C_1).	Millimols. $C_6H_5CH_2NHCH_3$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.23	1.17	5.08
0.4	2.12	5.17
0.645	3.665	5.69
1.14	5.66	5.84
2.08	12.84	6.17

Water and Xylene.

Millimols. $C_6H_5CH_2NHCH_3$ per liter of H_2O layer (C_1).	Millimols. $C_6H_5CH_2NHCH_3$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.15	0.725	4.83
0.226	1.20	5.30
0.75	5.00	6.66
1.138	8.86	7.80

COLLIDINE (2.4.6 Trimethyl Pyridine) $C_6H_2N(CH_3)_3$.

SOLUBILITY IN WATER.

(Rothmund, 1898.)

t°.	Gms. Collidine per 100 Gms. Aq. Layer.	Gms. Collidine per 100 Gms. Collidine Layer.	t°.	Gms. Collidine per 100 Gms. Aq. Layer.	Gms. Collidine per 100 Gms. Collidine Layer.
5.7 crit. t.	17.20				
10	7.82	41.66	80	1.73	86.12
20	3.42	54.92	100	1.78	88.07
30	2.51	62.80	120	1.82	88.98
40	1.93	70.03	140	2.19	89.10
60	1.76	80.19	160	2.93	87.2
			180	3.67	...

COLLIDINE (1.3.5 Trimethyl Pyridine) $C_6H_2N(CH_3)_3$.

DISTRIBUTION BETWEEN WATER AND TOLUENE.

(Hantzsch and Vagt, 1901.)

t°.	G. Mols. Collidine per Liter. H_2O Layer.	G. Mols. Collidine per Liter. Toluene Layer.	Dist. Coef.	t°.	G. Mols. Collidine per Liter. H_2O Layer.	G. Mols. Collidine per Liter. Toluene Layer.	Dist. Coef.
0	0.0035	0.0580	0.0603	50	0.0017	0.0596	0.0285
10	0.0026	0.0587	0.0443	70	0.0015	0.0597	0.0251
20	0.0022	0.0588	0.0374	90	0.0013	0.0598	0.0218
30	0.0020	0.0594	0.0337				

VERONAL (Diethylbarbituric Acid) $CO<(NHCO)_2>C(C_2H_5)_2$. See also p. 203

100 cc. H_2O dissolve 0.625 gm. veronal at 15-20°. (Squire & Caines, 1905.)
100 cc. 90% alcohol dissolve 11.7 gms. veronal at 15-20°. "
100 cc. ether dissolve 8.7 gms. veronal at 15-20°. "

100 cc. 86.5 % glycerol (d = 1.2326) dissolve 0.78 gm. veronal at 20°.
" 98.5 % " (d = 1.2645) " 0.96 " " " "

(Holm, 1921, 1922.)

SOLUBILITY OF VERONAL IN AQUEOUS SOLUTIONS OF PYRAMIDON.

(Irrera, 1931)

Results at 14°		Results at 19°		Results at 27°	
Gms. per 100 cc sat. sol.		Gms. per 100 cc sat. sol.		Gms. per 100 cc sat. sol.	
Pyramidon	Veronal	Pyramidon	Veronal	Pyramidon	Veronal
0.0	0.572	0.0	0.658	0.0	0.792
3.92	0.720	3.92	0.790	3.92	0.930
5.49	0.838	5.49	1.115	5.49	1.466

Freezing-point data are given for mixtures of Veronal (Barbital, Di ethyl barbituric acid) and:

Antipyrine(3)(5)
Acetyl amino antipyrine(3)
Benzanilide(3)
Bromural(7)

Pyramidon(2)(6)
Phenacetine(1)
Phenyl 2,3 dimethyl-5-pyrazolon(3)(5)
Salol(1)
Sarcosine anhydride(3)

Results for mixtures of Diallyl barbuturic acid + dimethyl amino antipyrine are given by (4)

(1) Hrynakowski and Szmyt, 1935d; (2) Pfeiffer, 1925; (3) Pfeiffer and Angern, 1926; (4) Pfeiffer and Ochiai, 1932; (5) Pfeiffer and Seydel, 1928; (6) Rheinboldt and Kirscheisen, 1925; (7) Sandquist and Hök, 1927.

Results for the freezing-points of mixtures of diallyl barbituric acids (methyl, ethyl, propyl, amyl and allyl) are given by Shonle and Kleiderer, 1934.

FUMARIC and MALEIC ACID DI ETHYL ESTERS $(:CHCOOC_2H_5)_2$.

Freezing-point data for mixtures of fumaric and maleic acid di ethyl esters are given by Wachholtz, 1927.

DIETHYL SUCCINIC ACID (Asym.) $HOOCCH_2C(C_2H_5)_2COOH$.

One liter sat. solution of asymetric di ethyl succinic acid in water contains 27.85 gm. $C_8H_{14}O_4$ at 25°.

DI ETHYL SUCCINATE $(CH_2)_2(COOC_2H_5)_2$.

100 cc H_2O dissolve 1.92 gm $(CH_2)_2(COOC_2H_5)_2$ at 20°. (Sobotka and Kahn, 1931.)

Freezing-point data are given for mixtures of:

Diethyl succinate + Acetylene methyl tetra carbonate (Timmermans and
" " + Ethylene cyanide Mme. Vesselovsky, 1931.
" " + Ethyl Fumarate (Viseur, 1926.)
" " + Ethyl Maleate " "
" " + Tri chlor acetic acid (Kendall and Booge, 1916.)

AMYL MALONIC ACID n $(C_5H_{11})CH(COOH)_2$ at 25°.

100 gms. H_2O dissolve 213.4 gms. $(C_5H_{11})CH(COOH)_2$ at 25°.
100 gms. C_6H_6 " 0.765 gms. " " "

(Verkade and Coops, 1940.)

SUBERIC ACID $C_6H_{12}(COOH)_2$.

Solubility in Water.

(Lamouroux, 1899.)

t°.	0°.	15°.	20°.	35°.	50°.	65°.
Gms. $C_6H_{12}(COOH)_2$ per 100 cc. sol.	0.08	0.13	0.16	0.45	0.98	2.22

Solubility of Suberic Acid in Alcohols at 4°.

(Timofeiew, 1894.)

Alcohol.	Gms. $C_6H_{12}(COOH)_2$ per 100 Gms. Sat. Sol.	Gms. $C_6H_{12}(COOH)_2$ per 100 Gms. Alcohol.
Methyl Alcohol	20.32	32.04
Ethyl Alcohol	15.5	18.44
Propyl Alcohol	12.2	13.9

100 gms. 95 per cent formic acid dissolve 2.13 gms. $C_6H_{12}(COOH)_2$ at 19.5°.
(Aschan, 1913.)

Data for the distribution of suberic acid between water and ether at 25° are given by Chandler, 1908.

SUBERIC ACID $C_6H_{12}(COOH)_2$.

Solubility of Suberic Acid in Aqueous Solutions of Acetic Acid, Hydrochloric Acid, Nitric Acid and Sulfuric Acid at 25°.

(Knox and Richards, 1919.)

In aq. Acetic acid.

Equiv. Normality. CH_3COOH.	Equiv. Normality. $C_6H_{12}(COOH)_2$.
0.0	0.0680
0.435	0.0776
0.887	0.0902
2.112	0.1340
4.262	0.2891
6.350	0.4317
8.402	0.5846

In aq. Hydrochloric acid.

Equiv. Normality. HCl.	Equiv. Normality. $C_6H_{12}(COOH)_2$.
1.423	0.0498
2.858	0.0428
4.281	0.0412
5.691	0.0432
7.130	0.0504
8.378	0.0633
9.865	0.0905
11.20	0.1370

In aq. Sulfuric acid.

Equiv. Normality. H_2SO_4.	Equiv. Normality. $C_6H_{12}(COOH)_2$.
0.000	0.068
1.858	0.039
5.233	0.037
7.524	0.042
11.33	0.060
18.65	0.200

In aq. Nitric acid.

Equiv. Normality. HNO_3.	Equiv. Normality. $C_6H_{12}(COOH)_2$.
0.00	0.0680
0.307	0.0594
0.555	0.0590
0.906	0.0634
1.543	0.0695
2.021	0.0839
4.035	0.0999
5.749	0.1133
8.091	0.1575
10.05	0.2231
11.77	0.3896
13.30	0.6049

DI ETHYL TARTRATE $(CHOH)_2(COOC_2H_5)_2$.

DISTRIBUTION OF DIETHYL TARTRATE BETWEEN WATER AND ETHYL ETHER.

(Tsuzuki, 1938.)

Results at 15°

Gms. $C_8H_{14}O_6$ per 100 cc. H_2O layer(1)	Gms. $C_8H_{14}O_6$ per 100 cc. $(C_2H_5)_2O$ layer(2)	$\frac{2}{1}$
0.164	0.427	2.60
0.310	0.827	2.61
0.613	1.700	2.77

Results at 20°

Gms. $C_8H_{14}O_8$ per 100 cc. H_2O layer(1)	Gms. $C_8H_{14}O_8$ per 100 cc. $(C_2H_5)_2O$ layer(2)	$\frac{2}{1}$
0.172	0.371	2.16
0.446	1.01	2.26
0.910	2.11	2.31
2.28	5.19	2.28

DISTRIBUTION OF DIETHYL TARTRATE BETWEEN ETHER AND AQUEOUS BORATE SOLUTIONS.

(Tsuzuki, 1938.)

Results at 15°

Gm. Mols. Borate per liter aq. layer	Gms. $C_8H_{14}O_6$ per 100cc. Aq. layer(1)	Gms. $C_8H_{14}O_6$ per 100cc. $(C_2H_5)_2O$ layer(2)	$\frac{2}{1}$
0.25 KBO_2	0.021	0.93	44
" "	0.051	1.77	34
" "	0.136	3.43	25
" "	0.170	3.92	23
0.25 H_3BO_3	0.305	0.826	2.71
" "	0.618	1.595	2.58
" "	0.921	2.452	2.66
" "	1.212	3.380	2.79

Results at 20°

Gm. Mols. Borate per liter aq. layer	Gms. $C_8H_{14}O_8$ per 100cc. Aq. layer(1)	Gms. $C_8H_{14}O_8$ per 100cc. $(C_2H_5)_2O$ layer(2)	$\frac{2}{1}$
0.25 KBO_2	0.026	0.83	32.0
" "	0.063	1.55	24.7
" "	0.206	3.43	16.7
" "	0.577	5.48	9.5
" "	0.876	6.40	7.3
0.05 $Na_2B_4O_7$	0.109	1.271	11.7
" "	0.298	2.355	7.88
" " "	0.834	4.159	4.98

ETHYL CYCLOHEXANE $C_2H_5C_6H_{11}$.

The critical solution temperature of mixtures of Ethyl Cyclohexane and Sulfur dioxide is 26° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 55 to 88 mol. percent SO_2.
(Leslie, 1934.)

CAPRYLIC ACID $CH_3(CH_2)_6COOH$.

5.0cc aq. 2.0 normal sodium benzoate solution dissolve 0.22 cc caprylic acid at about 18°. (Traube, Schoning and Weber, 1927.)

DISTRIBUTION OF CAPRYLIC ACID AT ABOUT 18 BETWEEN WATER AND PETROLEUM ETHER.

([illegible] and Miermeister, 1931.)

Distribution of Caprylic Acid Between 2.2.4 Trimethyl Pentane and β Methoxy Ethanol.

(Henriques, 1933.)

Results at -19.5°

Gm. Mols. $C_8H_{16}O_2$ per liter		$\frac{1}{2}$
Pentane layer(1)	Ethanol layer(2)	
0.0039	0.0522	0.075
0.0122	0.1447	0.084
0.0200	0.2344	0.085

Results at 0°

Gm. Mols. $C_8H_{16}O_2$ per liter		$\frac{1}{2}$
Pentane layer(1)	Ethanol layer(2)	
0.0058	0.0482	0.12
0.0177	0.1428	0.13
0.0291	0.2159	0.14

Distribution of Caprylic Acid Between 2.2.4-Trimethyl Pentane and Methanol at 0°.

(Smith and Norton, 1922.)

Gm. Mol. $C_8H_{16}O_2$ per liter		$\frac{1}{2}$
Pentane layer(1)	Methanol layer(2)	
0.00686	0.03801	0.180
0.02120	0.10575	0.201

Results showing the distribution of caprylic acid between water and olive oil at 23° are given by Bodansky, 1928.

ETHYL CAPROATE $CH_3(CH_2)_4COOC_2H_5$.

100cc H_2O dissolve 0.063 gm. $C_8H_{16}O_2$ at 20°. (Sobotka and Kahn, 1931.)

TRI CAPRYLIN $C_3H_5[CH_3(CH_2)_6COOH]_3$.

Results for the reciprocal solubility of tri caprylin and benzene are given by Loskit, 1928.

AMYL PROPIONATE $C_2H_5COOC_5H_{11}$.

100 cc H_2O dissolve 0.1 cc Amyl propionate at 20°. (Bancroft, 1895; Traube, 1884.)

"Octane Sultone" $C_8H_{16}O_3S$.

Solubility in Several Organic Solvents at 20°.

(Baldschwieler and Cassar, 1929.)

Solvent	Gms. $C_8H_{16}O_3S$ per 100 gms. sat. sol.	Solvent	Gms. $C_8H_{16}O_3S$ per 100 gms. sat. sol.
Ethyl Ether	4.84	Ethyl Alcohol	4.98
Benzene(90%)	25.88	" " (95%)	5.21
Chloroform	55.57	Iso propyl alcohol	4.37
Acetone	52.43	Benzine (normal)	0.22
Methyl alcohol	13.15		

CONIINE (α Propyl Piperidine) $C_5H_{10}N.C_3H_7$

100 gms. H_2O dissolve 1.83 gms. coniine at 20°. (Zalai, 1910.)

DISTRIBUTION OF CONIINE AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Ether.

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.19	1.055	5.55
0.33	1.875	5.68
0.62	3.72	7.16
1.06	7.38	6.95

Water and Xylene..

Millimols. per liter of H_2O. layer (C_1).	Millimols. per liter of $C_6H_4(CH_3)_2$ layer (C_2),	$\frac{C_2}{C_1}$.
0.146	0.861	5.9
0.265	1 735	6.5
0.495	3.505	7.1
0.935	9.065	9.8

OCTANE $CH_3(CH_2)_6CH_3$.

100 cc. H_2O dissolve approx. 0.002 cc. octane at 16° (Fühner, 1924.)

MUTUAL SOLUBILITY OF NORMAL OCTANE AND SULFUR DIOXIDE.
(Seyer and Gallaugher, 1926.)

t°....................	—49.7.	—18.6.	+0.7.	19.81.	26.85.	24.25.	—3.6.	—10.8.
Wt. % C_8H_{18}	96.34	87.44	76.95	61.37	50.0	17.26	3.39	2.45

The critical solution temperature of mixtures of octane and sulfur dioxide is 25.5° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 50 and 90 mol. % SO_2. (Leslie, 1934.)

OCTANE $CH_3(CH_2)_6CH_3$.

RECIPROCAL SOLUBILITY OF OCTANE AND PHENOL.
(Campetti and Del Grosso, 1913.)

t°.	Gms. Phenol per 100 Gms. Mixture.	t°.	Gms. Phenol per 100 Gms. Mixture.
22.55	13.28	49.5 crit. t.	52.2
37.85	22.74	49.35	52.37
38.15	23.53	44.7	71.14
44.70	32.85	30.65	82.01
47.75	41.72	19.65	85.99

Freezing-point data are given for mixtures of:

Octane and Dotriacontane (Diacetyl). $CH_3(CH_2)_{30}CH_3$, (Seyer, 1938.)
Octane and Nonane (Smittenberg, Hoog and Henks, 1938.)

TETRA METHYL BUTANE 2,2,3,3,- $CH_3C(CH_3)_2C(CH_3)_2CH_3$.

Freezing-point data for mixtures of tetra methyl butane and tri methyl butane are given by Smittenberg, Hoog and Henkes, 1938.

TRI METHYL PENTANE 2,2,4- $CH_3C(CH_3)_2CHCH_3CH_2CH_3$.

Freezing-point data for mixtures of tri methyl pentane and heptane are given by Smittenberg, Hoog and Henkes, 1938.

2-METHYL HEPTANE $(CH_3)_2CH(CH_2)_4CH_3$.

The critical solution temperature of mixtures of 2-Methyl Heptane and Sulfur dioxide is 24° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 50 and 90 Mol. % SO_2. (Leslie, 1934.)

OCTYL ALCOHOL (normal) $CH_3(CH_2)_6CH_2OH$.

100 gms. sat. aqueous solution of normal octyl alcohol contain 0.0586 gm. $C_8H_{18}O$ at 25°. (Butler, Thomson and Maclennon, 1933.)

5.0 cc of aqueous saturated sodium benzoate solution dissolve 1.1 cc octyl alcohol at about 18°. (Traube, Schöning and Weber, 1927.)

OCTYL ALCOHOL (Secondary) $CH_3(CH_2)_5CHOH.CH_3$

By means of a new optical method, involving the use of an interferometer of the type described by Janin (*Ann. chim. phys.*, 52, 171, 1858), it was found that 1000 cc. of H_2O dissolve 1.508 gms. sec. octyl alcohol at 15° and 1.280 gms. at 25° (Mitchell, 1926.)

2,2,3-TRI METHYL PENTANOL-3 $(CH_3)_3C.COH(CH_3)CH_2CH_3$.

RECIPROCAL SOLUBILITY OF TRIMETHYL PENTANOL AND WATER.
(Ginnings and Coltrane, 1939.)

d. and B. pt. of the pure Tri methyl Pentanol		t°	Gms. $C_8H_{18}O$ per 100 gms. sat. sol. in H_2O	Gms. H_2O per 100 gms. sat. sol. in $C_8H_{18}O$
0.8420	153°-154°	20	0.75(0.9975)	1.98(0.8536)
"	"	25	0.69(0.9964)	2.01(0.8503)
"	"	30	0.64(0.9951)	2.02(0.8455)

The figures in parentheses are densities of the sat. solutions.

DI n BUTYL ETHER $(C_4H_9)_2O$.

The solubility of Di-n-Butyl Ether in water is less than 0.01 gm. per 100 gms. sat. solution at 17°. (Bennett and Philip, 1928.)

TRIONAL $C_2H_5(CH_3)C(SO_2.C_2H_5)_2$. (See also p. 568

10 cc. of horse serum dissolve 0.0102 gm. trional at 20°. The distribution between horse serum in contact with olive oil was found to be 0.0080 gm. trional per 10 cc. of serum layer and 0.0022 gm. per 10 cc. of olive oil layer at 20°. (Aiello, 1921.)

TETRA ETHYL AMMONIUM PHOSPHOR HEXA FLUORIDE $(C_2H_5)_4N.PF_6$.

One liter sat. solution of Tetra ethyl ammonium phosphur hexa fluoride in water contain 8.1 gm. $(C_2H_5)_4N.PF_6$ at 19°.(Lang and Muller 1930)

Phenyl**PROPIOLIC ACID** $C_6H_5C:C.COOH$.

SOLUBILITY IN SEVERAL SOLVENTS. (Herz and Rathmann, 1913.)

Solvent.	$C_6H_5C:C\ COOH$ per Liter.		Solvent.	$C_6H_5C:C\ COOH$ per Liter.	
	Mols.	Gms.		Mols	Gms.
Chloroform	0.789	115.30	Tetrachloro Ethylene	0.324	47.34
Carbon Tetrachloride	0.227	33.16	Tetrachloro Ethane	0.718	104.90
Trichloro Ethylene	0.382	55.82	Pentachloro Ethane	0.410	59.91

COUMARIN (1,2 Benzo pyrone) $C_6H_4OCOCH:CH$.

100 gms. water	dissolve	0.01 gm.	coumarin at 20°–25°.	(Dehn, 1917.)
" pyridine	"	87.7 gms.	" " "	"
" 50% aq. pyridine	"	60.1 "	" " "	"
" chloroform	"	49.4 "	" " 25°.	(Osaka, 1903–08.)

100 gms. abs. alcohol dissolve 12.57 gms. Coumarin at 20-25°. } (Pucher and Dehn, 1921.)
» quinoline » 0.56 » » »
» equi mol. mixture of alcohol and quinoline dissolve 0.8 gm. Coumarin at 20-25°.

Solubility of Coumarin in Aqueous Solutions of Glycerol.

(de Groote, 1920.)

Note. — The glycerol solutions were prepared by diluting given volumes of C. P. grade 95 % glycerol with water in a 1000 cc. flask. Thus the 5 % glycerol was prepared by diluting 50 cc. of 95 % glycerol (measured at 20°) to 1000 cc. with water at 20°. The saturated solutions were prepared by adding an excess of coumarin to 500 cc. of solvent at a temperature about 10° higher than that of the determination, and then allowing to stand at the selected temperature, with intermittent shaking, for 72 hours. The saturated solutions were analyzed by extracting the coumarin with ether. The ethereal extract was evaporated and the residue dissolved in water and again extracted with ether. The residue of purified coumarin was dried at 30° and weighed. The curves given by the results are not as smooth as is desirable.

Per cent of 95 % glycerol in solvent.	Gms. Coumarin per 100 cc. sat. solution at					
	0°.	20°.	30°.	40°.	50°.	60°.
0.0 (= H_2O)....	0.09	0.19	0.26	0.45	0.65	0.70
5.0..............	0.10	0.20	0.28	0.47	0.68	0.80
10.0..............	0.12	0.22	0.31	0.50	0.72	0.88
15.0..............	0.13	0.24	0.36	0.55	0.78	0.98
20.0..............	0.14	0.26	0.38	0.56	0.85	1.09
25.0..............	0.14	0.28	0.43	0.60	0.92	1.17
30.0..............	0.15	0.30	0.47	0.65	1.03	1.30
40.0..............	0.19	0.37	0.55	0.77	1.16	1.75
50.0..............	0.28	0.50	0.68	0.92	1.46	2.20

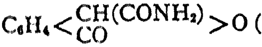
Freezing-point data are given for mixtures of:

Coumarin + Phosphorus acid (Redfield and King, 1936.)
" + Sulfuric acid (Kendall and Carpenter, 1914.)
" + p Toluidine (Puschin and Zivadinovic, 1933.)
" + s Trinitro benzene (Sudborough and Beard, 1911.)

PHTHALONIC ACID (o) $HOOC.C_6H_4.CO.COOH.2H_2O$.

100 gms. H_2O dissolve 115.0 gms. Phthalonic acid at 15° (Sidgwick and Clayton, 1922.)
» $CHCl_3$ » 2.0 » » » »

100 gms. sat. solution in water contain 64.4 gms. anhydrous acid at 15°, Sp. Gr. of sat. solution = 1.243. (Tcherniac, 1916.)

Amide of **PHTHALIDECARBOXYLIC ACID**  $C_6H_4<{}^{CH(CONH_2)}_{CO}>O$ (m. pt. 185.5°).

100 gms. H_2O dissolve 0.132 gm. of the acid at 16.2° and 5.7 gms. at b. pt. (Tcherniac, 1916.)

QUINOLINE C_9H_7N.

DISTRIBUTION OF QUINOLINE AT 25° BETWEEN WATER AND XYLENE.

(Smith, 1921, 1922.)

Millimols. C_9H_7N per liter of		$\frac{c_4}{c_3}$
H_2O layer (c_3).	Xylene layer (c_4).	
0.116	1.80	15.5
0.250	4.20	16.8
0.470	9.40	20.0

Freezing-point data are given for mixtures of Quinoline and:

Acetic acid(3)
Benzoic acid(1)
Cresols(5)
Guaiacol(4)
Nitroso dimethyl aniline(6)
Phenol(2)
9 Chloro phenol(2)

(1) Baskov, 1918; (2) Bramley, 1916; (3) Puschin and Rikovski, 1932a; (4) Puschin and Rikovski, 1937; (5) Puschin and Sladovic, 1928; (6) Kremann and Wlk, 1919.

QUINOLINE HELIANTHATE $C_{14}H_{15}N_3SO_3.C_9H_7N$.

1000 cc. H_2O dissolve 0.854 gms. quinoline helianthate at 20-25°.

(Stark and Dehn, 1918.)

α **BROMO CINNAMIC ALDEHYDE** $BrC_6H_4CH:CHCHO$.

Freezing-point data for mixtures of α Bromo cinnamic aldehyde and α Chloro cinnamic aldehyde are given by Kuster, 1891.

BromoCINNAMIC ACIDS.

SOLUBILITY OF α AND OF β BROMOCINNAMIC ACIDS IN WATER AT 25°.

(Paul, 1894.)

Acid.	Per 1000 cc. Sat. Solution.	
	Gms.	Millimols.
α $C_6H_5CH:CBrCOOH$	3.9325	17.32
β $C_6H_5CBr:CHCOOH$	0.5255	2.315

SOLUBILITY OF α ISO BROMOCINNAMIC ACID IN AQUEOUS SOLUTIONS OF OXANILIC ACID (Melting point = 120°) AT 25°.

(Noyes, 1890.)

Normality of Solutions.		Grams per Liter.	
C_6H_5NHCO-COOH.	C_6H_5CH-CBrCOOH.	C_6H_5NHCO-COOH.	C_6H_5CH-CBrCOOH.
0	0.0176	0	3.995
0.0275	0.0140	4.54	3.178
0.0524	0.0129	8.65	2.928

SOLUBILITY OF α CHLOROCINNAMIC ACID, ETC., IN BENZENE.

(Stoermer and Heymann, 1913.)

Name of Compound.		M. pt.	t°.	Gms. Cmpd. per 100 Gms. C_6H_6.	Name of Compound.		M. pt.	t°.	Gms. Cmpd. per 100 Gms. C_6H_6.
α Chlor-	cinnamic Acid	137	20	2.6	β Brom-	cinnamic Acid	135	13	1.58
Allo α "		111	21	11	Allo β "		159.5	14	0.86
α Brom-		131	20	5.17	*cis* Dichlor-		121	13	6.1
Allo α "		120	18.5	6.9	*trans* "		101	14	21.2
β Chlor-		142	17	1.94	*cis* Dibrom-		100	14	26.9
Allo β "		132	16	3.17	*trans* "		136	14	10.6

CINNAMIC ALDEHYDE $C_6H_5.CH:CH.CHO$.

Freezing-point lowering data for mixtures of cinnamic aldehyde and each of the following compounds are given by Kremann and Zechner, 1925.

α and β Naphtol	Pyrocatechol
o, *m*, *p* Nitro phenol	Resorcinol

Allo CINNAMIC ACIDS (Unstable Isomers of Cinnamic Acid).

SOLUBILITY OF EACH OF THE THREE ISOMERIC ALLOCINNAMIC ACIDS AND OF THE MELTS OF THE THREE ISOMERS IN WATER.

(Meyer, 1911.)

Results for:

Allocinnamic Acid of M. pt. 68°.		Allocinnamic Acid of M. pt. 58°. (Natural Isocinnamic Acid.)		Allocinnamic Acid of M. pt. 42°. (Artificial Isocinnamic Acid.)		Melted Allocinnamic Acid.	
t°.	Gms. Acid per Liter.	t°.	Gms. Acid per Liter.	t°.	Gms. Acid per Liter.	t°.	Gms. Acid per Liter
18	6.88	18	7.62	18	8.95	18	13.63
25	8.45	25	9.37	25	11.03	25	14.44
35	11.14	35	12.39	35	14.61	35	16.05
45	14.46	45	16.09			45	18.11
55	18.45					55	20.55
						65	23.43
						75	27.69

These curves intersect that for the melted acid at the melting points of the solid isomers.

The results show that the three isomers are polymorphic modifications of the *cis* acid.

100 gms. ligroïn (b. pt. 60–70°) dissolve more than 16 gms. isocinnamic acid. (Liebermann, 1903.)

100 gms. ligroïn (b. pt. 60–70°) dissolve approx. 2 gms. allocinnamic acid. "

CINNAMIC ACID $C_6H_5CH:CH.COOH$.

SOLUBILITY OF CINNAMIC ACID IN WATER.

t°	Gms. $C_6H_5CH:CHCOOH$ per 100 gms. H_2O	Authority
25	0.0495	De Jong, 1909.
25	0.0546	Meyer, 1911.
25	0.0607	Sidgwick, 1910.
25	0.0604	Gross, Saylor and Gorman, 1933.

100 cc. 0.5 n sodium cinnamate solution dissolve 0.155 gm. $C_6H_5CH:CHCOOH$ at 25°. (Sidgwick, 1910.)

SOLUBILITY OF CINNAMIC ACID IN WATER AT TEMPERATURES ABOVE 100°.

(Kume, 1937.)

t°	Gms. $C_9H_8O_2$ per 100 gms. sat. sol.	t°	Gms. $C_9H_8O_2$ per 100 gms. sat. sol.	t°	Gms. $C_9H_8O_2$ per 100 gms. sat. sol.
131	17.50(3)	137	66.99	116.7	94.99(2)
139	35.6(3)	115	80.12	119.0	95.01(2)
140.5(Cr.T.)	49.0	107.1	80.12(1)	125.0	97.61(2)
107.2	50.17(1)	114.7	80.12(1)	129.0	98.90(2)
139.5	50.17	110	89.69(2)	130.5	99.29(2)
140	53.18	110.5	92.23(2)		

(1) Solid + 2 liquids; (2) Solid + one liquid; (3) Two liquid layers.

SOLUBILITY OF CINNAMIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1910.)

Equivalent normality		Equivalent normality	
HCl.	$C_9H_8O_2$.	HCl	$C_9H_8O_2$
0.00	0.00385	8.007	0.00400
2.100	0.00283	10.29	0.00556
4.174	0.00272	10.47	0.00572
6.250	0.00318		

SOLUBILITY OF CINNAMIC ACID IN AQUEOUS SOLUTIONS OF SODIUM SALTS AT 25°.

(Larsson, 1926, 1927.)

Solvent	Gm. mols. $C_9H_8O_2$ per liter
Water alone	0.00334 (= 0.4945 gm.)
Aq. 0.025 normal Na acetate	0.0127
" 0.05 " " "	0.0176
" 0.10 " " "	0.0242
" 0.025 " " fumarate	0.00938
" 0.05 " " "	0.0126

SOLUBILITY OF CINNAMIC ACID IN AQUEOUS SOLUTIONS OF SODIUM SALTS.

(Doosaj and Bhagwat, 1933; Bhagwat and Doosaj, 1933.)

In aqueous solutions of:

Sodium acetate at 30°		Sodium citrate at 30°		Sodium benzoate at 16.3°	
Gms. per liter		Gms. per liter		Gms. per liter	
CH_3COONa	$C_9H_8O_2$	$(CH_2)_2C(OH)(COONa)_3$	C_9H_8O	C_6H_5COONa	$C_9H_8O_2$
2.3574	1.763	0.0	0.6937	0.0	0.3914
3.5322	2.334	5.3701	3.469	1.7306	0.7827
7.0643	2.907	7.9274	4.317	3.4612	1.021
10.4281	3.525	15.1341	6.322	6.9224	1.393
19.9087	4.825	27.7459	8.486	17.3061	2.069
36.4989	6.563	33.2951	9.404	34.6121	2.997
43.7986	7.224	55.4918	11.75	57.6868	4.212
72.9977	9.162	83.2377	12.79	86.5303	5.121
109.4966	11.10	110.9836	13.69	115.3737	5.571
218.9932	18.41	166.4754	14.49		

SOLUBILITY OF CINNAMIC ACID IN AQUEOUS SOLUTIONS OF SODIUM ACETATE, BUTYRATE, FORMATE, AND SALICYLATE AT 26.4°.

(Philip — J. Chem. Soc. 87, 992, '05.)

Calculated from the original results, which are given in terms of molecular quantities per liter.

Gms. Na Salt per Liter.	Gms. $C_6H_5CH{:}CH.COOH$ per Liter in Solutions of: CH_3COONa.	C_3H_7COONa.	$HCOONa$.	$C_6H_4.OH.COONa$.
0	0.56	0.56	0.56	0.56
1	1.50	1.30	0.92	0.62
2	2.12	1.85	1.12	0.70
3	2.52	2.25	1.27	0.73
4	2.85	2.60	1.40	0.77
5	3.05	2.90	1.47	0.80
8	...	...	...	0.90

1 liter of aqueous solution contains 0.491 gm. $C_6H_5CH{:}CH.COOH$ at 25° (Paul).

SOLUBILITY OF CINNAMIC ACID IN AQUEOUS SOLUTIONS OF ANILIN AND OF PARA TOLUIDIN AT 25°.

(Lowenherz — Z. physik. Chem. 25, 394, '98.)

Original results in terms of molecular quantities per liter.

In Aqueous Anilin. Grams per Liter. $C_6H_5NH_2$.	$C_6H_5CH{:}CHCOOH$.	In Aqueous *p* Toluidin. Grams per Liter. $C_6H_4CH_3NH_2$.	$C_6H_5CH{:}CHCOOH$.
0	0.49	0	0.49
1	1.20	1	1.52
2	1.65	2	2.20
3	2.02	3	2.83
4	2.35	4	3.35
6	2.92	5	3.80

DISTRIBUTION OF CINNAMIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform. Gm. Mols. $C_9H_8O_2$ per liter H_2O layer	$CHCl_3$ layer	Water and Toluene. Gm. Mols. $C_9H_8O_2$ per liter H_2O layer	$C_6H_5CH_3$ layer
0.00077	0.0684	0.00126	0.0506
0.0084	0.0788	0.00175	0.0790
0.00098	0.0921	0.00227	0.1050
0.00112	0.1195	0.00244	0.1215
0.00132	0.1364	0.00264	0.1397

DISTRIBUTION OF CINNAMIC ACID BETWEEN WATER AND XYLENE AT 25°.

(Smith, 1921-1922.)

Millimols. $C_9H_8O_2$ per liter of H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.160	0.465	2.90
0.225	1.025	4.55
0.295	2.215	7.45

100 cc. sat. sol. in petroleum ether (b. pt. 30°–70°) contain 0.095 gm. $C_6H_5CH{:}CH.COOH$ at 26°.

SOLUBILITY OF CINNAMIC ACID (Melting point, 133°) IN ALCOHOLS. (Timofeiew, 1894.)

t°.	Gms. Cinnamic Acid per 100 Gms. Sat. Solution in			
	CH_3OH.	C_2H_5OH.	C_3H_7OH.	$(CH_3)_2CH\ CH_2OH$.
−18	8.1	6.74	4.3	...
−12.5	9.3	8	5.5	...
0	13	11.3	8.2	...
+19.5	22.5	18.1	13.4	8.6

SOLUBILITY OF CINNAMIC ACID IN ORGANIC SOLVENTS AT 25°. (Herz and Rathmann, 1913.)

Solvent.	Gms. $C_6H_5CH:CHCOOH$ per 100 cc. Sat. Sol.	Solvent. $CHCl_3$		Solvent. CCl_4		Gms. $C_6H_5CH:CHCOOH$ per 100 cc. Sat. Sol.	Solvent C_2HCl_3		Solvent C_2HCl_5		Gms $C_6H_5CH:CH\cdot COOH$ per 100 cc. Sat. Sol.
Chloroform	12.00	100	cc.+	0	cc.	12.00	100	cc.+	0	cc.	6.04
Carbontetrachloride	1.75	80	" +	20	"	9.86	80	" +	20	"	5.91
Trichlorethylene	6.04	50	" +	50	"	6.61	50	" +	50	"	5.85
Tetrachlorethylene	2.55	33.3	" +	66.6	"	4.50	33.3	" +	66.6	"	5.82
Tetrachlorethane	11.05	20	" +	80	"	3.32	20	" +	80	"	5.70
Pentachlorethane	5.54	0	" +	100	"	1.75	0	" +	100	"	5.54

SOLUBILITY OF CINNAMIC ACID IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $C_9H_8O_2$ per 100 gms. solvent.	Authority.
Absolute ethyl alcohol	20-25	22.03	(Pucher and Dehn, 1921.
Quinoline	»	1.85	»
Equi mol. mixture of alcohol and quinoline	»	132.50	»
Dichlor acetylene (cis) (b. pt. 60°.2)	0	2.32	(Lebrun, 1925.)
» » (trans.) (b. pt 48°.3)	0	1.93	»
Bromobutene (b. pt. 93°.9)	40	4.65	»
» (b. pt. 85°.5-85°.6)	40	3.68	»
Crotonic nitrile (b. pt. 107°.7-108°.2)	30	10.27	»
» » (b pt. 121°.8-122°.2)	30	9.72	»
Ethyl chlor isocrotonate	20	4.38	»
Cocoanut oil	25	1.77	(Verkade, 1921.)
Cotton seed oil	25	1.44	»
Castor oil	25	7.52	»
Linseed oil	25	1.66	»
Olive oil	25	1.29	»
Peanut oil I	25	1.62	»
» II	25	1.52	»

SOLUBILITY OF CINNAMIC ACID IN WATER AND IN OTHER SOLVENTS.

(Desai and Patel, 1935.)

Solvent	Gm. Mol. $C_9H_8O_2$ per 100 gm. mols. sat. sol.	Solvent	Gm. Mols. $C_9H_8O_2$ per 100 gm. mols. sat. sol.
Water	0.00894	Chloroform	7.268
CCl_4	1.071	Methyl alcohol	6.337
Benzene	3.033	Ethyl alcohol	7.665
Toluene	2.966	n Propyl alcohol	8.500
m Xylene	2.852	n Butyl alcohol	9.156
Chloro benzene	3.608	Acetone	11.930
Nitro benzene	4.965		

SOLUBILITY OF CINNAMIC ACID IN SEVERAL STERIOISOMERIC SOLVENTS.

(Lebrun, 1930.)

Solvent	b. pt. of solvent	t°	Gms. $C_9H_8O_2$ per 100 gms. solvent
Acetylene dichloride (Cis)	60.2	0	2.32
" " (Trans.)	48.3	0	1.93
β Chlor iso crotonate (Cis)	—	20	4.38
Bromo butene (Cis)	94.9	40	4.65
" " (Trans)	85.5	40	3.68
Crotonic nitrile	107-7-108.2	30	10.27
" "	121.8-122.2	30	9.72

100 gms. sat. solution of cinnamic acid in liquid ammonia contain 6.0 gms. $C_9H_8O_2$ at ? t°. (De Carli, 1927.)

Freezing-point data for mixtures of Cis and Trans Cinnamic acid are given by Eisenlohr and Metzner, 1937. Results are also given for mixtures of Cinnamic acid and:

Azobenzene(9)
Benzoic acid(3)(4)
Camphor(2)
Chlor acetic acid(4)
Dichlor acetic acid(4)
Dimethyl pyrone(4)
Dinitro phenol(6)
Dinitro benzene(6)
Erythritol(7)
Hydroquinone(6)
Naphthols(6)
Naphthylamine(5)
Nitro phenol(6)
Phenol(6)
Phenylene diamine(5)(8)
Phenyl propionic acid(1)
Picric acid(6)
Pyrocatechol(6)
Pyrogallol(6)
Resorcinol(6)
Toluidine(5)
Trichlor acetic acid(4)
Urea(5)

(1) Bruni and Gorni, 1899; (2) Efremow, 1913, 1914; (3) Kachler, 1870; (4) Kendall, 1914; (5) Kremann, Weber and Zechner, 1925; (6) Kremann, Zechner and Drazil, 1924; (7) Puschin and Dezelic, 1932; (8) Puschin and Dezelic, 1938; (9) Kremann and Zechner, 1925.

PHENYL METHYL FUROXIME $C_6H_5[(C_2N_2O)O]CH_3$.

Freezing-point data for mixtures of phenyl methyl furoxime and phenyl methyl dioxy diazine are given by Milone, 1929.

HYDROXY CINNAMIC ACID p (Coumaric Acid) $HOC_6H_4CH:CHCOOH$.

One liter sat. solution in water contains 1.307 gm. p Hydroxy cinnamic acid at 25°.

One liter sat. solution of allo p-Hydroxy cinnamic acid in water contains 3.94 gms. at 25°. (Roth and Stoermer, 1913.)

β Phenyl Dibromo**PROPIONIC ACID** $C_2H_2Br_2(C_6H_5)COOH$.
100 cc. sat. sol. in carbon tetrachloride contain 0.124 gm. acid at 26°. (De Jong. 1909)
100 cc. sat. sol. in petroleum ether contain 0.072 gm. acid at 26°. "

n PHENYL VOLUNTAL (Phenyl carbaminic acid tri chlor ethyl ester)
$CO(NHC_6H_5)OC_2H_2Cl_3$.

Freezing-point data are given by Pfeiffer and Seydel, 1928(a) for mixtures of n Phenyl voluntal with acetyl amino antipyrine, antipyrine, pyramidon and with sarcosine anhydride.

Acetyl **SALICYLIC ACID** (Aspirin) $CH_3COO.C_6H_4.COOH$, 1.2.

SOLUBILITY AND MELTING-POINT CURVES FOR MIXTURES OF ACETYL SALICYLIC ACID AND WATER, DETERMINED BY THE SYNTHETIC METHOD.
(Flaschner and Rankin, 1909.)

Solubility Curve (Liquid Acid + H_2O).			M.-pt. Curve (Solid Acid + H_2O).	
t°.	Gms. $CH_3COO.C_6H_4.COOH$ per 100 Gms. H₂O Rich Layer.	Gms. $CH_3COO.C_6H_4.COOH$ per 100 Gms. Acid Rich Layer.	t°.	Gms. $CH_3COOC_6H_4$-COOH per 100 Gms. Mixture
25	4.8	...	82.4	4.8
50	6	74	90.4	10
70	10	67	92.4	20
80	14	60	93.0	60
85	17.5	55	99	80
87.5	20	50	109.4	89.5
89 crit. temp.	35		131	100

100 gms. water dissolve 0.25 gm. aspirin at room temperature. (Squire and Caines, 1905.)
100 cc. 90% alcohol dissolve 20 gm. aspirin at room temperature. " "

100 gms. sat. sol. in water contain 0.577 gms. aspirin at 14° (Oliveri-Mandala, 1926.)
» 9.98 % solution of antipyrine contain 1.238 gms. aspirin at 14°
(Oliveri-Mandala, 1926.)

100 gms. 86.5 % Glycerol (d = 1.2326) dissolve 0.71 gm. $CH_3COO.C_6H_4COOH$ at 20°
» 98.5 » (d = 1.2645) » 0.88 " " "
(Holm, 1921, 1922.)

100 gms. benzene dissolve 0.325 gm. acetyl salicylic acid at 25°.
" " CCl_4 dissolve 0.04 gm. acetyl salicylic acid at 25°. (Warren, 1933.)

DISTRIBUTION OF ACETYL SALICYLIC ACID AT 25° BETWEEN :
(Smith, 1921, 1922.)

Water and Ethyl Ether.			Water and Xylene.		
Millimols. $CH_3COO.C_6H_4COOH$ per liter of H₂O layer (C_1).	Millimols. $CH_3COO.C_6H_4COOH$ per liter of $(C_2H_5)_2O$ layer (C_2)	$\frac{C_2}{C_1}$.	Millimols. $CH_3COO.C_6H_4COOH$ per liter of H₂O layer (C_1).	Millimols. $CH_3COO.C_6H_4COOH$ per liter of Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.205	0.96	4.70	3.28	0.719	0.219
0.31	1.57	5.06	3.85	0.875	0.227
0.49	2.75	5.62	7.15	2.00	0.280
0.84	5.16	6.15	14.62	5.38	0.368
1.32	8.84	6.70	17.30	7.25	0.419

DISTRIBUTION OF ACETYL SALICYLIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mol. $C_9H_8O_4$ per liter	
H_2O layer	$CHCl_3$ layer
0.0094	0.0440
0.0127	0.0764
0.0137	0.0882
0.0148	0.1023
0.0161	0.1200
0.0198	0.1810

Water and Toluene

Gm. Mol. $C_9H_8O_4$ per liter	
H_2O layer	$C_6H_5CH_3$ layer
0.00752	0.00310
0.00845	0.00370
0.00937	0.00436
0.01122	0.00581
0.01400	0.00818
0.01580	0.01010

ETHYL DI NITRO BENZOATE $3,5\text{-}(NO_2)_2C_6H_3COOC_2H_5$.

Results for the temperature-composition phase diagrams of the systems Ethyl 3,5-dinitro benzoate and butyl, 3,5-dinitro benzoate and ethyl 3,5-dinitro benzoate and methyl 3,5-dinitro benzoate are given by Caldwell and MacLean, 1933.

SKATOLE C_9H_9N.

Freezing-point data are given for mixtures of:

Skatole + Sarcosine anhydride (Pfeiffer and Angern, 1925.)
" + Tetra methyl diamino benzo phenone (Pfeiffer, Goebel and
" + Michler's ketone (Pfeiffer, 1924.) Angern, 1925.)

METHYL INDOLE α & β $CH_3NC_8H_6$.

Freezing-point data for mixtures of α and β Methyl indole with Sarcosine anhydride are given by Pfeiffer, Angern and Wang, 1927 and by Miers and Isaac, 1930.

Phenyl Brom Oxy PROPIONIC ACIDS (Optically Active Isomers).

SOLUBILITY OF EACH SEPARATELY IN CHLOROFORM AT 20°.

(Berner and Riiber, 1921.)

Compound.	M. pt.	Gms. cmpd. per 100 gms. $CHCl_3$.
r β Phenyl β Brom α Oxy Propionic Acid	165°....	0.30
d " " "	143.....	1.00
l " " "	143.....	1.00
r β " β " "	157.....	0.20
d " " "	138.....	2.60
l " " "	138.....	2.60
α Modification of β Phenyl α Brom α Oxy Acid	125.....	0.30
β " " " "	126.5...	0.66
d β Phenyl α Brom α Oxy Propionic Acid	119.....	0.37
r " " "	69.....	0.51
l " " "	97.....	1.77

r = racemic; *d* = dextro; *l* = laevo.

The authors also give the melting point curves of various mixtures of the isomers.

HIPPURIC ACID $C_6H_5CO.NHCH_2COOH$.

One liter	water	dissolves	3.754	gms. $C_9H_9O_3N$ at 25°	(Larsson, 1926.)
»	0.025 *n* Na fumarate	»	7.615	»	»
»	0.05 *n* »	»	10.38	»	»
»	0.025 *n* Na tartrate	»	7.418	»	»
»	0.05 *n* »	»	9.712	»	»

SOLUBILITY OF HIPPURIC ACID IN AQUEOUS SALT SOLUTIOLS AT 25°.

(Larsson, 1927.)

Aq. Solvent	$C_9H_9O_3N$ per liter		Aq. Solvent	$C_9H_9O_3N$ per liter	
	Gm. Mols.	Gms.		Gm. Mols.	Gms.
Water	0.02095	3.752	0.05 normal Na formate	0.0429	7.68
0.05 normal Na acetate	0.0631	11.30	0.10 " " "	0.0560	10.03
0.10 " " "	0.0969	17.35	0.05 " Na chloracetate	0.0301	5.39
			0.10 " " "	0.0351	6.29.

SOLUBILITY OF HIPPURIC ACID AT 25° IN AQUEOUS SOLUTIONS OF:

Formic Acid. (Kendall, 1911.) Sodium Hippurate. (Sidgwick, 1910.)

Normality of Aq. HCOOH.	Gms. Hippuric Acid per Liter.	Normality of Aq. HCOOH.	Gms. Hippuric Acid per Liter.	Normality of Aq. Sodium Hippurate.	Gms. Hippuric Acid per Liter.
0	3.67	5	4.08	0	6.99(?)
1.25	3.61	10	4.77	1	13.97(?)
2.5	3.72				

SOLUBILITY OF HIPPURIC ACID IN AQ. POTASSIUM HIPPURATE SOLUTIONS AT 20°.

(Hoitsema, 1898a.)

Density of Solutions.	Gram Mols. per Liter Sol.		Grams per Liter Solution.		Solid Phase.
	$C_9H_9NO_3$.	$KC_9H_8NO_3$.	$C_9H_9NO_3$.	$KC_9H_8NO_3$.	
1.002	0.0182	0	3.276	0.0	$C_9H_9NO_3$
1.003	0.0163	0.011	2.919	2.39	"
1.008	0.0183	0.071	3.278	15.43	"
1.022	0.0234	0.254	4.191	55.18	"
1.114	0.064	1.36	11.47	295.4	"
1.182	0.131	2.21	23.46	480.1	"
1.192	0.147	2.32	26.32	504.1	$C_9H_9NO_3$ + $C_9H_9NO_3.KC_9H_8NO_3.H_2O$
1.195	0.153	2.40	27.40	521.4	
1.201	0.133	2.50	23.82	543.1	$C_9H_9NO_3.KC_9H_8NO_3.H_2O$
1.239	0.084	3.01	15.04	654.0	"
1.282	0.068	3.57	12.18	775.7	$C_9H_9NO_3.KC_9H_8NO_3.H_2O$ + $KC_9H_8NO_3$
1.282	0.065	3.58	11.60	777.8	
1.276	0.031	3.56	5.55	773.4	$KC_9H_8NO_3$
1.277	0.011	3.55	1.917	771.3	"
1.277	0.00	3.56	...	773.4	"

SOLUBILITY OF HIPPURIC ACID IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $C_6H_5CO.NHCH_2COOH$ per 100 Gms. Solvent.	Authority.
Water	20–25	0.42	(Dehn, 1917.)
Methyl Alcohol	22	9.80	(Timofeiew, 1894.)
Ethyl Alcohol	22	5.20	"
Propyl Alcohol	23	2.80	"
50% Aqueous Pyridine	20–25	88	(Dehn, 1917.)

100 gms. absolute alcohol dissolve 4.6 gms. $C_9H_9O_3N$ at 20°-25° (Pucher and Dehn, 1921.)
" quinoline " 20.41 " "
" equi mol. mixture of alcohol and quinoline dissolve 23.10 gms. $C_9H_9O_3N$ at 20°-25°.

DISTRIBUTION OF HIPPURIC ACID AT 25° BETWEEN: (Smith, 1921, 1922.)

Water and Ether.

Millimols. $C_9H_9O_3N$ per liter of H_2O layer (C_1).	Millimols. $C_9H_9O_3N$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.855	0.355	0.415
1.42	0.56	0.394
2.58	0.98	0.380
4.66	1.70	0.364
8.04	2.80	0.348

Acetone and Glycerol.

Millimols. $C_9H_9O_3N$ per liter of Acetone layer A.	Millimols. $C_9H_9O_3N$ per liter of Glycerol layer G.	$\frac{A}{G}$.
2.75	2.40	1.15
4.80	4.10	1.17
9.70	8.20	1.18
22.80	19.85	1.15

3.5 DI IODO dl TYROSINE (dl Iodo gorgoic Acid) $HOC_6H_2I_2CH_2CH(NH_2).COOH$.

SOLUBILITY OF 3.5 DI IODO dl TYROSINE IN WATER.

(Dalton and Schmidt, 1933.)

The following values were derived from a solubility equation calculated from a series of 12 very careful determinations at 7 different temperatures between 0 and 47°.

t°	Gms. $C_9H_9O_3I_2N$ per 1000 gms. H_2O	t°	Gms. $C_9H_9O_3I_2N$ per 1000 gms. H_2O	t°	Gms. $C_9H_9O_3I_2N$ per 1000 gms. H_2O
0	0.204	30	0.769	60	2.90
5	0.255	35	0.959	65	3.61
10	0.318	40	1.197	70	4.51
15	0.396	45	1.493	75	5.62
20	0.494	50	1.862	100	17.00
25	0.617	55	2.32		

ETHYL NITRO BENZOATE p $C_6H_4(NO_2)COOC_2H_5$.

Freezing point data for mixtures of ethyl p nitro benzoate and methyl p nitro benzoate are given by Caldwell and Mac Lean, 1933.

Results for mixtures of ethyl nitro benzoates and nitro mannitol are given by Urbanski, 1934.

TRI NITRO MESITYLENE $C_6(NO_2)_3(CH_3)_3$.

Freezing point data are given by Hammic and Hellican, 1938 for mixtures of tri nitro mesitylene with hexa methyl benzene and with naphthalene.

β Phenyl**PROPIONIC ACID** (Hydrocinnamic Acid) $CH_2(C_6H_5).CH_2COOH$.

SOLUBILITY OF β PHENYL PROPIONIC ACID IN WATER AND IN BENZENE.

(Sidgwick and Ewbank, 1921 a.)

The determinations were made by the synthetic method and very careful attention was paid to all details necessary to insure accuracy.

Results for Water.

t°.	Gms. $CH_2CH(C_6H_5)COOH$ per 100 gms. sat. sol.	Solid Phase
38.5.....	94.92	Solid
34.0 tr. pt..		Solid + liquid layers
101.5.....	80.3	Liquid layers
143.5.....	60.16	"
150.0 crit. t.	39.31	"
149.2.....	19.31	"
119.9.....	5.0	"

Results for Benzene.

t°.	Gms. $CH_2CH(C_6H_5)COOH$ per 100 gms. sat. sol.	Solid Phase.
48.6....	100	$CH_2CH(C_6H_5)COOH$
28.....	78.87	"
14.8....	60.41	"
−6.1....	40.20	"
−1.8...	31.26	C_6H_6
+1.3 ...	19.63	"
5.5...	0.0	"

β Phenyl**PROPIONIC ACID**

SOLUBILITY IN WATER AND IN AQ. NORMAL SODIUM β PHENYLPROPIONATE.

(Sidgwick, 1910.)

Solvent.	Gms. $CH_2(C_6H_5)CH_2COOH$ per Liter Solution at: 11°	18°
Water	4.80	7.5
1 *n* aq. $CH_2(C_6H_5)CH_2.COONa$	7.65	172.5 (liquid layers formed)

SOLUBILITY OF β PHENYLPROPIONIC ACID IN WATER AND IN ALCOHOLS.

(Timofeiew, 1894.)

Alcohol.	t°.	Gms. $CH_2(C_6H_5)CH_2COOH$ per 100 Gms. Sat. Solution.	Alcohol.	t°.	Gms. $CH_2(C_6H_5)CH_2COOH$ per 100 Gms. Sat. Solution.
Water	19	0.7	Ethyl Alcohol	+19.6	77.2
Methyl Alcohol	−18.5	55.8	" "	20	78.8
" "	−16	57.6	Propyl Alcohol	−18.5	35
" "	0	66.9	" "	−16	39
" "	+19.6	82.8	" "	+19.6	73.4
" "	20	83.8	" "	20	73.9
Ethyl "	−18.5	46	Isobutyl Alcohol	19.6	67.3
" "	−16	48			

SOLUBILITY OF β PHENYLPROPIONIC ACID IN SEVERAL SOLVENTS.

(Herz and Rathmann, 1913.)

Solvent.	$CH_2(C_6H_5)CH_2.COOH$ per Liter. Mols.	Gms.	Solvent.	$CH_2(C_6H_5)CH_2COOH$ per Liter. Mols.	Gms.
Chloroform	5.444	817.2	Tetrachloro Ethylene	4.725	709.2
Carbon Tetrachloride	4.604	691.1	Tetrachloro Ethane	5.430	815.1
Trichloro Ethylene	5.140	771.6	Pentachloro Ethane	5.019	753.4

Hydro **CINNAMIC ACID** $C_6H_5CH_2.CH_2COOH$.

DISTRIBUTION OF HYDROCINNAMIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $C_9H_{10}O_2$ per liter of H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.089	0.650	7.30
0.1058	0.835	7.90
0.134	1.190	8.87
0.177	1.770	10.00

Water and Xylene.

Millimols. $C_9H_{10}O_2$ per liter of H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.375	0.975	2.60
0.575	1.775	3.09
0.85	3.40	4.00
1.15	5.00	4.35

Freezing-point data are given for mixtures of hydro cinnamic acid (β phenyl propionic acid) +

Dimethyl pyrone (Kendall, 1914.)
Cinnamic acid (Bruni and Gorni
Phenyl

ETHYL BENZOATE $C_6H_5COO(C_2H_5)$.

FREEZING-POINTS OF MIXTURES OF ETHYL BENZOATE AND TIN TETRACHLORIDE.
(Kournakov, Perelmouter and Kanov, 1916.)

t°.	Mol. % SnCl4.	t°.	Mol. % SnCl4.	t°.	Mol. % SnCl4.	t°.	Mol. % SnCl4.
16......	5.0	45.0....	30.0	44.0....	40.0	46.4....	55.0
27.5....	10.0	45.1....	31.5	42.0....	42.5	44.5....	60.0
33.8....	15.0	45.3....	33.0	44.8....	45.0	36.7....	70.0
39.5....	20.0	45.5*..	33.3	47.3....	48.0	26.5....	80.0
43.3....	25.0	45.4....	34.0	47.5**..	50.0	6.0....	90.0
44.0....	27.5	44.8....	38.0	47.3....	52.0	—33.0....	100.0

* M. pt. of the Compound $SnCl_4.2C_6H_5COOC_2H_5$. ** M. pt. of the Compound $SnCl_4.C_6H_5COOC_2H_5$

100 gms. H_2O dissolve 0.08 gm. $C_6H_5COO(C_2H_5)$ at 20°.
" " Aq. 0.4 normal sodium oleate solution (= 10.8 gm. Na oleate per 100 gms. solution) dissolve 5.4 gms. $C_6H_5COOC_2H_5$ at 20°. (Smith, 1932.)

Freezing-point data for mixtures of Ethyl benzoate and Tri chlor acetic acid are given by Kendall and Booge, 1916.

METHYL TOLUATE p $CH_3C_6H_4COOCH_3$.

Freezing point data for mixtures of methyl p toluate and tri chlor acetic acid are given by Kendall and Booge, 1916.

TOLUIDINE TRI CHLOR ACETATE o and p $C_6H_4CH_3NH_2.CCl_3COOH.H_2O$.

SOLUBILITY OF o AND OF p TOLUIDINE TRICHLOR ACETATE IN WATER.
(Florence, 1927.)

Compound	t°	Gms. $C_6H_4CH_3NH_2.CCl_3COOH$ per 100 gms. sat. sol.	Solid Phase
o Toluidine Trichlor acetate	15	7.2	o $C_6H_4CH_3NH_2CCl_3COOH.H_2O$
" " "	54	43.3	
p " " "	15	2.7	p "
" " "	57	38.4	"

METHYL MANDELATES $C_6H_5CH(OH)COOCH_3$.

Freezing-point data of mixtures of the optical isomeric methyl mandelates are given by Ross, 1936.

TROPIC ACID (α Phenylhydracrylic Acid) *i* and *l*, $C_6H_5.CH(CH_2OH)COOH$.

100 gms. sat. solution in H_2O contain 1.975 gms. of the *i* acid at 20°.
100 gms. sat. solution in H_2O contain 2.408 gms. of the *l* acid at 20°. } (Schlossberg 1900.)

METHYL ANISATE $CH_3OC_6H_4COOCH_3$.

Freezing-point data for mixtures of methyl anisate and tri chlor acetic acid are given by Kendall and Booge, 1916.

PROPIONANILIDE $C_6H_5.NH(C_3H_5O)$.

SOLUBILITY OF PROPIONANILIDE IN AQUEOUS ACETIC ACID SOLUTIONS.

(Bradfield and Williams, 1929.)

The determinations were made by gradually heating mixtures of known weights of solute and solvent and noting the temperature at which the last trace of solid disappeared. The results were plotted and the values for selected temperatures obtained from the curve.

Gms. CH_3COOH per 100 gms. sat. solution at each temperature	Gms. $C_6H_5NH(C_3H_5O)$ per 100 gms. sat. solution at:			
	20°	25°	30°	35°
0.0	0.18	—	—	—
26.9	0.87	1.05	1.26	1.52
52.4	4.15	5.10	6.36	8.05
76.8	18.0	21.9	28.6	37.4
85.0	26.6	32.5	40.9	51.7
91.3	33.5	41.0	50.0	61.4
99.0	35.5	40.8	48.7	61.6

F. pt. data for mixtures of propionanilide and acetanilide are given by Gilbert and Clarke, 1927 and by Skau and Rowe, 1935.)

N-METHYL ACETANILIDE $CH_3CON(CH_3)C_6H_5$.

SOLUBILITY OF N-METHYL ACETANILIDE IN AQUEOUS ACETIC ACID SOLUTIONS.

(Bradfield and Williams, 1929.)

Gms. CH_3COOH per 100 gms. sat. sol. at each temp.	Gms. $CH_3CON(CH_3)C_6H_5$ per 100 gms. sat. solution at:			
	20°	25°	30°	35°
0.0 (= H_2O)	2.25	2.56	2.93	3.34
26.9	45.0	59	78	104
52.4	119	136	156	181
76.8	153	168	186	206
85	156	172	189	207
91.3	158	172	188	204
99.0	158	170	186	204

Freezing-point data are given for mixtures of:

N-Methyl acetanilide + Antipyrine (Angeletti, 1928; Giua, 1916.)
" " + Salol (Angeletti, 1928.)

p ACETOTOLUIDE $CH_3CO.NHC_6H_4.CH_3$

SOLUBILITY OF p ACETOTOLUIDE IN MIXTURES OF ALCOHOL AND WATER AT 25°.

(Holleman and Antusch, 1894.)

Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.
100	10.18	0.8074	50	1.92	0.9306
95	10.79	0.8276	45	1.41	0.9380
90	10.62	0.8440	40	0.96	0.9460
85	9.62	0.8576	35	0.66	0.9544
80	8.43	0.8685	25	0.31	0.9668
75	7.04	0.8803	20	0.23	0.9725
70	5.81	0.8904	15	0.16	0.9780
65	4.39	0.9021	5	0.13	0.9903
60	3.59	0.9115	0	0.12	0.9979
55	2.60	0.9207			

SOLUBILITY OF *p* ACETOTOLUIDE IN AQUEOUS SOLUTIONS OF ETHYLALCOHOL

(Pleuger, 1925.)

The synthetic method of Alexejeff was used. Weighed amounts of the solvent and *p* Acetotoluide were sealed in small tubes and the temperature of complete solution determined. The individual determinations were plotted and the following results read from the curves.

Wt. per cent C_2H_5OH in solvent.	Gms. $CH_3CO.NHC_6H_4CH_3$ dissolved per 100 gms. sat. solution at 30°.	50°.	70°.	90°.	110°.	130°.	138°
100	10.8	20.0	35.0	54.0	72.5	88.5	94.0
89.6	11.6	22.0	37.5	57.0	75.0	90.0	....
70.6	7.5	17.0	35.0	57.5	80.0	93.0	....
50.2	3.2	8.3	21.5	50.0	81.0	94.0	....
30.1	....	2.0	5.0	22.0	51.0	55.5	....
10.0	...	.....	....	2.0	5.0	13.0	....
0.0 (H_2O)	....	....	...	....	....	....	97.5

SOLUBILITY OF *p* ACETOTOLUIDE IN MIXTURES OF ETHYLALCOHOL AND CARBON DISULFIDE.

(Pleuger, 1925.)

Wt. per cent C_2H_5OH in solvent.	Gms. $CH_3CO.NHC_6H_4CH_3$ dissolved per 100 gms. sat. solution at 30°.	50°.	70°.	90°.	110°.	130°.	140°.
89.8	11.8	21.5	36.5	54.7	72.3	88.3	....
70.5	14.0	23.5	37.5	55.5	72.0	87.4	....
48.9	14.5	24.5	37.5	54.0	70.5	86.7	....
30.3	12.5	21.5	34.5	51.5	68.0	85.5	94.0
10.0	5.0	11.5	23.5	41.5	61.5	82.0	92.5
0.0 (CS_2)	....	....	....	17.5	47.0	75.5	90.0

SOLUBILITY OF *p* ACETOTOLUIDE IN MIXTURES OF ETHYLALCOHOL AND CARBON TETRACHLORIDE.

Wt. per cent C_2H_5OH in solvent.	Gms. $CH_3CO.NHC_6H_4CH_3$ dissolved per 100 gms. sat. solution at 30°.	50°.	70°.	90°.	110°.	130°.	140°.
80.4	10.6	14.7	34.0	52.0	71.0	87.5	94.5
60.2	10.3	19.0	32.0	49.5	67.5	85.5	93.5
40.0	9.5	17.5	29.0	45.0	63.0	82.5	92.5
20.0	6.8	13.5	23.5	38.0	57.0	78.5	91.0
0.0 (CCl_4)	....	....	....	....	33.5	69.5	87.5

SOLUBILITY OF p ACETO TOLUIDIDE IN MIXTURES OF SOLVENTS AT 25°.

(Mahieu, 1936.)

Results for mixtures of:

$CCl_4 + C_6H_6$		$CS_2 + CH_3OH$		$CHCl_3 + (C_2H_5)_2O$		$C_6H_5NH_2 + C_6H_{12}$	
Wt. % C_6H_6 in Solvent	Gms. $C_9H_{11}ON$ per 100 gms. Solvent	Wt. % CH_3OH in Solvent	Gms. $C_9H_{11}ON$ per 100 gms. Solvent	Wt. % $(C_2H_5)_2O$ in Solvent	Gms. $C_9H_{11}ON$ per 100 gms. Solvent	Wt. % C_6H_5NH in Solvent	Gms. $C_9H_{11}ON$ per 100 gms. Solvent
0.0	0.54	0.0	0.11	0.0	5.07	0.0	0.13
25.1	0.38	23.8	17.3	25.6	2.34	28.4	1.9
47.7	0.30	52.9	26.9	51.6	1.50	45.4	5.0
74.6	0.15	75.1	26.5	75.2	1.16	72.6	11.9
100	0.10	100.0	14.4	100	1.06	100.0	11.0

$C_9H_{11}O_1$

o ACETOTOLUIDE (o Methyl acetanilide) $CH_3CONHC_6H_4CH_3$.

SOLUBILITY OF o ACETOTOLUIDE IN VARIOUS SOLVENTS.

(Hall, Collett and Lazzell, 1933.)

The determinations were made by the synthetic method. The results are expressed in mol. percentage. They were plotted on a large scale and from the curves the following values for 5 degree intervals were obtained.

Gm. Mols. $CH_3CONHC_6H_4CH_3$ per 100 gm. mols. sat. solution in:

t°	Methyl Alcohol CH_3OH	Ethyl Alcohol C_2H_5OH	n Propyl Alcohol C_3H_7OH	n Butyl Alcohol C_4H_9OH	Iso Propyl Alcohol $CH_3CHOHCH_3$	Iso Butyl Alcohol $(CH_3)_2CHCH_2OH$
25	15.6	9.5	—	10.0	—	8.2
30	17.7	11.6	12.0	12.0	9.1	10.2
35	19.8	14.0	14.4	14.4	11.6	12.7
40	22.2	16.4	17.0	17.0	14.0	15.0
45	24.7	19.3	20.0	20.0	16.8	17.8
50	27.9	22.7	23.5	23.1	20.1	21.2
55	31.4	26.8	27.6	27.2	23.9	25.2
60	35.4	31.5	32.3	31.5	28.5	29.7
65	39.7	36.3	37.0	36.0	33.5	34.4
70	44.6	41.5	42.3	41.2	39.2	39.8
75	50.2	47.4	47.9	47.4	45.5	46.0
80	56.0	53.9	54.3	54.0	52.0	52.3
85	61.9	60.5	61.0	60.7	58.6	56.9
90	68.2	67.0	67.2	67.0	65.8	65.9
95	74.7	74.1	74.1	74.7	73.5	73.6
100	82.1	81.8	81.6	82.1	81.7	81.8
105	90.6	90.5	90.0	90.6	90.3	90.4
110.3	100	100	100	100	100	100

Gm. Mols. $CH_3CONHC_6H_4CH_3$ per 100 gm. mols. sat. solution in:

t°	Benzene C_6H_6	Carbon Tetrachloride CCl_4	Chloroform $CHCl_3$	Acetone $(CH_3)_2CO$	Ethyl Ether $(C_2H_5)_2O$
25	—	—	22.1	8.7	0.9
30	—	—	24.2	10.8	1.3
35	0.8	0.6	26.5	13.2	1.5
40	2.2	0.7	29.1	15.5	1.8
45	4.3	0.8	32.1	18.4	2.0
50	7.5	1.5	35.2	31.9	2.4
55	12.6	3.7	38.5	25.7	3.1
60	19.2	9.5	42.0	30.2	4.5
65	26.8	13.4	45.5	35.1	6.9
70	34.0	28.0	49.5	40.5	11.7
75	41.5	37.3	53.7	46.6	22.0
80	49.4	46.0	58.5	53.0	36.0
85	56.9	54.5	63.5	59.7	47.7
90	65.0	63.2	69.4	66.4	59.7
95	73.3	72.0	75.7	73.8	69.8
100	81.8	81.0	82.0	81.8	79.9
105	90.3	89.8	90.9	90.5	89.6
110.3	100	100	100	100	100

NITROSO MESITYLENE $NOC_6H_2(CH_3)_3$.

Freezing-point data are given by Hammick, Edwards, Illingworth and Suell, 1933, for mixtures of nitroso mesitylene with 4-nitroso m xylene, tri bromo nitroso benzene, o nitro nitroso benzene, o nitroso toluene, nitroso anisole and with nitroso benzene.

DI METHYL AMINO BENZOIC ACID p $(CH_3)_2NH_2C_6H_2COOH$.

Freezing-point data for mixtures of dimethyl amino benzoic acid and sarcosine anhydride are given by Pfeiffer, Angern and Wang, 1927.

PHENYL URETHAN (Carbanilic acid ethyl ester) $C_6H_5NHCOOC_2H_5$.

Freezing-point data for mixtures of phenyl urethan with pyramidon and with sarcosine anhydride are given by Pfeiffer and Seydel, 1928(a).

Meth**ACETIN** (*p* Acetanisidine, or *p* oxymethylacetanilide) $C_6H_4.OCH_3.NHCH_3CO$.

100 gms. H_2O **dissolve** 0.19 gms. of the compound at 15° and 8.3 gms. at 100°.

(German Pharmacopoeia.)

β PHENYL dl ALANINE $C_6H_5CH_2CH(NH_2)COOH$.

SOLUBILITY OF β PHENYL dl-ALANINE IN WATER.

(Dalton and Schmidt, 1933.)

The following values were derived from a solubility equation calculated from a series of 29 very careful determinations at 10 different temperature between 0° and 75°.

t°	Gms. $C_9H_{11}O_2N$ per 1000 gms. H_2O	t°	Gms. $C_9H_{11}O_2N$ per 1000 gms. H_2O	t°	Gms. $C_9H_{11}O_2N$ per 1000 gms. H_2O
0	9.97 (10.09)	30	15.29 (	60	26.71
5	10.61	35	16.63	65	29.70
10	11.33	40	18.15	70	33.12
15	12.15	45	19.88	75	37.08 (36.96)
20	13.07	50	21.87 (22.01)	100	68.86 (65.3)
25	14.11 (14.18)	55	24.13		

The density of an aqueous solution containing 13.83 gms. dl phenyl alanine per 1000 gms. H_2O at 25° is 1.00055.

The results in parentheses are by Dunn, Ross and Read, 1933.

Data for the solubility of phenyl alanine in aqueous salt solutions at 20° are given by Würgler (1914) and Pfeiffer and Würgler (1916).

100 cc of butyric acid dissolve 0.056 gm β phenyl alanine at 18

(v. Przylecki and Kasprzyk-Czaykowska, 1938.)

β PHENYL *l*|ALANINE $C_6H_5CH_2CH(NH_2)COOH$.

SOLUBILITY OF β PHENYL *l* ALANINE IN WATER.

(Dalton and Schmidt, 1933.)

The following values were derived from a solubility equation calculated from a series of 26 very careful determinations at 9 different temperatures between 0 and 65°.

t°	Gms. $C_9H_{11}O_2N$ per 1000 gms. H_2O	t°	Gms. $C_9H_{11}O_2N$ per 1000 gms. H_2O	t°	Gms. $C_9H_{11}O_2N$ per 1000 gms. H_2O
0	19.83	30	32.11	60	52.04
5	21.50	35	34.82	65	56.40
10	23.29	40	37.71	70	61.11
15	25.24	45	40.89	75	66.24
20	27.35	50	44.31	100	99.00
25	29.65	55	48.02		

The density of the sat. solution at 25° is 1.0045.

l TYROSINE $HOC_6H_4CH_2CH(NH_2)COOH$.

SOLUBILITY OF *l* TYROSINE IN WATER.

(Dalton and Schmidt, 1933.)

The following values were derived from a solubility equation calculated from a series of 32 very careful determinations at 9 different temperatures between 0° and 60°.

t°	Gms. $C_9H_{11}O_3N$ per 1000 gms. H_2O	t°	Gms. $C_9H_{11}O_3N$ per 1000 gms. H_2O	t°	Gms. $C_9H_{11}O_3N$ per 1000 gms. H_2O
0	0.196 (0.225)	30	0.537	60	1.471
5	0.232	35	0.635	65	1.742
10	0.274	40	0.752	70	2.001
15	0.324	45	0.889	75	2.448 (2.378)
20	0.384	50	1.052 (1.100)	100	5.650 (4.92)
25	0.453 (0.479)	55	1.245		

The results in parentheses are by Dunn, Ross, and Reed, 1933.

l TYROSINE (*p* Hydroxy phenyl alanine) $C_6H_4OH.CH_2.CH(NH_2)COOH$.

SOLUBILITY OF *l* TYROSINE IN WATER AND IN AQUEOUS SALT SOLUTIONS.

The solutions were saturated by agitating a large excess of tyrosine with the solvent in a thermostat. The dissolved tyrosine was calculated from a micro nitrogen determination.

Solvent.	t°.	Mols. $C_9H_{11}NO_3$ per. liter.	Gms. $C_9H_{11}NO_3$ per liter	Authority.
Water.	20.5	0.00246	0.446	(von Euler and Rudberg, 1924-1925.)
»	21.0	0.00250	0.452	(von Euler and Angern, 1924.)
Aq. 0.10 *n* $LiNO_3$.	20.5	0.00086	0.155	(von Euler and Rudberg, 1924-1925.)
» 0.25 *n* » .	20.5	0.000071	0.0129	»
» 0.05 *n* NaCl. .	20.5	0.00245	0.444	»
» 0.10 *n* » . .	20.5	0.00239	0.433	»
» 0.25 *n* » . .	20.5	0.00214	0.388	»

SIMULTANEOUS SOLUBILITY OF *l* TYROSIN AND *dl* LEUCINE IN WATER AND IN AQUEOUS 0.01 NORMAL HYDROCHLORIC ACID AT 21°. (von Euler and Rudberg, 1921.)

Saturation was obtained by constant agitation of a large excess of the amino acids with the solvents in a thermostat. The saturated solutions were analyzed by a determination of total nitrogen and a colorimetric estimation of the tyrosin, by means of the xanthoprotein reaction in alkaline solution.

Solvent.	Gms. per liter of sat. sol.		Solid Phase.
	l Tyrosine.	*dl* Leucine.	
Water....................	0.338	9.87	*l* Tyrosine + *dl* Leucine
Aq. 0.01 *n* HCl ($p_H = 1.74$)..	0.782	12.544	» »

The sat. solution in 0.01 *n* HCl had $p_H = 2.93$.

SOLUBILITY OF TYROSINE IN AQUEOUS SOLUTIONS OF DIFFERENT HYDROGEN ION CONCENTRATION AT 25°. (Sano, 1926.)

The desired p_H concentration was secured with such acids and bases as form easily soluble salts with tyrosine. The solid phase in all cases was the amino acid. A large excess of tyrosine was shaken in a thermostat with the solvent and the saturated solution was analyzed by determination of the p_H with a hydrogen electrode, and the nitrogen by the micro Kjeldahl method, using iodometric titration according to Bang.

Solvent	p_H of sat. sol.	Gms. N per liter sat. sol.	Solvent.	p_H of sat. sol.	Gms. N per liter sat. sol.
0.1 *n* HCl + 0.9 *n* KCl	1.07	0.41400	0.32 mol. sec. phosphate +0.0025 mol. prim. phosphate	7.41	0.04160
0.1 *n* »	1.17	0.34070	0.066 mol. sec. phosphate	8.39	0.04532
0.03 *n* »	1.74	0.12460	0.003 *n* NaOH	9.04	0.07022
0.01 *n* »	2.25	0.07008	0.01 *n* »	9.51	0.12070
1.0 *n* CH_3COOH	2.39	0.06056	0.02 *n* » + 0.9 *n* KCl	9.63	0.15110
0.1 *n* »	3.02	0.04131	0.04 *n* NaOH	10.07	0.44260
0.016 *n* » + 0.1 *n* CH_3COONa	5.56	0.03658	0.10 *n* »	10.25	0.83900
» + 0.1 *n* CH_3COONa + 0.9 *n* KCl	5.60	0.03554	0.33 *n* »	10.55	0.24520

The solubility minimum is at 0.03658 gm. N or 0.4726 gm. tyrosine per liter.

SOLUBILITY OF TYROSINE IN AQUEOUS SOLUTIONS AT 22°.

(Ando, 1926.)

Solvent 1.0 n Aq. solution of.	Gms. $C_9H_{11}O_3N$ per liter sat. sol.	Solvent 1.0 n Aq. solution of:	Gms. $C_9H_{11}O_3N$ per liter sat. sol.
KCl	0.411	$CaCl_2$	0.501
NaCl	0.406	K_2SO_4	0.406
LiCl	0.416	KBr	0.479
$BaCl_2$	0.505	KI	0.564

One liter H_2O dissolve 0.414 gm. $C_9H_{11}O_3N$ at 22°.

MESITYLENE 1,3,5-Tri methyl benzene $C_6H_3(CH_3)_3$.

100 gms. H_2O dissolve about 0.002 gm. mesitylene (Horiba, 1917). The terms in which the author's results are expressed are not clearly defined.

Freezing-point data for mixtures of mesitylene and sulfur dioxide are given by De Carli, 1926.

Pseudo **CUMENE** 1,2,4-Tri methyl benzene $C_6H_3(CH_3)_3$ (b. pt. 168°-2°).

Freezing-point data for mixtures of $C_6H_3(CH_3)_3$ + SO_2 are given by De Carli, 1926

Acetone **PHENYL HYDRAZONE** $(CH_3)_2C.N_2HC_6H_5$.

DATA FOR THE SYSTEM ACETONE PHENYL HYDRAZONE + WATER ARE GIVEN BY BLANKSMA (1912)

The following results were obtained for the solubility of $(CH_3)_2C.N_2.HC_6H_5.H_2O$ in water.

t°.	Gms. $(CH_3)_2C.N_2.HC_6H_5$ per 100 cc. Solution.	Solid Phase.
0	0.090	$(CH_3)_2C.N_2.HC_6H_5.H_2O$
15	0.187	"
32.8	0.412	"

METHYL ETHYL PHENOLS $CH_3(C_2H_5)C_6H_3OH$.

Freezing-point data for mixtures of methyl ethyl phenols with cineole and with m-5-Xylidine are given by Morgan and Pettet, 1935.

NITROSO PROPYL ANILINE $NOC_6H_4NH(C_3H_7)$.

Freezing-point data for mixtures of nitroso propyl aniline and nitro propyl aniline are given by Jaeger and van Kregten, 1912.

MESIDINE (2,4,6 Tri methyl aniline) $(CH_3)_3C_6H_2NH_2$.

Freezing-point data for mixtures of mesidine and acetic acid are given by O'Connor, 1924.

BENZYL ETHYL AMINE $C_6H_5CH_2.NHC_2H_5$.

RECIPROCAL SOLUBILITY OF BENZYL ETHYL AMINE AND GLYCEROL.

(Parvatiker and Mc Ewen, 1924)

This pair of compounds has an upper and a lower critical temperature of miscibility, hence the results, when plotted, give a complete circle.

Temp. of miscibility. Lower.	Temp. of miscibility. Upper.	Gms. $C_6H_5CH_2NHC_2H_5$ per 100 gms. sat. sol.	Temp. of miscibility. Lower.	Temp. of miscibility. Upper.	Gms. $C_6H_5CH_2NHC_2H_5$ per 100 gms. sat. sol.
61	177	10.14	51	281	54.89
50	251	18.07*	63	277	76.10
50	267	24.48	71	253	82.50
50.1	279	40.06	85	144	87.85

DISTRIBUTION AT 25° OF: (Smith, 1921-1922)

Benzyl Ethyl Amine Between: Water and Ethyl Ether. Millimols. $C_6H_5CH_2NHC_2H_5$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Water and Xylene. Millimols $C_6H_5CH_2NHC_2H_5$ per liter of H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.*	Benzyl Ethyl Amine Acid Phthalate* Between Acetone and Glycerol. Millimols Acid Phthalate per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$
0.145	1.74	12.0	0.103	1.368	13.6	0.70	2.525	0.277
0.230	2.83	12.3	0.141	1.86	13.5	1.30	3.975	0.327
0.365	4.995	13.7	0.35	4.65	13.3	1.80	5.45	0.330
0.56	7.60	13.6	0.70	9.30	13.3	2.55	7.80	0.322
0.92	12.92	14.1	1.40	18.60	13.4	3.65	10.35	0.302

* See Note p. 213.

PseudoCUMIDINE $(CH_3)_3.C_6H_2.NH_2$ (s, 5 Amino, 1. 2. 4. Trimethyl Benzene).

SOLUBILITY IN WATER.

(Lowenherz, 1898.)

t°.	19.4°.	23.7°.	28.7°.
Gms. ψ Cumidine per liter H_2O	1.198	1.330	1.498

MESITYLENE PHOSPHINOUS ACID $(CH_3)_3C_6H_2P(OH)$.

SOLUBILITY OF MESITYLENE PHOSPHINOUS ACID (M. PT. 147°.35) IN WATER

(Creighton, 1926.)

Saturation was secured by constant agitation. The solutions were analyzed by titration with standard $Ba(OH)_2$ solution. The conductance of the solutions was also determined.

t°.	Gms. $(CH_3)_3C_6H_2P(OH)_2$ per 100 gms. sat. sol.	t°.	Gms. $(CH_3)_3C_6H_2P(OH)_2$ per 100 gms. sat. sol.
1.0	0.289	45	0.385
25	0.299	65	0.525
35	0.324	85	0.700

Nor CAMPHOR $C_9H_{14}O$.

One liter of water dissolves 1.93 gms. Norcamphor at 15-20° (Rhode, 1922). The author used a stalogmometric method involving an estimation of the number of drops per unit of time in the case of a saturated solution and its dilutions, in comparison with similar determinations upon a series of solutions of known content.

TRI ACETIN (Glycerol, tri acetate) $C_3H_5(OOCCH_3)_3$.

SOLUBILITY OF TRIACETIN IN BENZENE.

(Loskit, 1928.)

t°	Gms. $C_9H_{14}O_6$ per 100 gms. sat. sol.	t°	Gms. $C_9H_{14}O_6$ per 100 gms. sat. sol.	t°	Gms. $C_9H_{14}O_6$ per 100 gms. sat. sol.
-38.	84.20(1)	-6.8	46.90	-0.2	24.96
-26.	77.14(1)	-5.0	42.19	+1.3	18.60
-14.6	63.87(1)	-3.0	35.81	1.8	16.28(1)
-14.	62.13	-1.9	30.24(1)	2.0	15.91
- 9.	52.31	-1.7	30.76	3.2	9.74
- 7.2	47.53(1)	-1.6	29.90(1)	3.51	8.73

(1) These determinations were made by the synthetic method and all others by the thermic method.

ETHYL GLUTARIC ACID $(CH_2)_3(COOC_2H_5)_2$.

100 cc H_2O dissolve 0.882 gm. $(CH_2)_3(COOC_2H_5)_2$ at 20°.
(Sobotka and Kahn,. 1931.)

AZELAIC ACID $C_7H_{14}(COOH)_2$.

SOLUBILITY IN WATER.

(Lamouroux, 1899.)

t°. =	0	15	20	35	50	65
Gms. $C_7H_{14}(COOH)_2$ per 100 cc. solution =	0.10	0.15	0.24	0.45	0.82	2 20

100 gms. 95% HCOOH dissolve 3.79 gms. azelaic acid at 19.4°. (Aschan, 1913.)

DISTRIBUTION OF AZELAIC ACID BETWEEN WATER AND ETHER AT 25°.

(Chandler, 1908.)

Gms. $C_7H_{14}(COOH)_2$ per 1000 cc.		Gms. $C_7H_{14}(COOH)_2$ per 1000 cc.	
Aq. Layer.	Ether Layer	Aq. Layer.	Ether Layer.
0.06	0.47	0.40	5.83
0.10	1.10	0.50	7.40
0.20	2.71	0.58	8.65

HEXYL MALONIC ACID $CH(C_6H_{13})(COOH)_2$.

100 gms. H_2O dissolve 0.415 gm. $CH(C_6H_{13})(COOH)_2$ at 25°.
" " C_6H_6 " 0.0406 " " " "

(Verkade and Coops, Jr., 1930a.)

Methyl PELLETIERINE $C_9H_{17}NO$.

Solubility of Methylpelletierine in Water. (Tanret, 1920.)

Methylpelletierine is soluble in cold water in all proportions but when the temperature is raised the solution becomes cloudy at a definite temperature for each concentration, and at sufficiently high concentrations the alkaloid separates as droplets. The following results were obtained by adding successively increasing amounts of water to 1.0 gm. of methylpelletierine and determining the temperature of clouding.

t° of clouding.	Gms. $C_9H_{17}NO$ per 100 gms. mixture.	t° of clouding.	Gms. $C_9H_{17}NO$ per 100 gms. mixture.	t° of clouding.	Gms. $C_9H_{17}NO$ per 100 gms. mixture.
80......	4.8	53.......	9.1	36.5.......	66.6
74......	5.3	47.......	11.1	37.5.......	71.4
68......	5.9	42.5.....	14.6	40.......	77.0
63......	6.6	38.......	20.0	44.......	84.4
58......	7.7	33.5.....	33.3	58.......	90.9
		35.5.....	50.0		

HEXA HYDRO MESITYLENE (1,3,5-Tri methyl cyclohexane) $C_6H_9(CH_3)_3$.

The critical solution temperature of mixtures of hexa hydro mesitylene and liquid sulfur dioxide is 30.5° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 40 and 95 mol. percent SO_2. (Leslie, 1934.)

NONA NAPHTHENE (1,3,4-Tri methyl cyclohexane) $C_6H_9(CH_3)_3$.

The critical solution temperature of mixtures of nonanaphthene and liquid sulfur dioxide is 27° and the reciprocal solubility curve is practically flat between the concentrations 50 and 90 mol. percent SO_2. (Leslie, 1934.)

DIBUTYL KETONE $(C_4H_9)_2O$.

1000 gms. H_2O dissolve 0.00357 gm. mols. $(C_4H_9)_2O$ at 10°, 0.00255 gm. mols. at 30° and 0.00243 gm. mols. at 50°, as determined by analyzing the saturated solutions with the aid of a Zeiss interferometer. (Gross, Rintelen and Saylor, 1939.)

AMYL BUTYRATE $C_3H_7COOC_5H_{11}$.

100 cc H_2O dissolve 0.06 cc amyl butyrate at 20°.

(Traube, 1884; Bancroft, 1895.)

PELARGONIC ACID $CH_3(CH_2)_7COOH$.

Results showing the distribution of pelargonic acid between water and olive oil at 23° are given by Bodansky, 1928.

ETHYL OENANTHATE $CH_3(CH_2)_5COOC_2H_5$.

100 cc H_2O dissolve 0.029 gm. $CH_3(CH_2)_5COOC_2H_5$ at 20°. (Sobotka and Kahn, 1931.)

NONANE $CH_3(CH_2)_7CH_3$.

The critical solution temperature of mixtures of nonane and liquid sulfur dioxide is 42° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 60 and 95 mol. percent SO_2. (Leslie, 1934.)

Freezing-point data for mixtures of nonane and octane are given by Smittenberg, Hoog and Henkes, 1938.

CARVOXIME $C_{10}H_{14}$:NOH *d*, *l* and *i*.

SOLUBILITY IN AQUEOUS ALCOHOL OF $d_{17.5} = 0.9125$ (51.6 PER CENT C_2H_5OH). (Goldschmidt and Cooper, 1898.)

The determinations were made by the synthetic method. On account of the slow rate at which melted carvoxime solidified on cooling below the melting point, in the tubes containing the synthetic mixtures, it was possible to obtain results which show the solubility curve for liquid carvoxime, in addition to the curves for dextro and inactive carvoxime. The curves for these latter intersect the curve for liquid carvoxime respectively at 51.7°, the m. pt. of dextro, and 70.5° the m.pt. of inactive carvoxime.

Gms. Carvoxime.	Gms. Solvent.	Mols. Carvoxime per 100 Gms. Solvent.	t° of Solution.		Solid Phase.
			Solid.	Liquid.	
0.0668	1.0868	0.0373	38.4	13.9	*d* Carvoxime
0.1232	1.0830	0.0689	45.8	31.9	"
0.2026	1.0218	0.1202	50.3	49.8	"
0.4040	1.0218	0.2396	...	79.6	"
0.4128	0.8130	0.3077	...	94.5	"
0.0657	1.0980	0.0363	54.2	...	*i* Carvoxime
0.1212	1.0161	0.0723	62.5	33.7	"
0.2715	1.0129	0.1625	69.25	61.3	"
0.3755	1.0384	0.2192	...	76.6	"
0.4496	0.7768	0.3409	...	102.9	"

SOLUBILITY IN *d* LIMONENE. (Goldschmidt and Cooper, 1898.)

t°.	Gms. $C_{10}H_{14}$:NOH per 100 Gms. *d* Limonene.	Solid Phase.	t°.	Gms. $C_{10}H_{14}$:NOH per 100 Gms. *d* Limonene.	Solid Phase.
24.6	44.6	*l* Carvoxime	48	198.7	*l* Carvoxime
30	59.2	*l* "	49.4	199.7	*d* "
30.3	63.3	*d* "	55.1	325.1	*l* "
38.4	104.3	*l* "	55.9	346.6	*d* "
39.3	103.1	*d* "	58.8	560	*d* "
43.1	130.8	*l* "	63.2	1269.3	*d* "

Freezing-point data are given for mixtures of *d* and *l* carvoxime by Adriani, 1900 and by Beck, 1904.

CHLORO TRINITRO NAPHTHALENE $C_{10}H_4Cl(1)(NO_2)_3(2,4,5)$

SOLUBILITY IN METHYL AND IN ETHYL ALCOHOL.

(Talen, 1927.)

t°	Gms. $C_{10}H_4Cl(NO_2)_3$ per 100 cc of:	
	CH_3OH	C_2H_5OH
25	0.525	0.256

CHLORO DINITRO NAPHTHALENE $C_{10}H_5Cl(1)(NO_2)_2(2.4)$

SOLUBILITY OF 1-CHLORO 2.4 DINITRO NAPHTHALENE IN METHYL AND IN ETHYL ALCOHOL.

(Talen, 1927.)

t°	Gms. $C_{10}H_5Cl(NO_2)_2$ per 100 cc of: CH_3OH	C_2H_5OH
0	0.1056	0.0752
25	0.2178	0.1780

TRI NITRO NAPHTHALENES $C_{10}H_5(NO_2)_3$.

100 gms. glycol diacetate ($CH_3COOCH_2.CH_2OOC.CH_3$ b. pt. 188-189°.6) dissolve 0.9 gm. trinitro naphthalene at 25°. The sat. solution was analyzed by evaporating in a wagon pipet, but about 9 months were required for the determination. (Taylor and Rinkenbach, 1926.)

Freezing-point data for various binary and ternary mixtures of tri nitro di nitro and mono nitro naphthalenes are given by Pascal, 1920.

DI NITRO NAPHTHALENES $C_{10}H_6(NO_2)_2$.

Freezing-point data for mixtures of dinitro and trinitro naphthalenes are given by Pascal, 1920 and by Urbanski and Kwiatkowski, 1934.

BROMO NAPHTHALENES α and β $C_{10}H_7Br$.

Freezing-point data are given for mixtures of:

Bromo naphthalenes + Fluoro naphthalene (Klemm, Klemm and Schiemann, 1933.)
" " + Naphthalene " " " "
" " + Picric Acid (Jefremow, 1918.)
+ Styphnic Acid (Jefremow, 1919a.)

CHLORO NAPHTHALENES α and β $C_{10}H_7Cl$

Freezing-point data are given for mixtures of chloro naphthalenes and:

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Bromo naphthalenes(4)	Naphthol(1)
Fluoro naphthalenes(4)	Naphthylamine(1)
Methyl naphthalene(1)	Picric acid(2)
Naphthalene(4)	Styphnic acid(3)

(1) Grimm, Gunther and Titus, 1931; (2) Jefremow, 1918; (3) Jefremow, 1919a; (4) Klemm, Klemm and Schiemann, 1933.

FLUORO NAPHTHALENES α and β $C_{10}H_7F$.

Freezing-point data for mixtures of fluoro, bromo and chloro naphthalene are given by Klemm, Klemm and Schiemann, 1933.)

Mono Nitro NAPHTALENE (α) $C_{10}H_7NO_2$ (α).

Solubility of α Mononitro Naphthalene (m. pt. 57°.5) in 95 per cent Ethyl Alcohol. (Crismer and Timmermans, 1920.)

The determinations were made by adding alcohol from a buret to weighed amounts of α mononitro naphthalene and observing the clouding point. The results were plotted and the following read from the curve.

t°.	Gms. $C_{10}H_7NO_2$ (α) per 100 gms. sat. sol.	
26	23.96	(cryst.)
25.5	24.82	»
25.5	26.3	liquid layer
30.3	27.4	»
34	31.1	»
38	36.4	»
40	40.0	»

t°.	Gms. $C_{10}H_7NO_2$ (α) per 100 gms. sat. sol.			
41	42.0	and	82.0	liquid layers
42	45.0	»	80.5	»
43	50.0	»	78.0	»
44	58.0	»	73.5	»
44.1 crit. t.	65.0	»	65.0	»
42	87.4 (cryst.)			
44.5	93.2 »			

Freezing-point data are given for mixtures of Nitro naphthalenes and:

Camphor(15)
Di nitro naphthalenes(7)
Di phenyl amine(1)(2)
Hydroquinone(9)
Naphthalene(2)(7)(8)
Naphthylamine(11)
Nitro mannitol(12)
Nitro penta erythritol(12)
Paraffine(3)(8)
Picric acid(4)(10)
Pyrocatechol(9)
Resorcinol(9)
Styphnic acid(5)
Tetra nitro benzene(10)
Tri nitro naphthalene(7)
Tri nitro benzene(10)
Tri nitro toluene(14)
Tri methylene tri nitramine(13)
Urethan(6)

(1) Battelli and Martinetti, 1885; (2) Bernoulli and Veillon, 1932; (3) Campetti and Delgrosso, 1913; (4) Jefremow, 1918; (5) Jefremow, 1919a; (6) Mascarelli, 1908; (7) Pascal, 1920; (8) Palazzo and Battelli, 1883; (9) Senden, 1923; (10) Shinomiya, 1940; (11) Tsakalotos, 1912; (12) Urbanski, 1933; (13) Urbanski and Rabek-Gawsonska, 1934; (14) Wogrinz and Vari, 1919; (15) Journiaux, 1912.

NITROSO β NAPHTHOL $C_{10}H_6(ON)OH$.

Solubility of Nitroso β Naphthol ($C_{10}H_6ONOH$) in Aqueous Solutions of Acetic Acid at 10°. (Nicolardot and Valli-Donau, 1918.)

Gms. CH_3COOH per 100 gms. solvent	0.0	1.0	2.5	5.0	10.0
» $C_{10}H_6ONOH$ per 100 gms. sat. sol.	0.017	0.022	0.023	0.031	0.064

NAPHTHALENE $C_{10}H_8$.

By means of an optical method, involving the use of an interferometer of the type described by Jamin (*Ann. chim. phys.*, 52, 171, 1858), it was found that 1000 cc. of H_2O dissolve 0.022 gm. $C_{10}H_8$ at 15° and 0.040 gm. at 25°. (Mitchell, 1926.)

1000 cc. H_2O dissolve 0.019 gm. $C_{10}H_8$ at 0° and 0.030 gm. at 25°. (Hilpert, 1916.)

Results for the aqueous solubility of the solid solution system Naphthalene-β Naphthol at 25°, 65° and 78° are given by Wright and Wallace, 1936.

SOLUBILITY OF NAPHTHALENE IN AQUEOUS SOLUTIONS OF FORMIC ACID.

(Christiansen, 1918.)

NOTE. — The determinations were made by mixing together the several ingredients and, after a period of standing in a thermostat, estimating from the presence or absence of solid, the composition corresponding to a saturated solution. Constant agitation was not employed.

At the higher concentrations the amount of naphthalene which just dissolved was determined.

t°.	Gms. per 100 gms. sat. sol. HCOOH.	Gms. per 100 gms. sat. sol. $C_{10}H_8$.	t°.	Gms. per 100 gms. sat. sol. HCOOH.	Gms. per 100 gms. sat. sol. $C_{10}H_8$.
0.......	76.6	0.106	25......	56.2	0.089
0.......	84.5	0.188	25......	67.8	0.168
0.......	92.2	0.331	25......	81.0	0.400
0.......	97.7	0.477	25......	91.6	0.715
			25......	97.0	1.185

SOLUBILITY IN ACETIC AND OTHER ACIDS. (Timofeew, 1894.)

Acid.	t°.	Gms. $C_{10}H_8$ per 100 Gms. Acid.	Acid.	t°.	Gms. $C_{10}H_8$ per 100 Gms. Acid.
Acetic Acid	6.75	6.8	Isobutyric Acid	6.75	12.3
" "	21.5	13.1	Propionic Acid	6.75	13.9
" "	42.5	31.1	" "	21.5	23.4
" "	51.3	53.5	" "	50	79.8
" "	60	111	Valeric Acid	6.75	9.5
Butyric Acid	6.75	13.6	" "	21.5	17.7
" "	21.5	22.1	" "	65	167.4
" "	60	131.6			

SOLUBILITY OF NAPHTHALENE IN AQUEOUS SOLUTIONS OF ACETIC ACID

(Christiansen, 1918.) See Note above

t°.	Gms. per 100 gms. sat. sol. CH_3COOH.	Gms. per 100 gms. sat. sol. $C_{10}H_8$.	t°.	Gms. per 100 gms. sat. sol. CH_3COOH.	Gms. per 100 gms. sat. sol. $C_{10}H_8$.
0°	71.4	0.482	25°	68.7	0.967
0	81.1	1.2	25	74.3	1.57
0	87.0	1.92	25	79.4	2.42
0	89.9	2.58	25	84.2	3.59
25	39.7	0.098	25	84.7	4.81
25	47.5	0.195	25	86.7	6.07
25	56.5	0.39	25	86.9	7.3
25	60.1	0.486	25	86.3	12.3

SOLUBILITY OF NAPHTHALENE IN AQUEOUS SOLUTIONS OF BUTYRIC ACID.

(Christiansen, 1918.)

t°.	Gms. per 100 gms. sat. sol. C_3H_7COOH.	Gms. per 100 gms. sat. sol. $C_{10}H_8$.	t°.	Gms. per 100 gms. sat. sol. C_3H_7COOH.	Gms. per 100 gms. sat. sol. $C_{10}H_8$.
0°	75.3	4.12	25°	65.1	6.07
0	84.3	8.27	25	75.0	14.38
0	86.9	9.67	25	76.0	15.49
25	55.3	4.07	25	76.1	20.7

SOLUBILITY OF NAPHTHALENE IN AQUEOUS SOLUTIONS OF PROPIONIC ACID.

(Christiansen, 1918.)

t°.	Gms. per 100 gms. sat. sol. C_2H_5COOH.	Gms. per 100 gms. sat. sol. $C_{10}H_8$.	t°.	Gms. per 100 gms. sat. sol. C_2H_5COOH.	Gms. per 100 gms. sat. sol. $C_{10}H_8$.
0°	69.1	1.5	25°	58.7	1.5
0	78.6	3.0	25	67.3	3.0
0	86.6	6.0	25	74.3	6.0
0	89.6	9.97	25	80.0	10.92
25	26.9	0.1	25	80.4	16.3

SOLUBILITY OF NAPHTHALENE IN AQUEOUS SOLUTIONS OF ALCOHOLS.

(Christiansen, 1918.) See Note on preceding page.

Aq. Methyl Alcohol.

t°.	Gms. per 100 gms. sat. sol. CH_3OH.	$C_{10}H_8$.
0° ...	80.7	0.91
0 ...	86.87	1.83
0 ...	95.32	3.72
0 ...	100	4.1
25 ...	43.10	0.11
25 ...	56.5	0.34
25 ...	65.1	0.75
25 ...	69.52	1.18
25 ...	79.2	2.4
25 ...	86.5	4.55
25 ...	90.86	8.77
25 ...	91.0	8.84
25 ...	100	9.9

Aq. Ethyl Alcohol.

t°.	Gms. per 100 gms. sat. sol. C_2H_5OH.	$C_{10}H_8$.
0° ...	51.4	0.235
0 ...	74.3	1.183
0 ...	88.6	2.89
0 ...	93.6	4.08
0 ...	100	4.90
25 ...	29.7	0.04
25 ...	34.1	0.108
25 ...	39.1	0.167
25 ...	41.4	0.225
25 ...	47.7	0.446
25 ...	58.2	1.14
25 ...	63.8	1.62
25 ...	72.9	2.83
25 ...	79.5	4.42
25 ...	88.6	9.50
25 ...	100	11.8

Aq. Propyl Alcohol.

t°.	Gms. per 100 gms. sat. sol. C_3H_7OH.	$C_{10}H_8$.
25° ...	23.7	0.105
25 ...	27.4	0.214
25 ...	33.7	0.432
25 ...	45.1	1.11
25 ...	58.8	2.28
25 ...	69.7	3.61
25 ...	80.4	5.81
25 ...	85.5	7.84
25 ...	100	11.97

100 gms. 95% formic acid dissolve 0.30 gm. naphthalene at 18.5°. (Aschan, 1913.)
100 gms. 95% formic acid dissolve 3.44 gms. α nitronaphthalene at 18.5°. "

Data for equilibrium in the systems: naphthalene, phenol, water and naphthalene, succinic acid nitrile, water, determined by the synthetic method, are given by Timmermans (1907).

EQUILIBRIUM IN THE SYSTEM NAPHTHALENE, ACETONE, WATER.

(Cady, 1898.)

An excess of naphthalene was added to each of a series of mixtures of water and acetone and the temperature determined at which a second liquid phase first appeared. Since an excess of naphthalene was present, the amount dissolved was not known. The following supplementary experiment was, therefore, required to ascertain the composition of the saturated solution in each case. "A weighed quantity of naphthalene was added to a known weight of the mixed liquids, the amount being just sufficient to cause the formation of two liquid phases. The consolute temperature of the system was then determined and the experiment repeated several times with different amounts of naphthalene. If the results are plotted, using the weights of naphthalene in a constant quantity of the mixed liquids as abscissas and the temperatures as ordinates, we shall get a series of curves. The composition of the liquid phase at the moment when the system passes from solid, solution and vapor to solid, two solutions and vapor is given by the point at which the prolongation of the curve for that particular mixture of acetone and water, cuts the ordinate for temperature at which the change takes place. This method requires no analysis and is of advantage in this case where ordinary quantitative analysis would be very difficult." Considerable difficulty was experienced in determining the consolute temperatures. It was necessary on account of the extreme volatility of the acetone to seal the mixtures in tubes.

The table of results, calculated with the aid of the determinations made as described above, is given on the following page.

TABLE SHOWING THE TEMPERATURES AT WHICH SOLUTIONS OF THE GIVEN COMPOSITIONS BEGIN TO SEPARATE INTO TWO LAYERS IN PRESENCE OF SOLID NAPHTHALENE.

(Cady, 1898.)

(Calculated as described on preceding page.)

t°.	Gms. per 100 Gms. Solution: Acetone.	Water.	Naphthalene.
65.5	10	89.92	0.08
53.3	19.91	80	0.09
45	29.92	69.67	0.41
38	40.81	58.22	0.97
32.2	48.67	48.68	2.65
28.5	57.43	36.64	5.93
28.2	60.43	25.75	13.82

The isotherms for intervals of 10° lie so close together that they are practically indistinguishable for the greater part of their length.

SOLUBILITY OF NAPHTHALENE IN AQUEOUS AMMONIA.

(Hilpert, 1916.)

Solvent.	Gms. $C_{10}H_8$ per 1000 Gms. Solvent at 0°.	25°.
Aq. 5% NH_3	0.030	0.044
Aq. 10% NH_3	0.042	0.074
Aq. 25% NH_3	0.064	0.102
100% NH_3	33	120
Aq. 2% Pyridine	0.082	0.245

DISTRIBUTION OF NAPHTHALENE BETWEEN METHYL ALCOHOL AND VASELINE AT 30°.

(Konakewitch, 1930.)

Gm. Mols. $C_{10}H_8$ per 1000 gms. $CH_3OH(1)$	Vaseline(2)	$\frac{1}{2}$
0.320	0.372	0.86
0.436	0.513	0.85

Results are also given showing the effect of the presence of LiBr, LiI, NaI, KI, CdI_2, $HgBr_2$ and $HgCl_2$ upon the above distribution.

SOLUBILITY OF NAPHTHALENE IN METHYL ALCOHOL.

(Speyers, 1902; Ward, 1926.)

In the following table the densities are taken from a curve plotted from the results of Speyers and the solubilities from a curve plotted from the results of Ward.

t°.	d of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. CH_3OH.	t°.	d of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. CH_3OH.
0	0.8194	4.00	60	0.837	61.0
10	0.812	5.6	65	0.870	120.0
20	0.807	8.5	67.5	0.902	205
25	0.805	10.0	70	—	460
30	0.804	12.0	71	—	630
40	0.805	18.0	72	—	900
50	0.813	30.5	73	—	1200
55	0.82	41.5	74	—	

SOLUBILITY OF NAPHTHALENE IN ETHYL ALCOHOL AND IN PROPYL ALCOHOL.

(Speyers, 1902.)

Results for Ethyl Alcohol.

t°.	d of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. C_2H_5OH.
0.....	0.8175	5.1
10.....	0.814	7.6
20.....	0.810	10.2
25.....	0.809	11.6
30.....	0.809	13.4
40.....	0.812	18.0
50.....	0.822	27.0
60.....	0.855	80.0
65.....	0.890	125.0
70.....	0.930	500.0

Results for Propyl Alcohol.

t°.	d of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. C_3H_7OH.
0.......	0.8285	4.55
10.......	0.824	5.9
20.......	0.821	8.5
25.......	0.820	10.0
30.......	0.820	12.0
40.......	0.823	17.5
50.......	0.837	35.0
60.......	0.867	100
65.......	0.897	160
68.5.....	0.933	361

SOLUBILITY OF NAPHTHALENE IN NORMAL BUTYL ALCOHOL AND IN CARBON TETRACHLORIDE. (Ward, 1926.)

Results for Normal Butyl Alcohol.

t°.	Gms. $C_{10}H_8$ per 100 gms. $CH_3(CH_2)_2CH_2OH$	t°.	Gms. $C_{10}H_8$ per 100 gms. $CH_3(CH_2)_2CH_2OH$
11.7...	7.28	56.9...	65.80
22.0...	10.54	63.2...	131.6
24.3...	11.44	68.1...	269.2
31.6...	15.43	70.1...	402.2
35.6...	18.23	71.7...	552.5
46.5...	32.26	73.9...	887.6
52.3...	46.33	76.0...	1630.0

Results for Carbon Tetra Chloride.

t°.	Gms. $C_{10}H_8$ per 100 gms. CCl_4.	t°.	Gms. $C_{10}H_8$ per 100 gms. CCl_4.
0.4...	11.3	39.5..	53.08
6.0...	13.9	46.9..	75.18
13.0...	17.96	58.3..	142.6
19.5...	23.12	64.8..	226.0
28.2...	32.74	72.4..	503.4

SOLUBILITY OF NAPHTHALENE IN SEVERAL ALCOHOLS.

(Hunter, 1930.)

The determinations were made by the synthetic method. The apparatus and precautions necessary to obtain accurate results are described.

Results for :

Methyl Alcohol CH_3OH		Ethyl Alcohol C_2H_5OH		n Propyl Alcohol C_3H_7OH		iso Propyl Alcohol $CH_3CHOHCH_3$	
t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.
37.6	11.45	15.7	7.73	22.9	9.62	24.4	7.597
40.1	14.81	25.8	11.26	27.9	11.43	30.9	9.936
47.8	19.81	35.2	14.97	36.0	15.59	37.8	13.61
48.9	19.98	41.1	20.09	41.7	19.44	45.2	19.36
57.4	31.32	47.0	23.60	49.8	27.49	51.7	27.30
57.9	32.21	57.1	38.16	53.8	33.71	54.9	33.02
58.4	31.24	64.0	54.30	59.3	45.22	60.2	46.26
68.6	71.94	67.7	73.28	66.9	70.20	63.8	66.07
				69.5	79.88	69.9	81.27

SOLUBILITY OF NAPHTHALENE IN SEVERAL ALCOHOLS (Con.)

Butyl Alcohol $CH_3(CH_2)_2CH_2OH$		Iso Butyl Alcohol $(CH_3)_2CHCH_2OH$		Sec. Butyl Alcohol $CH_3CH_2CHOHCH_3$		Tert. Butyl Alcol $(CH_3)_3COH$	
t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol
34.7	15.19	19.5	6.37	28.7	10.82	31.6	10.77
47.6	25.49	36.3	12.76	34.9	14.35	37.8	14.49
57.8	41.83	40.9	15.57	40.5	18.63	47.3	23.61
68.4	74.27	50.4	24.88	46.4	25.03	50.2	27.76
		60.3	45.09	57.3	45.35	57.8	43.61
		63.1	54.10	60.6	54.05	62.4	57.31
		70.2	80.83	68.8	73.06	66.6	71.64

SOLUBILITY OF NAPHTHALENE IN CHLOROFORM. (Speyers, 1902)

t°.	d of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. $CHCl_3$.	t°.	d of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. $CHCl_3$
0	1.393	26.12	35		80
10	1.355	31.0	40	1.205	94
20	1.300	45.0	45		112.0
25	1.280	54.0	50	1.150	132.0
30	1.255	66	55		158.0

SOLUBILITY OF NAPHTHALENE IN ACETONE, ACETIC ACID AND IN ANILINE.

(Ward, 1926.)

The determinations were made by the synthetic method. The results are given in terms of the weights of the ingredients of each mixture used for the determination. These have been calculated to grams of naphthalene per 100 gram of each solvent.

Results for Acetone.		Results for Acetic Acid.		Results for Aniline.	
t°.	Gms. $C_{10}H_8$ per 100 gms. CH_3COCH_3.	t°.	Gms. $C_{10}H_8$ per 100 gms. CH_3COOH	t°.	Gms. $C_{10}H_8$ per 100 gms $C_6H_5NH_2$
6.3	32.0	15.6	9.74	0.6	10.27
14.3	43.4	23.5	13.14	10.6	13.5
24.2	64.9	29.0	16.79	12.9	16.9
32.6	94.4	36.5	24.21	22.0	25.0
39.3	127.4	45.2	37.33	29.9	36.14
47.2	191.2	50.4	51.84	37.4	52.73
52.9	258.7	59.6	110.3	50.8	112.2
58.5	364.5	64.9	194.5	60.8	230.4
62.7	496.7	68.3	297.0	65.4	340.5
67.2	738.9	75.1	958.5	74.4	1014.0
69.5	926.0				

SOLUBILITY OF NAPHTHALENE IN CARBON TETRACHLORIDE AND IN CARBON DISULFIDE.

(Schroder, 1893; Arctowski, 1895.)

t^0	Gms. $C_{10}H_8$ per 100 gms. sat. sol. in CCl_4	Gms. $C_{10}H_8$ per 100 gms. sat. sol. in CS_2	t^0	Gms. $C_{10}H_8$ per 100 gms. sat. sol. in CCl_4	Gms. $C_{10}H_8$ per 100 gms. sat. sol. in CS_2
-108	—	0.62	20	20.0	36.3
- 82	—	1.38	25	23.0	41.0
- 50	—	2.3	30	26.5	46.0
- 30	—	6.6	40	35.5	57.2
- 10	—	14.1	50	47.5	67.6
0	9.0	19.9	60	62.5	79.2
+ 10	14.0	27.5	70	80.0	90.3

SOLUBILITY OF NAPHTHALENE IN MIXTURES OF ETHER AND CHLOROFORM AND OF ETHER AND CARBON DISULFIDE AT 25°.

(Mahieu, 1936.)

Results for mixtures of:

$(C_2H_5)_2O + CHCl_3$		$(C_2H_5)_2O + CS_2$	
Gms. $(C_2H_5)_2O$ per 100 gms. Mixed Solvent	Gms. $C_{10}H_8$ per 100 gms. Solvent	Gms. $(C_2H_5)_2O$ per 100 gms. Mixed Solvent	Gms. $C_{10}H_8$ per 100 gms. Solvent
0.0	55.4	0.0	67.4
24.6	44.3	26.7	77.6
49.7	42.0	53.8	79.4
76.4	51.6	76.4	72.9
100.0	56.8	100.0	56.8

SOLUBILITY OF NAPHTHALENE IN ETHYLENE AND ETHYLIDENE CHLORIDES AND BROMIDES.

(Sunier and Rosenblum, 1928.)

The determinations were made by the synthetic method observing the precautions described by Ward, 1926. The results were plotted and the following values for regular intervals of temperature were taken from the curves.

t^0	Gm. Mols. $C_{10}H_8$ per 100 gm. mols. sat. solution in: Ethylene Chloride $C_2H_4Cl_2$	Ethylene bromide $C_2H_4Br_2$	Ethylidene Chloride CH_2CHCl_2	Ethylidene bromide CH_2CHBr_2
20	—	26.2	—	28.6
25	31.8	30.2	—	32.4
30	36.0	34.4	35.0	36.6
35	40.5	38.9	39.1	40.9
40	45.2	43.9	43.7	45.6
45	50.3	49.3	48.8	50.6
50	56.0	55.2	54.5	56.2
55	62.0	61.5	60.8	62.1
60	68.6	68.2	67.4	68.5
65	75.6	75.2	74.5	75.5

SOLUBILITY OF NAPHTHALENE IN SEVERAL DERIVATIVES OF FURFURAL.

(Hunter, 1931.)

The determinations were made by the synthetic method, the results plotted and the following values taken from the curves. The b. pts. of the solvents are at 25 mm pressure.

t°	Gm. Mols. $C_{10}H_8$ per 100 gm. mols. sat. solution in:					
	Furfuryl Alcohol $C_4H_3OCH_2OH$ (b. pt. 75-6°)	Furfuryl Acetate $C_4H_3OCH_2OOCCH_3$ (b. pt. 84-5°)	Methyl Furoate $C_4H_3O.COOCH_3$ (b.pt. 83-4°)	Ethyl Furoate $C_4H_3OCOOC_2H_5$ (m.pt. 30-3°)	n Propyl Furoate $C_4H_3OCOOC_3H_7$ (b.pt. 106-7)	n Butyl Furoate $C_4H_3OCOOC_4H_9$ (b.pt. 118-20°)
20	7.28	19.9	19.2	24.6	26.0	27.2
25	8.49	23.3	22.7	28.1	29.7	30.9
30	10.48	27.2	26.7	32.1	33.8	35.1
35	11.94	31.6	31.3	36.5	37.9	37.9
40	14.46	36.7	36.6	41.5	43.0	44.5
45	17.58	42.5	42.5	47.1	48.3	49.8
50	21.9	49.1	49.1	53.1	54.3	55.5
55	27.5	56.5	56.5	59.7	60.7	61.8
60	35.2	64.4	64.4	66.8	67.8	68.4
65	47.4	72.6	72.6	74.7	75.0	75.3
75	85.7	90.0	90.0	90.8	91.0	91.3

SOLUBILITY OF NAPHTHALENE IN SEVERAL ORGANIC ETHERS AND OXIDES.

(Bennett and Philip, 1928.)

Solvent	Formula	t°	Gm. Mols. $C_{10}H_8$ per 100 gm. mols. sat. solution
Di n butyl ether	$(C_4H_9)_2O$	42.6	37.73
" " " "	"	45.7	41.53
" " " "	"	52.9	50.78
Ethyl n Propyl Ether	$C_2H_5.O.C_3H_7$	29.9	27.08
" " "	"	39.7	36.50
" " "	"	42.3	39.36
Ethyl iso Propyl Ether	$C_2H_5.O.CH(CH_3)_2$	43.9	40.26
" " "	"	52.3	51.16
Penta methylene oxide	$O(CH_2)_4CH_2$	20.4	34.21
" " "	"	30.1	37.05
" " "	"	40.2	46.08
ββ' Di methyl tri methylene oxide	$CH_2C(CH_3)_2CH_2O$	29.2	34.60
" " " " "	"	38.9	41.73
αα' Dimethyl tri methylene oxide	$CH_2CH_2C(CH_3)_2O$	33.8	30.10
" " " "	"	39.9	40.87
" " " "	"	44.7	45.57
αα' Methyl ethyl ethylene oxide	$CH_2C(CH_3)(C_2H_5)O$	27.4	32.56
" " " " "	"	38.2	42.23
" " " " "	"	46.6	50.52

SOLUBILITY OF NAPHTHALENE IN BENZENE, IN CHLORBENZENE AND IN NITROBENZENE. (Ward, 1926.)

Results for Benzene.

t°.	Gms. $C_{10}H_8$ per 100 gms. C_6H_6.	t°.	Gms. $C_{10}H_8$ per 100 gms. C_6H_6.
0.....	28.0	40.....	121
5.....	33.0	45.....	148
10.....	39.0	50.....	194
15.....	47.0	55.....	255
20.....	56.0	60.....	340
25.....	67.5	65.....	470
30.....	81.5	70.....	750
35.....	100.0		

Results for Chlor Benzene.

t°.	Gms. $C_{10}H_8$ per 100 gms. C_6H_5Cl.
4.2....	23.87
8.8....	29.88
22.1....	47.04
29.4....	60.96
42.8....	102.3
49.0....	133.9
62.6....	286.5

Results for Nitrobenzene.

t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_5NO_2$.
2.9....	20.01
13.8....	29.29
24.0....	42.46
45.3....	99.24
60.2....	219.1
65.3....	313.4
71.8....	598.8

The above results in chloro benzene were used by Ward, 1934 to verify calculations of the ideal solubility of naphthalene.

SOLUBILITY OF NAPHTHALENE IN HEXANE AND IN TOLUENE.

Results for Hexane (¹).

t°	Gms. $C_{10}H_8$ per 100 gms. $CH_3(CH_2)_4CH_3$.	t°	Gms. $C_{10}H_8$ per 100 gms. $CH_3(CH_2)_4CH_3$.
8.7.....	9.83	49.6.....	76.10
14.8.....	12.80	49.5.....	76.47
19.5.....	15.68	53.7.....	105.6
27.7.....	22.60	57.9.....	148.1
28.5.....	23.14	58.4.....	153.8
30.8.....	25.90	62.3.....	218.9
32.2.....	28.15	64.6.....	288.1
36.1.....	34.50	69.1.....	511.1
38.0.....	37.94	69.4.....	523.5
42.3.....	48.68	72.5.....	817.4
45.8.....	59.84		

Results for Toluene (²).

t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_5CH_3$.
—15.......	15
0.......	25
10.......	34
20.......	48
25.......	58
30.......	75
35.......	83
40.......	102
45.......	129
50.......	163
55.......	210
60.......	260
67.4.....	389

(¹) Ward, 1926. (²) Ward, 1926; Rhodes and Eisenhauer, 1927.

The previous results of Speyers, 1902, for the solubility of naphthalene in Toluene, are lower than the above values of Ward and Rhodes and Eisenhauer.

SOLUBILITY OF NAPHTHALENE IN BENZENE, IN TOLUENE AND IN XYLENE.
(Schlapfer and Flacks, 1927.)

Results for:

Benzene		Toluene		Xylene (technical)	
t°	Gms. $C_{10}H_8$ per 100 gms. C_6H_6	t°	Gms. $C_{10}H_8$ per 100 gms. $C_6H_5CH_3$	t°	Gms. $C_{10}H_8$ per 100 gms. $C_6H_4(CH_3)_2$
-5.0	26.85	-26.0	10.15	-26	2.77
0	30.02	-19.0	13.27	-18.0	6.90
5.2	34.0	-9.0	17.65	-14.0	9.29
9.2	38.57	0	23.55	- 4.0	15.50
16.0	49.25	5.2	27.02	0	18.92
21.0	59.25	9.2	31.62	6	24.05

SOLUBILITY OF NAPHTHALENE IN XYLENE.

(Rhodes and Eisenhauer, 1927.)

The temperatures of appearance of the first crystal and of disappearance of the last crystal in known mixtures of naphthalene and xylene were accurately determined and the mean taken as the temperature of solubility. The xylene was a mixture of *m* and *p* xylene practically free of *o* xylene.

t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_4(CH_3)_2$ *m* and *p*.	t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_4(CH_3)_2$ *m* and *p*.	t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_4(CH_3)_2$ *m* and *p*.
−22.0	5.0	6.0	25.0	35.0	70.0
−13.0	10.0	11.2	30.0	38.4	80.0
− 6.0	15.0	19.5	40.0	41.4	90.0
+ 0.4	20.0	25.6	50.0	44.7	100.0
		30.6	60.0		

Similar results are given for the solubility of naphthalene in refined heavy solvent naphtha and heavy coal tar oil. Data for the effect of cresol and of quinoline upon the solubility of naphthalene in heavy solvent naphtha and heavy coal tar oil are also given.

SOLUBILITY OF NAPHTHALENE IN TETRACHLOR ETHANE UNDER HIGH PRESSURES, AT 30°.

(Cohen, de Meester and Moesveld, 1924-1925.)

Pressure in atmospheres.	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	Pressure in atmospheres.	Gms. $C_{10}H_8$ per 100 gms. sat. sol.
0	35.07	750	23.33
250	30.26	1000	20.89
500	26.40		

100 gms. Methyl Formate dissolve 33.9 gms. Naphthalene at 25°. (Kröber, 1919).

100 gms. Para Cymene (b. pt. 176-176.5) dissolve 14.22 gms. Naphthalene at 30° (Wheeler, 1920.)

100 gms. Quinoline dissolve 3.02 gms. Naphthalene at 20-25° (Pucher and Dehn, 1921.)

100 gms. Equimol mixture of Quinoline and Ethyl alcohol dissolve 4.69 gms. naphthalene at 20-25°. (Pucher and Dehn, 1921.)

Data for the solubility and vapor pressures of naphthalene in (1) fresh wash oil (2) used oil after steam distillation and (3) still residues, are given by Hunte and Pippig, 1923. The results are of interest chiefly in the illuminating gas industry.

SOLUBILITY OF NAPHTHALENE IN TETRALIN AND IN OTHER SOLVENTS.

(Weissenberger, 1927.)

Results for:

Tetralin (1,2,3,4-Tetrahydro naphthalene $C_{10}H_{12}$)		Decalin (Decahydro naphthalene $C_{10}H_{18}$)		Hexalin (Cyclohexanol, $C_6H_{11}OH$)		Methyl hexalin (Methyl cyclohexanol $CH_3C_6H_{10}OH$)	
t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	t°	Gms. $C_{10}H_8$ per 100 gms. sat. sol.
−14	10	10	10.3	10	5.1	10	3.9
− 6	15	20	20.3	20	11.7	20	8.8
+ 1	20	30	30.4	30	19.4	30	15.3
13	30	40	42.1	40	27.9	40	25.4
23	40	48	76.5	50	35.4	45	41.2
30	50						
36	60						

Experiments upon the solubility of naphthalene vapor in tetra hydro naphthalene and in gas oil, made by an aspiration method, are described by Mauras, 1937.

RECIPROCAL SOLUBILITY OF NAPHTHALENE AND:

(Hammick and Hellican, 1938.)

Tri nitro mesitylene				Tri chloro tri nitro benzene	
t°	Gm. Mol. $C_{10}H_8$ per 100 gm. mol. sat. solution	Solid Phase	t°	Gm. Mol. $C_{10}H_8$ per 100 gm. mol. sat. solution	Solid Phase
232	0.0	$C_6(CH_3)_3(NO_2)_3$	187.0	0.0	$C_6H_2Cl_3(NO_2)_3$
229	10	"	183.0	7.0	"
220.7	20	"	171.2	20.0	"
216.5	27	"	158.3	31.0	"
205.2	37	"	149.8	37.0	"
192.5	49	"	135.0	48.0	" + 2.1
177.0	60	"	134.2	51.0	2.1
160	71	"	130.0	55.0	"
135.5	81	"	127.2	59.0	"
122.0	84	"	108.9	71.0	"
95.3	90	"	89.0	80.0	"
78.5	98	$C_{10}H_8$	74.3	90	$C_{10}H_8$
80.0	100		80.0	100	

2.1 = $2(C_6H_2Cl_3NO_2).C_{10}H_8$.

SOLUBILITY OF NAPHTHALENE IN LIQUID CARBON DIOXIDE.

(Buchner, 1905–06.) (Synthetic Method used.)

Crit. Temp.	Gms. $C_{10}H_8$ per 100 Gms. Sat. Sol.
34.8	8
64	54
80	100

SOLUBILITY OF NAPHTHALENE IN LIQUID CARBON DIOXIDE.

(Quinn, 1928a.)

The determinations were made in sealed tubes having two arms which permitted separating the saturated solution from the excess of $C_{10}H_8$. The volume of saturated solution was determined by graduations on the tube and the amount of $C_{10}H_8$ weighed after allowing the CO_2 to escape. The densities were determined in a specially disigned tube.

t°	Density of liquid CO_2	Density of sat. sol.	Gms. $C_{10}H_8$ per 1.0 gm. mol. CO_2 (= 44 gms.)	Gm. Mols. $C_{10}H_8$ per 100 gm. mols. sat. sol.
-21	1.031(-21°)	1.040(-21°)	0.231	0.180
0	0.927	0.938	0.479	0.372
+10	0.858	0.872	0.658	0.511
20	0.770	0.790	0.854	0.662
25	0.710	0.740	0.901	0.698

100 gms. sat. solution of naphthalene in liquid sulfur dioxide contain about 23 gms. $C_{10}H_8$ at ? t°. (DeCarli, 1927.)

$C_{10}H_8$

NAPHTHALENE

Freezing-point data are given for mixtures of Naphthalene and:

Amino phenols(4)
Benzene(7)(34)(49)
Benzil(5)
Benzilic acid(5)
Benzoic acid(15)(39)
Benzoic acid phenyl ester(5)
Benzoin(5)
Bi benzyl(24)
Bi phenyl(24)
Bromo naphthalene(16)
Camphene(65)
Camphor(11)(13)
Chlor acetic acid(26)(27)(57a)
Chlor acetic acid + phenol(26)
Chloro naphthalene(16)
Chloro nitro benzene(21)
Cineole(3)
Cresols(41)
Cyclohexane(25)
Di nitro benzenes(17)(21)(18)(23)(32)(36)(38)(46)
Di nitro phenol(47)
Dinitro toluene (21)(18)
Di acetyl tartrate(35)(45)
Di chloro benzene(30)
Di phenyl amine(44)(51)
" " " + benzene(7)
Di phenyl methane(29)
Di hydro naphthalene(56)
Ethylene bromide(2)(9)
Fluoro naphthalene(16)
Guaiacol(40)
Hydroquinone(19)
Iodoform(50)
Menthol(45)
Naphthol(43)(12)(55)(56)(51)(57)
Naphthol + benzene(7)
Naphthylamine(43)(11)(51)
Nitraniline(64)
Nitro benzene(18)(23)
Nitro naphthalene(6)(33)(35)
Nitro phenol(42)(18)(47)
Nitro mannitol(48)
Nitro penta erythritol(48)
Nitro toluenes(8)
Phthalic anhydride(53)
Phenanthrene(31)(51)(29)
Picric acid(18)(42)(52)
Phenol(6)(28)(59)(60)
" + chlor acetic acid (26)
Picryl chloride(10)(14)
Pyrocatechol(42)(19)
Pyridine(60)
Picramide(14)
Phenylene diamine(4)
(Palmitic acetic ester (58)
Paraffine(15)
Quinone(22)
Resorcinol(51)(19)
Salicylic acid(5)
Salol(1)
Styphnic acid(14)
Tetryl(15)
Toluidine(51)
Tri chlor acetic acid (17)
Tri nitro benzene(18)(23)
Tri nitro cresol(47)
Tri methyl carbinol(20)
Tri phenyl carbinol(20)
Tri nitro m xylene(15)
Tri nitro phenol(31)
Tri nitro aniline(10)
Tri nitro toluene(10)(18)
Thymol(6)(61)
Urea(17)
Urethan(54)
Stearic acid(62)
Sulfur(63)

(1) Angelletti, 1928; (2) Baud, 1912; (3) Bellucci and Grassi, 1913; (4) Bernoulli and Latter, 1933; (5) Bernoulli and Sarasin, 1930; (6) Bernoulli and Veillon, 1932; (7) Bruni, 1898; (8) Crockford and Simmons, Jr., 1933; (9) Dahms, 1895; (10) Grimm, Gunther and Titus, 1931; (11) Girard, 1891; (12) Hrynakowski and Szmyt, 1935e; (13) Journiaux, 1912; (14) Jefremow, 1918; (15) Jefremow and Tichomirowa, 1928; (16) Klemm, Klemm and Schiemann, 1933; (17) Kitran, 1924; (18) Kremann, 1904; (19) Kremann and Janetzky, 1912; (20) Kremann, Mauermann, Muller II and Rösler, 1922; (21) Kremann and Rodenis, 1906; (22) Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922; (23) Kurnakov, Krotkov and Oksman, 1915; (24) Lee and Warner, 1935; (25) Linard, 1925; (26) Mameli and Mannessier-Mameli, 1933; (27) Mameli and Mannessier; 1913; (28) Migliacci and Garuili, 1927; (29) Miolati, 1892; (30) Morris and Cook, 1935; (31) Milone and Rossignolli, 1932; (32) Olivari, 1911; (33) Pascal, 1920; (34) Pickering, 1893; (35) Palazzo and Battelli, 1883; (36) Puschin, 1926a; (37) Puschin and König, 1928; (38) Puschin and Rikovski, 1930; (39) Puschin and Wilowitsch, 1925; (40) Puschin and Vaic, 1927; (41) Rhodes and Hance, 1921; (42) Rheinboldt, Henning and Kirscheisen, 1925; (43) Rheinboldt and Kirscheisen, 1926; (44) Roloff, 1895; (45) Scheuer, 1910; (46) Skau, 1930; (47) Saposchinikow and Gelvich, 1903, 1904; (48) Urbanski, 1933; (49) Washburn and Read, 1915; (50) Wassilijew, 1916; (51) (51) Vignon, 1891; (52) de Gee, 1916; (53) Monroe, 1919; (54) Vasilev, 1917; (55) Crompton & Whiteby, 1895; (56) Küster, 1895; (57) Miers and Isaac, 1908a; (57a) Miers and Isaac, 1908; (58) Battelli and Martinetti, 1885; (59) Yamamoto, 1908; (60) Hatcher

BROMO NAPHTHYLAMINE $C_{10}H_6BrNH_2$.

Freezing-point data are given for mixtures of:

1 Bromo -2- naphthylamine	+ Picric acid	(Hertel and Mischinat, 1926.)
" -4- "	+ 1,2,6 Dinitro phenol	" "
" -4- "	+ " " "	(Hertel and Van Cleef, 1928.)
4 " -1- "	+ Tri nitro anisole	(Hertel and Römer, 1930.)
4 " -1- "	+ α[2,4,6-Tri nitro-phenoxy]-propionic ethyl ether	" " " "

BIPYRIDYL $(C_5H_5N)_2$.

Freezing-point data are given for mixtures of bipyridyl and tri nitro benzene. (Smith and Watts, 1910.)

β NAPHTHOL $C_{10}H_7OH$.

SOLUBILITY IN WATER.

t°.	Gms. β $C_{10}H_7OH$ per 100 cc. Sat. Sol.	Authority.
12.5	0.044	(Kuriloff, 1897.)
25.1	0.074	(Küster, 1895.)
29.5	0.0876	(Kuriloff, 1898.)

Data for the solubility of isomorphous mixtures of β naphthol and naphthalene in water at 25.1° are given by Küster (1895).

SOLIDIFICATION TEMPERATURES OF MIXTURES OF β NAPHTHOL AND SALOL.
(Bellucci, 1912.)

t° of Solidification.	Gms β $C_{10}H_7OH$ per 100 Gms. Mixture.	t° of Solidification.	Gms. β $C_{10}H_7OH$ per 100 Gms. Mixture.
121.7	100	80	40
116.5	90	68	30
111	80	52.5	20
105	70	34 Eutec.	10
97.5	60	38.5	5
88	50	42	0

100 gms. C_6H_6 dissolve 4.13 gm. β Naphthol at 25°.
" " CCl_4 " 0.442 " " " " "

(Warren, 1933.)

$C_{10}H_8O_1$

SOLUBILITY OF β NAPHTHOL IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.

(Knox and Richards, 1919.)

Equiv. Normalities.		Equiv. Normalities.		Equiv. Normalities.	
HCl.	$C_{10}H_7OH$.	HCl.	$C_{10}H_7OH$.	HCl.	$C_{10}H_7OH$.
0.00	0.00524	4.344	0.00334	8.674	0.00307
1.466	0.00410	5.785	0.00319	11.47	0.00341
2.952	0.00360	7.122	0.00316		

SOLUBILITY OF β NAPHTHOL IN AQUEOUS SOLUTIONS OF PICRIC ACID AT 29°.

(Kuriloff, 1898.)

Mols. × 10^6 per 100 cc. Solution.		Gms. per 100 cc. Solution.		Solid Phase.
$C_6H_2.OH(NO_2)_3$.	$C_{10}H_7OH$.	$C_6H_2OH(NO_2)_3$.	$C_{10}H_7OH$.	
0	609	0	0.0877	β Naphthol
54	615	0.0124	0.0886	"
68.5	620	0.0157	0.0894	" + β Naphtholpicrate
69	607	0.0158	0.0875	β Naphtholpicrate
69	597	0.0158	0.0860	"
88	494	0.0212	0.0712	"
100	390	0.0229	0.0562	"
196	180	0.0449	0.0259	"
308	105	0.0706	0.0151	"
933	8	0.2138	0.0011	" + Picric Acid
928	0	0.2126	0	Picric Acid

Data are also given for the distribution of β naphthol between water and benzene. The mean of the conc. in C_6H_6 layer divided by conc. in H_2O layer is given as 67. The temperature is not given. The determination of the β naphthol was made by an iodine titration method.

The coefficient of distribution of β naphthol between H_2O and $CHCl_3$ at 25° is: conc. in H_2O ÷ conc. in $CHCl_3$ = 0.0171. (Marden, 1914.)

Data for the solubility of β naphthol, picric acid (naphthol picrate) and their mixtures in benzene, determined by the synthetic (sealed tube) method, are given by Kuriloff (1897a).

100 cc. 90% alcohol dissolve about 55 gms. β $C_{10}H_7OH$ at 15.5°. (Greenish and Smith, 1903.)

100 gms. 95% formic acid dissolve 3.11 gms. β $C_{10}H_7OH$ at 18.6°. (Aschan, 1913.)

NAPHTHOLS

Freezing point data are given for mixtures of Naphthols and:

Acetamide(23)
Acetanilide + Salicylic Acid(16)
Acetanilide + Urea(16)
Aceto phenone(36)
Anthracene(57)
Antipyrine(26)(50)
Aniline(28)
Amino phenols(28)
Azobenzene(40)
Benzoic acid(3)
Benzal acetophenone(45)
Benzhydrol(27)
Benzamide(23)
Benzo phenone(32)
Carbazole(31)
Camphor(11)
Chalcone(46)
Chloro naphthalene(15)
Cinnamic aldehyde(39)
Cineole(4)
Cyclic oxide from methyl diphenate(7)
Chlor acetic acid(44)
Cinnamic acid(33)
Di methyl amino benzo acetophenone(45)(46)
Di methyl amino-p methoxy aceto phenone(45)
Di methyl amino benzo phenone(45)(46)
Di methyl pyrone(20)
Di phenyl methane(25)
Di phenyl amine(34)(57)
Di nitro toluene(14)
Di nitro " + naphthols(56)
Di nitro benzene(14)
Di methyl oxalate(33)
Di anisol acetone(46)
Ethylene bromide(8)
Ethylene " + picric acid(8)
Ethyl oxalate(33)
Fenchon(24)
Iodo biphenyl(47)
Methylene dioxy chalcone(1)
" " . " + picric acid(1)
Methylene dioxy benzal aceto phenone(2)
Methyl naphthalene(54)
Naphthalene(10)(17)(41)(42)(51)(56)
Naphthols(57)(10)
" + Dinitro toluene(56)
Naphthylamine(57)(38)(18)(51)(52)
Nitro benzene + quinone(37)
Nitro benzaldehyde(12)(13)
Oxy benzaldehyde(29)
Phenyl tetra methyl tetra hydro pyran(7)
Phenol(43)
Phenylene diamine(38)
Phenyl acrylo phenone(45)
Picric Acid(1)(21)
Picric Acid + Ethylene bromide(8)
Quinone(37)
" + nitro benzene(37)
Resorcinol(57)
Sarcosine anhydride(48)
Salol(50)
Salicylic acid(9)(3)
" " + Acetanilide(16)
Salol + Sulfonal(5)
Styryl ketone(46)
Sulfonal(5)
Sulfonal + Salol(5)
Salicylic aldehyde(39)
Succinic acid(27)(33)
Succinimide(24)
Styphnic acid(19)
Toluidine(28)(38)(49)(57)
Tetra methyl-p-diamino benzo phenone(46)
Tetra methyl phthalan (7)
Tri chlor acetic acid (22)(21)
Tri nitro toluene(14)
Tri nitro phenol(2)
Tri phenyl carbinol(35)
Tri phenyl methane(30)
Urea(53)
" + acetanilide(16)

(1) Asahina, 1934a; (2) Asahina, 1934; (3) Bartholomew and Wark, 1926; (4) Bellucci and Grassi, 1913; (5) Bianchini, 1914; (7) Bennett and Wain, 1936; (8) Bruni, 1898; (9) Castiglioni, 1937; (10) Crompton and Whiteby, 1895; (11) Caille, 1909, 1910; (12) Dischendorfer, 1928; (13) Dischendorfer and Nesitka, 1928; (14) Giua and Marcellino, 1920; (15) Grimm, Gunther and Titus, 1931; (16) Hrynakowski and Szmyt, 1935c; (17) Hrynakowski and Szmyt, 1935b; (18) Hrynakowski and Szymt, 1934; (19) Jefremow, 1934; (20) Kendall, 1914; (21) Kendall, 1916; (22) Kitran, 1924; (23) Kremann and Auer, 1918; (24) Kremann and Dietrich, 1923; (25) Kremann and Fritsch, 1920; (26) Kremann and Haas, 1919; (27) Kremann and Drazil, 1924; (28) Kremann, Lupfer and Zawodsky, 1920; (29) Kremann and Pogantsch, 1923; (30) Kremann, Odelga and Zawodsky, 1921; (31) Kremann and Slovak, 1920; (32) Kremann and Zechner, 1918; (33) Kremann, Zechner and Drazil, 1924; (34) Kremann and Schadinger, 1919; (35) Kremann and Wlk, 1919; (36) Kremann and Marktl, 1920; (37) Kremann, Sutter, Sitte, Strzelba and Dobolzky, 1922; (38) Kremann and Stroschneider, 1918; (39) Kremann and Zechner, 1925; (40) Kremann, Zechner and Weber, 1924; (41) Küster, 1895; (42) Miers and Isaac, 1908a; (43) Migliacci and Garguilo, 1927; (44) Mameli and Coccini, 1923; (45) Pfeiffer, 1924; (46) Pfeiffer,

DIOXY NAPHTHALENES (Naphthalenediols) $C_{10}H_6(OH)_2$.

Freezing-point data for mixtures of Dioxy naphthalenes with Benzamide, Naphthylamines and Phenylene diamines are given by Kremann, Hemmelmayr and Riemer, 1922. Results for mixtures of Dioxy naphthalenes with succinimide are given by Kremann and Dietrich, 1924.

FURFURALIZINE $C_4H_3OCH:N\cdot N:CHC_4H_3O$

Freezing-point data for mixtures of Furfuralazine with Benzalazine and with Thiophenalazine are given by Pascal, 1914.

β NAPHTHALENE SULFONIC ACID $C_{10}H_7SO_3H$.

SOLUBILITY IN AQUEOUS HYDROCHLORIC ACID AT 30°.

(Masson, 1911.)

d_{30} of Sat. Solution.	Mols per Liter Sat. Sol.		Gms. per Liter Sat. Sol.	
	HCl.	$C_{10}H_7SO_3H$	HCl.	$C_{10}H_7SO_3H$.
1.1925	0	3.263	0	679
1.1653	1.291	2.470	47.08	514
1.1553	1.826	2.117	66.59	440.6
1.1115	4.017	0.762	146.5	158.0
1.1197	7.232	0.080	264.7	18.5
1.1569	9.88	0.063	360.4	13.1

SOLUBILITY OF α AND β NAPHTHYLAMINE SALTS OF NAPHTHALENE MONO AND DISULFONIC ACIDS, IN 0.01 NORMAL HYDROCHLORIC ACID. (Wales, 1922.)

The solutions were saturated by constant agitation in a thermostat for one day. Freshly prepared mixtures were used in all cases. The saturated solutions were analyzed by evaporation to dryness and weighing the residue. The author does not state clearly that 0.01 *n* HCl was used as solvent in all cases, but this is apparently the case since it is mentioned that the compounds hydrolyze in pure water and that 0.01 *n* HCl is necessary to prevent hydrolysis. Results are given for intervals of 5° between 25° and 98°.

	Grams each compound determined separately per 100 gms. solvent at					
	25°	35°	45°	55°	[illegible]	[illegible]
α Naphthylamine salt of:						
Naphthalene α Mono sulfonate.	0.3125	0.5007	0.7340	0.9733	1.368	2.028
" β "	0.2049	0.2985	0.4430	0.6043	0.8493	2.132
β Naphthylamine salt of:						
Naphthalene β Mono sulfonate.	0.0361	0.0736	0.1008	0.1434	0.2493	0.3667
" α " .	0.1735	0.2533	0.3985	0.6044	1.141	2.980
Ferrous salt of Naphthalene β Mono sulfonate.	0.3022	0.4233	0.6174	0.9171	1.393	2.882
α Naphthylamine salt of:						
Naphthalene 1.5 Di sulfonate.	0.0605	0.0853	0.1033	0.1363	0.2212	0.5010
" 1.6 " .	2.290	4.210	9.590	—	—	—
" 2.6 " .	0.517	0.7178	1.005	1.288	2.062	3.770
" 2.7 " .	0.8689	1.160	1.599	2.405	10.30	87.70
β Naphthylamine salt of:						
Naphthalene 1.5 Di sulfonate.	0.0727	0.0887	0.1233	0.1701	0.2561	0.4427
" 1.6 " .	0.2952	0.4934	0.6789	0.9546	1.852	4.019
" 2.6 " .	0.0296	0.0412	0.0594	0.0701	0.1093	0.2207
" 2.8 " .	0.1327	0.1917	0.2717	0.4241	0.6791	1.433

The Ferrous salt of naphthalene β mono sulfonate crystallized with 6 H_2O. The solubility results are in terms of the anhydrous compound. The solubility curve for α naphthylamine salt of naphthalene β sulfonate shows a break at 54°, and that for the α naphthylamine salt of naphthalene α sulfonate shows a break at 66°.

NAPHTALENE SULFONIC ACIDS.

SOLUBILITY OF BENZYL PSEUDO THIOUREA SALTS OF NAPHTHALENE MONO AND DISULFONIC ACIDS, IN 0.2 NORMAL HYDROCHLORIC ACID.

(Chambers and Scherer, 1924.)

The experiments were made to obtain data upon which methods for the analytical separation of naphthalene sulfonic acids might be based.

Gms. compound per liter of sat. sol. in 0.2 n.HCl.

t°.	Benzyl pseudo thio urea salt of Naphthalene : α monosulfonate	β monosulfonate.	1.5 disulfonate.	2.7 disulfonate.	2.6 disulfonate.
0.	4.4	0.2	0.03	0.7	0.7
10.	5.8	0.3	0.07	1.2	1.1
20.	7.7	0.5	0.16	2.2	1.6
30.	10.1	0.8	0.35	3.9	2.4
40.	13.5	1.2	0.77	6.6	3.7
50.	17.8	2.2	1.7	11.5	5.7
60.	23.5	3.5	3.6	20.0	8.8
70.	30.9	5.5	7.8	34.7	13.8
80.	40.4	8.6	16.8	59.4	20.4
90.	54.0	13.7	35.7	103.5	31.0
100.	70.0	21.6	77.6	177.8	47.3

PIPERONYL ACRYLIC ACID $C_{10}H_8O_4$.

One liter sat. solution in water contains 0.027 gm. piperonyl acrylic acid at 25°. One liter sat. solution of allo piperonyl acrylic acid contains 0.48 gm. at 25°. (Roth and Stoermer, 1913.)

β NAPHTHYLAMINE $C_{10}H_7.NH_2$.

100 gms. para cymene (b. pt. 176-176.5°) dissolve 8.63 gms. β $C_{10}H_7NH_2$ at 30°. (Wheeler, 1920.)

α NAPHTHYLAMINE *p* Sulfonic Acid, 1.4 α $C_{10}H_6NH_2.SO_3H$.

α NAPHTHYLAMINE *o* Sulfonic Acid, 1.2 α $C_{10}H_6NH_2.SO_3H$.

SOLUBILITY OF EACH SEPARATELY IN WATER.

(Dolinski, 1905.)

t°.	Gms. per 100 Gms. H_2O. *p* Sulphonic Ac.	*o* Sulphonic Ac.	t°.	Gms. per 100 Gms. H_2O. *p* Sulphonic Ac.	*o* Sulphonic Ac.
0	0.027	0.24	50	0.059	0.81
10	0.029	0.32	60	0.075	1.01
20	0.031	0.41	70	0.097	1.37
30	0.037	0.52	80	0.130	1.80
40	0.048	0.65	90	0.175	2.40
			100	0.228	3.19

The coefficient of distribution of β naphthylamine between benzene and water at 25° is; conc. in C_6H_6 ÷ conc. in H_2O = 279. The coefficient for α naphthylamine, similarly determined, is 252. (Farmer and Warth, 1904.)

Results for equilibrium in the ternary system α Naphthylamine + Resorcinol + Sulfur are given by Hrynakowski, Staszewski and Szmyt, 1937.

Freezing-point data are given for mixtures of Naphthylamines and:

Acetanilide(6)
Acetyl diphenyl(28)
Antipyrine(4)(27)
Acetic acid(21)
Amino phenols(16)
Anthracene(39)(37)
Azobenzene(28)
Benzoic acid(1)(21)(25)
Benzamide(35)
Benzo phenone(19)
Benzo hydrol(13)
Catechol(32)
Camphor(8)
Cinnamic acid(21)
Chloro nitro benzene(2)
Chloro dinitro benzene(2)
Chloro naphthalene(10)(3)
Di anisal acetone(29)
Di nitro benzene(35)(15)
Di phenyl(40)
Di nitro toluenes(17)(15)
Di nitro phenol(15)
Di nitro anisole(5)
Di oxy naphthalenes(18)
Di phenyl methane(14)
Di phenyl amine(37)
Fluorene(26)
Fluorenone(29)
Guaiacol(38)(34)
Hydroquinone(32)(12)
Iodo diphenyl(40)
Methoxy anthraquinone(28)
Methyl naphthalene(3)
Michler's Ketone(26)
Naphthalene(36)(37)(25)
Naphthols(37)(7)(3)(15)(36)(20)
Naphthylamines(4a)
Nitroso dimethyl aniline (15)(23)
Nitro phenols(15)
Nitronaphthalene(41)
Nitro benzene + Quinone(22)
Phenol(11)(33)
Propionic acid(21)
Pyrocatechol(12)
Pyrogallol(24)
Quinone(22)
" + nitro benzene(22)
Resorcinol(32)(37)(12)
Sarcosine anhydride(31)
Salicylic acid(21)(25)
Succinic acid(21)
Tetra methyl di amino benzal acetone(29)
Tetra methyl diamino benzo phenone(29)
Toluidine(17)
Tri chlor acetic acid(9)
Tri nitro benzene(15)(35)(36)
Tri phenyl carbinol(23)
Tri phenyl methane(19)

(1) Baskow, 1918; (2) Giua, Marcellino and Carti, 1920; (3) Grimm, Gunther and Titus, 1931; (4) Hammick, Edwards, Illingworth and Snell, 1933; (4a) Grubelmann and Weiland, 1929; (5) Hertel and Romer, 1930; (6) Hrynakowski and Adamanis, 1933a; (7) Hrynakowski and Szmyt, 1934; (8) Journiaux, 1912; (9) Kitran, 1924; (10) Klemm, Klemm and Schiemann, 1933; (11) Kremann, 1906; (12) Kremann and Csanyi, 1916; (13) Kremann and Drazil, 1924; (14) Kremann and Fritsch, 1920; (15) Kremann and Grasser, 1916; (16) Kremann and Hohl, 1920; (17) Kremann, Honigsberg and Mauermann, 1923; (18) Kremann, Hemmelmayr, and Riemer, 1922; (19) Kremann and Schadinger, 1918; (20) Kremann and Strochschneider, 1918; (21) Kremann, Weber and Zechner, 1925; (22) Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922; (23) Kremann and Wlk, 1919; (24) Kremann and Zechner, 1918; (25) Milone and Rossignoli, 1932; (26) Pfeiffer, 1924; (27) Pfeiffer and Angern, 1926; (28) Pfeiffer, Angern, Wang, Seydel and Quehl, 1930; (29) Pfeiffer, Goebel and Angern, 1928; (30) Pfeiffer, Schmitz and Inoue, 1929; (31) Pfeiffer, Angern and Wang, 1927; (32) Philip and Smith, 1905; (33) Philip, 1903; (34) Puschin and Masarowitsch, 1914; (35) Rheinboldt, Henning and Kirscheisen, 1925; (36) Rheinboldt and Kirscheisen, 1926; (37) Vignon, 1891; (38) Puschin and Vaic, 1927; (39) Vignon and Miolati, 1892; (40) Washburn and Read, 1915. (41) Tsakalotos, 1912.

PHENYL PYRROLE $C_{10}H_9N$.

100 gms. sat. solution of phenyl pyrrole in liquid sulfur dioxide contain 15 gms. $C_{10}H_9N$ at ? t°. (De Carli, 1927.)

2-Amino-5 NAPHTHOL 1-SULFONIC ACID $C_{10}H_5(5)OH(2)NH_2(1)SO_3H$.

1000 cc. cold water dissolve 2.12 gms. of the compound. The solubility of the potassium salt of the compound is about 94 grams per liter at 18°.

(Bucherer and Wahl, 1921.)

NAPHTHYLAMINE Di SULFONIC ACIDS 2.6.8 and 2.5.7 $C_{10}H_5(NH_2)(SO_3H)_2$.

100 gms. sat. sol. of the 2.6.8 compound in water contain 9.24 gms. at 15°
" " 2.5.7 " " 22.97 "

(Braunschweig, 1926.)

1 NAPHTHYLAMINE. 2.4.7-Tri SULFONIC ACID $C_{10}H_4NH(SO_3H)_3$.

One liter sat. solution of 1 Naphthylamine, 2.4.7-Tri Sulfonic Acid in Water contain 184 gms. $C_{10}H_4NH(SO_3H)_3$ at 20° and 315 gms. at 80°. (Fritsch, 1930.) The author also gives results for the solubility of the Na, Ca, Ba and K salts of this acid in water at 20° and at 80°.

α β NAPHTHYLAMINE HELIANTHATE $C_{10}H_7NH_2.C_{14}H_{15}N_3SO_3$.

1000 cc. water dissolve 0.142 gm. of the α compound at 20-25°
" " 0.104 " β " "

(Stark and Dehn, 1918.)

PHENYL TARTRIMIDE and Related Compounds.

Solubility of Each Separately in Water and in Methyl Alcohol.

(Casale, 1917, 1918.)

Compound	Formula	Solvent.	t°.	Gms. cmpd. per 100 gms. sat. sol.
d Phenyl tartrimide or Tartranil	$\begin{array}{l}CHOH.CO\\CHOH.CO\end{array}\!>NC_6H_5$	H_2O	Changes to tartranilic acid	
		CH_3OH	18	2.84
d Phenyl tartramic acid or Tartranilic acid	$CHOH.CONH.C_6H_5$ $CHOH.COOH$	H_2O	17.4	2.853
		CH_3OH	14	15.66
d Mono phenyl tartramide or tartranilamide	$CHOH.CONH.C_6H_5$ $CHOH.COONH_2$	H_2O	21.5	0.4726
		CH_3OH	21.5	1.031
d Tartranilide	$CHOH.CONH.C_6H_5$ $CHOH.CONH.C_6H_5$	CH_3OH	20	0.2151
p Ethoxy phenyl tartramide	$\begin{array}{l}CHOH.CO\\CHOH.CO\end{array}\!>NC_6H_4.OC_2H_5$	CH_3OH	14	1.504
p Ethoxy phenyl tartramic acid	$CHOH.CONH.C_6H_4.OC_2H_5$ $CHOH.COOH$	H_2O	14	0.4005
Methyl ether of *p* Ethoxy phenyl tartramic acid	$CHOH.CONH.C_6H_4.OC_2H_5$ $CHOH.COO.CH_3$	CH_3OH	15	1.88
Ethyl ether of *p* Ethoxy phenyl tartramic acid	$CHOH.CONH.C_6H_4.OC_2H_5$ $CHOH.COO.C_2H_5$	CH_3OH	15	4.496
p Oxy phenyl tartramide	$\begin{array}{l}CHOH.CO\\CHOH.CO\end{array}\!>N.C_6H_4OH$	CH_3OH	13	2.913
d Mono oxy phenyl tartramide	$CHOH.CO.NH.C_6H_4OH$ $CHOH.CO.NH_2$	CH_3OH	15	1.58
d Mono oxy di phenyl tartramide	$CHOH.CO.NH.C_6H_4OH$ $CHOH.CO.NH.C_6H_5$	CH_3OH	15	1.582
p Oxy phenyl tartramic acid	$CHOH.CO.NH.C_6H_4OH$ $CHOH.COOH$	H_2O	14	4.215

PYRENE $C_{10}H_{10}$.

Freezing-point data are given by Shinomiya, 1940, for mixtures of Pyrene and each of the following compounds: Dinitro benzenes, dinitro phenol, dinitro toluene, picramide, picryl chloride, tetra nitro benzene tri nitro anisole, tri nitro benzene, tri nitro cresol, and tri nitro toluene

DIHYDRO NAPHTHALENE $C_{10}H_{10}$.

Freezing-point data for mixtures of dihydro naphthalene and naphthalene are given by Küster, 1891.

NAPHTHYLENE DIAMINE $C_{10}H_6(NH_2)_2$.

Freezing-point data for mixtures of naphthalene diamine and o cresol are given by Puschin and Sladovic, 1928.

BENZAL ACETONE $C_6H_5CH:CHCOCH_3$.

Freezing-point data are given by Pfeiffer, Goebel, and Angern, 1925, for mixtures of Benzal acetone and each of the following compounds: Acenaphthene, Naphthylamine, Nerolin, Nitraniline and Tetra methyl diamino dibenzal acetone.

BENZOYL ACETONE $C_6H_5COCH_2COCH_3$.

100 gms. sat. solution of benzoyl acetone in liquid sulfur dioxide contain about 43 gms. $C_6H_5COCH_2COCH_3$ at ? t°. (DeCarli, 1927.)

METHYL CINNAMIC ACID $C_6H_5C(CH_3):CHCOOH$.

SOLUBILITY OF SEVERAL ALKYL CINNAMIC ACIDS IN BENZENE AND IN PETROLEUM ETHER. (Stoermer, Grimm and Laage, 1917.)

Compound.	Formula	M. pt.	t°.	Gms. cmpd. per 100 gms. Benzene.	Gms. cmpd. per 100 gms. Petroleum ether
β Methyl cinnamic acid (stable)	$C_6H_5.C(CH_3):CH.COOH$	98.5	21	19.2	2.08
" " (unstable)	"	131.5	21	7.8	0.83
" " (mixed form)	"	76.0	21	41.2	5.2
β Ethyl cinnamic acid (stable)	$C_6H_5.C(C_2H_5):CH.COOH$	98.1	20	44.5	1.7
" " (unstable)	"	93.5	20	11.5	0.68
" " (mixed)	"	63-65	20	111.0	6.2
β Propyl cinnamic acid (stable)	$C_6H_5.C(C_3H_7):CH.COOH$	94	18	14.6	1.5
" " (unstable)	"	80.5	22	58.0	4.5 (18°)
" " (mixed)	"	59-60	21	88.5	9.8 (21°)
o Methoxy β Methyl cinnamic acid (stable)	$o\ CH_3O\ C_6H_4.C(CH_3):CHCOOH$	96.5	21	10.0	1.1
" " (unstable)	"	123.4	21	8.2	0.1
" " (mixed)	"	76-78	21	11.2	1.25
p β Dimethyl cinnamic acid (stable)	$CH_3(4)C_6H_4.C(CH_3):CHCOOH$	135	20	1.6	0.12
" " (unstable)	"	117.5-118	20	11.8	0.55
" " (mixed)	"	95-96	20	18.1	1.8

METHYL CINNAMATE $C_6H_5CH:CHCOOCH_3$.

The critical solution temperature of mixtures of methyl cinnamate and iso amyl benzoate is 15.8°. (Lecat, 1928.)

Freezing point data for mixtures of methyl cinnamate with chloro acetic acid and tri chloro acetic acid are given by Kendall and Booge, 1916.

METHYL PHENYL TRICHLORO ETHYL CARBAMATE $CO(NCH_3.C_6H_5)(OC_2H_2Cl_3)$.

Freezing point data for mixtures of p Methyl phenyl voluntal with acetyl amino antipyrine, with antipyrine and with sarcosine anhydride are given by Pfeiffer and Seydel, 1928a.

METHOXY CINNAMIC ACID p $CH_3O.C_6H_4CH:CHCOOH$.

One liter sat. solution of p methoxy cinnamic acid in water contains 0.0712 gm. $CH_3O.C_6H_4CH:CHCOOH$ at 25°.

One liter sat. solution of allo p methoxy cinnamic acid in water contains 1.966 gms. at 25°. (Roth and Stoermer, 1913.)

Freezing point data are given for:

p Methoxy Cinnamic acid + Azoxyphenetol (Prins, 1909.)
" " " + p Azoxyanisole (de Kock, 1904.)
" " " + Hydroquinone " "

p METHOXY PHENYL FUROXIME $CH_3OC_6H_4[(C_2N_2O)O]CH_3$.

Freezing point data for mixtures of p methoxy phenyl furoxime and methoxy phenyl methyl dioxy diazine are given by Milone, 1929.

METHYL CUMARIC ACID $C_{10}H_{10}O_3$.

One liter sat. solution in water contains 0.084 gm. methylcumaric acid at 25°. (Roth and Stoermer, 1913.)

METHYL CUMARINIC ACID $C_{10}H_{10}O_3$.

One liter sat. solution in water contains 0.712 gms. methyl cumarinic acid at 25°. (Roth and Stoermer, 1913.)

DIMETHYL TEREPHTHALATE $C_6H_4(COOCH_3)_2$.

Freezing point data for mixtures of dimethyl terephthalate and tri chloracetic acid are given by Kendall and Booge, 1916.)

CREATININE PICRATE $C_4H_7N_3O.OHC_6H_2(NO_2)_3$.

100 gms. sat. solution in water contain 0.122 gm. picrate at 7°.5, 0.182 gm. at 21°, 0.263 gm. at 33.5°, 0.416 gm. at 48.0°, 1.035 gm. at 78° and 1.572 gm at 92°.

100 gms. sat. solution in aq. 50 % ethyl alcohol contain 0.224 gm. picrate at 8°, 0.362 gm. at 19° 0.751 gm. at 37°, 1.718 gm. at 57° and 3.1 6 gm. at 74°. (Medes, 1925-1926.)

n-α-DIMETHYL INDOLE [illegible]

Freezing-point data for mixtures of n α dimethyl indole and sarcosine anhydride are given by Pfeiffer, Angern and Wang, 1927.

p Acetoxy **ACETANILIDE**, $CH_3CO.OC_6H_4NHCOCH_3$ *p*.

100 cc. of sat. solution in water contain 0.239 gms. $CH_3CO.OC_6H_4NHCOCH_3$ at 25°.
100 cc of sat. solution in chloroform contain 3.25 gms. " "

(Emery and Wright, 1921.)

Data for the distribution of *p* acetoxyacetanilide between water and chloroform are also given by Emery and Wright, 1921.

ANETHOLE (*p* Propylanisole) $CH_3CHCH[4]C_6H_4OCH_3$.

Solubility in Aqueous Alcohol at 20°

(Schimmel and Co., Reports, Oct. 1895, p. 6.)

Vol. per cent alcohol =	20	25	30	40	50
Gm. anethole per liter aq. alcohol =	0.12	0.20	0.32	0.86	2.30

333.3 gms. anethole dissolve in one liter of 90% alcohol at room temperature.

(Squire and Caines, 1905.)

Freezing-point data for mixtures of anethole and menthol are given by Scheuer (1910).

CUMINIC ACID $C_3H_7C_6H_4COOH$ (*p* Isopropyl Benzoic Acid).

Solubility in Water at 25°. (Paul, 1894.)

1000 cc. sat. solution contain 0.1519 gm. or 0.926 millimol cuminic acid.

TETRALIN (1, 2, 3, 4-Tetrahydro Naphthalene) $C_{10}H_{12}$.

Solubility of Tetralin in Super-Heated Water. (Jaeger, 1926.)

The determinations were made in a large shaking autoclave. The air in the autoclave was previously displaced and mixtures of 500 cc. of the hydrocarbon and 2 liters of water were introduced and shaken 10 minutes at each temperature and allowed to stand 20 minutes. 500 cc. of the solution were withdrawn and after allowing about a day for the separation of the two layers the volume of the upper floating layer was carefully measured.

t° . . . . 150° 200° 250°

Cc. $C_{10}H_{12}$ dissolved per 100 cc. H_2O. 0.02 (0.02) 0.05 (0.05 0.09) 0.30 (0.35 0.90

Experiments made with various samples of hydrocarbons from generator tar, gas flame coal tar, etc., gave results (shown in parentheses) agreeing quite closely with those for tetralin.

ALLYL PHENYL THIO UREA $(NHC_3H_5)(NHC_6H_5)CS$.

SOLUBILITY OF ALLYL PHENYL THIOUREA IN SEVERAL SOLVENTS.

(Schlachokin, 1928.)

Results for:

Acetic Acid		Methyl Alcohol		Ethyl Alcohol		Paraldehyde	
t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.	t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.	t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.	t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.
43.0	5.02	40.0	4.57	44.7	4.85	49.0	4.92
56.5	10.50	46.0	6.99	55.2	10.18	58.0	9.71
65.5	19.80	59.5	19.24	61.3	16.55	68.0	19.42
72.5	31.04	65.7	28.13	64.8	21.44	72.8	27.23
76.7	41.16	71.7	38.37	68.8	26.63	78.3	40.37
78.1	49.54	77.2	48.70	70.2	31.49	81.2	48.98
84.8	63.57	81.5	57.63	74.5	41.16	84.5	59.54
86.7	67.83	86.5	70.79	78.7	49.54	88.6	70.58
91.0	78.74	91.0	77.45	84.8	63.57	92.3	80.0
99.0	100.00	99.0	100.00	91.0	78.74	99.0	100.0

Chloroform				Tri chlor acetic acid		Acetic acid anhydride	
t°	Gm. Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gms. mols. sat. sol.	t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gms. mols. sat. sol.	t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.	t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.
46.7	19.85	85.0	62.76	50	44.69	43.5	54.04
58.0	28.56	86.0	67.26	69	58.81	71.3	66.63
66.5	36.86	90.8	78.36	74.5	68.66	81.3	78.46
75.0	47.46	99.1	100.0	81.8	75.57	99.0	100.00

Di bromo benzene		o Nitraniline		Nitro benzene		Di phenyl amine	
t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.	t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.	t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.	t°	Gm. Mols. $C_{10}H_{12}N_2S$ per 100 gm. mols. sat. sol.
87	0.0 (1)	71.0	0.0 (2)	30.0	4.98	53.8	19.50
83.7	11.0 (1)	65.5	9.90(2)	42.5	9.92	57.0	21.60
81.5	20.45(1)	63.2	13.20(2)	56.2	19.26	64.6	30.30
79.2	30.20(1)	59.0	19.94(2)	65.3	29.85	69.0	34.70
79.0	41.68	60.5	29.46	72.5	39.60	72.5	39.62
81.0	47.30	70.5	41.99	80.0	52.86	77.5	48.80
85.0	60.47	83.0	62.28	83.9	61.01	78.0	49.32
88.2	70.33	91.5	80.50	90.5	76.25	83.5	60.00
92.3	82.12	99.0	100.0	94.3	88.10	88.5	70.77
95.8	90.91					91.5	78.40

(1) Solid Phase, Di bromo benzene (2) Solid Phase, o Nitraniline.

THYMOQUINONE $(CH_3)_2CHC_6H_2CH_3O_2$.

Freezing-point data are given for mixtures of thymoquinone and cinnamylidine acetophenone. (Giua, 1925.)

ISO EUGENOL $CH_3CH{:}CHC_6H_3(OCH_3)OH$.

ISO CHAVIBETOL $CH_2{:}CHCH_2C_6H_3(OH)(OCH_3)$.

Freezing-point data for mixtures of iso eugenol and iso chavibetol are are given by Hiraidzumi, 1932.

ETHYL MANDELATES $C_6H_5CH(OH)COOC_2H_5$.

Freezing-point data for mixtures of the optical isomerides of ethyl mandelate are given by Ross, 1936.

CANTHARIDINE

APPROXIMATE SOLUBILITY IN SEVERAL SOLVENTS AT ROOM TEMP.
(Self and Greenish, 1907.)

Solvent.	Gms. Cantharidine per 100 Gms. Solvent.	Solvent.	Gms. Cantharidine per 100 Gms. Solvent.
Aq. 25% Acetone	0.02	Aq. 10% Acetic Acid	0.14
" 50% "	0.16	" 45% Formic "	0.12
" 75% "	0.45	Carbon Tetrachloride	0.04
		Lanolin	4.4 (Kline, 1907.)

TRI NITRO DI ETHYL ANILINE $2.4.6.(NO_2)_3C_6H_2N(C_2H_5)_2$.

100 gms. H_2O dissolve 0.005 gm. $C_{10}H_{12}O_6N_4$ at 50° and 0.020 gm. at 100°. (Desvergnes, 1926.)

DILACTONE $C_{10}H_{12}O_8$.

SOLUBILITY OF DILACTONE IN WATER. (Feofilaktow, 1926.)

Dilactone is the product of aldol condensation of two molecules of α Oxo-β-methyl-γ-butyrolactone. The author does not state the exact terms in which the results are given but it is probable that the figures refer to the grams of lactone per 100 gms. of water.

t°.	0°	25°	50°	[illegible]	100°.
Gms. lactone per 100 gms. H_2O	2.5	5.2	18.4	87.4	176.0

PHENACETIN (*p* Acetophenetide) $C_6H_4(OC_2H_5)NHCH_3CO$ *p*.

SOLUBILITY OF PHENACETIN IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms $C_6H_4(OC_2H_5)NHCH_3CO\,p$ per 100 gms. solvent.	Authority.
Walter	14°	0.054	(Oliveri-Mandala, 1926.)
Aq. 9.984% Antipyrine solution	14°	0.128	"
Absolute Alcohol (*com.*)	20-25°	18.80	(Purher and Dehn, 1926.)
Quinoline	"	7.83	"
Equi mol mixture Alcohol and quinoline.	"	12.87	"

SOLUBILITY OF PHENACETIN IN AQUEOUS ALCOHOL AT 25°.

(Seidell, unpublished.)

Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_6H_4(OC_2H_5)NHCH_3CO$ per 100 Gms. Sat. Solution.	Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_6H_4(OC_2H_5)NHCH_3CO$ per 100 Gms. Sat. Solution.
0 (water)	1	0.0766	70	0.879	6.25
10	0.984	0.14	80	0.858	7.63
20	0.968	0.28	85	0.847	7.88
30	0.952	0.65	90	0.834	7.82
40	0.935	1.50	92.3	0.827	7.70
50	0.917	2.85	95	0.821	7.45
60	0.898	4.55	100	0.806	6.64

100 gms. H_2O dissolve 1.43 gms. phenacetin at the b. pt. (U.S.P., VIII.)
100 gms. 92.3 wt. % alcohol dissolve about 50 gms. phenacetin at the b. pt. "

100 gms. Ethyl ether (abs.) dissolve 0.31-0.33 gm. phenacetin at 25°.

100 gms. Ethyl ether containing 3.6% C_2H_5OH dissolve 0.64-0.98 gm. phenacetin at 25°.

100 gms. Ethyl ether containing less than 3.0% C_2H_5OH dissolve 0.525 gm. phenacetin at 25°. (Taylor and Bebie, 1924.)

100 gms. CCl_4 dissolve 0.037 gm. phenacetin at 25°. (Warren, 1933.)

SOLUBILITY OF PHENACETIN IN SEVERAL SOLVENTS.

(Seidell, 1907.)

Solvent.	t°.	Gms. Phenacetin per 100 Gms. Sat. Solution.	Solvent.	t°.	Gms. Phenacetin per 100 Gms. Sat. Solution.
Acetone	30-31	10.68	Benzene	30-31	0.65 (0.873)
Amyl Acetate	30-31	2.42 (0.865)	Chloroform	25	4.76
Amyl Alcohol	25	3.51 (0.819)	Ether	25	1.56
Acetic Acid (99.5%)	21.5	13.65 (1.064)	Toluene	25	0.30 (0.863)
Aniline	30-31	9.46 (1.025)	Xylene	32.5	1.25 (0.847)
Benzaldehyde	30-31	8.44 (1.063)			

(Figures in parentheses are Sp. Gr. of Sat. Solutions.)

100 cc. petroleum ether dissolve 0.015 gm. phenacetin at room temp. (Salkower, 1916.)
100 gms. pyridine dissolve 17.39 gms. phenacetin at 20-25°. (Dehn, 1917.)
100 gms. aq. 50% pyridine dissolve 28.94 gms. phenacetin at 20-25°. "

Freezing-point data are given for mixtures of Phenacetin and:

Acetanilide(1)(2)(3)(5)
Antipyrine(2)(3)(8)
Benzoic acid(5)
Bromural(4)(6)
Menthol(2)(3)
Pyramidon(1)
Quinine(2)(8)(3)
Resorcinol(2)
Salol(2)(3)(7)(8)
Sulfonal(2)(3)
Thymol(7)
Urea(2)(3)(8)
Urethan(2)(3)(5)(8)
Veronal(4)

Results for ternary mixtures of phenacetine, acetanilide, antipyrine, menthol, quinine, resorcinol, sulfonal, urea and urethan(2)

(1) Angelletti, 1927; (2) Hrynakowski, 1934; (3) Hrynakowski and Adamanis, 1933, 1933a; (4) Hrynakowski and Szmyt, 1935d; (5) Kitran, 1924; (6) Sandquist and Höle, 1927; (7) Quercigh and Cavagnari, 1912; (8) Adamanis, 1933.

CYMENE $C_6H_4(CH_3)(1)(C_3H_7)(4)$.

F. pt. data for mixtures of cymene and SO_2 are given by De Carli, 1926

TETRA METHYL BENZENES (Durene and Iso durene) $C_6H_2(CH_3)_4$.

Freezing-point data for mixtures of durene and isodurene are given by Smith and Mac Dougall, 1929.

NICOTINE $C_{10}H_{14}N_2$.

SOLUBILITY IN WATER.

(Hudson, 1904.)

Determinations made by Synthetic Method, for which see Note, page 16. Below 60° and above 210° both liquids are miscible in all proportions; likewise with percentages of nicotine less than 6.8 and above 82 per cent the liquid does not show two layers at any temperature. Below 94° the upper layer is water. Above 94° the upper layer is nicotine. The curve plotted from the following results makes a complete circle.

Percentage of Nicotine in the Mixture	Temperature of Appearance of Two Layers Degrees C.	Temperature of Homogeneity Degrees C.
6.8	94	95
7.8	89	155
10.0	75	...
14.8	65	200
32.2	61	210
49.0	64	205
66.8	72	190
80.2	87	170
82.0	129	130

Additional data for the above system are given by Tsakalotos (1909). The values for the temperatures of saturation are in general, from 1° to 5° lower than those of Hudson.

The temperature of clouding of various mixtures of nicotine and aqueous solutions of sodium hydroxide, sodium sulfate and hydrochloric acid was determined by Dubrisay, 1922. The results were used in the study of certain reactions. When plotted, a change in direction of the curve was found to occur at the point of neutralization. The presence of acids, bases and salts was shown to modify considerably the miscibility of liquid pairs.

The formation of hydrates of nicotine and their decomposition at higher temperatures is suggested by Jephcott, 1919, as the explanation of the true nature of the « closed curve of solubility. »

Results for the effect of various salts and organic acids upon the inter facial tension by the drop method and the critical mixing temperature (60.9°) of nicotine and water are given by Ssementschenko and Davidoffskaja, 1934. Results for the effect of deuterium upon the lower critical solution temperature of nicotine-water mixtures are given by Hall, Wentzel and Smith, 1934.

Results in the form of curves, showing the decreasing solubility of nicotine in water caused by increasing amounts of various salts at 50°, and the effect of increasing amounts of

NICOTINE SILICO TUNGSTATE $2C_{10}H_{14}N_2 \cdot SiO_2 \cdot 12WO_3 \cdot 2H_2O$.

SOLUBILITY OF NICOTINE SILICOTUNGSTATE IN AQUEOUS HYDROCHLORIC ACID AT 25°.

(Spies, 1936.)

The saturated solutions were prepared by constant stirring and approaching equilibrium both from above and from below. The saturated solutions were analyzed by evaporating in a platinum dish and igniting the residue.

Normality of Aq. HCl solvent	Gms. $2C_{10}H_{14}N_2 \cdot SiO_2 \cdot 12WO_3 \cdot 2H_2O$ per liter sat. solution	Normality of Aq. HCl solvent	Gms. $2C_{10}H_{14}N_2 \cdot SiO_2 \cdot 12WO_3 \cdot 2H_2O$ per liter sat. solution
0.0 (= H_2O)	0.0385 (pH = 6.5)	0.025	0.00759
0.001	0.00608	0.030	0.00780
0.005	0.00530	0.050	0.00941
0.010	0.00556	0.070	0.01100
0.015	0.00696	0.100	0.01340
.020	0.00681		

THYMOL (3 Methyl 6 Isopropyl Phenol) $C_3H_7.C_6H_3.OH.CH_3$.

SOLUBILITY IN WATER. (Seidell, 1912.)

t°.	Gms. Thymol per 100 Gms. Sat. Sol.	t°.	Gms. Thymol per 100 Gms. Sat. Sol.	t°.	Gms. Thymol per 100 Gms. Sat. Sol.
10	0.067	25	0.0995	37	0.132 ($d_{37}=1$)
15	0.077	30	0.112	40	0.141
20	0.088	35	0.126		

SOLUBILITY OF THYMOL IN WATER.

By means of a stalogmometric method (see Carvone, p. 676) the solubility of thymol in water was found by Rhode, 1922, to be 5.7 millimols, or 0.876 gms., per liter at 15-20°.

Approximate determinations of the solubility of thymol in water made by analysis of the saturated solution (temperature of saturation not stated) and by measuring its freezing-point gave, respectively, 0.78 and 1.11 gm. thymol per liter.
(Vladesco, 1922.)

RECIPROCAL SOLUBILITY OF THYMOL AND WATER.

(Wilcox and Bailey, 1929.)

The determinations were made partly by thermal analysis and partly (for co-existing liquids) by the synthetic method.

t°	Gms. $C_{10}H_{13}OH$ per 100 gms. sat. sol.		Solid Phase	t°	Gms. $C_{10}H_{13}OH$ per 100 gms. sat. sol.		Solid Phase
	H_2O rich layer	Thymol rich layer			H_2O rich layer	Thymol rich layer	
0.0	0	—	Ice	65	0.1	95.0	Liquid layers
-0.05 (Eutec)	0.04	—	" + $C_{10}H_{13}OH$	120	0.1+	90.0	" "
+15.0	—	95.6	Liquid layers	200	10.0	75.1	" "
40.0	0.1	95.4	" "	250	19.0	71.5	" "
				270*	20.0	70.2	" "

* It was not possible to observe the critical solution temperature of the system since the vapor liquid critical temperature was reached before complete miscibility was obtained. The authors also give results for equi-

SOLUBILITY OF THYMOL IN AQUEOUS HYDROCHLORIC ACID. (Seidell, 1912.)

Normality of Aq. HCl.	Gm. Thymol per 100 cc. Sat. Sol. at 25°		Gm. Thymol per 100 cc. Sat. Sol. at 37.5°
0	0.0905		0.132
0.1	0.0908	(d_{25} = 1.002)	0.129
0.5	0.0884	(d_{25} = 1.009)	0.121
1	0.0802	(d_{25} = 1.018)	0.112
2.5	0.0612	(d_{25} = 1.041)	0.0935
5	0.0445		0.0772 (d_{25} = 1.081)

100 cc. 90 vol. per cent alcohol dissolve about 300 gms. of thymol at 15°-20°. (Squire and Caines, 1905.)

100 gms. aq. 0.4 normal sodium oleate solution (= 10.8 gm. Na Oleate pe 100 gms. solution) dissolve 6.3 gms. $C_{10}H_{13}OH$ at 45°. (Smith, 1932.)

SOLUBILITY OF THYMOL IN AQUEOUS SOLUTIONS OF GLYCEROL AT 25°. (Marquina, 191.)

The saturated solutions were analyzed by the Messinger and Vortmann method as modified by Redman, Werth and Brock.

Wt. per cent Glycerol in solvent.	Gms. Thymol per 100 gms. sat. sol.	Wt. per cent Glycerol in solvent.	Gms. Thymol per 100 gms. sat. sol.
0.0 (= water)	0.0952	75.10	0.313
20.01	0.113	87.45	0.695
24.95	0.126	100.00	1.71
50.19	0.191		

100 gms. para cymene (b. pt. 176°-176°.5) dissolve 111.85 gms. thymol at 25°. (Wheeler, 1920.)

DISTRIBUTION OF THYMOL BETWEEN WATER AND OILS AT 25° AND AT 37°. (Seidell, 1912.)

t°.	Water + Olive Oil. Gms. Thymol per 100 cc. H_2O Layer (c_w).	Water + Olive Oil. Gms. Thymol per 100 cc. Oil Layer (c_o).	$\frac{c_o}{c_w}$.	Water + Cod Liver Oil. Gms. Thymol per 100 cc. H_2O Layer (c_w).	Water + Cod Liver Oil. Gms. Thymol per 100 cc. Oil Layer (c_o).	$\frac{c_o}{c_w}$.	Water + Peanut Oil. Gms. Thymol per 100 cc. H_2O Layer (c_w).	Water + Peanut Oil. Gms. Thymol per 100 cc. Oil Layer (c_o).	$\frac{c_o}{c_w}$.
25	0.1014	44.95	443	0.1070	49	454	0.1077	46.48	431
25	0.0848	36.34	428	0.0816	32.58	400	0.0780	32.45	413
25	0.0340	16.26	465	0.0371	16.18	436	0.0403	16.16	400
25	0.0106	4.54	430	0.0127	4.57	360	0.0088(?)	4.63	523
37	0.1087	46.35	427	0.1000	43.81	438			
37	0.0807	33.48	415	0.0862	32.90	380			
37	0.0381	16.24	426	0.0574	22.51	392			
37	0.0122	4.61	378	0.0250	8.86	357			

SOLUBILITY OF THYMOL IN SEVERAL OILS. (Seidell, 1912.)

t°.	Gms. Thymol per 100 Gms. of: Olive Oil	Peanut Oil	Cod Liver Oil	Liquid Petrolatum.	Castor Oil.	Cottonseed Oil.	Linseed Oil.
10	46.2	73	50	3.1	81.2	56.2	62.3
15	50.1	73.8	52	3.95	90.2	64	63.1
20	56.2	74.6	55.5	5.6	101.5	74.2	65.1
25	66.9	76.4	63.1	9.78	116.5	89.4	69
30	84.5	83.2	77	16.3	137	113.7	78.3
35	111	106.7	102	25.5	165	146.5	100
37	124.3	130.5	116.5	29.9	180	166.5	116.5
40	151.9	212.5	150	38.9	213	217.5	152

The specific gravities of the above saturated solutions and of solutions of lower concentrations of thymol in the several oils are also given.

Freezing point data are given for mixtures of Thymol and:

Acetanilide(1)(4)(9)
Acetic acid(6)
Antipyrine(4)
Benzo phenone(7)
Bromo toluene(6)
Camphor(4)
Chlor acetic acid(5)
Cineole(12)
Naphthalene(2)(10)
Phenol(3)(6)
Phenacetine(9)
Phenylene diamine(8)
Salicylic acid(3)
Salol(3)
Sulfonal(9)
Sulfuric acid(4)
Tri chlor acetic acid(11)
Urea(3)

(1) Angeletti, 1928; (2) Bernoulli and Veillon, 1932; (3) Hrynakowski and Szmyt, 1936; (4) Kendall and Carpenter, 1914; (5) Mameli and Cocconi 1922; (6) Paterno and Ampola, 1897; (7) Pawlewski, 1893; (8) Puschin and Dezelic, 1938; (9) Quercigh and Cavagnari, 1912; (10) Roloff, 1895; (11) Kendall, 1916; (12) Bellucci and Grassi, 1913.

CARVACROL $(CH_3)_2CH.C_6H_3(CH_3)OH$.

MISCIBILITY OF AQ. ALKALINE SOLUTIONS OF CARVACROL WITH SEVERAL ORGANIC COMPOUNDS INSOLUBLE IN WATER. (Scheuble, 1907.)

To 5 cc. portions of aq. KOH solution (250 gms. per liter) were added the given amounts of the aq. insoluble compound from a buret and then the carvacrol, dropwise until solution occurred. Temperature not stated.

Composition of Homogeneous Solutions. Aq. KOH	Aq. Insol. Compd.	Carvacrol.
5 cc.	2 cc. (= 1.64 gms.) Octyl(1) Alcohol	1.8 gms.
5 "	5 cc. (= 4.1 gms.) "	2.6 "
5 "	2 cc. (= 1.74 gms.) Toluene	4 "
5 "	3 cc. (= 2.61 gms.) "	4.8 "
5 "	2 cc. (= 1.36 gms.) Heptane	4.6 "

(1) = the normal secondary octyl alcohol, i.e., the so-called capryl alcohol, $CH_3(CH_2)_5.CH(OH)CH_3$.

CARVONE $C_{10}H_{14}O$, CARVENONE $C_{10}H_{16}O$ etc.

SOLUBILITY OF EACH COMPOUND SEPARATELY IN WATER AT 15-20°.

[illegible]

The determinations were made by a stalagmometric method in which the number of drops per unit of time in the case of saturated solutions and their dilutions were compared with the number of drops per unit of time found for solutions of known content. For obtaining saturation long periods of shaking were often necessary. The attainment of saturation was controlled by stalagmometric measurements.

Compound	Formula	Millimols per liter of sat. sol.
Carvone	[illegible]	8.8
Carvenone	[illegible]	14.5
Dihydro carvone	[illegible]	6.8
Tetrahydro carvone	[illegible]	3.9
Carvotanazetone	$C_{10}H_{16}O$	[illegible]

THYMO HYDROQUINONE [illegible]

Freezing-point data for mixtures of thymo hydroquinone and cinnamylidene acetophenone are given by [illegible].

CAMPHORIC ANHYDRIDE $C_{10}H_{14}O_3$ d and l

One liter of benzene dissolves 12.5 gms. d camphoric anhydride at 5°, determined by depression of the freezing-point. ([illegible])

ACETYLENE METHYL TETRA CARBONATE [illegible]

Freezing-point data for mixtures of acetylene methyl tetra carbonate with methyl succinate, with ethyl succinate and with ethylene cyanide are given by Timmermans and Vesselovsky, [illegible].

DIETHYL ANILINE $C_6H_5N(C_2H_5)_2$

Freezing-points of mixtures of diethyl aniline, mono ethyl aniline and aniline are given by Yaginuma and Hagakawa, 1914.

BromoCAMPHOR α $C_{10}H_{15}OBr$.

APPROXIMATE SOLUBILITY IN SEVERAL ORGANIC SOLVENTS AT ORDINARY TEMP.

(U. S. P.; Squires; Beilstein; results in alcohol by Müller, 1892.)

Solvent.	Parts Bromo Camphor per 100 Parts Solvent.	Solvent.	Parts Bromo Camphor per 100 Parts Solvent.
Alcohol	12.1 at 15°	Ether	50
"	19.7 " 25°	Chloroform	143
"	130.0 " 50°	Olive Oil	12.5
"	705.0 " 61°	95% Formic Acid	13.6 (Aschan, 1913.)

100 gms. sat. solution of bromo camphor in liquid sulfur dioxide contain about 61 gms. $C_{10}H_{15}OBr$ at ? t°. (De Carli, 1927.)

Freezing point data are given for mixtures of:

Bromo camphor(d) + bromo camphor (l)(Timmermans, 1930; Padoa and Rotondi, 1912.)
" " + chloro camphors (Timmermans, 1930; Padoa, 1904.)
" " + borneol (Timmermans, 1930.)
" " + stearin (Batelli and Martinetti, 1885.)
" " + salol (Caille, 1909.)
" " + camphor (Hrynakowski, Staszewski and Szmyt, 1936.
" " + " + borneol " " " " "

CARVOXIME $C_{10}H_{14}$:NOH d and l.

Freezing-point data for mixtures of d and l carvoxime are given by Rheinboldt and Kircheisen, 1926; and by Timmermans, 1930.

NITROSO DIETHYL ANILINE $NOC_6H_4N(C_2H_5)_2$

Freezing-point data are given for mixtures of nitroso and nitro di ethyl aniline by Jaeger, 1905, 1907.

PINENE $C_{10}H_{16}$.

RECIPROCAL SOLUBILITY OF PINENE AND OTHER COMPOUNDS.

(Lecat, 1930.)

Mixture of Pinene and:	t° of separation	Percent Pinene in Mixture
Ethyl acetate	19.15	50.2
α Di chlor hydrine	43.3	63.5
Methanol	-64.0	9.0
Methyl malonate	54.5	78.0

Freezing point data for mixtures of d and l pinene are given by Ross and Sommerville, 1926.

PINENE HYDROCHLORIDE $C_{10}H_{16}.HCl$.

100 gms. 95% formic acid dissolve 1.2 gms. $C_{10}H_{16}.HCl$ at 16.8°. (Aschan, 1913.)

Freezing-point data for mixtures of pinene hydrochloride and l borneol are given by Timmermans, 1930.

CAMPHENE $C_{10}H_{16}$.

Freezing-point data are given for mixtures of:

Camphene(d) + Camphene (l) (Ross and Sommerville, 1926.)
" + Camphor " " "
" + Tri chlor acetic acid (Timofeiew and Kravtzov, 1915, 1917.)
" + Methyl mustard oil (Kurnakov and Jefremow, 1912.)
" + Naphthalene " " "
" + Phenanthrene " " "
" + Benzene " " "

FENCHONE d $C_{10}H_{16}O$.

Freezing-point data are given by Kremann and Dietrich, 1923, for mixtures of fenchone and each of the following compounds: Di nitro phenol, hydroquinone, naphthols, nitro phenols, phenol, picric acid, pyrocatechol, pyrogallol and resorcinol.

CAMPHOR $C_{10}H_{16}O$.

SOLUBILITY OF CAMPHOR IN WATER AND IN AQUEOUS SOLUTIONS.

(Leo and Rimbach, 1919.)

Solvent.	t°.	Gms $C_{10}H_{16}O$ per 100 gms. sat. sol.	Solvent.	t°.	Gms. $C_{10}H_{16}O$ per 100 gms. sat. sol.
Water ..	14-17	0.167*a*	Ringer's solution	14-17	0.151*c*, 0.131*a*, 0.201*b*
" ..	15-20	0.170 (Rhode, 1922.)	"	35.5	0.140*c*
" ..	39	0.160*a*	" + 2% C_2H_5OH	14-17	0.218*b*
			" + 5% "	14-17	0.270*b*

a. These determinations were made by shaking with just sufficient excess of active camphor to almost completely dissolve, and also by titrating the saturated solution with 0.1 n $KMnO_4$ solution.

b. In these cases a weighed amount of active camphor was shaken at room temperature with one liter of solvent for 24 hours. The undissolved camphor then filtered off, dissolved in 50 cc of 95 % C_2H_5OH and from the rotation of the solution, the undissolved camphor was calculated

c. In these cases 300 cc. of the saturated aqueous solution were extrated with 10 cc. of benzene and the camphor in this determined by the optical method. The determination by Rhode was made by use of a stalognometric method for estimating the dissolved camphor. (See Norcamphor, page 643 and Carvone, p. 676).

APPROXIMATE SOLUBILITY OF *d* CAMPHOR IN SEVERAL SOLVENTS AT ORDINARY TEMPERATURE. (U. S. P., Squires, Greenish and Smith, 1903.)

Solvent.	Parts Camphor per 100 Parts Solvent.	Solvent.	Parts Camphor per 100 Parts Solvent.
Water	0.08–0.14	Chloroform	300–400
90% Alcohol	100	Olive Oil	25–33
95% Alcohol	125	Turpentine	66
Ether	173	Glacial Acetic Acid	200
Carbon Disulfide	Readily Soluble	Lanolin	12.5 (Kline 1907).

Saturated solutions of *d* camphor and of *l* camphor in turpentine of $\alpha_D = 4.38$ (in a 10 cm. tube at 18°) were found to have $d_{18} = 0.9028$ and 0.9030 respectively; the α_D in a 10 cm. tube were $+23.07$ and -16.52 respectively. (Jones, 1907–08.)

SOLUBILITY OF CAMPHOR IN CONCENTRATED AQUEOUS HYDROCHLORIC ACID. (Zaharia, 1899.)

(The dissolved camphor could not be determined by evaporating and weighing the residue on account of volatility; polarimetric methods could not be used on account of the interference of the HCl. The author, therefore, determined the densities (H_2O at 4° in each case) of the pure solvent and saturated solution in each case, and assumed that the difference represented the weight of camphor dissolved. The saturated solutions were prepared by stirring the several mixtures with a glass stirring rod, at intervals, during 6 hours.)

Solvent.	Densities at 0°		Densities at 10°.		Densities at 20°.		Densities at 40°.	
	Solvent.	Sat. Sol.	Solvent.	Sat. Sol.	Solvent.	Sat. Sol.	Solvent.	Sat. Sol.
27.2 % HCl	1.145	1.143	1.140	1.138	1.135	1.133	1.125	1.123
30.6 "	1.164	1.159	1.158	1.153	1.153	1.148	1.142	1.138
33.9 "	1.181	1.167	1.175	1.163	1.169	1.159	1.157	1.149
34.98 "	1.187	1.158	1.181	1.160	1.175	1.158	1.163	1.153
35.74 "	1.191	1.140	1.185	1.148	1.179	1.153	1.167	1.153
36.38 "	1.195	1.126	1.189	1.134	1.182	1.140	1.170	1.153
36.68 "	1.197	1.116	1.190	1.124	1.184	1.134	...	...

EQUILIBRIUM IN THE SYSTEM CAMPHOR, ALCOHOL AND WATER AT SEVERAL TEMPERATURES. (Scheringa, 1922.)

Results at 0°. Gms per 100 gms Homogeneous mixture		Results at 15°. Gms per 100 gms Homogeneous mixture.		Results at 25°. Gms per 100 gms. Homogeneous mixture.		Results at 40°. Gms per 100 gms Homogeneous mixture.	
$C_{10}H_{16}O$	C_2H_5OH	$C_{10}H_{16}O$	C_2H_5OH.	$C_{10}H_{16}O$.	C_2H_5OH.	$C_{10}H_{16}O$.	C_2H_5OH.
1.9	36.1	1.6	30.6	1.5	29.2	4.4	30.8
4.8	42.8	4.2	37.7	4.65	36.0	6.2	35.1
10.5	47.2	7.4	42.2	7.0	39.4	16.7	38.9
12.1	48.1	11.1	44.3	10.3	41.3	31.0	38.8
18.3	50.9	19.9	46.5	14.3	42.8	51.3	34.2
21.8	50.9	30.8	46.2	22.0	43.9	59.9	31.5
34.4	49.7	43.8	43.8	29.1	43.6	62.8	30.5
40.3	49.2	51.4	42.1	41.3	41.3	70.5	29.5
48.6	48.2	54.8	41.1	56.1	37.36		
50.9	49.1			61.0	36.5		
				62.8	35.9		
				63.8	36.2		

DISTRIBUTION OF CAMPHOR BETWEEN METHYL ALCOHOL AND OIL OF VASELINE AT 25°.

(Kozakewitch, 1935.)

Gm. Mols. $C_{10}H_{16}O$ per 1000 gms.		$\frac{1}{2}$	Gm. Mols. $C_{10}H_{16}O$ per 1000 gms.		$\frac{1}{2}$
CH_3OH layer(1)	Oil layer(2)		CH_3OH layer(1)	Oil layer(2)	
0.0868	0.0207	4.2	0.217	0.0611	3.5
0.0907	0.0291	3.1	0.222	0.0583	3.8
0.116	0.0317	3.6	0.251	0.0682	3.7
0.136	0.0355	3.8	0.309	0.0767	4.0
0.174	0.0453	3.8	0.340	0.0920	3.7
0.188	0.0563	3.3	0.346	0.0979	3.5

The author also gives results showing the effect of increasing amounts of a number of inorganic salts upon the above distribution.

Experiments showing the partition of d Camphor between ligroin on the one hand and either concentrated sulfuric or phosphoric acid on the other, are given by Baker, 1932.

CAMPHOR

Freezing-point data for mixtures of d and l camphor are given by Ross and Sommerville, 1926. Results are given for mixtures of camphor and:

Acetamide(8)(11)
Anthracene(8)(11)
Benzoic acid(8)(10)
Borneol(6)(19)(20)(21)(24)
Brom camphor(6)
Chloral hydrate(21)
Cinnamic acid(8)
Di bromo benzene(8)(11)
Di nitro benzene(8)(11)
Di nitro phenols(12)
Hydroquinone(8)(12)(18)
Mentho(18)
Methyl benzene(8)
Chlor acetic acid(18)
Chloro nitro benzenes(11
Di phenyl(27)
Di phenyl amine(29)
Methyl senevol(8)(11)
Naphthalene(5)(8)(10)
Naphthols(4)
Naphthylamine(10)(28)
Nitranilines(8)(11)
Nitric acid(22)
Nitro naphthalene(10)
Nitro phenols(12)
Phenol(23)(13)(26)
Phosphoric acid(22)
Picric acid(12)
Phthalic anhydride(8)(11)
Pyrocatechol(8)(12)
Methyl iodide(11)
Nitro penta erythritol (30)
Pyrogallol(10)(12)
Resorcinol(4)(8)(13)
Salol(2)(4)(13)(16)
Salicylic acid(15)(8)(11)(14)
Sulfur dioxide(3)
Thymol(1)(7)
Tetra nitro methyl aniline(9)
Toluidine(8)(11)
Tri nitro toluene(8)(11)(25)
Urethan(17)
Thio carbanilide(11)
Tri methylene tri nitramine(11)
Tri nitro benzene(11)

(1) Astruc and Cambe, 1917; (2) Barnouvin, 1893; (3) Bellucci and Grassi, 1913, 1914; (4) Caille, 1909, 1910; (5) Girard, 1891; (6) Hrynakowski, Staszewski and Szmyt, 1936; (7) Hrynakowski and Szmyt, 1935; (8) Jefremow, 1912, 1913; (9) Jefremow and Tichomirowa, 1928; (10) Journiaux, 1912; 1913; (11) Jefremow, 1915, 1916; (12) Kremann and Odelga, 1921; (13) Leger, 1880; (14) Lajoux, 1917; (15) LeFevre and Tideman, 1931; (16) LeFevre and Webb, 1931; (17) Migliacci and Calo, 1927; (18) Pawlewski, 1913; (19) Ross and Sommerville, 1926; (20) Timmermans, 1930; (21) Tsakalotos, 1915; (22) Zukow, and Kasatkin, 1909; (23) Wood and Scott, 1910; (24) Vanstone, 1909; (25) Giua, 1916. (26) Günther and Peiser, 1927; (27) Maki and Nagai, 1933; (28) Puschin and Zwadinovic, 1933; (29) Sswetlow, 1933; (30) Urbanski, 1934; (31) Urbanski and Rabek-Gawronska, 1934.

CAMPHORIC ACID $C_8H_{14}(COOH)_2$.

100 gms. of water dissolve 0.8 gm. $C_8H_{14}(COOH)_2$ at 25°, and 10 gms. at the b. pt. (U.S.P.)

SOLUBILITY OF CAMPHORIC ACID IN AQUEOUS SOLUTIONS OF ALCOHOL AT 25°.
(Seidell, 1908, 1910.)

Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_8H_{14}(COOH)_2$ per 100 Gms. Sat. Sol.	Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_8H_{14}(COOH)_2$ per 100 Gms. Sat. Sol.
0	1	0.754	60	1	45
10	1	1.60	70	1	49
20	1	6.30	80	0.995	51.20
30	1	14	90	0.980	51.40
40	1	26	96.3	0.970	50.37
50	1	31	100	0.960	50.10

$C_{10}H_{16}O_4$

CAMPHORIC ACID $C_8H_{14}(COOH)_2$.

100 gms. glycerol of *d* = 1.2326 (= 86.5 %) dissolve 2.36 gms. $C_8H_{14}(COOH)_2$ at 20°.
" " " *d* = 1.2645 (= 98.6%) " 4.32 " " "

(Holm, 1921-1922.)

100 gms. Para cymene (b. pt. 176–176°.5) dissolve 1.53 gms. $C_8H_{14}(COOH)_2$ at 100°.

(Wheeler, 1920.)

DISTRIBUTION OF CAMPHORIC ACID AT 25° BETWEEN: (Smith, 1921–1922.)

Water and Chloroform.			Water and Xylene.		
Millimols per liter of			Millimols. per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
4.30	0.525	0.116	3.922	0.0776	0.0198
7.95	1.50	0.189	9.722	0.278	0.0286
19.25	10.35	0.538	19.166	0.834	0.0436

SOLUBILITY OF CAMPHORIC ACID IN SEVERAL SOLVENTS.

Solvent.	t°.	d_{25} of Sat. Sol.	Gms. $C_8H_{14}(COOH)_2$ per 100 Gms. Solvent.	Solvent.	t°.	d_{25} of Sat. Sol.	Gms. $C_8H_{14}(COOH)_2$ per 100 Gms. Solvent.
Amyl Alcohol(iso)	25	0.907	50(3)	Carbon Disulfide	25	1.258	0.020(3)
Butyl Alcohol(iso)	22.5	...	54.1(1)	Chloroform	25	...	0.153(3)
Ethyl Alcohol	0	...	84.7(1)	Cumene	25	0.890	0.197(3)
" "	15.1	...	112(2)	Ether (abs.)	25	0.922	91.40(3)
" "	62.5	...	147(2)	95% Formic Acid	18.5	...	8.68(4)
Methyl Alcohol	0	...	116.3(1)	Ligroin	25	0.714	0.007(3)
" "	22.5	...	131.1(1)	Nitrobenzene	25	1.2	0.5(3)
Propyl Alcohol	0	...	42.2(1)	Spts. Turpentine	25	0.852	1.74(3)
" "	22.5	...	61 (1)	Toluene	25	0.862	0.15(3)
Benzene	25	0.873	0.008(3)	Xylene	25	0.859	0.23(3)

(1) Timofeiew (1914); (2) Beilstein; (3) Seidell (1910); (4) Aschan, (1913).

Data for the distribution of camphoric acid between water and ether at 25° are given by Chandler (1908). Data for the freezing points of mixtures of *d* and *l* camphoric acid and *d* and *l* isocamphoric acid are given by Centnerszwer (1899).

Results for mixtures of stereo isomeric camphoric acids, camphoric acid methyl esters and camphoric anhydrides are given by Ross and Sommerville, 1926.

CYMENE DISULFONAMIDE $C_{10}H_{12}(SO_2.NH_2)_2$.

100 gms. of ether dissolve 0.0727 gm. cymene disulfonamide at 25°. (Phillips, 1924.)

This author also gives f. pt. data for the system α cymene sulfonamide + β cymene sulfonamide.

CAMPHOROXIME $C_{10}H_{16}$:NOH *d* and *l*.

100 gms. turpentine dissolve 8.68 gms. *d* oxime at 18°, d_{18} = 0.8784, α_D = 2.30 in 10 cm. tube.

100 gms. turpentine dissolve 8.69 gms. *l* oxime at 18°, d_{18} = 0.8782, α_D = 18.24 in 10 cm. tube.

α_D of the turpentine = 4.38 in a 10 cm. tube at 18°.

In the case of results in *l* amyl bromide the d_{18} = 1.199 in both cases and the α_D was −3.55 (10 cm. tube) for the *d* oxime and + 11.48 for the *l* oxime. The α_D of the amyl bromide was + 4.6 in 10 cm. tube at 18°. The results show that the solubility and rotatory power of the *d* and *l* isomerides are identical in an optically active as well as in an inactive solvent.

Freezing-point data are given for mixtures of *d* and *l* camphoroxime by Beck (1904) and Adriani (1900).

DECALIN (Decahydronaphtalene) $C_{10}H_{18}$.

SOLUBILITY IN LIQUID SULFUR DIOXIDE (98.85 % SO_2).

(Zerner, Weisz and Opalski, 1922.)

The determinations were made in sealed resistance glass tubes. Weighed amounts of the constituents were introduced and the temperatures determined at which homogeneous mixing or slight clouding occurred. The Decalin had a corrected b. pt. of 188-189°. It had $d_{20} = 0.8857$ and $n^{15°}_{D}$ 1.4753.

t° of solution.	Gms. $C_{10}H_{18}$ per 100 gms. sat. sol.	t° of solution.	Gms. $C_{10}H_{18}$ per 100 gms. sat. sol.
−14.5	1.62	38.0	14.80
+ 0.5	2.86	50.75	27.34
18.0	5.54	51.50	52.48
28.5	9.72	[illegible]	81.49

TERPINEOL $\alpha C_{10}H_{18}O$ and $\beta C_{10}H_{18}O$.

SOLUBILITY OF α TERPINEOL AND OF β TERPINEOL IN WATER. (Rhode, 1922.)

By means of a stalogmometric method (see Carvone, p. 676) the solubility of α terpineol in water was found to be 1.98 gms. (= 0.0129 mols.) per liter at 15-20°. The result for β terpineol was 2.20 gms. (= 0.0143 mols.) per liter at 15-20°.

MENTHONE $C_{10}H_{18}O$.

Freezing-point data for mixtures of menthone and menthole are given by Vanstone, 1909.

BORNEOL $C_{10}H_{17}OH$.

SOLUBILITY OF BORNEOL IN WATER.

Using a stalogmometric method involving a comparison of the number of drops per unit of time in the case of saturated solutions and their dilutions, in comparison with similar determinations upon a series of solutions of known content, Rhode, 1922, found that 1 liter of H_2O dissolves 0.64 gm. (= 4.2 millimols) borneol at 15-20°.

By means of an optical method in which an interferometer of the type described by Jamin (*Ann. chim. phys.*, 52, 171, 1858) was used, Mitchell, 1926, found that 1 liter of H_2O dissolves 0.693 gm. borneol at 15° and 0.740 gm. at 25°.

100 gms. abs. alcohol dissolve 175.5 gms. borneol at 20-25°. (Pucher and Dehn, 1921.)

Freezing-point lowering data for mixtures of *d* borneol and *l* borneol, *d* borneol and *d* camphor, *d* bornyl hydrogen phthalate and *l* bornyl hydrogen phthlate are given by Ross and Somerville, 1926.

Freezing-point data for mixtures of stereoisomeric Borneols and each of the following stereoisomeric compounds are given by Timmermans, 1930. Bromo camphor, chloro camphor, camphor and pinene hydrochloride.

Results for mixtures of Borneol and camphor are also given by Vanstone, 1909, and Hrynakowski, Staszewski and Szmyt, 1936.

CINEOLE (Eucalyptol) $C_{10}H_{18}O$.

Solubility of Cineole in Water. (Earle, 1918.)

t°	1°.5.	7°.5.	10°.0.	21°.0.	40°.0.	50°.0.
Gms. $C_{10}H_{18}O$ per 100 gms. H_2O.	0.64	0.57	0.54	0.35	0.21	0.19

Freezing point data are given for mixtures of Cineole and:

Amido phenols(1)
Cresols(1)
Ethyl phenols(2)
Guaiacol(1)
Hydroquinone(1)
Methyl ethyl phenols(2)
Methyl salicylate(1)
Naphthalene(1)
Naphthols(1)
Nitro phenols(1)
Oxy benzoic acid(1)
Phenol(1)
Phenyl salicylate(1)
Pyro catechol(1)
Resorcinol(1)
Thymol(1)
Xylenols(2)

(1) Bellucci and Grassi, 1914; (2) Morgan and Pettet, 1935.

SEBACIC ACID $(CH_2)_8(COOH)_2$.

100 gms. 95% formic acid dissolve 1.05 gm. sebacic acid at 19°. (Aschan, 1913.)

Distribution of Sebacic Acid between Water and Ether at 25°.
(Chandler, 1908.)

Mol. Concentration of Sebacic Acid in: Aq. Layer.	Ether Layer.	Ratio.
0.00062	0.0291	0.0213
0.00058	0.0272	0.0213
0.00047	0.0213	0.0221
0.00036	0.0155	0.0232

HEXYL SUCCINIC ACID (d) $COOHCH(C_6H_{13})CH_2COOH$.

Freezing point data for mixtures of d and of l hexyl succinic acid with d and with l propyl succinic acid are given by Timmermans and Van der Haegen, 1944.

HEPTYL MALONIC ACID $CH(C_7H_{15})(COOH)_2$.

100 gms. H_2O dissolve 0.184 gm. $CH(C_7H_{15})(COOH)_2$ at 25°.
100 gms. C_6H_6 " 0.0917 " " "
(Verkade and Coops, 1930a.)

ETHYL ADIPATE $(CH_2)_4(COOC_2H_5)_2$.

100 cc H_2O dissolve 0.424 gm. $(CH_2)_4(COOC_2H_5)_2$ at 20°.
(Sobotka and Kahn, 1931.)

100 gms. H_2O dissolve 0.426 gm. $(CH_2)_4(COOC_2H_5)_2$ at 30°.
(Gross, Saylor and Gorman, 1933.)

BORNYL AMINE $C_{10}H_{17}NH_2$.

Distribution of Bornyl Amine between Water and Xylene at 25°.
(Smith, 1921-1922.)

Millimols $C_{10}H_{17}NH_2$ per liter of: H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.

CAMPHYLAMINE $C_9H_{15}CH_2.NH_2$.

DISTRIBUTION BETWEEN WATER AND XYLENE AT 25°. (Smith, 1921-1922.)

Millimols. per liter of		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$
0.0182	0.982	54.0
0.0396	2.210	55.8
0.0625	3.587	57.9

MENTHENON

$CH_3.CH\left\langle\begin{matrix}CO.CH\\CH_2.CH_2\end{matrix}\right\rangle C.CH(CH_3)_2$.

MENTHOL

$(CH_3)_2CH.CH\left\langle\begin{matrix}CH(OH)CH_2\\CH_2CH_2\end{matrix}\right\rangle CH.CH_3$.

MENTHON

$(CH_3)_2CH.CH\left\langle\begin{matrix}CO.CH_2\\CH_2.CH_2\end{matrix}\right\rangle CH.CH_3$.

SOLUBILITY OF EACH IN WATER AT ROOM TEMPERATURE. (Rhode, 1922.)

The author used a stalogmometric method, according to which the number of drops per unit of time in the case of saturated solutions and their dilutions were compared with similar determinations upon a series of solutions of known content. For obtaining saturation long periods of shaking were often necessary.

Compound.	Per liter of sat. sol. Grams.	Per liter of sat. sol. Millimols.
Menthenon..........		15.1
Menthol.....................	0.42	2.7
Menthon..........	0.69	4.5

One cc. of 95% alcohol dissolves about 5 gms. menthol at room temp. (Greenish and Smith, 1903.)

100 gms. sat. solution of menthol in liquid ammonia contain about 16 gms. $C_{10}H_{20}O$ at ? t°.

100 gms. sat. solution of menthol in liquid sulfur dioxide contain about 27 gms. $C_{10}H_{20}O$ at ? t°. (De Carli, 1927.)

Freezing-point data are given for mixtures of Menthol and:

Acetanilide(7)(14)
Antipyrine(1)(2)(6)
" + Phenacetine(5)
Anethol(15)
Benzene(4)
Camphor(9)
Chloral hydrate(8)
Ethylene bromide(4)
Guaiacol(1)(6)
Iodo biphenyl(12)
Menthane(16)
Menthone(16)
Methyl urethan(15)
Naphthalene(15)
Nitro benzene(15)
Phenacetine(6)
" + antipyrine(5)
" + urethan(5)
Phenylene diamine(13)
Quinine(1)(6)
Salol(3)(6)
Sarcosine anhydride(10)
Tetra methyl diamino benzo phenone(11)
Toluidine(8)
Urea(6)
Urethan(1)(6)
" + Phenacetine(5)
Michler's ketone(17)

(1) Adamanis, 1933; (2) Angeletti, 1928; (3) Bellucci, 1912; 1913; (4) Dahms, 1895; (5) Hrynakowski, 1934; (6) Hrynakowski and Adamanis, 1933; (7) Hrynakowski and Adamanis, 1933a; (8) Pawlewski, 1893; (9) Pawlewski, 1913; (10) Pfeiffer and Angern, 1926; (11) Pfeiffer, Goebel and Angern, 1925; (12) Pfeiffer, Schmitz and Inoue, 1929; (13) Puschin and Dezelic, 1938; (14) Quercigh and Cavagnari, 1912; (15) Scheuer, 1910; (16) Vanstone, 1909; (17) Pfeiffer, 1924.

Freezing-point data for mixtures of d and l iso menthol are given by Read, Robertson and Cook, 1927.

CAPRIC ACID $CH_3(CH_2)_8COOH$.

ETHYL CAPRYLATE $CH_3(CH_2)_6COOC_2H_5$.

100 cc H_2O dissolve 0.007 gm. $CH_3(CH_2)_6COOC_2H_5$ at 20° (Sobotka and Kahn, 1931.)

TRI CAPRIN $C_5H_5[CH_3(CH_2)_8COO]_3$.

SOLUBILITY OF TRI CAPRIN IN SEVERAL SOLVENTS.

(Loskit, 1928.)

The determinations were made by the thermic, the sealed tube and the analytical method. The author's results were plotted and the following table constructed from the curves.

t°	Gms. $C_3H_5[CH_3(CH_2)_8COO]_3$ per 100 gms. sat. sol. in: C_6H_6	$(C_2H_5)_2O$	CS_2
-15	—	2.5	—
-10	—	6.5	8.0
- 7.5	(51.)	9.0	13.0
- 5.0	(46.)	12.0	19.0
- 2.5	(40.)	16.5	25.0
- 1.5	37.0(37.)	—	—
0	40.0(32.)	22.2	32.2
2.5	46.0(20.)	29.0	40.0
5.0	51.0(7.)	37.5	48.0
10	61.5	54.0	59.0
15	71.5	66.5	70.0
20	81.5	80	81.0
25	90.0	90	91.0
25			

The author also gives the following results for the solubility of tricaprin in ethyl alcohol.

t°	Gms. tricaprin per 100 gms. sat. sol.
9.5	0.44
13.8	0.99
17.6	2.01
20.8	3.86
23.4	5.81
24.2	7.44
25.1	9.87
24.9	11.83
25.4	12.72
25.2	14.36
58.5	29.32
60.8	35.28
69	68.40
69	73.80
65	83.3
55	85.24
35	92.61

TERPIN HYDRATE $C_{10}H_{18}(OH)_2.H_2O$.

100 cc. H_2O dissolve 0.36 gm. terpin hydrate at 15-20°.
100 cc. 90% alcohol dissolve 7.1 gms. terpin hydrate at 15-20°.
(Squire and Caines, 1905.)

Freezing-point data for mixtures of terpin hydrate and salol are given by Angeletti, 1928.

DECANE $CH_3(CH_2)_8CH_3$.

The critical solution temperature of mixtures of decane and liquid sulfur dioxide is 36.5° and the reciprocal solubility curve at this temperature is practically flat between the concentrations 60-90 mol. percent SO_2. (Leslie, 1934.) The C.S.T. is given by Seyer and Todd, 1931, as 37.3°.

Freezing-point data for mixtures of decane and dicetyl are given by Seyer, 1938.

AGARIC ACID $C_{16}H_{30}O_5.H_2O$.

100 grams trichloroethylene dissolve 0.014 gram agaric acid at 15°.

(Wester and Bruins, 1914.)

β NAPHTHOIC ACID $C_{10}H_7COOH$.

One liter of aqueous solution contains 0.058 gm. $C_{10}H_7COOH$ at 25°.

(Paul, 1894.)

Freezing-point data for mixtures of α Naphthoic acid and tetra methyl diamino benzo phenone are given by Pfeiffer, Goebel and Angern, 1925.

β METHYL NAPHTHALENE $C_{10}H_7(CH_3)$.

Freezing-point data for mixtures of β methyl naphthalene with β naphthol, with β naphthylamine and with β chloro naphthalene are given by Grimm, Gunther and Titus, 1931.

Dihydro **β NAPHTHOIC ACIDS** $C_{10}H_9COOH$ (118° and 161° isomers).

SOLUBILITY OF EACH ISOMER, DETERMINED SEPARATELY, IN WATER.
(Derick and Kamm, 1916.)

t°.	cc. 0.01 n $Ba(OH)_2$ Solution Required per 10 cc. of the Sat. Solution of the 118° Isomer.	161° Isomer.
0	0.39	0.19
20	0.56	0.34
40	1.34	0.69
55-56	2.89	1.45
71-72	6.7	3.48
80	9.3	4.68
90	14.6	8
96-97	20.1	10.5

β NAPHTHOL METHYL ESTER (1-Methyl-β-Naphthol) $CH_3C_{10}H_6OH$.

Freezing-point data for mixtures of β naphthol methyl ester with m dinitro benzene and with 1,2,4 dinitro toluene are given by Guia and Marcellino, 1920.

DI ANISAL ACETONE (3-Buten-2-one, 4 p anisyl) $CH_3OC_6H_4CH:CHCOCH_3$.

Freezing-point data for mixtures of dianisal acetone and acenaphthene are given by Pfeiffer, 1924.

TRI NITRO PHENOXY PROPIONIC ACID ETHYL ESTER $CH_3CH[OC_6H_2(NO_2)_3]CO_2C_2H_5$

Freezing-point data for mixtures of α 2,4,6 tri nitro phenoxy propionic acid ethyl ester and di phenyl amine are given by Hertel and Römer, 1930.

QUINOLINE ETHIODIDE $C_9H_7N.C_2H_5I$.

100 gms. H_2O dissolve 301.3 gms. $C_9H_7N.C_2H_5I$ at 25°. (Peddle and Turner, 1913)
100 gms. $CHCl_3$ dissolve 1.78 gms. $C_9H_7N.C_2H_5I$ at 25°. "

ANTIPYRINE $\underbrace{N(CH_3)N(C_6H_5)COCH:C}CH_3$.

SOLUBILITY IN WATER, DETERMINED BY THE FREEZING-POINT METHOD.

(Kremann and Janetzky, 1923.)

t° of primary crystallization.	Gms. Antipyrine per 100 gms. sat. sol.	Solid Phase.	t° of primary crystallization.	Gms. Antipyrine per 100 gms. sat. sol.	Solid Phase.
-0.9	16.7	Ice	20.2	57.3	Antipyrine
-1.7	26.2	»	24.9	61.9	»
-2.8	35.4	»	30.4	67.0	»
—3.3 Eutec.	37.5	» + Antipyrine	38.0	72.5	»
0.0	39.1	Antipyrine	46.5	78.1	»
2.5	41.2	»	56.0	83.0	»
6.1	43.6	»	70.0	88.5	»
7.0	45.5	»	88.0	94.7	»
11.0	47.8	»	95.0	96.1	»
15.5	52.6	»	109.0	100.0	»

The authors also give data for mixtures of antipyrine and caffeine and for mixtures of antipyrine, caffeine and water.

SOLUBILITY OF ANTIPYRINE IN VARIOUS SOLVENTS.

100 gms. water	dissolve	80	gms. $C_{11}H_{12}N_2O$	at 15°.	(Greenish and Smith, '03.)
" "	"	100	"	"	25°.	(U. S. P.)
" alcohol	"	100	"	"	"	"
" 90% alcohol	"	75.2	"	"	"	"
" chloroform	"	100	"	"	"	"
" ether	"	1.3	"	"	"	(Enell, 1899.)
" pyridine	"	38.0	"	"	at 20–25°.	(Dehn, 1917.)
" 50% aq. pyridine	"	79.61	"	"	"	"

100 gms. abs. C_2H_5OH dissolve 74.09 gm. Antipyrine at 20-25°.
100 gms. Quinoline » 19.00 » » at 20-25°.
100 gms. equi. mols. Quinoline and C_2H_5OH dissolve 36.55+gm. Antipyrine at 20–25°.
(Pucher and Dehn. 1921.)

100 gms. Glycerol of $d = 1.2306$ dissolve 21.4 gms. Antipyrine at 20°. (Holm, 1921, 1922.)
100 gms. » » $d = 1.2645$ » 17.3 » » at 20°. » »
100 gms. Cymene » 2.09 » » at 30°. (Wheeler, 1920.)
100 gms. 86.5% Glycerol ($d = 1.2306$) dissolve 1.9 gms. *Dimethyl amino antipyrine* and 100 gms. 98.5% Glycerol ($d = 1.2645$) dissolve 1.5 gms. at 20°. (Holm, 1921, 1922.)

100 gms. C_6H_6 dissolve 8.1 gms. Antipyrine at 25°. (Warren, 1933.)
" " CCl_4 " 1.03 " " " " " "

DISTRIBUTION OF ANTIPYRINE AT 25° BETWEEN. (Emery and Wright, 1921.)

Water and Chloroform

Gms. Antipyrine per 100 cc.	
H_2O layer.	$CHCl_3$ layer.
0.0016	0.1984
0.0064	0.3936
0.0118	0.9882
0.1008	1.8992
0.3900	4.610
1.1600	8.840

1.0 normal Aq H_2SO_4 and $CHCl_3$.

Gms. Antipyrine per 100 cc.	
Aq layer.	$CHCl_3$ layer.
0.0908	0.1092
0.1884	0.2116
0.4644	0.5356
0.9452	1.0548
2.315	2.685
4.568	5.432

0.1 normal o $C_6H_4(OH)COONa$ and $CHCl_3$.

Gms. Antipyrine per 100 cc.	
Aq. layer.	$CHCl_3$ layer.
0.0092	0.1908
0.0212	0.3788
0.0524	0.9416
0.416	4.584
0.424	4.576
1.25	8.75

THE SOLIDIFICATION POINTS OF MIXTURES OF ANTIPYRINE AND SALOL.

(Bellucci, 1912, 1913.)

Initial t° of Solidification.	Gms. $C_{11}H_{12}N_2O$ per 100 Gms. Mixture.	Initial t° of Solidification.	Gms. $C_{11}H_{12}N_2O$ per 100 Gms. Mixture.
112.6	100	65	40
104.5	90	53	30
98	80	30 Eutec.	17
91	70	34	20
83	60	35	10
75	50	42	0

Freezing-point data are given for mixtures of Antipyrine and:

Acetanilide(3)(7)
" + Salicylic acid(10a)
" + Phenacetine(5)
Amino phenol(15)
Barbituric acid(13)
Butyl chloral hydrate(13)
Benzoic acid(19)
Benzoic + Salicylic acid(5)
Caffeine(11)
Carbazole(12)
Chloral hydrate(18)
Cholesterine(13)
Di phenyl amine(12)
Di methyl glyoxime(20)
Di nitro phenol(21)
Hydroquinone(17)(21)
" + pyrocatechol(5)(9)
Luminal(15)(13)
Mannite(13)
Menthol(1)(2)(6)
" +Phenacetine(5)
Methyl acetanilide(2)(4)
Methyl barbituric acid(13)
Methyl ethyl glyoxime(20)
Methyl glyoxime(20)
Methyl oxy benzoates(15)
Methyl phenyl voluntal(14)
Methyl veronal(13)
Naphthols(16)(21)
Naphthylamine(12)
Nitro phenol(21)
Orthoform neu(15)
Phenacetine(1)(6)
" + Acetanilide(5)
" + Menthol(5)
" + Quinine(5)
" + Salol(5)
" + Sulfonal(5)
" + Urea(5)
" + Urethan(5)
Phenylene diamine(12)
Phenyl urethan(22)
Phenyl veronal(13)
Phenyl voluntal(14)
Pyrocatechol(21)
" + Resorcine(5)
" + Hydroquinone(9)(5)
Pyrogallol(21)
Quinine(1)(6)
" + Phenacetine(5)
Resorcine(16)(21)
" + Urea(5)
Resorcine + Pyrocatechol
Phenol (21)
Salicylic acid(21)
" " + Benzoic Acid(5)
Salicylic acid + Urea(5)
Salol(1)(6)(16)
" + Phenacetine(5)
Salipyrine + Urea(5)
Sulfonal + Urea(5)
" + Phenacetine(5)
Thiosinamine(22)
Thymol(10b)
Urea(1)(6)
" + Phenacetine(5)
" + Resorcine(5)
" + Salicylic acid(5)
" + Salipyrine(5)
" + Sulfonal(10)
" + Urethan(5)(8)
Urethan(6)(14)
" + Phenacetine(5)
" + Urea(5)(8)
Veronal(13)(12)
Voluntal(14)

Freezing-point data are given for mixtures of 1-phenyl 2,3, di methyl-5-pyrazolone and: Barbital(12)(13)
Di phenyl amine(12)

(1) Adamanis, 1933; (2) Angeletti, 1928; (3) Comanducci, 1912; (4) Giua, 1916; (5) Hrynakowski, 1934; (6) Hrynakowski and Adamanis, 1933; (7) Hrynakowski and Adamanis, 1933a; (8) Hrynakowski and Adamanis, 1935; (9) Hrynakowski and Adamanis, 1937; (10) Hrynakowski and Szmyt, 1938a; (10a) Hrynakowski and Szmyt, 1935b; (10b) Hrynakowski and Szmyt, 1935; (11) Kremann and Janetzky, 1923; (12) Pfeiffer and Angern, 1926; (13) Pfeiffer and Seydel, 1928; (14) Pfeiffer and Seydel, 1928a; (15) Pfeiffer and Seydel, 1928b; (16) Quercigh and Cavagnari, 1912; (17) Rheinboldt, Henning and Kircheisen, 1925; (18) Tsakalotos, 1913; (19) Kremann and Marktl, 1920; (20) Semeria and Bocca, 1926; (21) Kremann and Haas, 1919; (22) Mazetti, 1926.

1 TRYPTOPHAN $C_6H_4NHCH{:}CCH_2CH(NH_2)COOH$.

SOLUBILITY OF TRYPTOPHAN IN WATER.

(Dalton and Schmidt, 1935.)

The results of 18 determinations at 8 temperatures between 0° and 65° were used for calculating the solubility equation and from this the following values for 5° intervals were obtained. The values above 70° are probably less accurate than those at the lower temperatures.

t°	Gm. 1 Tryptophan per 1000 gms. H_2O	t°	Gm. 1 Tryptophan per 1000 gms. H_2O	t°	Gm. 1 Tryptophan per 1000 gms. H_2O
0	8.23	30	12.23	60	20.57
5	8.72	35	13.23	65	22.70
10	9.27	40	14.35	70	25.14
15	9.88	45	15.62	75	27.95
20	10.57	50	17.06	100	49.87
25	11.36	55	18.70		

SOLUBILITY OF TRYPTOPHAN IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 22-23°.

(Pfeiffer and Angern, 1924.)

The determinations were made by the method described under Alanine, p. 1019.

Solvent.	Gms. $C_{11}H_{12}N_2O_2$ per 100 cc. sat. sol.
Water	1.306
Aq. 0.2 molecular CH_3COOK	1.202
» $(NH_4)_2SO_4$	0.588
» NaCl	1.080

100 cc Acetic Acid dissolve 0.85 gm. Tryptophan at 18°.
100 cc Butyric Acid dissolve 0.053 gm. Tryptophan at 18°.
(Przylecki and Kasprzyk-Czaykowska, 1938.

ETHYL COUMARIC ACID (Ethyl hydroxy cinnamic acid) $C_{11}H_{12}O_3$.

SOLUBILITY OF ETHYL COUMARIC ACID AND OTHER COMPOUNDS IN WATER.

(Roth and Stoermer, 1913.)

Compound	Formula	t°	Gms. Compound per liter
Ethyl Coumaric Acid	$C_{11}H_{12}O_3$	25	0.0910
Ethyl Coumarinic Acid	$C_{11}H_{12}O_3$	25	0.577
Acetyl Coumaric Acid	$C_{11}H_{11}O_4$	25	0.144
Acetyl Coumarinic Acid	$C_{11}H_{10}O_4$	25	1.14

BUTYL DINITRO BENZOATE $(NO_2)_2C_6H_3COOC_4H_9$

Freezing-point data for mixtures of butyl 3,5-di nitro benzoate and ethy 3.5 di nitro benzoate are given by Caldwell and MacLean, 1933.

METHOXY iso CHAVIBETOL $(CH_3O)_2C_6H_3CH:CHCH_3$.

Freezing-point data for mixtures of methoxy iso chavibetol and methoxy iso eugenol are given by Hiraidzumi, 1912.

CYTISINE (Ulexine) $C_{11}H_{14}N_2O$ (m. pt. 151°–151.5°.)

SOLUBILITY IN SEVERAL SOLVENTS AT 15°.
(Van de Moer, [illegible])

Solvent.	Gms. $C_{11}H_{14}N_2O$ per 100 Gms. Sat. Sol.	Solvent.	Gms. $C_{11}H_{14}N_2O$ per 100 Gms. Sat. Sol.
Water	soluble in all proportions.	Benzine	[illegible]
Alcohol	" " "	Petroleum Ether	insol.
Chloroform	" " "	Amyl Alcohol	[illegible]
Ether (*d* 0.725)	0.302	Carbon Disulfide	insol.
Ether, abs.	insol.	Ethyl Acetate	very soluble

PILOCARPINE $C_{11}H_{16}N_2O_2$.

100 cc. oil of sesame dissolve 0.3142 gm. $C_{11}H_{16}N_2O_2$ at 20°. (Zalai, [illegible])

PILOCARPINE HYDROCHLORIDE $C_{11}H_{16}N_2O_2.HCl$, Pilocarpine Nitrate $C_{11}H_{16}N_2O_2.HNO_3$, and Piperine $C_{17}H_{19}NO_3$ in Several Solvents.

(U. S. P. VIII.)

Solvent.	t°.	Gms. per 100 Gms. solvent. $C_{11}H_{16}N_2O_2.HCl$	$C_{11}H_{16}N_2O_2.HNO_3$	$C_{17}H_{19}NO_3$
Water	25	333	25	insoluble
Alcohol	25	4.35	1.66	6.66
Alcohol	60	9.09	6.2	22.7
Chloroform	25	0.18	...	58.8
Ether	25	...	...	2.8

d CAMPHOCARBONIC ACID $C_8H_{14}\begin{cases}CH.COOH\\CO\end{cases}$

SOLUBILITY IN XYLOL AT 20°.1. ([illegible])

An excess of *d* camphocarbonic acid was shaken [illegible] with 25 cc. of xylol for 15 minutes. To [illegible] of the clear solution [illegible] NaOH were added and the mixture shaken [illegible] minutes, centrifuged [illegible] minutes and the clear caustic solution layer polarized in a 2 dm. tube. The rotation [illegible], corresponding to 0.1827 gm. of the acid per 100 cc. xylol solution. The average of several determinations gave 0.[illegible] gm. $C_8H_{14}\begin{cases}CH.COOH\\CO\end{cases}$ per 100 cc. of solution in xylol at 20°.1.

SOLUBILITY OF CAMPHO CARBONIC ACID IN XYLOL SOLUTIONS OF SEVERAL COMPOUNDS AT 20°. (Bredig and Joyner, 1918.)

Base added to Xylol.	Gms. base per 25 cc. xylol.	Gms. $C_8H_{14}\left\langle\begin{matrix}CH.COOH\\ \vert\\ CO\end{matrix}\right.$ per 25 cc. sat. sol.	Base added to Xylol.	Gms. base per 25 cc. xylol.	Gms. $C_8H_{14}\left\langle\begin{matrix}CH.COOH\\ \vert\\ CO\end{matrix}\right.$ per 25 cc. sat. sol.
Dimethylaniline.	0.2402	0.490	Tripropyl amine.	0.1726	1.214
Collidine........	0.0838	0.706	α Picoline.......	0.1738	0.911
"	0.2478	1.259	Piperidine.......	0.0354	0.740
Diethyl amine...	0.0698	0.981	"	0.0450	0.732
" " ..	0.0768	1.011	"	0.0856	1.068
" " ..	0.1908	1.301	"	0.1766	1.688
" " ..	0.1430	0.960	Pyridine........	0.3088	1.30
Tribenzyl amine.	0.688	0.515	Quinaldine......	0.4412	1.035
Diethyl benzyl amine..	0.2214	1.247	"	1.122	1.846
Di iso butyl amine...	0.1080	0.934	Quinoline.	0.2824	0.916
" " " ...	0.2358	0.624	*m* Toluidine.....	0.7784	1.33

OCTYL MALONIC ACID $CH(C_8H_{17})(COOH)_2$.

100 gms. H_2O dissolve 0.026 gm. $CH(C_8H_{17})(COOH)_2$ (m.pt. 113°.5-115°) at 25°.
" " C_6H_6 " 0.0132 " " " " " "

(Verkade and Coops, Jr., 1930a.)

ETHYL PIMELATE $(CH_2)_5(COOC_2H_5)_2$.

100 cc H_2O dissolve 0.199 gm. $(CH_2)_5(COOC_2H_5)_2$ at 20°.

(Sobotka and Kahn, 1931.)

NONANE DICARBOXYLIC ACID $(CH_2)_9(COOH)_2$.

100 gms. C_6H_6 dissolve 0.0036 gm. $(CH_2)_9(COOH)_2$ at 25°.

(Verkade and Coops, Jr., 1930.)

FORMYL d NEOMENTHYL AMINE $C_{10}H_{19}NHCOH$.

Freezing point data for mixtures of d and l formyl neomenthyl amines are given by Read and Steele, 1927.

UNDECYLIC (Hendecanoic) **ACID** $CH_3(CH_2)_9COOH$.

Freezing point data for mixtures of undecylic and lauric acids are given by Kulka and Sandin, 1937.

UNDECANE (Hendecane) $CH_3(CH_2)_9CH_3$.

The critical solution temperature of mixtures of undecane and liquid sulfur dioxide is 92 and the reciprocal solubility curve at this temperature is practically flat between 65 and 95 mol. percent SO_2.

(Leslie, 1934.)

BROM UNDECAN ACIDS $CH_2Br(CH_2)_9COOH$.

Freezing-point data for mixtures of 10- and 11 Brom undecan acids are given by Ashton and Smith, 1934.

ETHYL PELARGONATE $(CH_3)(CH_2)_7COOC_2H_5$.

100 cc H_2O dissolve 0.003 gm. $CH_3(CH_2)_7COOC_2H_5$ at 20°.
(Sobotka and Kahn, 1931.)

BENZINE (Petroleum) $C_5H_{12}C_6H_{14}$.

100 parts of alcohol dissolve about 16 parts benzine of 0.638-0.660 Sp. Gr., at 25°.

HEXA NITRO DIPHENYL AMINE $(NO_2)_3C_6H_2NHC_6H_2(NO_2)_3$.

SOLUBILITY OF HEXANITRO DIPHENYL AMINE IN SEVERAL SOLVENTS.
(Desvergnes, 1925.)

Solvent	Gms. $C_{12}H_5O_{12}N_7$ per 100 gms. solvent at:		Solvent	Gms. $C_{12}H_5O_{12}N_7$ per 100 gms. solvent at:	
	17°	60°		17°	60°
Water	0.006	0.015	$CHCl_3$	0.0	0.058
"	—	0.034(100°)	$(C_2H_5)_2O$	trace	0.008(34°)
$CH_3COOC_2H_5$	0.841	1.251	C_5H_5N	172.28	485.26(1)
$(CH_3)_2CO$	0.573	1.149	CS_2	0.0	0.018(35°)
C_2H_5OH(96%)	0.073	0.104	CCl_4	0.0	0.062
" (100%)	0.030	0.117	$C_6H_5CH_3$	0.131	0.293
C_6H_6	0.0	0.399	(1) Complex formation.		

Freezing-point data for mixtures of hexa nitro phenyl amine and tri nitro toluene are given by Giua, 1914, 1915.

TETRA NITRO DIPHENYL AMINE $(NO_2)_2C_6H_3NHC_6H_3(NO_2)_2$.

SOLUBILITY OF TETRANITRO DIPHENYL AMINE IN SEVERAL SOLVENTS.
(Desvergnes, 1925.)

Solvent	Gms. $C_{12}H_7O_8N_5$ per 100 gms. solvent at:		Solvent	Gms. $C_{12}H_7O_8N_5$ per 100 gms. solvent at:	
	15°	60°		15°	60°
Water	0.0082(13.5°)	0.0103	C_6H_6	0.320	0.998
"	—	0.0202(100°)	$CHCl_3$	0.201	0.478
$CH_3COOC_2H_5$	0.100	0.519	$(C_2H_5)_2O$	0.024	0.104(35°)
$(CH_3)_2CO$	3.400	6.546	C_5H_5N	6.807	12.472
CH_3OH	0.100	0.519	CS_2	0.015	0.033(37°)
C_2H_5OH(96%)	0.040	0.233	CCl_4	0.020	0.040
" (100%)	0.063	0.212	$C_6H_5CH_3$	0.361	0.710

BIPHENYL, DIBROMO and DICHLORO $C_6H_4BrC_6H_4Br$, $C_6H_4ClC_6H_4Cl$.

Freezing-point data are given for mixtures of:

Dibromo biphenyl + Difluoro biphenyl (Roselius, 1933.)
" " + Biphenyl " "
Dichloro biphenyl + Biphenol (Grimm, Gunther and Titus, 1931.)
" " + Bitolyl " " " " "
" " + Benzidine " " " " "

BIPHENYLENE OXIDE (Dibenzo furan) $C_6H_4OC_6H_4$.

Freezing-point data are given by Cullinane and Plummer, 1938, for the following mixtures:

Diphenylene oxide + diphenylene sulfide
" " + " selenide
Diphenylene dioxide + diphenylene sulfide
" " + " selenide
Diphenylene sulfide + diphenylene selenide
" disulfide + " diselenide

BIPHENYL 4 BROMO, CHLORO etc. $C_6H_5C_6H_4Br$.

Freezing-point data are given by Klemm, Klemm and Schiemann, 1933, for mixtures of:

Bromo biphenyl + Chloro biphenyl
" " + Biphenyl
" " + Fluoro biphenyl
Chloro biphenyl + Biphenyl
" " + Fluoro biphenyl
Fluoro biphenyl + Biphenyl

BIPHENYL p IODO $C_6H_5C_6H_4I$.

Freezing-point data are given by Pfeiffer, Schmitz and Inoue, 1929, for mixtures of Iodo diphenyl and each of the following compounds: Dianisal acetone, dipiperonal acetone, menthol, α naphthol, α naphthylamine, piperonal aceto phenone, sarcosine anhydride, tri nitro benzene.

BROMO (Chloro, Iodo) **ACENAPHTHENE** $C_{10}H_5Br(CH_2)_2$.

Freezing point data for mixtures of Bromo, Chloro and Iodo acenaphthenes are given by Crompton and Walker, 1912.

CARBAZOLE (Diphenylene imide) $(C_6H_4)_2NH$.

100 grams abs. alcohol dissolve 0.92 gm. $(C_6H_4)_2NH$ at 14°, and 3.88 gms. at b. pt.

100 gms. toluene dissolve 0.55 gm. $(C_6H_4)_2NH$ at 16.5°, and 5.46 gms. at b. pt.

CARBAZOLE $(C_6H_4)_2NH$.

100 gms. abs. Alcohol dissolve 1.30 gms. $(C_6H_4)_2NH$ at [illegible]. (Fischer and Dehn, 1921.)
» Quinoline » 33.30 »
» Equi molecular Mixture of Alcohol and Quinoline dissolve 9.86 gms. $(C_6H_4)_2NH$ at 20°-25°. (Fischer and Dehn, 1921.)

SOLUBILITY OF CARBAZOLE IN VARIOUS ORGANIC SOLVENTS. ([illegible], 1919.)

Solvent.	d of solvent	B. pt. of solvent		Gms. $C_{12}H_9NH$ per 100 gms. solvent at				
				[illegible]	[illegible]	[illegible]	80°	100°
Benzene	0.880	80	80.4	[illegible]	1.01	[illegible]		
Toluene	0.870	110	110.5	0.5[illegible]	0.78	1.60	2.90	4.78
Refined Solvent Naphtha	0.865	140	166	0.38	[illegible]	1.[illegible]	[illegible]	[illegible]
Crude »	0.893	13[illegible]	170	[illegible]	0.44	[illegible]	1.8[illegible]	[illegible]
Heavy Naphtha	0.904	160	18[illegible]	0.38	[illegible]	[illegible]	[illegible]	[illegible]
Chloroform	1.491	60.5	[illegible]		0.[illegible]	1.[illegible]		
Carbon disulfide	1.270	46.5	47.[illegible]		0.[illegible]			
Acetone	0.800	56.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Light Pyridine[1]	0.9[illegible]	1[illegible]	1[illegible]	1[illegible]	15.[illegible]	[illegible]	16.80	
Heavy Pyridine[1]	1.0[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hydrated Pyridine[2]	1.000	94	96	[illegible]	0.81	1.[illegible]	[illegible]	
Carbon Tetra chloride	1.610	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Gasoline	0.74[illegible]	90	104	0.11	[illegible]	[illegible]		
Ether	0.720	[illegible]	[illegible]	[illegible]	[illegible]			

[1] These are the bases derived from coal tar oils by [illegible] and liberation of the base with caustic soda. They probably contain but very little pyridine.
[2] $C_5H_5N.3H_2O$

100 gms. sat. solution of Carbazole in liquid sulfur dioxide contain 3.0 gms. $C_{12}H_9N$ at [illegible]. ([illegible], 192[illegible].)

Freezing point data are given for mixtures of Carbazole and:

Acridine(7)
Antipyrine(9)
Anthracene(8)
" + Chrysene(8)
" + Phenanthrene(1)(6)(11)
Benzene + " (13)
Chrysene(7)(8)
Di nitro benzenes(3)
Di nitro phenol(4)
Di nitro toluene(4)
Hydroquinone(4)
Ketene(7)
Naphthol(4)
Nitro phenol(4)
Phenanthrene(1)(7)
Picric acid(4)
Pyrocatechol(4)
Pyrogallol(4)
Quinone(4)
Retene(8)
Resorcinol(4)
[illegible] anhydride(4)
Tri nitro benzene(3)
Tri nitro toluene(3)(4)(10)

(1) Garelli, 1894; (2) Jefremow, 1927; (3) Kremann and [illegible], 1921; (4) Kremann and Slovak, 1920; (5) Kremann, Sutter, [illegible], [illegible] and Dobotzky, 1922; (6) Kremann and Wenzing, 1919; (7) Pascal, 1913; (8) Pascal, 1921; (9) Pfeiffer and Angern, 1926; (10) [illegible], [illegible] and Kirscheisen, 1925; (11) Ward, 1926; (12) Pfeiffer, Angern and Wang, 1927; (13) Bruni, 1898.

THIO DI PHENYL AMINE $NH<(C_6H_4)_2>S$.

100 gms. sat. solution of Thio diphenyl amine in liquid sulfur dioxide contain 21.0 gms. C_8H_9NS at ? t°. (DeCarli, 1927.)

CHLORO AZO BENZENE $ClC_6H_4N:NC_6H_5$.

Freezing point data are given by Grimm, Gunther and Titus, 1931, for mixtures of 4-chloro azo benzene with 4-methyl azo benzene with 4-oxy azo benzene and with 4-amino azo benzene.

NITRO ACENAPHTHENE $C_{10}H_5(NO_2)(CH_2)_2$.

Freezing point data are given by Jefremow, 1918, for mixtures of nitro acenaphthene with picric acid and with styphnic acid.

DINITRO DIPHENYL AMINE $2,4\text{-}NO_2C_6H_4NHC_6H_4NO_2$.

SOLUBILITY OF DINITRO DIPHENYL AMINE IN SEVERAL SOLVENTS.
(Desvergnes, 1925.)

Solvent	Gms. $C_{12}H_9O_4N_2$ per 100 gms. solvent at: 15°	50°	Solvent	Gms. $C_{12}H_9O_4N_2$ per 100 gms. solvent at: 15°	50°
Water	0.0048	0.0084	C_6H_6	2.118	6.977
"	—	0.0143 (100°)	$CHCl_3$	5.826	10.641
$CH_3COOC_2H_5$	2.310	6.108	$(C_2H_5)_2O$	0.378	0.728 (30°)
$(CH_3)_2CO$	4.705	11.600	C_5H_5N	11.349	28.665
CH_3OH	0.126	0.611	CS_2	0.245	0.567 (32°)
C_2H_5OH (96%)	0.088	0.046	CCl_4	0.168	0.653
" (100%)	1.40	4.79	$C_6H_5CH_3$	1.919	6.352

BIPHENYL $C_6H_5.C_6H_5$.

100 grams absolute methyl alcohol dissolve 6.57 grams at 19.5°.
100 grams abs. ethyl alcohol dissolve 9.98 grams at 19.5°. (de Bruyn, 1892.)

SOLUBILITY OF BIPHENYL IN NON POLAR SOLVENTS.

(Warner, Scheib and Svirbely, 1934.)

The determinations were made by the synthetic method.

Results for the solubility in:

Heptane				Carbon Disulfide		Dioxane	
t°	Mol. % $C_{12}H_{10}$ in sat. sol.	t°	Mol. % $C_{12}H_{10}$ in sat. sol.	t°	Mol. % $C_{12}H_{10}$ in sat. sol.	t°	Mol. % $C_{12}H_{10}$ in sat. sol.
26.5	14.0	57.5	72.6	28.4	40.4	26.4	39.8
35.2	21.6	59.5	80.3	36.6	49.8	32.4	47.7
39.9	27.35	60.5	80.6	37.7	51.4	39.3	54.5
43.1	33.5	61.6	83.6	38.2	52.0	42.3	64.8
46.7	40.9	62.5	85.7	40.7	55.4	54.1	72.5
49.0	46.8	64.0	89.2	44.1	59.5	55.0	75.2
49.1	47.5	66.0	93.4	47.6	63.7	57.7	79.8
55.3	66.5	68.1	97.2	51.3	69.4	63.4	89.6
				58.4	84.0	67.7	95.9

Benzene		Carbon Tetrachloride		p Dichloro Benzene	
t°	Mol. % $C_{12}H_{10}$ in sat. sol.	t°	Mol. % $C_{12}H_{10}$ in sat. sol.	t°	Mol. % $C_{12}H_{10}$ in sat. sol.
27.9	41.0	28.1	37.2	27.7(Eutec.)	42.5
43.1	58.5	30.7	40.1	36.1	49.6
44.3	60.5	40.0	51.8	41.2	57.5
45.5	62.6	41.3	53.4	49.8	69.2
49.4	67.7	53.6	71.4	57.4	80.2
52.3	71.3	57.4	78.2	61.4	85.9
		64.3	90.6	65.0	92.3
		66.0	93.9		

Freezing-point data are given for mixtures of Biphenyl +

Anthracene(13)
Antipyrine(9)
Azobenzene(1a)
Benzophenone + Diphenylamine(3)(5)
Benzene(15)
Bibenzyl + Naphthalene(6)
Bromo biphenyl(4)
Camphor(7)
Chloro biphenyl(4)
Dianisal acetone(10)
Dibromo biphenyl(12)
Dichloro benzene(8)(14)
Dichloro biphenyl(12)

Difluoro biphenyl(12)
Diphenylamine(13)
Diphenylamine + benzophenone(3)(5)
Fluoro biphenyl(4)
Naphthalene(13)(15)
" + Biphenyl(6)
Phenanthrene(13)
Picric acid(2)
Styphnic acid(2)
Trinitro benzene (1)
Triphenyl methane(13)
Urea(11)

(1) Briegleb and Schachowskey, 1932; (1A) Beck, 1904; (2) Jefremow, 1918, 1919, 1919a; (3) Jefremow and Tichomirowa, 1926; (4) Klemm, Klemm and Schiemann, 1933; (5) Lee and Warner, 1933; (6) Lee and Warner, 1935; (7) Maka and Nagai, 1933; (8) Morris and Cook, 1935; (9) Pfeiffer and

ACENAPHTHENE $C_{12}H_{10}$.

SOLUBILITY IN SEVERAL ORGANIC SOLVENTS.

(Speyers — *Am. J. Sci.* [4], **14**, 294, 1902.)

	In Methyl Alcohol.			In Ethyl Alcohol.			In Propyl Alcohol.		
t°.	(*a*).	(*b*).	(*c*).	(*a*).	(*b*).	(*c*).	(*a*).	(*b*).	(*c*).
0...	81.33	1.80	0.39	81.1	1.9	0.57	82.3	2.26	0.88
10...	80.40	1.70	0.38	80.3	2.8	0.84	81.8	2.40	1.00
20...	79.60	2.25	0.48	79.6	4.0	1.20	81.4	3.40	1.35
30...	79.00	3.50	0.72	79.1	5.6	1.70	80.9	4.75	1.90
40...	78.45	6.00	1.20	78.7	8.4	2.60	80.6	7.10	2.90
50..	78.15	9.00	1.77	78.8	13.2	3.90	80.7	11.10	4.40
60...	78.30	11.70	2.35	79.4	23.2	7.00	81.5	19.60	8.20
70...	78.60	14.30	2.90	80.75	40.5	12.50	83.9	37.00	16.20

	In Chloroform.			In Toluene.		
t°.	(*a*).	(*b*).	(*c*).	(*a*).	(*b*).	(*c*).
0..........	143.8	18.8	12.7	90.7	12.4	7.9
10..........	140.1	24.0	16.0	90.8	15.0	10.7
20...	136.3	33.0	19.5	91.0	20.0	14.5
30..........	132.4	45.0	25.0	91.8	30.0	20.5
40.......	128.0	60.0	32.0	92.7	53.0	28.0
50..	123.4	85.0	40.0	94.0	85.0	35.7
60..........	119.3	122.0	50.0	95.5	125.0	43.5
70..........	.....	.....	....	97.2	180.0	52.5

(*a*) Weight in grams of 100 cc. of sat. solution. (*b*) Grams of Acenaphthene dissolved per 100 grams solvent. (*c*) Gram molecules of Acenaphthene per 100 gram molecules of solution.

1000 gms. Aq. 25% NH_3 dissolve 0.07 gm. acenaphthene at 25°. (Hilpert, 1916).

100 gms. sat. solution of acenaphthene in liquid sulfur dioxide contain 13.0 gms. $C_{12}H_{10}$ at ? t°. (De Carli, 1927.)

Freezing-point data are given for mixtures of Acenaphthene and:

Benzil(15)
Bromo acenaphthene(14)
Cinnamylidene acetophenone(2)
Chloro acenaphthene(14)
Dianisal acetone(11)(12)
Dinitro benzene(1)(7)
Dinitro phenol(7)
Dinitro toluene(1)(7)(8)
Dinitro xylene(6)
Iodo acenaphthene(14)
Fluorenone(11)(12)
Michler's ketone(11)
Nitro phenols(7)
Picramide (3)
Picric acid(3)
Picryl chloride(3)
Quinone(10)
Nitro benzoic aldehyde(16)
Piperonilic aldehyde(16)
Vanillic aldehyde(16)
Styphnic acid(3)
Tetra methyl diamino benzophenone(12)
Tetra methyl diamino dibenzyl acetone(11)(12)
Tetryl(5)
Tetra nitro benzene(13)
" " cresol(4)
" " toluene(1)(9)
" " xylene(5)

Freezing-point data for mixtures of Nitro acenaphthene with picric acid and with styphnic acid and for mixtures of Acenaphthylene with picryl chloride and with styphnic acid are given by (3).

(1) Giua, 1915; (2) Giua, 1916; (3) Jefremow, 1918; (4) Jefremow and Tichomirowa, 1927; (5) Jefremow and Tichomirowa, 1928; (6) Hertel and Kleu, 1930; (7) Kremann and Haas, 1919; (8) Kremann, Königsberg and Mauermann, 1923; (9) Kremann and Strzelba, 1921; (10) Kremann, Sutter,

Dibromo PHENYL SELENIDE and **TELLURIDE** $(C_6H_4)_2SeBr_2$, $(C_6H_4)_2TeBr_2$.

Data for the solubility of mixtures of dibromophenyl selenide and dibromophenyl telluride in benzene at 21° are given by Pellini (1909).

AZOBENZENE (trans) $C_6H_5N:NC_6H_5$.

SOLUBILITY OF TRANS AZOBENZENE IN AQUEOUS SOLUTIONS OF CETYL PYRIDIUM CHLORIDE ALONE AND CONTAINING SODIUM CHLORIDE AT 25°.

(Hartley, 1938.)

Results for aqueous solutions of:

Cetyl Pyridium Chloride Alone		Cetyl Pyridium Chloride + NaCl		
Gm. Equiv. Cetyl Pyridium Chloride per liter	Gm. Mols. Trans Azobenzene per liter	Gm. Equiv. per liter Cetyl Pyridium Chloride	Gm. Equiv. per liter Sodium Chloride	Gm. Mols. Trans Azobenzene per liter
0.0	0.000024	0.00041	0.0042	0.000029
0.00072	0.000026	0.00104	0.0042	0.000110
0.00095	0.000035	0.00415	0.0042	0.000542
0.00104	0.000048	0.00041	0.010	0.00047
0.00119	0.000070	0.00104	0.010	0.00161
0.00180	0.000175	0.00415	0.010	0.00671
0.00236	0.000268	0.00041	0.042	0.000162
0.00416	0.000558	0.00104	0.042	0.000138
0.00714	0.00104	0.00415	0.042	0.000581
0.0143	0.00219	0.000	0.10	0.000026
0.0209	0.00326	0.00041	0.10	0.000064
0.0314	0.00502	0.00104	0.10	0.000137
0.0500	0.00816	0.00415	0.10	0.000716
0.1045	0.0178	0.00041	0.42	0.000075
0.2080	0.0374	0.00104	0.42	0.000206
0.3120	0.0556	0.00415	0.42	0.000788
0.4980	0.1000			

Similar results are also given for the solubility of trans azo benzene in cetyl pyridium acetate and sulfate at 25° and in aqueous solutions of the bromide and chloride at 33°.

SOLUBILITY OF TRANS AZOBENZENE IN AQUEOUS SOLUTIONS OF ACETONE AT 25°.

(Hartley, 1938.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$(CH_3)_2CO$	H_2O	$C_{12}H_{10}N_2$	$(CH_3)_2CO$	H_2O	$C_{12}H_{10}N_2$
54.7	0.0	45.3	20.4	79.6	0.0097
67.8	17.5	14.7	12.0	88.0	0.0026
60.1	36.3	3.58	0.0	100.0	0.00044
42.2	57.3	0.28			

SOLUBILITY OF AZOBENZENE IN SEVERAL ALCOHOLS.

(Timofeiew, 1894.)

Solvent.	t°.	Gms. $(C_6H_3N)_2$ per 100 Gms. Sat. Sol.	Solvent.	t°.	Gms. $(C_6H_5N)_2$ per 100 Gms. Sat. Sol.
Methyl Alcohol	9.5	3.8	Ethyl Alcohol	10.5	5.88
" "	10.5	3.95	Propyl Alcohol	9.5	5.42
Ethyl Alcohol	9.5	5.29	" "	10.5	6.02

SOLUBILITY OF AZOBENZENES IN WATER AND IN PYRIDINE.

(Dehn, 1917.)

Solvent.	t°.	Gms. Each Compound (Determined Separately) per 100 Gms. Solvent: Azobenzene.	Diazoamino-benzene.	Dimethylamino-azobenzene.
Water	20-25	0.03	0.05	0.016
Pyridine	20-25	76.44	136.7	27.90
Aq. 50% Pyridine	20-25	16.78	67.7	4.51

SOLUBILITY OF AZOBENZENE IN SEVERAL SOLVENTS AT 25°.

(Hartley, 1938.)

Solvent	Gms. $C_{12}H_{10}N_2$ per 100 gms. sat. sol.	Solvent	Gms. $C_{12}H_{10}N_2$ per 100 gms. sat. sol.
Benzene	35.0(1)	n Decane	15.6
Pyridine	50.9	n Hexadecane	12.2

(1) Solid phase $(C_6H_5N)_2.C_6H_6$

SOLUBILITY OF AZOBENZENE IN SEVERAL SOLVENTS.

Solvent	t°	Gms. $C_6H_5.N_2.C_6H_5$ per 100 gms. solvent.	Authority.
Amyl acetate	25	44.1	(Kröber, 1919.)
Methyl butyrate	25	62.2	»
Methyl formate	25	46.6	»
Carbon tetrachloride	20	2.83	(Pawlowski, 1914.)
Chloroform	20	16.24	»
Ethyl alcohol (abs.)	20-25	9.25	(Pucher and Dehn, 1921.)
Equi. mol. Mixture of Ethyl alcohol + Quinoline.	20-25	22.9	»

SOLUBILITY OF AZOBENZENE IN RUBBER. (Bruni, 1921.)

Mixtures of azobenzene and rubber were heated untill homogeneous and then cooled to incipient crystallization.

t° of cryst.	Gms. $C_6H_5N_2C_6H_5$ per 100 gms. mixture.	t° of cryst.	Gms. $C_6H_5N_2C_6H_5$ per 100 gms. mixture.	t° of cryst.	Gms $C_6H_5N_2C_6H_5$ per 100 gms. mixture.
69.0	100.0	67.2	80.0	59.2	50.0
68.95	98.0	66.2	75.0	52.1	40.0
68.6	95.0	65.7	70.0	43.4	30.0
68.6	90.0	63.1	60.0		

Data for the distribution of azobenzene between hexane and methylalcohol are given by Perschke, 1926.

Freezing-point data are given for mixtures of Azobenzene and:

Acetic acid(2)(13)
Azo naphthalene(15)
Azo toluene(15)
Azoxybenzene(9)
Benzal aniline(15)
Benzene azonaphthalene(1)
Benzoic acid(13)
Benzil(17)(18)
Benzoin(18)
Benzylaniline(1)(10)(11)(12)(16)
Cinnamic acid(13)
Cinnamylidine acetophenone(1)
Dibenzyl(3)(15)(16)(18)
Dinitro benzene(7)
Dinitro toluene(7)
Dichlor acetic acid(13)
Dinitro phenol(4)
Dimethoxy stilbene(15)
Diphenyl(3)
Diphenyl amine(3)
Hydroquinone(14)
Naphthols(14)
Naphthylamine(16)
Nitro phenols(14)
Nitro toluene(7)
Pyrocatechol(14)
Pyrogallol(14)
Picric acid(14)
Resorcinol(14)
Salicylic acid(13)
Stilbene(3)(15)
Succinic acid(13)
Tolane(15)
Toluylic acid(15)
Tri chlor acetic acid(13)
Trinitro toluene(7)

(1) Beck, 1904; (2) Bradley and Marsh, 1933; (3) Bruni and Gorni, 1899; (4) Erlenmeyer and Leo, 1933; (5) Giua, 1916; (6) Giua and Cherchi, 1919; (7) Giua and Reggiani, 1925; (8) Garelli and Calzolari, 1899; (9) Hartley and Stewart, 1914; (10) Hasselblatt, 1913; (11) Isaac, 1910-11; (12) Jaeger, 1907; (13) Kremann and Zechner, 1925; (14) Kremann, Zechner and Weber, 1924; (15) Pascal and Normand, 1913; (16) Pfeiffer, Angern, Wang, Seydel and Quehl, 1930; (17) Tammann and Botschwar, 1926; Vanstone, 1913.

CHLORO DIPHENYL AMINE p $ClC_6H_4NHC_6H_5$.

Freezing point data are given by Chapman and Perrott, 1930, for mixtures of p chloro diphenyl amine with diphenyl amine and with di p chloro phenyl amine.

DI PHENYL DI SULFIDE $(C_6H_5)_2S_2$.

Freezing-point data are given by Grimm, Gunther and Titus, 1931, for mixtures of diphenyl disulfide and dibenzyl. Results for mixtures of diphenyl sulfide, selenide, telluride and diphenyl ether are given by Pascal, 1912.

PHENYL ETHER $(C_6H_5)_2O$.

The critical solution temperature of a mixture of phenyl ether and iso amyl benzoate is 23.5°. (Lecat, 1928.)

Freezing point data for mixtures of phenyl ether with diphenyl methane and with diphenyl amine are given by Grimm, Gunther and Titus, 1931.

Results for mixtures of Phenyl ether and tri nitro benzene are given by Sudborough and Beard, 1911.

Hydroxy**AZOBENZENE** $C_6H_5.N:N.C_6H_4OH$.

1000 cc. sat. solution in H_2O contain 0.0225 gm. $C_6H_5N:N.C_6H_4OH$ at 25°.

1000 cc. sat. solution in H_2O sat. with C_6H_6 contain 0.0284 gm. $C_6H_5N:N.C_6H_4OH$ at 25°.

1000 cc. sat. solution in C_6H_6 sat. with H_2O contain 15.20 gms. $C_6H_5N:N.C_6H_4OH$ at 25°. (Farmer, 1901.)

Distribution results for hydroxyazobenzene between benzene and water gave: conc. in C_6H_6 ÷ conc. in H_2O = 539 at 25°. (Farmer, 1901.)

Freezing-point data for mixtures of oxyazobenzene with amino azobenzene and with chloro azobenzene are given by Grimm, Gunther and Titus,

AZOXY BENZENE $C_6H_5(NON)C_6H_5$.

Freezing-point data for mixtures of azoxy benzene with bromo dinitro benzene, with dinitro toluene and with trinitro toluenes are given by Giuà and Guastella, 1925.

BIPHENOL $HOC_6H_4.C_6H_4OH$.

Freezing-point data for mixtures of biphenol with benzidine with di tolyl and with dichloro diphenyl are given by Grimm, Gunther and Titus, 1931

NAPHTHYL ACETATE $CH_3COOC_{10}H_7$.

Freezing-point data are given for

α and β Naphthyl acetates + Acetic acid(Kendall and Booge, 1916.)
β Naphthyl acetate + Picric acid (Shinomiya, 1940.)
" " + Tri nitro benzene " "
" " + Tetra nitro benzene" "

METHYL NAPHTHOATE β $C_{10}H_7COOCH_3$.

Freezing-point data are given by Shimomiya, 1940 for mixtures of β methyl naphthoate with picric acid with trinitro benzene and with tetra nitro benzene.

BENZOIC ANHYDRIDE $(C_6H_5CO)_2O$.

Freezing-point data are given for mixtures of benzoic anhydride and sulfuric acid by Kendall and Carpenter (1914).

METHYL ORANGE $H_2NC_6H_4.N_2.C_6H_4SO_3Na$.

100 gms. H_2O	dissolve	0.02 gm.	methyl orange	at	20–25°.	(Dehn, 1917.)
" pyridine	"	1.80	"	"	"	"
" aq. 50% pyridine	"	51.5	"	"	"	"

QUINHYDRONE $C_6H_4O_2, C_6H_4(OH)_2$.

SOLUBILITY OF DIFFERENT SAMPLES OF QUINHYDRONE IN 0.01 NORMAL HYDROCHLORIC ACID AT 18°. (Sörensen, Sörensen and Linderstrom-Lang, 1921.)

The samples were prepared by mixing alcoholic solutions of definite molecular amounts of the two constituents of the compound. The resulting precipitates were filtered, washed with alcohol and rapidly dried. The saturated solutions were prepared by constant agitation for periods of 4 to 19 hours.

	Mols. per liter			Mols. per liter	
Sample No.	Quinhydrone.	Hydroquinone.	Sample No.	Quinhydrone.	Hydroquinone.
UKL I....	0.01426	0.01418	CL II......	0.01301	0.01302
UKL II...	0.01371	0.01392	CL III.....	0.01302	0.01309
CL I......	0.01276	0.01267	CL IV.....	0.01298	0.01307
CL I*a*....	0.01297	0.01293			

QUINHYDRONE $C_6H_4O_2.C_6H_4(OH)_2$.

Data for the solubility and dissociation of quinhydrone in water at 25° are given by Luther and Leubner, 1912. Later experiments at 15°, 25° and 35° are reported by Berthoud and Kunz, 1938. These latter authors describ the difficulties of reaching equilibrium, both from above and from below, and found it necessary to use 0.001 n HCl as solvent instead of water in order to avoid persistant colloidal opalescence in the solutions. They give the following results for the solubility of quinhydrone in water (0.001 n HCl) and in aqueous solutions of hydroquinone.

Gm. Mol. Hydroquinone per liter aq. solvent	Gm. Mol. Quinhydrone per liter sat. sol. at: 15°	25°	35°
0.0(= 0.001 n HCl)	0.01224	0.01870	0.02788
0.00781	0.00893	—	—
0.01562	0.00675	0.01271	0.02154
0.03125	0.00447	0.00945	0.01711
0.0625	0.00273	0.00606	0.01160
0.125	0.00160	0.004775	0.00747
0.250	—	0.002425	0.00436

The solubility of Quinhydrone in aq. 0.01 n H_2SO_4 is 0.0181 gm. mol. per liter at 25°.

The solubility of Thymoquinhydrone in aq. 0.01 n HCl+0.09 nKCl is 0.00276 gm. mol. per liter at 25°. (Biilmann and Muus, 1931.)

One liter sat. solution of quinhydrone in water contains 0.0158 gm. mol. $C_{12}H_{10}O_4$ at 20°. (Brodsky and Alfero, 1929.)

SOLUBILITY OF QUINHYDRONE IN AQUEOUS ETHYL ALCOHOL AT 20°.

(Brodsky and Alfero, 1929.)

Wt. % C_2H_5OH in aq. solvent	Gm. Mols. $C_{12}H_{10}O_4$ per liter sat. sol.
25.55	0.0346
49.81	0.0684
71.31	0.1158

DIPHENYLAMINE $(C_6H_5)_2NH$.

RECIPROCAL SOLUBILITY OF DIPHENYLAMINE AND WATER, BY SYNTHETIC METHOD.

(Campetti and del Grosso, 1913.)

t°.	Gms. $(C_6H_5)_2NH$ per 100 Gms. Mixture.	t°.	Gms. $(C_6H_5)_2NH$ per 100 Gms. Mixture.	t°.	Gms. $(C_6H_5)_2NH$ per 100 Gms. Mixture.
231	1.48	305 crit. t.	47.5	230	88.28
264	3.40	304	62.52	220	90.23
275	5.62	290	73.07	210	92.93
297	16.50	280	82.08	182	97.10
303	45.16	240	86.73		

Similar data for the systems diphenylamine + ether and diphenylamine + isopentane are given by Campetti, 1917.

SOLUBILITY OF DIPHENYLAMINE IN WATER.

(Desvergnes, 1928.)

t°	Gms. $(C_6H_5)_2NH$ per 100 gms. H_2O
0	0.003
15	0.00316(1)
28	0.007
50	0.012
85	0.032

(1) Thiel, 1929.

SOLUBILITY OF DIPHENYLAMINE IN AQUEOUS ETHYL ALCOHOL.

(Desvergnes, 1928.)

Vol. % Aq. C_2H_5OH	d_{15} of Aq. C_2H_5OH	Gms. $(C_6H_5)_2NH$ per 100 gms. aq. C_2H_5OH at:		
		0°	28°	40°
29.9	0.9696	0.003	0.005	0.007
38.9	0.9532	0.007	0.089	0.22
52.4	0.9313	0.213	0.761	1.24
68.6	0.8939	1.395	5.025	7.63
77.1	0.8724	2.477	8.764	15.55
87.1	0.8430	6.510	23.054	109.61
92.0	0.8272	9.825	38.621	223.29
96.2	0.8112	14.545	64.207	317.20
100.0	0.7914	26.269	95.842	385.83

SOLUBILITY OF DIPHENYL AMINE IN VARIOUS SOLVENTS.

(Desvergnes, 1928.)

Solvent	d_{15} of solvent	Gms. C_6H_5NH per 100 gms. solvent at:			Color of solution
		0°	28°	40°	
Ethyl acetate	0.9048	135.218	306.79	—	pale amber
Acetone	0.7998	239.830	298.59	—	pale yellow
Methyl alcohol	0.8055	26.708	122.98	516.55	pale amber
Benzene	0.8826	110.674	277.99	416.67	" "
Chloroform	1.4887	86.545	206.26	—	wine red
Anhydrous ether	0.7193	140.576	324.79	—	pale amber
Pyridine	0.9805	217.626	306.91	425.62	" "
Carbon disulfide	1.2723	112.452	314.12	—	" "
Carbon tetra chloride	1.6012	27.734	122.63	—	dark violet
Toluene	0.8733	85.794	227.65	315.72	pale amber
m Xylene	0.8683	49.976	163.14	247.85	" "

SOLUBILITY OF DIPHENYLAMINE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $(C_6H_5)_2NH$ per 100 Gms. Solvent.	Authority.
Water	20–25	0.03	(Dehn, 1917.)
Methyl Alcohol	14.5	45.2	(Timofeiew, 1894.)
" "	19.5	57.5	(de Bruyn, 1892.)
Ethyl Alcohol	14.5	39.4	(Timofeiew, 1894.)
" "	19.5	56	(de Bruyn, 1892.)
Propyl Alcohol	14.5	29.4	(Timofeiew, 1894.)

SOLUBILITY OF DIPHENYLAMINE IN HEXANE AND IN CARBON DISULFIDE.

(Etard, 1894.)

t°.	Gms. $NH(C_6H_5)_2$ per 100 Gms. Sol. in:		t°.	Gms. $NH(C_6H_5)_2$ per 100 Gms. Sol. in:	
	Hexane.	CS_2.		Hexane.	CS_2.
−60	...	1.3	0	2.6	33.7
−50	...	2.2	+10	3.8	46.8
−40	...	3.8	20	6.7	60.9
−30	0.5	7.2	30	13.8	76
−20	0.8	12.5	40	47	...
−10	1.4	21.6	50	94	...

Freezing-point data are given for mixtures of Diphenyl amine and:

Acetanilide(13)
Acetyl diphenyl amine(4)
Antipyrine(20)
Arsenic trichloride(28)
Azobenzene(10)
Benzoic acid(2)
Benzene(5a)(6)
Benzophenone(10)
  " + diphenyl(8)(18)
Camphor(31)
Cetyl alcohol(10)
Chloro dihydro phen arsazine(28)
Chloro nitro benzene(32)
Cinnamylidene aceto phenone(9)
Cresols(24)
Dichlor aniline(10)
Diethyl diphenyl urea(11)
Dinitro benzene(8)
  " phenols(16)
  " toluene(8)(30)
Diphenyl methane(7)
  " ether(7)
Diphenyl(18)
  " + benzo phenone(18)
Ethylene bromide(6)
Guaiacol(26)
Hydroquinone(16)
Naphthols(35)(16)
Naphthalene(29)(35)
Naphthylamine(35)
Nitro anisole(23)
Nitro naphthalene(3)(4)
Nitro phenols(16)(10)
Nitro penta erythritol (33)
Nitro toluene(8)
Paraffine(21)
Phenanthrene(19)
Phenol(22)
Picric acid(10)(16)
Piperonal(27)
Phenyl dimethyl pyrazolon(20)
Pyrocatechol(16)
Pyrogallol(16)
Quinone(17)
Resorcinol(16)(35)(14)
  " + Urea(14)
Sarcosine anhydride(20)
Trichlor acetic acid(15)
  " phenol(10)
Trimethyl trinitramine(34)
Trinitro phenol(10)
Trinitro phenoxy propionic acid ethyl ester(12)
Trinitro toluene(8)
Urea(14)(19a)
  " + resorcinol(14)
Urethan(1)(24a)(26)

(1) Angeletti, 1928; (2) Baskov, 1918; (3) Battelli and Martinelli, 1885; (4) Boesken, 1912; (5) Bernoulli and Veillon, 1932; (5a) Bruni, 1898; (6) Dahms, 1895; (7) Grimm, Gunther and Titus, 1931; (8) Giua, 1915; (9) Giua, 1917; (10) Giua and Cherchi, 1919; (11) Giua and Guastella, 1923; (12) Hertel and Römer, 1930; (13) Hrynakowski and Adamanis, 1934a; (14) Hrynakowski, Stazewski and Szmyt, 1937; (15) Pitran, 1924; (16) Kremann and Schadinger, 1911; (17) Kremann, Sutter, Sitte, Strzelba and Dobrotzky, 1922; (18) Lee and Warner, 1933; (19) Narbutt, 1905; (19a) Nagveld, 1914; (20) Pfeiffer and Angern, 1926; (21) Palazzo and Battelli, 1883; (22) Philip, 1903; (23) Puschin, 1926b; (24a) Puschin, 1929; (24) Puschin and Basara, 1927; (25) Puschin and Grebenschikow, 1913, 1923; (26) Puschin and Vaic, 1926; (27) Puschin and Zivadinovic, 1929; (28) Puschin and Brastanovic, 1938; (29) Roloff, 1895; (30) Rheinboldt, 1926; (31) Schwetlow, 1933; (32) Tinkler, 1913; (33) Urbanski, 1933; (34) Urbanski and Kabel-Gawronska, 1934; (35) Vignon, 1891.

Freezing-point data are also given for

Diphenyl methyl amine + phenol (Bramley, 1916.)

SOLUBILITY OF DIPHENYLAMINE AND ALSO OF TRIPHENYLAMINE IN CARBON DISULFIDE. (Arctowski, 1895.)

$NH(C_6H_5)_2$ in CS_2		$N(C_6H_5)_3$ in CS_2.	
t°.	Gms. per 100 Gms. Solution.	t°.	Gms. per 100 Gms. Solution.
−88½	0.87	−83	1.91
−117	0.37	−91	1.56
		−102	1.24
		−113½	0.98

DIPHENYLAMINE BLUE.

SOLUBILITY IN SEVERAL SOLVENTS AT 23°.

(Szathmary de Szachinar, 1910.)

Solvent.	Gms. Diphenylamine Blue per 100 Gms. Sat. Sol.	Solvent.	Gms. Diphenylamine Blue per 100 Gms. Sat. Sol.
Methyl Alcohol	0.385	Acetone	0.177
Ethyl "	0.230	Aniline	0.395
Amyl "	0.049		

Amino**AZOBENZENE** $C_6H_5N:N.C_6H_4.NH_2$.

Distribution results for amino azobenzene between benzene and water gave: conc. in C_6H_6 ÷ conc. in H_2O = 3,173 at 25°. (Farmer and Warth, 1904.)

Freezing-point data for mixtures of p Amino Azobenzene and:

Amino benzo phenone(1)
Azoxybenzene(3)
Chlor azo benzene(4)
Dimethyl p amino azobenzene(3)
Dinitro benzene(3)
Nitro chloro benzene(3)
Nitro toluene(3)
Oxy azo benzene(4)
Tri nitro toluene(2)

(1) Erlenmeyer and Leo, 1937, (2) Giua and Angeletti, 1921; (3) Giua and Reggiani, 1925; (4) Grimm, Gunther and Titus, 1931.

α **ACETNAPHTHALIDE** $C_2H_3ONH(C_{10}H_7)$.

SOLUBILITY IN MIXTURES OF ALCOHOL AND WATER AT 25°.

(Holleman and Antusch — Rec. trav. chim. 13, 289, 1894.)

Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.	Vol. % Alcohol.	Gms. per 100 Gms. Solvent.	Sp. Gr. of Solutions.
100	4.02	0.7916	65	1.78	0.8977
95	4.31	0.8150	60	1.44	0.9091
90	4.11	0.8344	55	1.02	0.9201
85	3.69	0.8485	50	0.71	0.9290
80	3.18	0.8624	35	0.25	0.9537
75	2.73	0.8761	20	0.09	0.9717
70	2.31	0.8798	10	0.04	0.9841

Constant agitation was not employed. The mixtures were allowed to stand in bath and the solutions analyzed after different lengths of time. Formulas are not given. This applies to all determinations by Holleman and Antush.

HYDRAZO BENZENE $C_6H_5NH:NHC_6H_5$.

Freezing point data for mixtures of hydrazobenzene with dibenzyl and with benzal aniline are given by Pascal and Normand, 1913.

Results for mixtures of hydrazo benzene and benzoin are given by Vanstone, 1913.

BENZIDINE $NH_2.C_6H_4.C_6H_4.NH_2$.

100 gms. abs. Ethyl Alcohol dissolve 7.68 gms. Benzidine at 20-25°. (Pucher and Dehn, 1921.)
100 gms. Quinoline " 43.07 " " " "
100 gms Equi. Mol. Mixture of C_2H_5OH and Quinoline dissolve 47.23 gms. Benzidine at 20-25° (Pucher and Dehn, 1921.)

Freezing point data are given for mixtures of benzidine and:

Dichloro biphenyl (Grimm, Gunther and Titus, 1931.)
Diphenol " " " "
Ditolyl " " " "
Michler's ketone (Pfeiffer, 1928.)
Tetra methyl diamino benzo phenone (Pfeiffer, Goebel and Angern, 1925.)

BENZIDINE HYDROCHLORIDE $NH_2.C_6H_4.C_6H_4NH_2.HCl$

SOLUBILITY OF BENZIDINE HYDROCHLORIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.

(Meldrum and Newlin, 1929.)

Normality of Aq. HCl	Gms. $C_{12}H_{12}N_2.HCl$ per 1000 gms. sat. solution
0.0 (H_2O)	5.196
2.889	2.152
5.607	1.246
9.870	1.224

BENZIDINE SULFATE $NH_2.C_6H_4.C_6H_4.NH_2SO_4H$.

SOLUBILITY OF BENZIDINE SULFATE IN WATER. (Bisson and Christie, 1920.)

t	20°	25°	40°	50°
Gms. Benzidine Sulfate per liter	0.040	0.098	0.141	0.290

SOLUBILITY OF BENZIDINE SULFATE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.

(Meldrum and Newlin, 1929.)

Normality of Aq. HCl	Gms. $C_{12}H_{12}N_2.H_2SO_4$ per 1000 gms. sat. sol.	Normality of Aq. HCl	Gms. $C_{12}H_{12}N_2.H_2SO_4$ per 1000 gms. sat. sol.
0.0 (H_2O)	0.098	4.147	1.887
0.239	0.542	5.622	1.778
0.530	0.942	7.601	1.588
1.009	1.451	9.942	1.499
2.074	1.790	11.077	1.490
2.825	1.930		

BENZIDINE HELIANTHATE

1000 cc. H_2O dissolve 0.245 gms. of the salt at 20–25°. (Stark and Dehn, 1918.)

NEROLIN $C_{10}H_7OC_2H_5$.

Freezing-point data for mixtures of nerolin with dianisal acetone, with tetra methyl diamino dibenzyl acetone and with tetra methyl p diamino benzo phenone (Michler's ketone) are given by Pfeiffer, Goebel and Angern, 1925. Results for mixtures of β Naphthol ethyl ether and cinnamylidene acetophenone are given by Giua, 1916.

PHENO BARBITAL (Phenyl ethyl barbituric acid, Luminal) $\underline{NHCONHCOC(C_2H_5)(C_6H_5)CO}$

Freezing-point data are given by Pfeiffer and Seydel, 1928, for mixtures of pheno barbital with antipyrine, with dimethyl amino antipyrine, with pyramidon and with sarcosine anhydride.

PIPERONYLIDENE DIACETATE $CH_2O_2C_6H_3CH(OCOCH_3)_2$

Freezing-point data are given by Jorissen and van der Beek, 1924, for mixtures of piperonylidene diacetate with acetic anhydride and with piperonal.

ANILINE m NITRO BENZENE MONO SULFONATE etc $C_6H_5NH_2.NO_2C_6H_4SO_3H$.

SOLUBILITY OF ARYLAMINE SALTS OF NITROBENZENE MONO SULFONIC ACID, EACH SEPARATELY, IN WATER.

(Keyworth, 1927.)

Compound	Formula	m.pt.	t°	Gms. Compound per 100 gms. sat. sol.
m Nitro benzene Sulfonate of:				
Aniline	$C_6H_5NH_2.NO_2C_6H_4SO_3H$	222	20	1.51
o Toluidine	$C_6H_4CH_3NH_2$. "	193	15	1.93
m "	" "	195	15	1.40
p "	" "	222	22	0.83
α Naphthylamine	$C_{10}H_7NH_2$. "	221	17	0.55
β "	" "	250	20	0.27
Benzidine	$(C_6H_4NH_2)_2$. "	300+	15	0.15
Tolidine	$[NH_2CH_3C_6H_3].2NO_2C_6H_4SO_3H$	300+	21	0.25
Di anisidine	$(CH_3OC_6H_4NH_2)_2.NO_2C_6H_4SO_3H$	280	11	0.66
m Xylidine	$(CH_3)_2C_6H_3NH_2$. "	185	15	0.72
o Chloro aniline	$ClC_6H_4NH_2$. "	204	15	1.35
p " "	" "	234	17	1.19

ANILINE BENZENE MONO SULFONATE etc. $C_6H_5NH_2.C_6H_5SO_3H$

SOLUBILITY OF ARYLAMINE SALTS OF BENZENE MONO SULFONIC ACID, EACH SEPARATELY, IN WATER.

(Keyworth, 1924.)

Compound	Formula	m. pt.	t°	Gms. Compound per 100 gms. sat. sol.
Benzene Mono Sulfonate of:				
Aniline	$C_6H_5NH_2.C_6H_5SO_3H$	240	19	11.3
o Toluidine	$C_6H_4CH_3NH_2.C_6H_5SO_3H$	176	19	20.0
m "	" "	173	18	9.1
p "	" "	205	16	7.4
α Naphthylamine	$C_{10}H_7NH_2.C_6H_5SO_3H$	234	14	0.77
β "	" "	248	14	0.59
p Nitro toluidine	$NO_2C_6H_3CH_3NH_2.C_6H_5SO_3H$	222	15	1.84
m Nitro aniline	$NO_2C_6H_4NH_2.C_6H_5SO_3H$	236	15	4.85
m Xylidene	$(CH_3)_2C_6H_3NH_2.C_6H_5SO_3H$	233	15	1.46
Benzidine	$(C_6H_4NH_2)_2.C_6H_5SO_3H$	330+	16	0.59
o Tolidine	$[NH_2(CH_3)C_6H_3]_2.2C_6H_5SO_3H$	310	15	1.45
Di anisidine	$(CH_3OC_6H_4NH_2)_2.C_6H_5SO_3H$	277	18	2.11
m Phenylene diamine	$C_6H_4(NH_2)_2.2C_6H_5SO_3H$	320+	17	19.0
p " "	" "	320+	10	2.57
p Chloro aniline	$ClC_6H_4NH_2.C_6H_5SO_3H$	235	20	2.51
o " "	" "	204	—	—
ψ Cumidine	$(CH_3)_2CHC_6H_4NH_2.C_6H_5SO_3H$	217	16	2.03
p Anisidine	$CH_3OC_6H_4NH_2.C_6H_5SO_3H$	182	16	12.8
p Phenetidine	$C_2H_5OC_6H_4NH_2.C_6H_5SO_3H$	171	17	21.0

Results similar to the above for Arylamine Salts of α Naphthol,4, Sulfonic acid (Nevile and Winther's acid) and for Arylamine Salts of Acetyl amino naphthalene,4,sulfonic acid, using, however, as solvent aq. 1% acetic acid instead of water, are given by Forster and Watson, 1927.

Results for the solubility in water of Arylamine salts of α Naphthol,2, sulfonic acid (Schäffer's α acid, m. pt. 125°), of Crocein, of Crocein R and of Crocein G, are given by Forster and Keyworth, 1927.

N-DIMETHYL β NAPHTHYLAMINE $C_{10}H_7N(CH_3)_2$.

Freezing-point data for mixtures of N, Dimethyl β naphthylamine and 2,4,6 trinitro anisole are given by Hertel and van Cleef, 1928.

PHENOLATE of Phenyl Ammonium. $C_6H_5OH.C_6H_5NH_2$

SOLUBILITY IN WATER.

(Alexejew, 1886.)

The determinations were made by the synthetic method (see p. 292). The results were plotted and the following figures read from the curve:

t°	Gms. Phenolate per 100 Gms.		t°.	Gms. Phenolate per 100 Gms.	
	Aq. Layer.	Phenolate Layer.		Aq. Layer.	Phenolate Layer.
10	3	94	110	9	76
30	4	93	120	12	69
50	5	91	130	17.5	60
70	6	87.5	140 crit. temp.	40	
90	7	83			

TETRA METHYL PHTHALAN $C_{12}H_{16}O$.

Freezing-point data for mixtures of tetra methyl phthalan with naphthols, brom phenol, iodo phenol, tri bromo phenol, tri chloro phenol, catechol, resorcinol, p xylenol and with phenyl,acetic acid are given by Bennett and Wain, 1936. These authors also give similar results for the cyclic oxides $C_{15}H_{22}O$ and $C_{18}H_{20}O$.

ε PHENYL CAPROIC ACID $CH_2(C_6H_5)(CH_2)_4COOH$.

100 gms. H_2O dissolve 0.048 gm. $C_{12}H_{16}O_2$ at 30° and 0.077 gms. at 40°. (Daniels and Lyons, 1931.)

ARBUTIN $C_{12}H_{16}O_7.\frac{1}{2}H_2O$.

100 gms. trichlorethylene dissolve 0.011 gm. arbutin at 15°.

(Wester and Bruins, 1914.)

3.5 DimethoxyACETOPHENETIDE hydrate $C_{12}H_{17}O_4N.H_2O$.

SOLUBILITY IN WATER. (Bogert and Ehrlich, 1919.)

The freezing-point method was used up to 57° and the sealed tube method above this temperature and for the solubility of the liquid hydrate in water.

Results for the solid Hydrate.			Results for the liquid hydrate.		
t°.	Gms. $C_{12}H_{17}O_4N.H_2O$ per 100 gms. H_2O.	Mol. per cent $C_{12}H_{17}O_4N.H_2O$.	t°.	Gms. $C_{12}H_{17}O_4N.H_2O$ per 100 gms. H_2O.	Mol. per cent $C_{12}H_{17}O_4N.H_2O$.
21.8..	0.144	0.010	68.5..	3.39	0.237
39.9..	0.288	0.020	58.1..	3.39	0.237
57.0..	0.649	0.046	84.3..	3.68	0.257
69.5..	1.087	0.076	45.6..	3.68	0.257
72.8 .	1.297	0.091	99.8..	4.33	0.303
77.1..	1.716	0.120	35.6..	4.30	0.301
80.2..	2.152	0.151	111.1..	5.15	0.361
82.6..	2.589	0.180	118.4..	5.80	0.407
84.2..	2.897	0.203	129.2..	7.12	0.499
86.9..	3.685	0.257	173.6..	29.01	2.041

DIACETYL DIETHYL d TARTRATE $(CHOCOCH_3CO_2C_2H_5)_2$.

Freezing-point data are given for mixtures of diacetyl diethyl tartrate and:

Diacetyl diethyl r tartrate(2)	Nitro benzene(4)
Ethylene bromide(1)(4)	" toluene(4)
Naphthalene(3)(4)	Phenol(4)
	p Xylene(1)

(1) Bruni and Finzi, 1905; (2) Findlay and Campbell, 1928; (3) Palazzo and Batelli, 1883; (4) Scheuer, 1910.

DIPROPIONYL DIMETHYL d TARTRATE $(CHOCOC_2H_5CO_2CH_3)_2$.

Freezing-point data for mixtures of the dipropionyl dimethyl d and r tartrates are given by Findlay and Campbell, 1928.

DEXTRIN $C_{12}H_{20}O_{10}$.

SOLUBILITY IN WATER. (Lewis, 1914.)

"In the case of dextrin, however, no matter how small an amount of water be employed, under no condition does the concentration of the solution remain constant, while on the other hand the addition of further solvent, never fails to dissolve additional dextrin, although the use of no amount of water, however large, will dissolve the whole of the sample."

100 gms. pyridine dissolve 65.44 gms. dextrin at 20–25°. (Dehn, 1917.

100 gms. aq. 50% pyridine dissolve 103 gms. dextrin at 20–25°. "

ETHYL SUBERATE $(CH_2)_6(COOC_2H_5)_2$.

100 cc H_2O dissolve 0.068 gm. $(CH_2)_6(COOC_2H_5)_2$ at 20°. (Sobotka and Kahn, 1931.)

n **DECYL MALONIC ACID** $CH(C_9H_{19})(COOH)_2$.

100 gms. H_2O dissolve 0.0025 gm. $CH(C_9H_{19})(COOH)_2$ at 25°.
" " C_6H_6 " 0.0066 " " " "
(Verkade and Coops, Jr., 1930a.)

Iso **BUTYL TARTRATES** d, l and r $[CHOH.CO_2C_4H_9]_2$

SOLUBILITY OF d AND OF r ISO BUTYL TARTRATES AND OF THEIR MIXTURES IN ETHYL ALCOHOL.
(Campbell, 1929.)

t°	Gms. per 100 gms. C_2H_5OH		
	d Tartrate	r Tartrate	d + r Tartrates
0	35.0	34.9(1)	33.75 d + 18.35 l
18	50.7	56.9(1)	101.85 d + 51.15 l
25	58.4	71.5(1)	117.75 d + 58.25 l

(1) Total d + l.

These results show that "the total solubility is always increased by additions of the active form to the inactive, i.e. the liquid phase becomes active. At all the above temperatures, therefore, the solid inactive form is a solid racemate."

The author also gives results for the freezing points of mixtures of iso butyl d and l tartrates.

SUGAR (Sucrose) $C_{12}H_{22}O_{11}$ (Cane Sugar).

FREEZING-POINTS OF AQUEOUS SOLUTIONS OF CANE SUGAR.
(Kremann and Eitel, 1923.)

t° of f. pt.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
-0.58, 0.61	9.234	5.70, 5.75	43.77	(10.42,	56.52)
-1.51, -1.57	19.472	6.03, 6.64	44.73	-11.94, -12.21	58.37
-2.31, -2.35	25.98	7.39, 7.46	48.52	(-12.46	60.00)
-3.03, -3.15	31.75	7.78, 7.84	50.00	(-13.68	62.12
(-4.03,	37.51)	8.34, - 8.58	51.48	-14.43, -14.51	62.58
-4.25,	37.75	10.27, 10.34	54.88	(13.9 Eutec.	62.40)
				(17.0	66.67)

The results in parentheses are by Mondain-Monval, 1925.

The eutectic as given by Kremann and Eitel is at -- 14°.5 and 62.5 % $C_{12}H_{22}O_{11}$.

SOLUBILITY OF CANE SUGAR IN WATER.

(Herzfeld, 1892; see also Courtonne, 1877.)

t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 Gms. Solution.	Gms. $C_{12}H_{22}O_{11}$ per 100 Gms. Water.	t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 Gms. Solution.	Gms. $C_{12}H_{22}O_{11}$ per 100 Gms. Water.
0	64.18	179.2	40	70.42	238.1
5	64.87	184.7	45	71.32	248.7
10	65.58	190.5	50	72.25	260.4
15	66.33	197	60	74.18	287.3
20	67.09	203.9	70	76.22	320.4
25	67.89	211.4	80	78.36	362.1
30	68.70	219.5	90	80.61	415.7
35	69.55	228.4	100	82.97	487.2

Sp. Gr. of sat. solution at 15° = 1.329; at 25° = 1.340.

100 gms. H_2O dissolve 212 gms. cane sugar at 25°, determined by means of Pulfrich's refractometer.

(Osaka, 1903-08.)

SOLUBILITY OF CANE SUGAR IN WATER.

(Grube and Nussbaum, 1928; Reinders and Klinkenberg, 1929.)

t°	Gms. $C_{12}H_{22}O_4$ per 100 gms. sat. sol. G and N	Gms. $C_{12}H_{22}O_4$ per 100 gms. sat. sol. R and K	t°	Gms. $C_{12}H_{22}O_4$ per 100 gms. sat. sol. G and N	Gms. $C_{12}H_{22}O_4$ per 100 gms. sat. sol. R and K
0	64.22	—	75	77.23	78.58(1)
25	67.97	67.89	90	80.60	—
35	69.50	69.55	95	81.75	—
45	—	71.3	100	82.96	—
50	72.24	—			

(1) Nishizawa and Hachakama, 1929.

SOLUBILITY OF CANE SUGAR IN WATER. (Mondain-Monval, 1925.)

The solutions were saturated by two periods of 24 hours constant rotation in a thermostat. The saturated solutions were analyzed polarimetrically. Equilibrium was reached more quickly from below than from above.

t°	0.9.	15.8.	25.6.	30.5.
Gms. $C_{12}H_{22}O_{11}$ per 100 gms. H_2O	180.5	196.0	210.5	218.0

The following determinations of the density of saturated aqueous solutions of cane sugar are given by Horiba, 1917.

t.	d of sat. sol.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms sat. sol.	t°.	d of sat. sol.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
0.	1.321	64.18	40.	1.339	70.42
10.	1.325	65.58	50.	1.344	72.25
20.	1.329	67.09	60.	1.350	74.18
30.	1.334	68.70			

SOLUBILITY OF SUCROSE IN AQUEOUS SOLUTIONS OF INVERT SUGAR.

(Van der Linden, 1919.)

Results at 30°. Gms. per 100 gms. H_2O Sucrose.	Invert Sugar.	Gms. per 100 gms. H_2O Sucrose.	Invert Sugar.	Results at 50°. Gms. per 100 gms. H_2O Sucrose.	Invert Sugar.
219.0	0.0	180.7	121.8	260.4	0.0
214.8	5.5	169.8	146.0	254.6	11.0
211.9	10.5	164.0	189.1	247.1	26.5
204.4	26.9	150.4	268.6	240.1	44.5
200.2	36.1	136.3	309.0	228.2	109.9
182.9	103.1	127.1	401.4	213.9	161.5
				201.5	314.8
				200.6	416.[illegible]

SOLUBILITY OF CANE SUGAR IN PURE HYDROGEN PEROXIDE.

(Maass and Hatcher, 1922.)

The temperatures were determined at which the last crystal of solid dissapeared in accurately weighed mixtures of the constituents.

t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.	t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
−1.97	3.88	5.90	30.94
−2.60	11.64	7.57	36.82
−3.47	18.66	10.40	41.86
−4.72	25.16	14.40	50.00

Determinations of the solubility of sucrose in various samples of the final mother liquor syrups obtained in beet sugar factories located in the Rocky Mountain region of the U.S. are described by Brown, Sharp and Dalberg, 1928, and Brown and Nees, 1933.

SOLUBILITY OF SUGAR IN AQUOUS SALT SOLUTIONS AT 30°, 50°, AND 70°.

Interpolated from original results. (Schukow, 1900.)

t°.	Gms. Salt per 100 Gms. H_2O.	Gms. $C_{12}H_{22}O_{11}$ per 100 grams H_2O in Aq. Solution of KCl.	KBr.	KNO_3.	NaCl.	$CaCl_2$.
30	0	219.5	219.5	219.5	219.5	219.5
"	10	216	218	217	210	197
"	20	221	220	216	211	189
"	30	228	224	216	219	192
"	40	237	228	217	233	200
"	50	...	...	218	250	218
"	60	...	...	...	269	243
50	0	260.4	260.4	260.4	260.4	260.4
"	10	261	262	260	255	239
"	20	266	266	261	260	228
"	30	274	272	262	269	228
"	40	284	276	262	284	236
"	50	296	280	263	302	253
"	60	...	...	...	...	276
70	0	320.5	320.5	320.5	320.5	320.5
"	10	326	324	321	323	295
"	20	334	328	324	330	286
"	30	345	334	327	344	286
"	40	357	341	331	361	295
"	50	370	349	334	384	308
"	60					

SOLUBILITY OF CANE SUGAR IN SATURATED AQUEOUS SALT SOLUTIONS AT 31.25°.

(Köhler, 1897.)

Salt.	Gms. Sugar per 100 Gms.		Salt.	Gms. Sugar per 100 Gms.	
	Solution.	Water.		Solution.	Water.
CH_3COOK	...	324.8	Na_2CO_3	64.73	229.2
C_3H_7COOK	49.19	306.1	KNO_3	61.36	224.7
$C_3H_4.OH.(COOK)_3$	50.30	303.9	K_2SO_4	66.74	219.0
K_2CO_3	56.0	265.4	CH_3COOCa	60.12	190.0
KCl	62.28	246.5	Na_2SO_4	52.20	183.7
CH_3COONa	59.93	237.6	$CaCl_2$	42.84	135.1
NaCl	62.17	236.3	$MgSO_4$	46.52	119.6

SOLUBILITY OF CANE SUGAR IN AQUEOUS ALCOHOL SOLUTIONS AT 14°.

(Schrefeld, 1894.)

Wt. per cent Alcohol.	Wt. per cent Sugar.	Gms. Sugar per 100 cc. Alcohol-H_2O Mixture.	Wt. per cent Alcohol.	Wt. per cent Sugar.	Gms. Sugar per 100 cc. Alcohol-H_2O Mixture.
0	66.2	195.8	50	38.55	62.7
5	64.25	179.7	60	26.70	36.4
10	62.20	164.5	70	12.25	13.9
20	58.55	141.2	80	4.05	4.2
30	54.05	117.8	90	0.95	0.9
40	47.75	91.	100	0.00	0.0

SOLUBILITY OF CANE SUGAR IN AQUEOUS ALCOHOL SOLUTIONS.

(Scheibler, 1872; correction, 1891.)

	Results at 0°.		Results at 14°.				Results at 40°.
				Gms. per 100 cc. Solution.			
Per cent Alcohol by Vol.	Sp. Gr. of Solution at 17.5°.	Gms. Sugar per 100 cc. Solution.	Sp. Gr. of Solution at 17.5°.	Sugar.	C_2H_5OH.	H_2O.	Gms. Sugar per 100 cc. Solution.
0	1.325	85.8	1.326	87.5	0	45.10	...
10	1.299	80.7	1.300	81.5	3.91	44.82	95.4
20	1.236	74.2	1.266	74.5	8.52	43.83	90
30	1.229	65.5	1.233	67.9	13.74	41.87	82.2
40	1.182	56.7	1.185	58	20.24	40.38	74.9
50	1.129	45.9	1.131	47.1	28.13	38.02	63.4
60	1.050	32.9	1.058	33.9	37.64	34.47	49.9
70	0.972	18.2	0.975	18.8	49.28	29.42	31.4
80	0.893	6.4	0.895	6.6	61.15	21.95	13.3
90	0.837	0.7	0.838	0.9	71.18	12.83	2.3
97.4	0.806	0.08	0.808	0.36	77.39	3.28	0.5

100 gms. absolute methyl alcohol dissolve 1.18 gms. cane sugar at 19°. (de Bruyn, 1892.)

100 gms. aq. 50 per cent pyridine dissolve the following gms. of sugars at 20°–25°; sucrose, 38.5; maltose, 43.07; mannose, 78.70; lactose, 1.98; fructose, 85.42; galactose, 68.3; glucose, 49.17; raffinose, 8.76. (Dehn, 1917.)

100 gms. trichlorethylene dissolve 0.004 gm. cane sugar at 15°. (Wester & Bruins, 1914.)

For additional data on **Galactose,** see p. 448 and on **Glucose,** see p. 445

SOLUBILITY OF CANE SUGAR IN AQUEOUS ACETONE AT 25°.

(Herz and Knoch, 1904.)

Sp. Gr. of Solutions.	cc. Acetone per 100 cc. Solvent	Gms. Sugar per 100 cc. Solution	Gms. per 100 cc. Solution. H_2O	$(CH_3)_2CO$	$C_{12}H_{22}O_{11}$
1.3306	0	89.8	43.5	0	89.8
1.2796	20	76.7	42.9	8.4	76.7
1.2401	30	72.1	40.8	13.4	72.1
1.2002	40	59.4	39.8	20.9	59.3
1.1613	45	52.5	40	24.6	52.5

Above 45 cc. acetone per 100 cc. solvent the solution begins to separate into two layers. The lower of these contains 81 gms. sugar per 100 cc. and has Sp. Gr. 1.1522. The upper layer contains so little sugar that the amount could not be determined by the method employed. 100 cc. evaporated in a vacuum desiccator left a residue of 4.08 gms. Above the concentration of 80 cc. acetone per 100 cc. solvent the two layers unite. In pure acetone 100 cc. solution gave a residue of 0.18 gm. sugar.

SOLUBILITY OF SUCROSE IN AQUEOUS SOLUTIONS OF LACTOSE AND OF LACTOSE IN AQUEOUS SOLUTIONS OF SUCROSE.

(Soter, 1908.)

Results at 4°

Gms. per 100 gms. sat. solution Lactose	Sucrose	Solid Phase
0.0	64.2	Sucrose
0.85	63.2	"
1.50	62.7	"
2.18	62.1	"
2.89	61.9	"
2.14	58.9	Lactose
2.70	53.63	"
3.98	43.4	"
5.97	28.37	"
9.85	0.0	

Results at 0°

Gms. per 100 gms. sat. solution Lactose	Sucrose	Soli Phas
0.0	64.5	Sucr
0.85	63.8	"
1.72	63.0	"
2.57	62.4	"
3.29	61.9	"
3.26	61.85	"
2.47	61.86	Lact
4.42	*51.24	"
6.48	38.79	"
8.43	24.37	"
10.68	0.0	

SOLUBILITY OF SEVERAL SUGARS IN PYRIDINE AT 26°.

(Holty, 1905.)

Sugar	Formula	Sp. Gr. Sat. Sol.	Gms. Sugar per 100 Gms. Sat. Sol.	
Cane Sugar (Sucrose)	$C_{12}H_{22}O_{11}$		6.45	
Milk Sugar (Lactose)	$C_{12}H_{22}O_{11}.H_2O$	0.9881	2.18	
Grape Sugar (Glucose)	$2C_6H_{12}O_6.H_2O$	1.0405	7.62	
Fruit Sugar (Fructose)	$2C_6H_{12}O_6$	1.0532	18.49	
Galactose	$C_6H_{12}O_6$	[illegible]	5.45	
Maltose	$C_{12}H_{22}O_{11}$		28.2*	[illegible]
Mannose	$C_6H_{12}O_6$		[illegible]*	
Raffinose	$C_{18}H_{32}O_{16}.5H_2O$		[illegible]*	

* It is uncertain whether these figures refer to gms. per 100 gms. sat. solution or gms. per 100 pyridine at 20°-25°.

SOLUBILITY OF MILK SUGAR (LACTOSE) HYDRATE AND β ANHYDRIDE IN WATER.

(Hudson, 1904, 1908.)

It was found that the saturation point was reached very slowly with this compound. From the results, it was concluded that "aqueous solutions of milk-sugar contain two substances in equilibrium and that the mutarotation of milk-sugar results from the slow establishment, in cold solutions, of the equilibrium of the balanced reaction, $C_{12}H_{24}O_{12}$ (Hydrate) $\rightleftarrows$ $H_2O + C_{12}H_{22}O_{11}$ (β-anhydride).

The final solubility of hydrated milk sugar was determined by approaching saturation from below and from above with mixtures of water and excess of once recrystallized hydrated milk sugar. These were constantly rotated until equilibrium was reached (one week was allowed in all cases). The filtered saturated solutions were evaporated to dryness and the crystalline residues, consisting of the α and β anhydrides, weighed.

t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 Gms. Sat. Sol.	t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 Gms. Sat. Sol.
0	10.6	49	29.8
15	14.5	64	39.7
25	17.8	74	46.3
39	24	89	58.2

The initial solubility, obtained by agitating an excess of milk sugar hydrate with water for a few minutes, was somewhat less than one-half the above figures, at temperatures up to 25°.

The final solubility of β anhydrous milk sugar was difficult of determination on account of the high concentration and instability of the saturated solution below 92°. At 0° the final saturation was hastened by addition of 0.1 *n* NH_4OH solution. At 0°, 42.9 gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. solution were found and at 100°, 61.2 gms.

SOLUBILITY OF α AND β LACTOSE (MILK SUGAR) IN WATER. (Gillis, 1920.)

The determinations were made to supplement those of Hudson, 1908. Accurately weighed amounts of the sugar and water were sealed in tubes, and, while being slowly agitated, the temperature was determined at which the last crystal just dissapeared.

The column headings for mol. % and wt. % as given in the original table for α lactose are the reverse of those here shown.

The author gives an exhaustive treatment of the equilibria between the two anhydrous modifications of lactose and considers the system water-milk sugar to be a pseudo ternary system with a transi-dehydration temperature of 93.5°.

Results Obtained with α Lactose.

t	Mol. % $C_{12}H_{22}O_{11}$ in sat. sol.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
128.4....	11.77	71.8
128.0....	12.06	72.3
134.0....	13.00	74.0
146.2....	16.14	78.3
158.1....	19.08	81.7
164.1....	21.36	83.8

Results Obtained with β Latose.

t°.	Mol. % $C_{12}H_{22}O_{11}$ in sat. sol.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
88.6....	6.34	58.25
107.0....	8.54	63.94
121.5....	10.67	69.41
133.6....	12.58	73.22
138.8....	13.76	75.20
158.8....	18.50	81.13
178.8....	25.58	86.72
200.0....	39.41	92.51

SOLUBILITY OF HYDRATED LACTOSE IN WATER. (Saillard, 1919.)

The hydrated lactose which was used contained a trace of mineral matter and less than 0.10% hygroscopic H_2O as determined by drying at 100°. Constant agitation was employed for obtaining saturation and equilibrium was approached from below and from above. In the latter case the mixture was previously heated to 75°-80°. A trace of formol was added in both cases, before the period of agitation.

t°	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gms. $C_{12}H_{22}O_{11}$ per 100 gms. H_2O	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE. — It is pointed out by Gillis, 1920, that the above determinations at 48°, 57° and 65°, and the result of Hudson at 89°, are undoubtedly incorrect. Very carefully made new determinations between 0° and 100°, have confirmed the transition dehydration temperature of 93°.5 for α and β lactose.

SOLUBILITY OF LACTOSE IN MIXTURES OF WATER AND PYRIDINE.

(Pucher and Dehn, 1921.)

Per cent C_5H_5N in solvent	Gms. Lactose per 100 gms. solvent at 5°	at 25°	Per cent C_5H_5N in solvent	Gms. Lactose per 100 gms. solvent at 5°	at 25°
0.0	14.18	21.03	70.0	2.85	4.34
10.0	13.83	22.15	80.0	1.62	2.64
20.0	11.39	19.23	85.0	1.23	1.01
30.0	11.94	14.48	90.0	[illegible]	[illegible]
40.0	9.15	10.56	95.0	1.84	1.82
50.0	6.85	[illegible]	100.0	1.61	2.22
60.0	4.61	6.85			

100 gms. Abs. Alcohol dissolve 0.019 gm. Lactose at 20-25°. (Pucher and Dehn, 1921.)
" " Quinoline " 1.96 " " " "
" " Equimolal mixture of alcohol and quinoline dissolve 1.34 gm. Lactose at 20-25°.

MALTOSE $C_{12}H_{22}O_{11}.H_2O$

SOLUBILITY OF MALTOSE IN WATER.

(Kullin, 1926.)

t°	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. Water	Sat. Sol.	Solid Phase	t°	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. Water	Sat. Sol.	Solid Phase
[illegible]		[illegible]	Ice	[illegible]	[illegible]	[illegible]	$C_{12}H_{22}O_{11}.H_2O$
[illegible]		[illegible]	"	[illegible]	[illegible]	[illegible]	"
[illegible]		[illegible]	"	[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	$C_{12}H_{22}O_{11}.H_2O$	[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"	[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"	[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"	[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"	[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"	[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	"

The determinations above 100° were made by the synthetic method. The temperature of disappearance of the last crystal was determined.

Several determinations of the freezing point of solutions of maltose in 0.1 n ammonia gave the following results:

t°	[illegible]	[illegible]	[illegible]	[illegible]
Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.	[illegible]	[illegible]	[illegible]	18.87

LAURIC ACID $C_{11}H_{23}COOH$

SOLUBILITY IN ALCOHOLS.

(Timofeev, 1894.)

Alcohol	t°	Gms. $C_{11}H_{23}COOH$ per 100 gms. Sat. Sol.	Alcohol	t°	Gms. $C_{11}H_{23}COOH$ per 100 gms. Sat. Sol.
Methyl Alcohol	0	14.8	Propyl Alcohol	0	21.5
"	22	68.7	"	21	52.6

SOLUBILITY OF LAURIC ACID IN AQUEOUS ETHYL ALCOHOL.

(Ekwall and Mylius, 1932.)

Solubility in aqueous:

	80 Vol. % C_2H_5OH		96 Vol. % C_2H_5OH		99.9 Vol. % C_2H_5OH
t°	Gms. $CH_3(CH_2)_{10}COOH$ per 100cc solvent	t°	Gms. $CH_3(CH_2)_{10}COOH$ per 100cc solvent	t°	Gms. $CH_3(CH_2)_{10}COOH$ per 100cc solvent
0	5.26	-1	14.17	0	20.84
6	9.15	+8	28.48	8	36.00
14	22.50	12	38.65	12	48.36
21	48.30	16.5	56.32	16.5	72.81

100 gms. H_2O dissolve 0.00017 gm. undissociated lauric acid at 25°, as determined by conductivity measurements.

100 gms. C_6H_6 dissolve 186 gm. lauric acid at 25°; at 40° there is miscibility in all proportions. (McBain and Eaton, 1928.)

The authors also give experiments upon the extraction of lauric acid from aqueous potassium laurate solutions by benzene.

LAURIC ACID $CH_3(CH_2)_{10}COOH$.

FREEZING-POINTS OF MIXTURES OF LAURIC ACID AND PALMITIC ACID $[CH_3(CH_2)_{14}COOH]$.

(Waentig and Pescheck, 1919.)

The reading for the melting point was taken when a slight rise and holding constant of the thermometer occurred during the gradual cooling of the well stirred mixture of the two fatty acids.

	Palmitic Acid in mixture			Palmitic Acid in mixture			Palmitic Acid in mixture	
t°.	Wt. %.	Mol. %.	t°.	Wt. %.	Mol. %.	t°.	Wt. %.	Mol. %.
60.95...	100.0	100.0	48.70...	61.41	55.42	39.15...	42.02	36.15
59.48...	94.0	92.4	48.05...	59.96	53.92	38.03...	37.65	32.06
58.40...	89.87	87.39	47.28...	58.06	51.96	37.60...	34.97	29.58
57.16...	85.59	82.27	46.45...	56.31	50.17	37.12...	31.95	26.84
56.16...	82.04	78.11	45.57...	54.72	48.56	36.34...	28.39	23.65
55.22...	78.83	74.42	44.08...	52.16	46.00	35.50...	24.64	20.35
54.15...	75.66	70.83	43.53...	51.92	45.76	36.33...	20.32	16.61
53.12...	72.62	67.45	43.00...	51.45	45.29	36.90...	16.17	13.16
52.10...	69.91	64.48	42.78...	49.09	42.97	38.26...	10.87	8.70
51.26...	67.60	61.98	42.63...	47.83	41.72	40.55...	5.32	4.21
50.45...	65.40	59.63	41.70...	46.22	40.17	43.35...	0.00	0.00
49.45...	63.24	57.34	40.55...	44.32	38.34			

Results for the freezing-points of mixtures of Lauric and Undecylic acids and for mixtures of Lauric and Capric acids are given by Kulka and Sandin, 193

Tri LAURIN $C_3H_5(O.C_{12}H_{23}O)_3$.

100 gms. abs. alcohol dissolve 6.66 gms. Trilaurin at 20-25° } (Pucher and Dehn, 1921.)
» Quinoline » 18.22 » » }
» equi mol. mixture of alcohol and Quinoline dissolve 16.57 gms. Trilaurin at 20-25°.

SOLUBILITY OF TRILAURIN IN SEVERAL SOLVENTS.
(Loskit, 1928.)

The determinations were made by the thermic, the sealed tube and the analytical method. The author's results were plotted and the following table constructed from the curves.

t°	Gms. $C_3H_5[CH_3(CH_2)_{10}COO]_3$ per 100 gms. sat. solution in: C_6H_6	$(C_2H_5)_2O$	$CHCl_3$	CS_2
-10.0	—	—	15	0.5
- 5.0	—	1.0	20	1.5
0.0	—	2.0	25	4.2
2.0	(23.5*)	2.7	—	6.0
3.0	(20.0*)	3.3	28.5	7.5
4.0	14.0(14.0)	3.7		9.0
5.0	15.0(3.0)	4.3	30.7	10.5
10	27.5	10.2	36.7	21.0
15	40.0	21.5	43.5	35.0
20	51.5	36	50.5	47.5
25	61.5	52.2	59.0	60.0
30	71.0	66.5	67.0	71.0
35	81.0	78.0	76.5	81.0
40	91.0	88.0	88.0	91.0

The results in parentheses are for solutions in contact with benzene as solid phase. * = unstable.

PHENACYL LAURATE $CH_3(CH_2)_{10}COO.CH_2COC_6H_5$ etc.

SOLUBILITY OF PHENACYL, BROMOPHENACYL AND CHLOROPHENACYL LAURATES IN 95 % ETHYL ALCOHOL
(Hann, Reid and Jameson, 1930.)

Compound	Formula	Gms. laurate per 100 gms alcohol at: 20°	30°
Phenacyl laurate	$CH_3(CH_2)_{10}COO.CH_2COC_6H_5$	2.915	[illegible].3800
p Bromo " "	$CH_3(CH_2)_{10}COOCH_2COC_6H_4Br$	0.3832	0.4288
p Chloro " "	$CH_3(CH_2)_{10}COOCH_2COC_6H_4Cl$	0.6060	0.9856

ETHYL CAPROATE $CH_3(CH_2)_8COOC_2H_5$.

100cc H_2O dissolve 0.0015 gm. $CH_3(CH_2)_8COOC_2H_5$ at 20°. (Sobotka and Kahn, 1931.)

DODECANE $CH_3(CH_2)_{10}CH_3$.

The critical solution temperature of mixtures of dodecane and liquid sulfur dioxide is 47° and there is 95 Mol. % SO_2 in the mixture at this temperature. (Leslie, 1934.)

Freezing-point data for mixtures of dodecane and dotriacontane (Dicetyl) are given by Seyer, 1938.

2-BROMO NITRO FLUORENONE $C_{13}H_6OBrNO_2$ (m.pt. 230°).

100 gms. C_2H_5OH dissolve less than 0.25 gm. $C_{13}H_6OBrNO_2$ at 18°.
" " C_6H_6 " 0.2 gm. $C_{13}H_6OBrNO_2$ at 18°.
" " $CHCl_3$ " 0.435" " " " (Courtot, 1930.)

2-CHLORO NITRO FLUORENONE $C_{13}H_6OClNO_2$ (m.pt. 230°).

100 gms. C_2H_5OH dissolve less than 0.4 gm. $C_{13}H_6OClNO_2$ at 18°.
" " C_6H_6 " " " 0.25 " " " "
" " $CHCl_3$ " " " 0.26 " " " " (Courtot, 1930.)

FLUORENONE $C_6H_4COC_6H_4$.

Freezing-point data are given for mixtures of fluorenone and:

Acenaphthene (Pfeiffer, 1924; Pfeiffer, Goebel and Angern, 1925.)
Naphthylamine (Pfeiffer, Goebel and Angern, 1925.)
s Tri nitro benzene(Sudborough and Beard, 1911.)

2- BROMO NITRO FLUORENONE OXIME $C_{13}H_8OBr$ (m.pt. 233°-4).

100 gms. C_2H_5OH dissolve less than 0.25 gm. $C_{13}H_8OBr$ at 18°.
" " C_6H_6 " 0.28 " " " "
" " $CHCl_3$ " 0.2 " " " " (Courtot, 1930.)

XANTHONE (9-Xanthenone) $C_{13}H_8O_2$

100 gms. Carbon Tetrachloride dissolve 0.96 gm. Xanthone at 20° (Pawlewski,
» » Chloroform » 11.24 » » » » 1914, 1926.)

Freezing-point data for mixtures of xanthone and s tri nitro benzene are given by Sudborough and Beard, 1911.

2-BROMO NITRO FLUORENE $C_{13}H_8BrNO_2$ (m.pt. 236°).

100 gms. C_2H_5OH dissolve less than 0.25 gm. $C_{13}H_8BrNO_2$ at 18°.
" " C_6H_6 " 0.31 " " " "
" " $CHCl_3$ " 0.36 " " " " (Courtot, 1930.)

2-CHLORO NITRO FLUORENE $C_{13}H_8ClNO_2$(m.pt. 237°)

100 gms. C_2H_5OH dissolve less than 0.25 gm. $C_{13}H_8ClNO_2$ at 18°.
" " C_6H_6 " 0.37 " " " "
" " $CHCl_3$ " 0.43 " " " " (Courtot, 1930.)

2-CHLORO AMINO FLUORENONE $C_{13}H_6OClNH_2$ (m.pt.203-5°)

100 gms. C_2H_5OH dissolve less than 0.3 gm. $C_{13}H_6OClNH_2$ at 18°.
" " C_6H_6 " " " 0.37 " " " "
" " $CHCl_3$ " " " 0.4 " " " " (Courtot, 1930.)

DINITRO PHENYL CARBONATE $(C_6H_4NO_2)_2CO_3$.

Freezing-point data for mixtures of the isomers of dinitro phenyl carbona are given by Hoeflake, 1921.

BROM BENZOYL p NITRANILINE $C_{13}H_9O_3N_2Cl$.

Freezing-point data are given by Lettre and Barnbeck, 1938, for binary mixtures of o, m and p brom, chlor and methyl benzoyl p nitranilines.

ACRIDINE

$C_6H_4<\overset{CH}{\underset{N}{}}>C_6H_4$.

Freezing-point lowering data are given for mixtures of Acridine and each of the following compounds :

Anthracene (Pascal, 1921.)
Methyl acridine "
Carbazole "
Nitrosodimethylaniline (Kremann and Wlk, 1919.)
Hydroquinol (Kremann and Slovak, 1920.)
α and β Naphthol (Kremann and Slovak, 1920.)
Phenanthrene (Pascal, 1921.)
Phenol (Kremann and Slovak, 1920.)
Pyrocatechol "
Resorcinol "

Results for mixtures of 5.phenylacridine and picric acid are given by Bassett and Simmons, 1921.

3,5-DIBROM 4 AMINO BENZOPHENONE $C_6H_3Br_2COC_6H_4NH_2$.

Freezing point data for mixtures of 3.5 dibrom 4 amino benzo phenone and 3-Brom, 5 iodo, 4 amino benzo phenone are given by Gibby and Waters, 1931.

Polymorphic NitroBENZALDEHYDRAZONES $C_{13}H_9O_2Cl_2N_3$.

SOLUBILITY OF THE STABLE AND LABILE FORMS OF POLYMORPHIC NITROBENZALDEHYDRAZONES IN ALCOHOL.

(Chattaway and Walker, 1924.)

Equilibrium attained by constant shaking for 4 to 6 hours in the case of the stable forms and 1 to 2 hours in the case of the labile forms. The solutions were analyzed by evaporating and weighing the residues.

Results for :
o Nitrobenzaldehyde-2-chloro 4 bromo-phenyl hydrazone.

t°.	Gms. cmpd per 100 gms. sat. sol. Stable form.	Labile form.
0.05	0.039	0.073
5.25	0.047	0.082
10.5	0.056	0.093
15.0	0.065	0.106
18.0	—	0.118
20.0	0.079	
25.0	0.093	0.150
30.0	0.116	0.179
37.85	0.159	

Results for :
p Nitrobenzaldehyde-2'4 dichloro-phenyl hydrazone.

t°.	Gms. cmpd per 100 gms. sat. sol. Stable form.	Labile form.
0.05	0.054	0.079
5.85	0.057	0.086
11.90	0.064	0.097
16.0	0.075	0.105
21.5	0.089	0.126
29.85	0.115	0.173
34.80	0.142	0.225
39.44	0.173	
44.15	0.214	—

p Nitrobenzaldehyde-4-chloro 2 bromo phenyl hydrazone (Stable form.)

t°.	Gms. per 100 gms. sat. sol.	t°.	Gms. per 100 gms. sat. sol.	t°.	Gms. per 100 gms. sat. sol.
0.05	0.034	20.0	0.066	33.5	0.109
12.5	0.052	26.9	0.082	40.05	0.141

FLUORENE (Diphenylene methane) $C_6H_4CH_2C_6H_4$.

SOLUBILITY OF FLUORENE IN SEVERAL SOLVENTS. (Mortimer, 1923.)

t°.	Mols. $C_6H_4.CH_2.C_6H_4$ per 100 mols. of saturated solution in Ethylene dichloride.	Chloro benzene.	Nitro benzene.	p xylene.	Toluene.	Benzene.	Pyridine.
0 ...	7.1	6.6	6.3	5.5	5.4	5.4	5.1
20....	12.9	12.4	11.8	11.2	10.6	10.5	10.1
40....	22.0	21.4	20.6	19.3	19.1	19.0	18.3
60....	35.6	34.9	34.1	32.7	32.4	32.4	31.4
80....	54.1	53.3	52.5	51.3	51.1	51.1	49.9
100....	78.4	78.2	77.1	76.6	76.5	—	75.5

t°.	Mols. $C_6H_4.CH_2.C_6H_4$ per 100 mols. of saturated solution in Carbon tetra chloride	Aniline.	Acetone.	Acetic acid.	Ethyl acohol	Methyl alcohol.
0..........	3.7	2.4	2.0	—	—	—
20..........	7.8	5.6	4.7	0.8	0.50	0.35
40..........	15.1	11.7	10.4	1.9	0.85	0.58
60..........	27.5	23.2	15.0 (50°)	4.5	1.76	1.10
80..........	—	42.7	—	11.3	4.60	—
100..........	—	71.0	—	40.0	—	—

100 gms. sat. solution of fluorene in liquid sulfur dioxide contain 24 gms. $C_6H_4CH_2C_6H_4$ at ? t°. (De Carli, 1927.

FLUORENE

Freezing-point data are given for mixtures of Fluorenone and:

Dinitro benzenes(4)(8)
" phenol(4)
" toluenes(4)(5)
Naphthylamines(7)
Picramide(1)

Picric acid(4)
Picryl chloride(1)
Quinone(6)
Styphnic acid(1)
Tetra nitro benzene(8)

Tetryl(3)
Trinitro benzene(4)
" cresol(2)
" m xylol(3)
" toluene(4)

(1) Jefremow, 1916; (2) Jefremow and Tichomirowa, 1927; (3) Jefremow and Tichomirowa, 1928; (4) Kremann, 1911; (5) Kremann, Hönigsberg and Mauermann, 1923; (6) Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922; (7) Pfeiffer, 1924; (8) Shinomiya, 1940.

2-BROMO AMINO FLUORENE $C_{13}H_8.Br.NH_2$. (m.pt.146°)

100 gms. C_2H_5OH dissolve 1.0 gm. $C_{13}H_8BrNH_2$ at 18°.
" " C_6H_6 " 2.86 " " " "
" " $CHCl_3$ " 4.00 " " " " (Courtot, 1930.)

2-CHLORO AMINO FLUORENE $C_{13}H_8Cl.NH_2$ (m.pt.133°)

100 gms. C_2H_5OH dissolve 1.66 gm. $C_{13}H_8ClNH_2$ at 18°.
" " C_6H_6 " 4.54 " " " "
" " $CHCl_3$ " 5.00 " " " " " "

BENZOPHENONE $(C_6H_5)_2CO$.

SOLUBILITY IN AQUEOUS ALCOHOL AND IN OTHER SOLVENTS.

(Derrien — Compt. rend. 130, 722, '00; Bell — J. Phys. Chem. 9, 550, '05.)

In Aqueous Alcohol at 40°.

(Bell.)

Wt. % Alcohol in Solvent.	Gms. $(C_6H_5)_2CO$ per 100 Gms. Solvent.	Gms. $(C_6H_5)_2CO$ per 100 Gms. Solution.	Wt. % Alcohol in Solvent.	Gms. $(C_6H_5)_2CO$ per 100 Gms. Solvent.	Gms. $(C_6H_5)_2CO$ per 100 Gms. Solution.
40	2	1.9	67.5	39	28.1
45	5	4.8	70	56	35.9
50	8	8.3	71	67	39.2
55	11	9.9	72	90	47.4
60	16	13.8	72.5	105	51.2
65	28	22.6	73	156	61.0

In Aqueous Alcohol and other Solvents.

(Derrien.)

Solvent.	t°.	Gms. $(C_6H_5)_2CO$ per 100 Gms. Solvent.	Solvent.	t°.	Gms. $(C_6H_5)_2CO$ per 100 Gms. Solvent.
97% Ethyl Alcohol	17	13.5	Ethyl Ether (rectified)	12.7	17.5
85 cc. 97% Alcohol + 15 cc. H_2O	17	3.8	Benzene	17	70.9
80 " " + 20 "	17	2.2	Xylene	17.6	48.4
75 " " + 26 "	17	1.4	Nitro Benzene	15.8	58.8
Methyl Alcohol (pure)	9.8	11	Chloroform (com.)	16.5	55.5
" " "	15	13.1	Bromoform	17.4	34.4
Acetic Ether (pure)	9.6	39.2	Toluene	17.2	55.5
Carbon Disulfide	16.1	[illegible]	Ligroine	14.6	6.2

Determinations made by means of the Pulfrich refractometer (Osaka, 1904, 8), gave 39 gms. benzophenone per 100 gms. absolute ethyl alcohol at 20°, and 78.6 gms. benzophenone per 100 gms. benzene at 25°.

BENZOPHENONE

Freezing-point data are given for mixtures of benzophenone and:

Azobenzene(2)
Azoxyanisole(6)
Benzene(13)
Bibenzyl(14)
Benzohydrol(1)
Dinitro phenol(7)
Diphenyl + diphenyl amine(3)(12)
Diphenylamine(4)
Hydroquinone(5)
Naphthols(5)
Naphthylamines(8)
Nitrophenols(5)
Phenol(5)
Picric acid(9)(18)
Pyrocatechol(5)(13)
Pyrogallol(5)
Resorcinol(5)(13)(15)(16)
Sulfuric acid(10)
Thymol(19)
Toluidines(8)
Trichlor acetic acid(11)
Trinitro phenol(18)

(1) Boeseken, 1921; (2) Erlenmeyer and Leo, 1911; (3) Giua, 1915; (4) Giua and Cherchi, 1919; (5) Freundlich and Posnjak, 1912; (6) de Kock, 1904; (7) Kremann and Marktl, 1920; (8) Kremann and Schadinger, 1918; (9) Kremann and Zechner, 1918; (10) Kendall and Carpenter, 1914; (11) Kendall and Gibbons, 1915; (12) Lee and Warner, 1911; (13) Lombit, 1928; (14) Malataux and Straub, 1917; (15) Pfeiffer, 1924; (16) Pfeiffer, Goebel and Angern, 1925; (17) Pawlewski, 1893; (18) Puschin and Rikovski, 1930.

2-BROMO AMINO FLUORENOL $C_{13}H_9OBrNH_2$. (m.pt. 186° ?)

100 gms. C_2H_5OH dissolve 0.41 gm. $C_{13}H_9OBrNH_2$ at 18°
" " C_6H_6 " less than 0.22 gm. $C_{13}H_9OBrNH_2$ at 18°

PHENYL BENZOATE $C_6H_5COOC_6H_5$.

Freezing-point data are given for mixtures of:

Phenyl benzoate + Naphthalene (Bernoulli and Sarasin, 1930.)
" " + Trichlor acetic acid (Kendall and Booge, 1916.)

SALOL (Phenylsalicylate) $C_6H_4.OH.COOC_6H_5$, 1.2.

SOLUBILITY OF SALOL IN AQUEOUS ALCOHOL AT 25°. (Seidell, 1909, 1910.)

Wt. Per cent C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. Salol per 100 Gms. Sat. Sol.	Wt. Per cent C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. Salol per 100 Gms. Sat. Sol.
0	0.999	0.015	70	0.877	4.40
20	0.967	0.020	80	0.863	7.70
40	0.934	0.22	90	0.865	14
50	0.914	0.76	92.3	0.868	17.70
60	0.895	2.10	100	0.898	35

SOLUBILITY OF SALOL IN SEVERAL SOLVENTS. (Seidell, 1907.)

Solvent.	t°.	d Sat. Sol.	Gms. Salol per 100 Gms. Sat. Sol.	Solvent.	t°.	d Sat. Sol.	Gms. Salol per 100 Gms. Sat. Sol.
Acetone	30-31	...	90.99	Amyl Alcohol	25	0.869	20.44
Benzene	30-31	1.148	88.57	Acetic Acid (99.5%)	21.5	1.143	63.24
Amyl Acetate	30-31	1.136	85.29	Xylene	32.5	...	87.14+
Aniline	30-31	...	very soluble	Toluene	25	1.128	83.62

100 gms. pyridine dissolve 381 gms. salol at 20°-25° (Dehn, 1917). The solution in aqueous 50 per cent pyridine separates into two layers.

100 gms. benzene dissolve approximately 229 gms. $C_6H_4OHCOOC_6H_5$ at 25°.
" " CCl_4 " " 285 " " " "
" " Pet. benzine" " 91 " " " "

(Warren, 1933.)

SOLIDIFICATION TEMPERATURES FOR MIXTURES OF:

Salol and Thymol. (Bellucci, 1912.)

t° of Solidif.	Gms. Salol per 100 Gms. Mixture.	t° of Solidif.	Gms. Salol per 100 Gms. Mixture.
42	100	23	50
34	90	29	40
26	80	34.5	30
18	70	40	20
13 Eutec.	66	46	10
17.5	60	51	0

Salol and Urethan. (Bellucci, 1912, 1913.)

t° of Solidif.	Gms. Salol per 100 Gms. Mixture.	t° of Solidif.	Gms. Salol per 100 Gms. Mixture.
42	100	36.5	50
36.5	90	39	40
29 Eutec.	86	41.5	30
31	80	44	20
30	70	47	10
34	60	48.5	0

The Eutec. for salol + camphor is at +6° and contains 56% salol.
The Eutec. for salol + monobromcamphor is at 21° and contains 60% salol. } (Bellucci, 1912, 13.)

Solidification temperatures for Salol + Sulfonal and for Salol + β Naphthol are given by Bianchini (1914).

PHENYL SALICYLATE

Freezing-point data are also given for mixtures of Salol and the followin compounds:

Acetanilide(10)
Antipyrine(1)(9)(19)
" + Phenacetine(8)
Benzene(16)
Benzo naphthalene(2)
Benzoyl β Naphthol(2)
Bromural(13)(20)
Camphor(7)(15)
Chlor acetic acid(21)
Chloral hydrate(4)
Cineole(5)
Guaiacol(4)
Menthol(1)(4)(9)
Methyl acetanilide(3)
Naphthalene(3)(18)
" + Sulfonal(6)
Naphthol(19)
Phenacetine(1)(9)(19)
" + Antipyrine(8)
Phenylene diamine(17)
Quinine(1)(9)
Resorcinol(11)
Sulfonal(19)
" + Naphthol(6)
Terpine hydrate(3)
Thymol(12)
Tri chlor acetic acid(14)
Urea(1)(9)
Urethan(1)(9)
Veronal(13)

(1) Adamanis, 1933; (2) Angeletti, 1927; (3) Angeletti, 1928; (4) Bellucci, 1912, 1913; (5) Bellucci and Grassi, 1913; (6) Bianchini, 1914; (7) Caille, 1909; (8) Hrynakowski, 1934; (9) Hrynakowski and Adamanis, 1933; (10) Hrynakowski and Adamanis, 1933a; (11) Hrynakowski and Adamanis 1933b; (12) Hrynakowski and Szmyt, 1935; (13) Hrynakowski and Szmyt, 1935d; (14) Kendall and Booge, 1916; (15) LeFevre and Webb, 1931; (16) Laskit, 1928; (17) Puschin and Dezelic, 1938; (18) Puschin and Grebenschtschikow, 1925; (19) Quercigh and Cavagnari, 1912; (20) Sandqvist and Hök, 1927; (21) Mameli and Mannessier, 1913.

Di PHENYL CARBONATES.

Freezing-point lowering data are given for mixtures of diortho nitro diphenyl carbonate, di para nitro diphenyl carbonate and ortho para nitro diphenyl carbonate by Hœflake, 1921.

Methylphenyl **PICRAMIDES.** $(NO_2)_3C_6H_2(CH_3)(C_6H_5)NH_2$.

SOLUBILITY IN ETHYL ALCOHOL AT 18°.
(Hantzsch, 1911.)

100 cc. C_2H_5OH dissolve 0.32 gm. of the isomer melting at 108°.
100 cc. C_2H_5OH dissolve 0.42 gm. of the isomer melting at 128°.

N-**BENZAL ANILINE** $C_6H_5CH:NC_6H_5$.

100 gms. sat. solution of N-Benzal aniline in liquid sulfur dioxide conta 53 gms. $C_6H_5CH:NC_6H_5$ at ? t°. (DeCarli, 1927.)

Freezing-point data are given for mixtures of N Benzal aniline and:

Anisylidene aniline(1)
Azobenzene(2)
Benzanilide(3)
Benzylaniline(2)
Benzoin(3)
Dibenzyl(2)
Hydrazo benzene(2)
Stilbene(2)
Tolane(2)

(1) Pascal, 1923; (2) Pascal and Normand, 1913; (3) Vanstone, 1913.

BENZANILIDE $C_6H_5CONHC_6H_5$.

SOLUBILITY OF BENZANILIDE IN AQUEOUS SOLUTIONS OF ACETIC ACID.

(Bradfield and Williams, 1929.)

The determinations were made by the synthetic method and the eight or nine determinations over the range 15-40° were plotted and the values for regular intervals of temperature read from the curves.

Gms. CH_3COOH per 100 gms. Aq. solvent	Gms. $C_6H_5CONHC_6H_5$ dissolved per 100 gms. solvent at: 20°	25°	30°	35°
0.0 (= H_2O)		Almost insoluble		
52.4	0.13	—	—	—
76.8	0.61	0.79	1.00	1.22
85.0	1.11	1.37	1.69	2.07
91.3	1.60	1.92	2.31	2.77
99.0	1.73	2.09	2.54	3.10

Freezing-point data are given for mixtures of benzanilide and:

Benzil (Van stone, 1913.)
Benzoin " "
Benzylidene aniline (Van stone, 1913.)
Veronal (Pfeiffer and Angern, 1926.)

Results for mixtures of o and p chloro benzanilide are given by King and Orton, 1911.

AMINO BENZOPHENONE $C_6H_5COC_6H_4NH_2$.

Freezing-point data for mixtures of amino benzo phenone and p amino azobenzene are given by Erlenmeyer and Leo, 1933.

DIPHENYL METHANE $CH_2(C_6H_5)_2$.

Freezing-point data are given for mixtures of Diphenyl methane and:

Diphenyl amine(1)
" ether(1)
Hydroquinone(3)
Naphthols(3)
Naphthalene(4)
Naphthylamines(3)
Phenol(5)
Phenylene diamine(3)
Pyrocatechol(3)
Pyrogallol(3)
Picric acid(2)(3)
Resorcinol(3).
Styphnic acid(2)

(1) Grimm, Gunther and Titus, 1931; (2) Jefremow, 1918; (3) Kremann and Fritsch, 1920; (4) Miolati, 1892; (5) Paterno and Ampola, 1897.

4-METHYL AZOBENZENE $CH_3C_6H_4N:NC_6H_5$.

Freezing-point data for mixtures of 4-methyl azobenzene and 4-chlor azobenzene are given by Grimm, Gunther and Titus, 1931.

BENZOHYDROL (Diphenyl carbinol) $(C_6H_5)_2CHOH$

Freezing-point data are given for mixtures of Benzohydrol and:

Benzene(3)	Naphthols(2)	Picric acid(2)
Benzophenone(1)	Naphthylamines(2)	Phenylene diamines(2)
Dimethyl aniline(1)	Nitrophenols(2)	Pyrocatechol(2)
Dinitro phenol(2)	Phenol(2,3)	Pyrogallol(2)
Hydroquinone(2)	α naphthyl acetone(2)	Resorcinol(2)

(1) Boeseken, 1921; (2) Kremann and Brazil, 1924; (3) Schmidlin and Lang, 1912.

BENZYL PHENOL $C_6H_5CH_2C_6H_4OH$

Freezing-point data for mixtures of benzyl phenol with dibenzyl and with benzylaniline are given by Pascal and Normand, 1913.

DIPHENYL UREA $CO.(NHC_6H_5)_2$

100 gms. H_2O dissolve 0.015 gm. diphenyl urea (sym. or unsym.?) at 20-25°.
" pyridine dissolve 0.88 gms. diphenyl urea (sym. or unsym.?) at 20-25°.
" aq. 50% pyridine dissolve 8.4 gms. diphenyl urea (sym. or unsym.?) at 20-25°. (Dehn, 1917.)

SOLUBILITY OF SYMMETRICAL AND OF ASYMMETRICAL DIPHENYL UREA IN SEVERAL SOLVENTS.

Solvent	t°	Gms. per 100 gms. solvent	
		$CO(NHC_6H_5)_2$ (1)	$NH_2CON(C_6H_5)_2$ (2)
Abs. alcohol	20-25	0.84	—
Quinoline	"	2.80	—
Alcohol + Quinoline	"	1.12	—
Chloroform	"	0.07	8.33(20°)
Carbon tetrachloride	20		1.66

(1) Pucher and Dehn, 1921; (2) Pawlewski, 1918, 1926.

Benzoyl **PHENYL HYDRAZINE** $C_6H_5NH.NHCO.C_6H_5$

SOLUBILITY IN AQUEOUS ALCOHOL AT 25°.
(Holleman and Antusch, 1894.)

Vol. % Alcohol.	Gms. Hydrazine per 100 g. Solvent.	Sp. Gr. Solutions.	Vol. % Alcohol.	Gms. Hydrazine per 100 g. Solvent.	Sp. Gr. Solutions.
100	2.30	0.793	80	1.50	0.850
95	2.43	0.814	70	1.08	0.884
93	3	0.822	55	0.51	0.917
90	2.26	0.831	40	0.16	0.940

The above results give an irregular curve. See remarks under α acetnaphthalide, p. 705.

BENZYL ANILINE $C_6H_5CH_2C_6H_4NH_2$.

Freezing-point data are given by Pascal and Normand, 1913, for mixtures of benzyl aniline and each of the following compounds: Azobenzene, benzal aniline, dibenzyl, hydrazo benzene, benzyl phenol, phenyl benzyl ether, stilbene and tolane. Results for mixtures of benzyl aniline and azobenzene are also given by Beck, 1904, Isaac, 1910-11, Jaeger, 1907, and Hasselblatt, 1913.

DIPHENYL GUANIDINE $NH:C-[NHC_6H_5]_2$.

Determinations of the solubility of diphenyl guanidine and of other compounds in rubber by means of the microscopic examination of thin sheets of samples prepared in a laboratory mill are described by Morris, 1932.

Freezing-point data for mixtures of diphenyl guanidine and benzothiazol are given by Minatoya, Kojima and Nogai, 1931.

PHENYL p TOLYL AMINE $(C_6H_5)(C_7H_7)NH$.

Freezing-point data for mixtures of phenyl p tolyl amine and di p tolyl amine are given by Chapman and Perrott, 1930.

p TOLUENE SULPHONE ANILIDE $CH_3C_6H_4SO_2.NHC_6H_5$.

SOLUBILITY OF p TOLUENE SULFONE ANILIDE IN AQUEOUS SOLUTIONS OF ACETIC ACID.

(Bradfield and Williams, 1929.)

See Benzanilide p. 725.

Gms. CH_3COOH per 100 gms. aqueous solvent.	Gms. $CH_3C_6H_4SO_2.NHC_6H_5$ dissolved per 100 gms. solvent at: 20°	25°	30°	35°
0.0 (= H_2O)	Almost insoluble			
26.9	0.09	—	—	—
52.4	0.88	1.02	1.24	1.60
76.8	6.2	7.5	9.7	12.6
85.0	11.0	13.2	16.7	21.6
91.3	15.9	19.4	24.6	31.7
99.0	22.0	26.1	32.5	42.1

Sym. DIPHENYL CARBAZIDE (carbohydrazide) 1,5-$(C_6H_5NHNH)_2CO$.

Freezing point data are given for mixtures of s diphenyl carbazide and 1-phenyl semicarbazide by Sswetlow, 1933.

Freezing-point data are given for mixtures of sym. diphenyl carbazide and 1-phenyl semi carbazide by Noller, 1930.

ACETYL AMINO ANTIPYRINE $C_3N_2O(NHCOCH_3)(C_6H_5)(CH_3)_2$.

Freezing point data are given for mixtures of acetyl methyl antipyrine and:

n Methyl phenyl voluntal (Pfeiffer and Seydel, 1928.)
n Phenyl voluntal " " " "
Veronal (C-Diethyl barbituric acid)(Pfeiffer and Angern, 1926.)
Voluntal (carbaminic acid tri chlor ethyl ester (Pfeiffer and Angern, 1926

PYRAMIDON (Dimethyl amino antipyrine; 1 phenyl, 2.3 dimethyl, 4 dimethyl amine, 5 pyrazolone) $(C_{11}H_{11}ON_2)N(CH_3)_2$.

SOLUBILITY OF PYRAMIDON IN WATER.

(Charonnat, 1927.)

The curve representing the solubility of pyramidon in water is quite unusual in that at temperatures above 66° the system separates into two liquid phases of which the curve of demarcation is a complete circle.

			*Results for the liquid laye		
t°	Gms. $(C_{11}H_{11}ON_2)N(CH_3)_2$ per 100 gms. sat. sol.	Solid Phase	t° (lower	upper)	Gms. $(C_{11}H_{11}ON_2)N(CH_3$ per 100 gms. sat. so
0	6.54	$(C_{11}H_{11}ON_2)N(CH_3)_2$	121	121	9.38
20	5.3	"	104	129	10.0
37	5.3	"	81	166	15
55	7.9	"	77.5	175	20
65	13.0	"	70.5	181	27
70	40.0	"+liquid phase	70	190	40
69.5	50.0	"+ " "	70	190	45
74	75	"	69.5	188	50
90	94	"	74.4	175	66.6
108(m.pt.)	100	"	84	154	75
			94	138	77.7
			115	115	79.5

Due to the peculiar solubility of pyramidon in water it will be noted, for instance, that when a mixture of one part of pyramidon and 9 parts of water which forms a saturated solution at about 60°, is heated in a sealed tube, it becomes cloudy at about 100° and becomes clear again at about 110°. On cooling, the reversephenomena occurs and crystals separate only when the temperature decreases to about 60°. This solution is therefore saturated at three different temperatures. A solution of somewhat lower concentratio is, however, saturated at only one temperature.

PYRAMIDON

Freezing-point data are given for mixtures of pyramidon and:

Acetanilide(1)
o Amino phenol(7)
Barbital(2)(4)
Benzimidazole(3)
Bromural(9)
Butyl chloraldehyde(5)
Cholesterol(5)
Ethyl carbamate(5)
Luminal(6)
Methyl amino benzoate(7)
" barbituric acid(6)
" p oxy benzoate(7)
''' phenyl voluntal(5)
" veronal(6)
Orthoform neu(7)
Phenacetine(1)
Ph
Pheno barbital(Luminal(6)
Phenyl urethan(5)
" veronal(6)
" voluntal(5)
Tri chlor ethyl carbamate(Voluntal(5)
Urethan(5)
Veronal(c Diethyl barbituric acid(2)(8)

(1) Angeletti, 1927; (2) Pfeiffer, 1925; (3) Pfeiffer and Angern, 1926; (4) Pfeiffer and Ochiai, 1932; (5) Pfeiffer and Seydel, 1928; (6) Pfeiffer and Seydel, 1928a; (7) Pfeiffer and Seydel, 1928b; (89 Rheinboldt and Kirscheisen, 1925; (9) Sandquist and Hök, 1927.

SALICIN $C_6H_4(CH_2.OH)O.C_6H_{11}O_5$.

SOLUBILITY IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. per 100 Gms. Solvent.	Authority.
Water	15	3.52	(Greenish and Smith, 1903.)
Water	25	4.16	(Dott, 1907.)
90% Alcohol	15	1.5	(Greenish and Smith, 1903.)
90% Alcohol	15	2	(Squire and Caines, 1905.)
Trichlor Ethylene	15	0.013	(Wester and Bruins, 1914.)

NOVOCAINE (base) $CH_2(C_6H_4NH_2COO)CH_2[N.(C_2H_5)_2].2H_2O$.

100 cc. H_2O dissolve 0.333 gm. anhydrous novocaine at 20°. (Zalai, 1910.)
100 cc. oil of sesame dissolve 4.29 gms. anhydrous novocaine at 20°.

Determinations of the dissociation constants, solubilities in water and distribution coefficients between water and ether of Novocaine, $NH_2C_6H_4COO.CH_2.CH_2N(C_2H_5)_2$, and of Pantocaine, $NH(C_4H_9)C_6H_4COO.CH_2.CH_2.CH_2N(CH_3)_2$, are described by Eisenbrand and Pitcher, 1938. The solubility of these compounds in water depends upon the hydrogen ion concentration of the solution. The dissociation constants show that Novocaine is completely undissociated at pH10 and Pantocaine at pH9. The solubilities at these hydrogen ion concentrations were found to be:

0.013 gm. Novocaine per 100 cc H_2O at ? t°.
0.0156 " Pantocaine " " " " " " "

NOVOCAINE (Hydrochloride) $CH_2(C_6H_4NH_2COO).CH_2[N(C_2H_5)_2].HCl$.

100 gms. H_2O dissolve about 100 gms. of the salt at room temp.
100 gms. alcohol dissolve about 3 gms. of the salt at room temp.

NOVOCAINE Bichromate $(C_{13}H_{20}O_2N_2)_2.H_2Cr_2O_7$.

SOLUBILITY OF NOVOCAINE BICHROMATE IN WATER.

(Bungenburg, de Jong and Holleman, 1937.)

In this system separation into two liquid layers occurs at 74°, between the concentrations 9 and 74 percent salt. The determinations were made by the sealed tube method (thermic analysis) and the results are given in the form of a diagram from which the following approximate values were read

t°	Gms. $(C_{13}H_{20}O_2N_2)_2.H_2Cr_2O_7$ per 100 gms. sat. sol.	Solid Phase
63	2.0	$(C_{13}H_{20}O_2N_2)_2.H_2Cr_2O_7$
70	3.0	"
74	9.0	" + liquid
74	74.0	" "
80	79	"
90	82.5	"
100	90.0	"
120	97.5	"
133 m.pt.	100	"

Results for the liquid layers

t°	Gms. $(C_{13}H_{20}O_2N_2)_2.H_2Cr_2O_7$ per 100 gms. sat. sol.
80	11
90	18
95	22
98 Crit. t.	40
97	50
92.5	60
90	62.5
80	71
74	74 + solid

ELAIDIC ACID $C_8H_{17}CH:CH(CH_2)_7COOH$.

SOLUBILITY OF ELAIDIC ACID IN SEVERAL SOLVENTS. (Lebrun, 1925.)

Solvent	t.	Gms. $C_{18}H_{34}O_2$ per 100 gms. solvent
Acetylene dichloride (trans) (b. pt. 48°.3)	[illegible]	10.92
" " (cis) (b. pt. 60°.2)	[illegible]	6.70
Ethyl chlorisocrotonate	[illegible]	[illegible]
Crotonic nitrile (b. p. 107°.7-108°.2)	[illegible]	17.47
" " (b. pt. 121°.8-122°.3)	[illegible]	14.33
Bromo butene (b. pt. 93°.9)	[illegible]	3.68
" " (b. pt. 85°.5-85°.6)	[illegible]	3.10

n DECYL MALONIC ACID $C_{10}H_{21}CH(COOH)_2$.

100 gms H_2O dissolve 0.0025 gm. $C_{10}H_{21}CH(COOH)_2$ at 25°. (Verkade and Coops, Jr., 1930a.)

ETHYL AZELATE $(CH_2)_7(COOC_2H_5)_2$.

100 cc H_2O dissolve 0.025 gm. $(CH_2)_7(COOC_2H_5)_2$ at 20°. ([illegible] and Kahn, 1931.)

MYRISTIC ACID $C_{13}H_{27}COOH$.

SOLUBILITY IN ALCOHOLS. (Timofeiew, 1894.)

Alcohol.	t°.	Gms $C_{13}H_{27}COOH$ per 100 Gms Sat. Sol.	Alcohol.	t°.	Gms $C_{13}H_{27}COOH$ per 100 Gms. Sat. Sol.
Methyl Alcohol	0	2.81	Propyl Alcohol	0	5.6
" "	21	21.2	" "	21	31.2
" "	31.5	59.2	" "	30.5	55.3
Ethyl Alcohol	0	7.14	Isobutyl Alcohol	0	6.4
" "	21	31	" "	21	28

Freezing point data for myristic acid + palmitic acid are given by Heintz (1854).

BENZOTHIAZOLE DISULFIDE $C_{14}H_8N_2S_4$.

Determinations of the solubility of Benzothiazole disulfide of Mercapto benzothiazole and of other compounds in rubber by means of the microscopic examination of thin sheets of samples prepared in a laboratory mill, are described by Morris, 1932.

CHLORO ANTHRAQUINONES (Mono and Di) $C_{14}H_7ClO_2$, $C_{14}H_6Cl_2O_2$.

Freezing-point data for mixtures mono and dichloro anthraquinones are given by Coppens, 1925, and by Lauer, 1931.

ANTHRAQUINONE $(C_6H_4)_2(CO)_2$.

Solubility in Liquid Sulfur Dioxide in the Critical Region.

(Centnerswer and Teletow 1903.) (See Anthracene, p. 738.)

t°.	Gms. $C_{14}H_8O_2$ per 100 Gms. SO_2.	t°.	Gms. $C_{14}H_8O_2$ per 100 Gms. SO_2.	t°.	Gms. $C_{14}H_8O_2$ per 100 Gms. SO_2.
3.96	0.64	92.1	2.81	118.5	5.60
51.5	0.88	101.4	3.67	141.6	7.53
67.9	1.73	106.3	4.23	160	9.60
82.4	2.24	108.7	4.40	179	12.70
				183.7	18.30

100 parts of absolute ethyl alcohol dissolve 0.05 part anthraquinone at 18° and 2.249 parts at b. pt. (v. Becchi.)

100 gms. alcohol dissolve 0.437 gm. anthraquinone at 25°. (Hildebrand, Ellefson and Beebe, 1917.)

Solubility of Anthraquinone in Benzene and in Chloroform.

(Tyrer, 1910.)

In Benzene.			In Chloroform.		
t°.	Sp. Gr. Solution.	Gms. $C_{14}H_8O_2$ per 100 Gms. C_6H_6.	t°.	Sp. Gr. Solution.	Gms. $C_{14}H_8O_2$ per 100 Gms. $CHCl_3$.
0	0.8900	0.110	0	1.5244	0.340
20	0.8794	0.256	10	1.5046	0.457
30	0.8692	0.350	20	1.4850	0.605
40	0.8591	0.495	30	1.4656	0.780
50	0.8439	0.700	40	1.4461	0.994
60	0.8389	0.974	50	1.4261	1.256
70	0.8288	1.355	55	1.4164	1.415
80	0.8190	1.775	60	1.4070	1.577

Solubility of Anthraquinone in a Mixture of Chloroform and Hexane at 12.6° and 49°.

(Tyrer, 1910, also private communication. See Note, p. 735.)

% $CHCl_3$ in Solvent.	Gms. $C_{14}H_8O_2$ per 100 Gms. Solvent at:		% $CHCl_3$ in Solvent.	Gms. $C_{14}H_8O_2$ per 100 Gms. Solvent at:	
	12.6°.	49.0°.		12.6°.	49.0°.
0	0.006	0.056	60	0.101	0.292
10	0.016	0.074	70	0.148	0.417
20	0.024	0.096	80	0.222	0.608
30	0.034	0.124	90	0.334	0.852
50	0.068	0.212	100	0.482	1.209

SOLUBILITY OF ANTHRAQUINONE IN ETHER.

([illegible])

Weighed amounts of ether and anthraquinone were placed in glass tubes which were then sealed. The temperature noted at which the anthraquinone disappeared and also at which the liquid phase disappeared (critical temp.). The two curves cross at 195° and again at 241°. Between these two temperatures the critical curve lies below the solubility curve, hence for this range of temperature no solubility curve is shown. The following figures were read from the curves, and are therefore only approximately correct:

t°.	Gms. $C_{14}H_8O_2$ per 100 gms. Solution.	t°.	Gms. $C_{14}H_8O_2$ per 100 gms. Solution.	t°.	Gms. $C_{14}H_8O_2$ per 100 gms. Solution.
130	3	241	30	260	80
150	4	245	40	270	90
170	4.5	247	50	275	100
195	5.0	250	60		

100 parts of toluene dissolve 0.19 part anthraquinone at 15° and 5.56 parts at 100°. (v. Bechi.)

100 gms. ether dissolve 0.104 gm. anthraquinone at 25°.

(Hildebrand, Ellefson and Beebe, 1917.)

Data for the solubility of anthraquinone in mixtures of phenol and water are given by Timmermans (1907).

100 gms. carbon tetrachloride dissolve 0.053 gm. $C_6H_4(CO)_2C_6H_4$ at 20°. } (Pawlewski,
" " chloroform " 0.54 " " " " } 1914, 1926.)

SOLUBILITY OF ANTHRAQUINONE IN MIXTURES OF SOLVENTS AT 17°.5.

([illegible], 1914, 1926.)

RESULTS FOR MIXTURES OF CARBON TETRACHLORIDE AND

Acetone $CCl_4 + CH_3COCH_3$		Benzene $CCl_4 + C_6H_6$		Chloroform $CCl_4 + CHCl_3$		Ethyl acetate $CCl_4 + CH_3COOC_2H_5$	
Gms. CCl_4 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. CCl_4 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. CCl_4 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. CCl_4 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.
97.36	0.079	100.0	0.053	100.0	0.053	100.0	0.053
95.[illegible]	0.093	90.0	0.080	90.0	0.093	90.0	0.066
90.0	0.104	80.0	0.097	80.0	0.097	80.0	0.087
80.0	0.113	70.0	0.109	70.0	0.164	70.0	0.089
70.0	0.128	63.33	0.115	60.0	0.181	60.0	0.097
66.8	0.133	60.0	0.118	[illegible]	0.221	57.8	0.095
60.0	0.140	50.0	0.129	50.0	0.241	50.0	0.111
50.0	0.133	40.0	0.14[illegible]	40.0	0.385	40.0	0.117
40.0	0.133	30.0	0.1[illegible]	30.0	0.442	30.0	0.115
30.0	0.139	20.0	0.185	20.0	0.4[illegible]	20.0	0.115
10.0	0.136	10.0	0.200	10.0	0.5[illegible]	10.0	0.129
0.0	0.131	0.0	0.225	0.0	0.54[illegible]	0.0	0.120

RESULTS FOR MIXTURES OF :

$CHCl_3 + CH_3COCH_3$.		$CHCl_3 + C_6H_6$.		$CHCl_3 + CH_3COOC_2H_5$.		$C_6H_6 + CH_3COOC_2H_5$.	
Gms. $CHCl_3$ per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. $CHCl_3$ per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. $CHCl_3$ per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. C_6H_6 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.
0.0	0.121	0.0	0.223	0.0	0.120	0.0	0.121
10	0.121	10	0.218	10.0	0.113	10	0.132
20	0.117	20	0.236	20.0	0.114	20	0.150
30	0.117	30	0.244	30.0	0.097	30	0.166
40	0.111	40	0.244	40.0	0.106	40	0.176
50	0.115	45.9	0.249	50.0	0.104	50	0.184
60	0.123	50	0.263	54.1	0.100	52.6	0.190
65.32	0.121	60	0.287	60.0	0.119	60	0.206
70	0.137	70	0.325	70.0	0.142	70	0.230
80	0.177	80	0.365	90.0	0.304	80	0.232
90	0.276	90	0.437	95.0	0.357	90	0 244
95	0.328	100	0.542	100.0	0.542	100	0.223

SOLUBILITY OF ANTHRAQUINONE AT 25° IN MIXTURES OF:

(Mahieu, 1936.)

Methyl Alcohol + Chloroform		Chloroform and Benzene	
Gms. $CHCl_3$(1) per 100 gms. $CHCl_3$ + CH_3OH	Gms. $C_{14}H_8O_2$ per 100 gms. Solvent	Gms. C_6H_6 per 100 gms. C_6H_6 + $CHCl_3$	Gms. $C_{14}H_8O_2$ per 100 gms. Solvent
-0.0	0.707	0.0	0.707
10.4	0.88	25.9	0.437
16.4	1.73	52.1	0.415
25.8	1.54	74.4	0.425
26.2	0.92	100.0	0.470
49.2	0.305		
73.6	0.437		
100.0	0.400		

(1) This is evidently an error in the original paper and should be CH_3OH

SOLUBILITY OF AMINO AND OTHER ANTHRAQUINONES IN ABSOLUTE ETHYL ALCOHOL AT 60°

(Kartsschoff and Farine, 1928.)

Compound	Formula	Gms. Compound per liter sat. so
1-Amino Anthraquinone	$C_6H_4(CO)_2C_6H_3NH_2$	3.51
1,4-Diamino "	$NH_2C_6H_3(CO)_2C_6H_3NH_2$	5.54
1,5- " "	"	6.85
1,8- " "	"	6.82
1,4,5,8-Tetraamino Anthraquinone	$(NH_2)_2C_6H_2(CO)_2C_6H_2(NH_2)_2$	1.84
1,2-Dioxy " (Alizarine)	$C_6H_4(CO)_2C_6H_2(OH)_2$	3.70
1,2,4-Tri oxy " (Purpurine)	$C_6H_4(CO)_2C_6H(OH)_3$	8.61
1-Oxy,4-Amino "	$C_6H_4(CO)_2C_6H_2(OH)(NH_2)$	5.14
1-Oxy,4-8-diamino " (Anthrarufine)	$NH_2C_6H_3(CO)_2C_6H_2(OH)(NH_2)$	1.06
1-Methyl amino "	$C_6H_4(CO)_2C_6H_3(NHCH_3)$	14.96
1-amino,2-methyl "	$C_6H_4(CO)_2C_6H_2(NH_2)(CH_3)$	5.88
1-amino,4-anilido "	$C_6H_4(CO)_2C_6H_2(NH_2)(NHC_6H_5)$	6.57
1-amino,4-toluido "	$C_6H_4(CO)_2C_6H_2(NH_2)(NHC_6H_4CH_3)$	0.47
1,4 ditoluido "	$C_6H_4(CO)_2C_6H_2(NHC_6H_4CH_3)_2$	0.34
1,4 " 2-methyl "	$C_6H_4(CO_2)C_6H(NHC_6H_4CH_3)_2(CH_3)$	2.25

Experiments on the distribution of these compounds between alcohol and cellulose acetate silk are also given and explanations deduced in regard

ANTHRAQUINONES

SOLUBILITY OF ANTHRAQUINONE SULFONIC ACIDS IN WATER AT 18°.
(Fierz-David, Krebser and Anderau, 1927.).

Compound	Formula	Gms. Compound per 100cc H_2O
1.5-Anthraquinone disulfonic acid	$C_{14}H_6O_2(SO_3H)_2 \cdot 4\ H_2O$	66.6
1.8 " " "	" $\cdot 5\ H_2O$	66.6
1.6 " " "	" $\cdot 5\ H_2O$	100.0
1.5 " chloro sulfonic acid	$C_{14}H_6O_2ClSO_3H \cdot 4H_2O$	50.0
1.6 " " " "	" $\cdot 3H_2O$	25.0
1.7 " " " "	" $\cdot 3H_2O$	25.0

These authors also give the solubilities in water of inorganic salts of the above and other anthraquinone sulfonic acids. (See Vol. 1)

Hydroxy **ANTHRAQUINONES** $C_6H_4 < (CO)_2 > C_6H_3OH$.

1000 cc. H_2O dissolve 0.0035 gm. α oxyanthraquinone at 25°. (Hüttig, 1914.)

1000 cc. H_2O dissolve 0.0011 gm. β oxyanthraquinone at 25°. "

1000 cc. H_2O dissolve 0.000012–0.000062 gm. 1.4 dioxyanthraquinone (= chinizarin) at 25°.

1000 cc. H_2O dissolve 0.00158 gm. 1.6 dioxyanthraquinone (= chrysazin) at 25°. (Hüttig, 1914.)

ANTHRAFLAVINE (2.6 Dioxyanthraquinone) $C_{12}H_6(CO)_2(OH)_2$.

1000 cc. H_2O dissolve 0.0003 gm. anthraflavine at 25°. (Hüttig, 1914.)

ANTHRARUFINE (1.5 Dioxyanthraquinone) $C_{12}H_6(CO)_2(OH)_2$.

1000 cc. H_2O dissolve 0.000285 gm. anthrarufine at 25°. (Hüttig, 1914.)

Trioxy methyl**ANTHRAQUINONE** (Emodin) $C_{15}H_{10}O_5$.

SOLUBILITY IN SEVERAL SOLVENTS. (Beal and Katti, 1925.)

The saturated solutions were prepared by boiling an excess of the compound with the solvent, allowing to stand at room temperature and filtering.

Solvent.	Gms. Emodin per 100 cc. sat. sol.	Solvent	Gms. Emodin per 100 cc. sat. sol.
Benzene....	0.0405	Chloroform..........	0.0703
Carbon tetra chloride..	0.0102	Ether...............	0.1400
Carbon disulfide.......	0.0088		

PHENANTHRAQUINONE $C_6H_4COCOC_6H_4$.

SOLUBILITY OF PHENANTHRAQUINONE IN AQUEOUS SOLUTIONS OF ACIDS AT 25°.
(Knox and Will, 1919.)

The determinations were made by shaking a weighed amount of phenanthraquinone with 200 cc. of solvent untill saturation was complete, and then filtering, drying and weighing the undissolved residue of phenanthraquinone.

Solubility in Aqueous Sulfuric Acid. Gm. equivalents per liter.		Solubility in Aqueous Hydrochloric Acid. Gm. equivalents per liter.		Solubility in Aqueous Nitric Acid. Gm. equivalents per liter.	
H_2SO_4.	$C_{14}H_8O_2$.	HCl	$C_{14}H_8O_2$.	HNO_3.	$C_{14}H_8O_2$.
0.0	0.0075	0.0	0.0075	0.0	0.0075
5.97	0.0080	3.11	0.012	4.06	0.049
6.19	0.0085	4.25	0.016	4.54	0.053
7.00	0.0095	5.12	0.023	5.02	0.067
9.48	0.012	6.05	0.029	6.11	0.099
11.6	0.019	6.07	0.031	6.66	0.114
13.7	0.030	7.20	0.036	6.70	0.118
15.1	0.043	8.50	0.058	7.00	0.127

PHENANTHRAQUINONE $C_6H_4CO_2CO_2C_6H_4$.

SOLUBILITY IN BENZENE AND IN ETHYL ACETATE.

(Tyrer, 1910.)

Solubility in Benzene.

t°.	Sp. Gr. of Sat. Solution.	Gms. $(C_6H_4)_2(CO_2)_2$ per 100 Gms. Benzene.
10	0.8902	0.412
15	0.8850	0.471
20	0.8800	0.538
30	0.8698	0.738
40	0.8601	1.032
50	0.8506	1.354
60	0.8415	1.760
70	0.8327	2.687
80	0.8241	3.770

Solubility in Ethyl Acetate.

t°.	Sp. Gr. of Sat. Solution.	Gms. $(C_6H_4)_2(CO_2)_2$ per 100 Gms. Ethyl Acetate.
10	0.9102	0.518
20	0.9025	0.626
30	0.8906	0.770
40	0.8789	0.995
50	0.8674	1.292
60	0.8561	1.640
65	0.8508	1.902
70	0.8454	2.215
75	0.8401	2.515

NOTE. — The Sp. Gr. determinations given in the above table and in the tables for anthracene, p. 737 and anthraquinone, p 731 are not included in the original paper of Tyrer (1910) but, in response to my request, have been kindly supplied for the present volume. I am also indebted to Dr. Tyrer for the modified form of his original tables showing the solubilities of anthraquinone and phenanthraquinone in mixed solvents. (A. S.)

SOLUBILITY OF PHENANTHRAQUINONE IN MIXTURES OF ORGANIC SOLVENTS.

(Tyrer, 1910.)

In C_6H_6 + Hydrocarbons (1) at 48°.		In $CHCl_3$ + Pentane at 14.5°.		In $CH_3COOC_2H_5$ + Hydrocarbons(1) at 48°.	
Per cent C_6H_6 in Mixed Solvent	Gms. Phenanthraquinone per 100 Gms. Solvent.	Per cent $CHCl_3$ in Mixed Solvent.	Gms. Phenanthraquinone per 100 Gms. Solvent.	Per cent $CH_3COOC_2H_5$ in Mixed Solvent.	Gms. Phenanthraquinone per 100 Gms. Solvent.
0	0.0708	0	0.025	0	0.073
10	0.088	10	0.045	14.19	0.126
20	0.118	20	0.080	27.37	0.207
30	0.160	30	0.115	39.94	0.335
40	0.228	40	0.165	52.12	0.494
50	0.318	50	0.220	63.56	0.656
60	0.440	60	0.330	74.19	0.817
70	0.588	70	0.525	84.62	0.993
80	0.772	80	0.805	90	1.073
90	1.004	90	1.415	100	1.230
100	1.288	100	2.402		

(1) Distilled from petroleum, b. pt. = 82°–92°. (See note, above.)

ALIZARIN (1.2 Dioxyanthraquinone) $C_{14}H_6O_2(OH)_2$.

Solubility in Water at Varying Temperatures.

(Hüttig, 1914; Beilstein.)

t°.	25°.	100°.	250°.
Grams Alizarin per liter	0.000505	0.340	3.017

According to Dehn (1917), 100 gms. H_2O dissolve 0.04 gm. alizarin at 20°-25°.

Solubility of Alizarin in Aqueous Solutions of:

Ammonia at 25°.		Sodium Hydroxide at 25° (Hüttig, 1914.)		
Gms. NH_3 per Liter.	Gms. Alizarin per Liter.	Gms. NaOH per Liter.	Gms. Alizarin per Liter.	Solid Phase.
0.160	0.132	0.427	1.150	$C_{14}H_8O_4$
4.025	0.228	1.050	3.820	$C_{14}H_8O_4 + C_{14}H_7O_4Na$

100 gms. 95% formic acid dissolve 0.10 gm. alizarin at 20.8°. (Aschan, 1913.)

Alizarin is soluble in all proportions in pyridine and in aq. 50% pyridine at 20°-25°. (Dehn, 1917.)

ALIZARIN (1.2 Dioxyanthraquinone) $C_{14}H_6O_2(OH)_2$.

100 gms. chloroform dissolve 0.12 gm. alizarin at 20° (Pawlewski, 1914, 192
" carbon tetrachloride " 0.01 " "

ANTHRACENE $C_{14}H_{10}$

Solubility of Anthracene in Several Solvents.

Solvent.	t°.	Gms. $C_{14}H_{10}$ per 100 Gms. Solvent.	Authority.
Ethyl Alcohol (abs.)	16	0.076	(v. Becchi.)
" " "	19.5	1.9	(de Bruyn, 1892.)
" " "	25	0.328	(Hildebrand, Ellefson and Beebe, 1917.)
" " "	b. pt.	0.83	(v. Becchi.)
Methyl Alcohol (abs.)	19.5	1.8	(de Bruyn, 1892.)
Benzene	25	1.86	(Hildebrand, Ellefson and Beebe, 1917.)
Carbon Disulphide	25	2.58	" " "
Carbon Tetrachloride	25	0.732	" " "
Ether	25	1.42	" " "
Hexane	25	0.37	" " "
95% Formic Acid	18.3	0.03	(Aschan, 1913.)
Toluene	16.5	0.92	(v. Becchi.)
"	100	12.94	"
Trichlorethylene	15	1.01	(Wester and Bruins, 1914.)

SOLUBILITY OF ANTHRACENE IN BENZENE AND IN MIXTURES OF BENZENE AND PENTANE AND OF BENZENE AND HEPTANE.

(Tyrer, 1910, and private communication. See Note, p. 735.)

	In Benzene.		In Benzene + Pentane at 15°.		In Benzene + Heptane at 14° and 70°.		
t°.	d. of Sat. Sol.	Gms. $C_{14}H_{10}$ per 100 Gms. Solvent.	% C_6H_6 in Solvent	Gms. $C_{14}H_{10}$ per 100 Gms. Solvent.	% C_6H_6 in Solvent.	Gms. C_6H_{10} per 100 Gms. Solvent at 14°.	Gms. C_6H_{10} per 100 Gms. Solvent at 70 .
0	0.9008	0.605	0	0.184	0	0.210	1.67
10	0.8909	0.975	10	0.225	12.5	0.284	2.10
20	0.8812	1.43	20	0.279	25	0.372	2.64
30	0.8717	2.03	30	0.357	37.5	0.474	3.23
40	0.8627	2.78	40	0.447	50	0.592	3.87
50	0.8541	3.75	50	0.549	62.5	0.718	4.59
60	0.8460	5.14	60	0.600	75	0.850	5.37
70	0.8374	7	70	0.780	87.5	0.976	6.15
75	0.8347	8.35	80	0.915	100	.1.180	6.93
			90	1.059			
			100	1.225			

Results for the solubility in benzene, differing from the above in some cases by 15%, are given by Findlay (1902).

SOLUBILITY OF ANTHRACENE IN ALCOHOLIC PICRIC ACID SOLUTIONS AT 25°.

(Behrend — Z. physik. Chem. 15, 187, '94.)

Grams per 100 Grams Solution. Picric Acid.	Grams per 100 Grams Solution. Anthracene.	Solid Phase.	Grams per 100 Gms. Solution. Picric Acid.	Grams per 100 Gms. Solution. Anthracene.	Solid Phase.
0	0.176	Anthracene	3.999	0.202	Anthracene Picrate
1.017	0.190	"	5.087	0.180	"
2.071	0.206	"	5.843	0.162	"
2.673	0.215	"	6.727	0.151	"
3.233	0.228	"	7.511	0.149	Anthracene Picrate + Picric Acid
3.469	0.236	Anthracene and Anthracene Picrate	7.452	0	Picric Acid

SOLUBILITY OF ANTHRACENE IN VARIOUS ORGANIC SOLVENTS.

(Clark, 1919 *a*.)

The sample of anthracene was 99.8 % pure and melted at 212°.7.

Solvent.	d of solvent.	B. pt of solvent.	Gms. Anthracene per 100 gms. of solvent at 15°.5.	30°.	50°.	80°.	100°.
Benzene	0.880	80 – 80.5	1.05	2.10	–	–	–
Toluene	0.870	110 –110.3	0.53	1.90	3.10	7.88	12.20
Naphtha (refined)	0.865	145 –166	0.46	1.42	2.90	6.58	10.10
» (crude solvent)	0.893	152 –179	0.50	1.71	3.25	7.20	8.82
» (heavy)	0.909	165 –185	0.32	1.35	3.10	7.65	10.53
Chloroform	1.495	60.4– 62.0	0.83	1.64	7.10	–	–
Carbon disulfide	1.270	45.7– 47.0	0.52	1.62	–	–	–
Acetone	0.800	56.0– 57.0	0.55	1.42	2.48	–	–
Pyridine (light)*	0.952	125 –150	0.85	2.15	4.10	11.22	16.72
» (heavy)*	1.057	202 –247	0.38	1.40	2.98	7.87	8.82
» (hydrated)**	1.050	94 – 96	0.0	0.0	0.001	1.53	–
Carbon tetrachloride	1.610	75.5– 76.5	0.67	1.15	1.30	–	–
Gasoline	0.742	90 –164	0.12	0.37	0.76	–	–
Ether	0.720	35 – 40.2	0.70	1.03	–	–	–

* These are the bases derived from coal tar oils by abstraction with sulfuric acid and libera-

SOLUBILITY OF ANTHRACENE IN BENZENE AT 30°.5 AS INFLUENCED BY VERY SLIGHT TRACES OF WATER IN THE BENZENE.

(Cohen and Miyake, 1926.)

Thousandths of a wt % of H_2O in the C_6H_6.	0.0	38.9	88.9	saturated
Gms. anthracene per 100 gms. sat. sol.....	2.00	2.00	1.98 1.99	1.98

100 gms. carbon tetrachloride dissolve 0.17 gms. Anthracene at 20°. (Pawlewski,
" " chloroform " 1.74 " " " " (1915, 1926.)

SOLUBILITY OF ANTHRACENE IN CYMENE. (Wheeler, 1920.)

t°.	[illegible]	[illegible]	100°.	156°.
Gms. anthracene per 100 gms. cymene....	1.57	1.72	9.24	98.60

SOLUBILITY OF ANTHRACENE IN MIXTURES OF ACETONE AND ETHYL ALCOHOL.

(Disselkamp, 1926.)

Wt. per cent acetone in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at			
	[illegible]	[illegible]	85°.	100°.
100....................	2.3	3.7	6.0	10.0
75....................	1.6	3.0	5.5	8.1
50....................	1.25	2.4	4.0	6.9
25....................	0.75	1.4	2.4	4.05
Alcohol................	0.4	0.7	1.4	3.45

SOLUBILITY OF ANTHRACENE IN LIQUID SULFUR DIOXIDE IN THE CRITICAL REGION.

(Centnerswer and Teletow, 1903.)

Weighed amounts of anthracene and liquid SO_2 were placed in glass tubes which were sealed and rotated at a gradually increasing temperature, and the point observed at which the solid disappeared.

t°.	Gms. $C_{14}H_{10}$ per 100 Gms. SO_2.	t°.	Gms. $C_{14}H_{10}$ per 100 Gms. SO_2.	t°.	Gms. $C_{14}H_{10}$ per 100 Gms. SO_2.
40.1	2.11	65	4	98	9.36
45.8	2.48	78.2	5.66	99.1	9.95
47.9	2.65	88	7.14	106.5	12.78

SOLUBILITY OF ANTHRACENE IN MIXTURES OF SOLVENTS.

(Disselkamp, 1926.)

The synthetic method of Alexieff was used. A special shaking apparatus was employed. The individual determinations were plotted and the following results read from the curves.

RESULTS FOR MIXTURES OF ETHYL ALCOHOL AND BENZENE.

Wt. % C_6H_6 in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at				
	[illegible]	60°.	[illegible]	[illegible]	[illegible]
100....................	4.1	4.7	7.6	12.1	16.0
87.5....................	2.4	4.3	6.9	10.8	14.6
75.0....................	1.8	2.4	5.8	9.3	8.2
50.0....................	1.2	2.1	3.5	5.8	8.2
25.0....................	0.55	1.2	1.9	4.2	4.3
12.5....................	0.3	0.8	1.4	2.3	3.4
Alcohol................	0.23	0.55	1.05	1.68	2.5

RESULTS FOR MIXTURES OF ETHYL ALCOHOL AND CARBON DISULFIDE.

Wt. % CS_2 in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at				
	40°	55°.	[illegible]	[illegible]	[illegible]
100....................	3.4	5.1	8.5	11.4	–
80....................	2.6	4.5	7.5	10.6	15.8
60....................	1.8	3.0	4.8	6.5	8.9
40....................	0.85	1.55	2.75	3.9	5.4
20....................	0.55	0.8	1.55	2.2	3.0
Alcohol................	0.23	0.45	0.8	1.2	1.8

$C_{14}H_{10}$

RESULTS FOR MIXTURES OF ACETONE AND CHLOROFORM.

Wt. % Acetone in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at 45°.	60°.	75°.	90°.	100°.
100	1.6	3.0	4.6	7.1	9.7
75	1.4	2.6	4.2	6.7	9.2
50	1.2	2.5	4.1	6.5	9.1
25	1.5	3.9	4.6,	7.3	10.2
10	1.95	3.6	5.5	8.5	11.9
$CHCl_3$	2.5	4.5	6.4	9.6	13.0

RESULTS FOR MIXTURES OF ACETONE AND CARBON DISULFIDE.

Wt. % Acetone in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at 35°.	50°.	65°.	80°.
100	1.1	2.9	4.2	5.1
80	2.0	3.3	5.2	8.6
60	2.7	4.4	7.2	11.9
40	3.5	5.6	8.9	14.5
20	4.1	6.4	10.0	15.6
10	3.3	5.5	8.7	13.7
CS_2	2.7	4.5	7.4	12.3

RESULTS FOR MIXTURES OF CARBON TETRACHLORIDE AND CARBON DISULFIDE.

Wt. % CCl_4 in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at 35°.	50°.	65°.	80°.	90°.
100	0.44	1.0	2.13	3.4	4.6
80	1.15	1.9	3.2	5.1	7.1
60	1.7	2.7	4.3	6.7	9.6
40	2.15	3.4	5.4	8.4	12.2
20	2.45	3.9	6.5	9.9	14.7
CS_2	2.6	4.1	7.5	11.5	—

RESULTS FOR MIXTURES OF CARBON TETRACHLORIDE AND TOLUENE.

Wt. % CCl_4 in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at 40°.	50°.	65°.	80°.	95°.	100°.
100	2.5	3.2	5.0	8.0	12.4	15.0
80	2.1	2.9	4.65	7.4	11.0	13.1
60	1.7	2.5	4.0	6.5	9.6	9.7
40	1.3	2.1	3.4	5.6	8.2	9.7
20	0.9	1.6	2.8	4.5	6.8	7.9
Toluene	0.55	1.1	2.1	3.4	5.4	6.2

SOLUBILITY OF ANTHRACENE IN MIXTURES OF :

Benzene and Carbon Disulfide.

Wt. % C_6H_6 in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at 40°.	55°.	70°.	85°.
100	2.5	4.15	6.6	10.4
66.7	3.0	4.8	8.1	13.4
50.0	3.1	5.0	8.5	14.8
CS_2	3.2	5.2	8.7	15.1

Benzene and Chloroform.

Wt. % C_6H_6 in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at 50°.	70°.	85°.	100°.
100	3.55	6.5	10.3	16.1
80	3.3	6.0	9.0	13.1
50	3.1	5.8	8.6	12.3
$CHCl_3$	3.0	5.6	8.3	11.8

SOLUBILITY OF ANTHRACENE IN MIXTURES OF :

Toluene and Carbon Disulfide.

Wt. % $C_6H_5CH_3$ in solvent.	Gms. Anthracene per 100 gms. sat. sol. at 40°.	55°.	70°.	85°.
100	2.1	3.8	6.0	9.4
75	2.55	4.4	7.0	11.6
50	2.8	4.75	7.6	13.0
CS_2	3.1	5.0	8.3	14.5

Toluene and Chloroform.

Wt. % $C_6H_5CH_3$ in solvent.	Gms. Anthracene per 100 gms. sat. sol. at 40°.	60°.	85°.
100	1.95	4.5	8.0
71.4	2.1	4.1	7.7
50.0	2.2	3.95	7.6
25.0	2.2	4.0	7.7
$CHCl_3$	2.1	4.4	7.85

RESULTS FOR MIXTURES OF BENZENE AND TOLUENE.

Wt. % $C_6H_5CH_3$ in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at 40°	60°	75°	90°
100	2.45	4.45	6.7	10.6
50	2.6	4.7	8.2	11.4
C_6H_6	2.75	5.1	8.7	12.4

SOLUBILITY OF ANTHRACENE AT 17°.95 IN MIXTURES OF :

(Joscht, 1915, 1926.)

Benzene and Ethyl Acetate.

Gms. C_6H_6 per 100 gms. solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent.	Gms. C_6H_6 per 100 gms. solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent.
0.0	0.120	50.0	0.180
10.0	0.139	60.0	0.199
20.0	0.137	70.0	0.210
30.0	0.163	80.0	0.204
40.0	0.177	90.0	0.226
49.3	0.164	100.0	0.223

Acetone and Carbon Tetrachloride.

Gms. CCl_4 per 100 gms. solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent.	Gms. CCl_4 per 100 gms. solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent.
100.0	0.470	40.0	0.971
90	0.740	30.0	0.967
80	0.873	20.0	0.966
70	0.936	10.0	0.962
60	0.962	0.0	0.938
50	0.985		

SOLUBILITY OF ANTHRACENE AT 25° IN MIXTURES OF:

(Mahieu, 1936.)

Bromobenzene + Chlorobenzene

Gms. C_6H_5Cl per 100 gms. $C_6H_5Cl+C_6H_5Br$	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	1.37
24.5	1.43
50.5	1.51
75.5	1.56
100	1.64

Ether + Benzene

Gms. C_6H_6 per 100 gms. $C_6H_6+(C_2H_5)_2O$	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	0.85
29.8	1.0
50.0	1.28
70.6	1.45
100.0	1.70

Ether + Chloroform

Gms. $(C_2H_5)_2O$ per 100 gms. $(C_2H_5)_2O+CHCl_3$	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	1.02
26.2	0.794
58.6	0.610
70.0	0.614
100	0.851

ANTHRACENE

SOLUBILITY OF ANTHRACENE AT 25° IN MIXTURES OF NITROBENZENE AND:

(Mahieu, 1936.)

Aniline

Gms. $C_6H_5NH_2$ per 100 gms. $C_6H_5NH_2 + C_6H_5NO_2$	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	1.51
22.2	3.64
48.9	1.64
67.2	1.30
100.0	0.75

Acetone

Gms. $(CH_3)_2CO$ per 100 gms. $(CH_3)_2CO + C_6H_5NO_2$	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	1.51
24.9	1.71
47.5	1.55
74.5	1.36
100	1.33

Carbon Disulfide

Gms. $C_6H_5NO_2$ per 100 gms. $C_6H_5NO_2 + CS_2$	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	2.03
24.1	3.36
49.1	2.54
72.6	1.90
100	

Hexane

Gms. C_6H_{14} per 100 gms. $C_6H_{14} + C_6H_5NO_2$	Gms. $C_{14}H_{10}$ per 100 gms. solvent
9.8	1.67
28.7	1.64
45.3	1.32
73.1	0.75

SOLUBILITY OF ANTHRACENE IN MIXTURES OF:

(Mahieu, 1936.)

Methyl Alcohol and Benzene at 25°

Gms. C_6H_6 per 100 gms. C_6H_6 + CH_3OH	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	0.14
25.6	0.34
51.5	0.68
74.0	1.25
88.0	1.53

Methyl Alcohol and CS_2 at 40°

Gms. CH_3OH per 100 gms. CH_3OH + CS_2	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	3.14
25.9	1.51
45.3	0.753
75.7	0.462
100.0	0.168

Propyl Alcohol and Benzene at 25°

Gms. C_6H_6 per 100 gms. C_6H_6 + C_3H_7OH	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	0.11
27.9	0.39
50.9	0.76
74.0	1.13
100.0	1.70

Aniline and Cyclohexane at 40°

Gms. $C_6H_5NH_2$ per 100 gms. $C_6H_5NH_2$ + C_6H_{14}	Gms. $C_{14}H_{10}$ per 100 gms. solvent
0.0	0.65
20.3	1.0
51.7	1.9
75.2	1.77
100.0	1.49

Freezing-point data are given for mixtures of Anthracene and:

Acridine(16)
Amino phenols(1)
Camphor(5)
Carbazole(17)
" + Chrysene(17)
" + Phenanthrene(3)(12)(15)(16)(22)
Chrysene(17)
Dihydro anthracene(4)
Dinitro benzenes(11)
" phenols(11)
" toluenes(10)(11)
Diphenyl(20)
Diphenyl amine(20)
Methyl acridine(17)
Naphthols(20)
Naphthylamines(20)
Naphthalene(21)
Nitrobenzene + Quinone(13)
Nitro phenols(11)
Phenanthrene(2)(3)(17)(20)
" + Carbazole(3)(12)(15)(16)(22)
Phenylene diamine(1)
Picric acid(9)(18)
Picrimide(6)
Picryl chloride(6)
Quinone(13)
Quinone + Nitrobenzene (13)
Retene(17)
Resorcinol(20)
Styphnic acid(7)
Tetra nitro benzene(19)
Toluidine(20)
Trinitro benzene(11)
" cresol(8)
" phenol(14)
" toluene(7)(11)
Tri phenyl methane(20)

(1) Bernoulli and Lotter, 1933; (2) Bradley and Marsh, 1933; (3) Garelli, 1894; (4) Grimm, Gunther and Titus, 1931; (5) Jefremow, 1913a, 1914, 1916; (6) Jefremow, 1918; (7) Jefremow, 1919, 1919a; (8) Jefremow and Tichomirowa, 1927; (9) Kremann, 1905; (10) Kremann, Hönigsberg and Mauermann, 1923; (11) Kremann and Müller II, 1921; (12) Kremann and Wenzig, 1917; (13) Kremann, Sutter, Sitte, Strzelba and Dobotsky, 1922; (14) Milone and Rossignolli, 1932; (15) Mortimer, 1928; (16) Pascal, 1914; (17) Pascal, 1921; (18) Rheinboldt, Henning and Kirscheisen, 1925; (19) Shinomiya, 1940; (20) Vignon, 1891; (21) Vignon and Miolati, 1892; (22) Ward, 1926.

PHENANTHRENE $C_{14}H_{10}$.

SOLUBILITY OF PHENANTHRENE IN AQUEOUS SOLUTIONS OF ALCOHOLS AT 20°.

(Gregg-Wilson and Wright, 1928.)

Results for aqueous solutions of:

Methyl Alcohol		Ethyl Alcohol		Propyl Alcohol	
Wt. % CH_3OH in in Aq. solvent	Gms. $C_{14}H_{10}$ per 100 gms. solvent	Wt. % C_2H_5OH in in Aq. solvent	Gms. $C_{14}H_{10}$ per 100 gms. solvent	Wt. % C_3H_7OH in in Aq. solvent	Gms. C_{14} 100 gms.
59.8	0.12	61.4	0.28	69.8	1.
79.0	0.62	80.0	1.27	79.0	1.
88.7	1.27	90.4	2.17	93.5	2.
96.0	2.27	95.6	2.91	95.4	2.
100.0	3.18	100.0	4.15	100	3.

Behrend, 1892, reports 2.77 gms. phenanthrene per 100 gms. alcohol at 12.3°, and 3.09 gms. at 14.8°.

SOLUBILITY OF PHENANTHRENE IN ORGANIC ACIDS. (Timofeiew, 1894.)

Acid.	t°.	Gms $C_{14}H_{10}$ per 100 Gms Sat. Sol.	Acid.	t°.	Gms. $C_{14}H_{10}$ per 100 Gms. Sat. Sol.
Acetic Acid	23	8.31	Propionic Acid	23	17
" "	30	9.8	" "	30	21.4
" "	70.5	34.6	" "	62.4	40.3
Butyric Acid	23	15.6	Isobutyric Acid	23	12.3
" "	30	21	Valeric Acid	30	16.6

100 gms. 95% formic acid dissolve 0.46 gms. $C_{14}H_{10}$ at 20.8°. (Aschan, 1911.)

PHENANTHRENE $C_{14}H_{10}$.

SOLUBILITY OF PHENANTHRENE IN ALCOHOL AND IN TOLUENE.

(Speyers, 1902.)

In Alcohol			In Toluene.		
t°.	Sp. gr. of sat. sol.	Gms. $C_{14}H_{10}$ per 100 gms. C_2H_5OH.	t°.	Sp. gr. of sat. sol.	Gms. $C_{14}H_{10}$ per 100 gms. $C_6H_5CH_3$
0	0.814	3.0	0	0.925	26.0
10	0.807	3.5	10	0.929	30.0
20	0.801	4.5	20	0.934	41.0
25	0.799	5.1	25	0.939	55.0
30	0.797	5.8	30	0.944	70.0
40	0.795	7.3	40	0.955	140.0
50	0.794	9.5	50	0.971	172.0
60	0.797	14.0	60	0.989	280.0
70	0.815	30.0	70	1.007	480.0
			78	1.030	850.0

SOLUBILITY OF PHENANTHRENE IN SEVERAL ORGANIC SOLVENTS. (Henstock, 1922.)

The solutions were saturated by constant agitation and analyzed by evaporating and weighing the dried residue.

Solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent at −10°	−5°.	0°.	+5°.	10°.	15°.	20°.	25°.	30°.
(1)......	0.0	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80
(2)......	0.8	1.60	2.40	3.20	4.00	5.00	6.60	8.40	10.60
(3)......	1.75	2.25	2.75	3.26	3.77	4.28	4.80	5.50	5.81
(4)......	–	–	–	–	–	5.00	5.80	6.60	7.80
(5)......	5.50	6.10	7.60	9.80	12.66	15.80	19.00	22.50	26.20
(6)......	12.20	14.80	17.44	20.64	23.84	30 64	36.78	43.22	50.42
(7)......	15.70	20.00	25.50	31.02	36.54	42.50	51.94	63.50	77.46
(8)......	21.20	22.70	25.50	29.60	34.30	39.90	46.60	54.60	64.20
(9)......	–	–	–	29.86	36.66	44.06	51.70	60.32	69.68
(10)......	21.60	28.84	37.32	45.88	54.48	63.28	72.08	80.92	89.82

(1) Methyl alcohol; (2) Light petroleum (b. pt. 60°-85°); (3) Ethyl alcohol; (4) Glacial acetic acid; (5) Carbon tetrachloride; (6) Ethyl ether; (7) Acetone; (8) Chloroform; (9) Benzene; (10) Carbon disulfide.

Additional determinations in solvent (5) carbon tetrachloride, gave results higher than the above, but it is probable that equilibrium had not been reached.

* 9.20 gms. at 35° and 11.20 gms. at 40°.

SOLUBILITY OF PHENANTHRENE IN SEVERAL ORGANIC SOLVENTS.

(Clark, 1919 *a*.)

Solvent.	*d* of solvent.	B. pt. of solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent at 15°.5.	30°.	50°	80°.
Benzene................	0.880	80° – 80°5	16.72	40.10	–	–
Toluene................	0.870	110 – 110.3	13.80	29.10	–	–
Refined solvent Naphtha..	0.865	145 – 166	12.52	22.42	30.8	84.8
Crude » » ..	0.893	152 – 179	15.30	31.80	74.2	243.0
Heavy Naphtha..........	0.909	165 – 185	11.94	21.30	60.3	193.0
Chloroform.............	1.495	60.4 – 62.0	18.70	29.20	–	–
Carbon disulfide.........	1.270	45.7 – 47.0	26.42	–	–	–
Acetone................	0.800	56.0 – 57.0	15.08	22.40	–	–
Light Pyridine (1).......	0.952	125 – 150	25.54	38.0	78.9	241.0
Heavy » (1).......	1.056	202 – 247	20.00	24.5	64.7	182.0
Hydrated Pyridine.......	1.050	94 – 96	0.43	1.32	7.4	11.1
Carbon Tetrachloride.....	1.610	75.5 – 76.5	7.40	11.24*	–	–
Gasoline................	0.742	90 – 161	4.53	6.30	–	–
Ethyl Ether..............	0.720	35 – 40.2	8.93	15.24	–	–

(1) These are the bases derived from coaltar oils by abstraction with sulfuric acid and liberation of the base with caustic soda. They probaby contain but very little pyridine, C_5H_5N.

100 gms. methyl formate dissolve 26.1 gms. $C_{14}H_{10}$ at 25°. (Kröber, 1919.)

100 gms. sat. solution of Phenanthrene in liquid Sulfur Dioxide contain 23 gms. $C_{14}H_{10}$ at ? t°. (DeCarli, 1927.)

SOLUBILITY OF PHENANTHRENE IN SEVERAL SOLVENTS AT 25°.

(Hildebrand, Ellefson and Beebe, 1917.)

Solvent.	Gms. $C_{14}H_{10}$ per 100 Gms. Solvent.	Solvent.	Gms. $C_{14}H_{10}$ per 100 Gms. Solvent.
Alcohol	4.91	Carbon Tetrachloride	26.3
Benzene	59.5	Ether	42.9
Carbon Disulfide	80.3	Hexane	9.15

SOLUBILITY OF PHENANTHRENE PICRATE IN ABSOLUTE ALCOHOL.

(Behrend, 1892.)

t°.	Grams per 100 Grams Saturated Solution		
	Picric Acid +	Phenanthrene =	Phenanthrene Picrate.
12.3	0.91	0.71	1.62
14.3	1.00	0.78	1.78
17.5	1.05	0.82	1.87

SOLUBILITY OF PHENANTHRENE PICRATE IN ALCOHOLIC SOLUTIONS CONTAINING PICRIC ACID AND ALSO PHENANTHRENE.

(Behrend.)

t°.	Grams Added to 62 cc. Abs. Alcohol.			Gms. per 100 Gms. Sat. Solution.		
	P. Picrate +	Picric Ac. +	Phenanthrene.	Picric Ac. +	Phenanthrene =	P. Picrate
12.3	1.4	0	0.5	0.534	1.413	1.947
12.3	1.4	0	0.9	0.409	2.141	2.550
12.3	0.8	0	2.1	0.354	2.77	3.124
12.3	0.8	0	4.0	0.139	5.626	5.765
17.5	1.4	0.1	0	1.159	0.75	1.91
17.5	1.4	0.2	0	1.285	0.68	1.97
17.5	1.4	1.0	0	2.45	0.37	2.82
17.5	1.4	4.0	0	6.15	0.195	6.345
17.5	1.4	0.0	2.2	0.423	3.276	3.699

Freezing point data are given for mixtures of Phenanthrene and:

Acridine(15)
Amino phenols(2)
Anthracene(3)(5)(15)(17)
" + Carbazole(5)(6)(15)
(18)
Benzene(4)
" + Carbazole(4)
Carbazole(5)
" + benzene(4)
" + anthracene(5)(6)(15)
(18)

Chrysen(15)
Dinitro benzene(9)
" toluenes(9)(10)
Diphenyl(17)
" amine(14)
Hydroquinone(1)
Naphthalene(12)(13)(17)
Phenanthrene(19)
Phenylene diamines(2)
Picramide(7)
Picric acid(7)

Picryl chloride(7)
Pyrocatechol(1)
Quinone(11)
Resorcinol(1)
Retene(15)
Styphnic acid(7)
Tetranitro benzene(16)
Tetryl(8)
Trinitro benzene(9)
" cresol(8)
" toluene(9)

(1) Bernoulli and Sarasin, 1930; (2) Bernoulli and Lotter, [illegible]; (3) Bradley and Marsh, 1933; (4) Bruni, 1898; (5) Garelli, [illegible]; (6) Hrynakowski and Kapuscinski, 1934; (7) Jefremow, 1918, [illegible]; (8) Jefremow and Tichomirowa, 1927, 1928; (9) Kremann et al, 1908; (10) Kremann and Hofmeier, 1910; (11) Kremann, Sutter, Sitte Strzelba and Dobotzky, 1922; (12) Milone and Rossignoli, 1932; (13) Miolati, 1892; (14) Narbutt, 1905; (15) Pascal, 1921; (16) Shinomiya, 1940; (17) Vignon, 1891; (18) Ward, 1926; (19) Furnakov and Jefremow, 1912.

TOLAN (Acetylene diphenyl) $C_6H_5C:CC_6H_5$.

Freezing-point data for mixtures of tolan with dibenzyl, with benzal aniline and with azobenzene are given by Pascal and Normand, 1913.

AZOXY BENZENE $C_6H_5(NON)C_6H_5$.

Freezing-point data for mixtures of azoxy benzene and azobenzene are given by Hartley and Stewart, 1914.

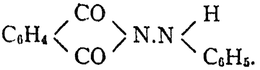
BENZIL $C_6H_5CO.COC_6H_5$.

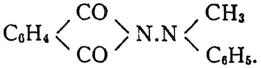
Data for the solubility of benzil in aqueous ethyl alcohol are given by Timmermans (1907) and by Kendall and Gibbons (1915). Data for aqueous solutions of benzil and phenol, for benzil and succinic acid nitrile and for benzil and triethyl amine are given by Timmermans (1907).

Freezing-points are given for mixtures of Benzil and:

Acenaphthene(6)
Azobenzene(7)(9)
Benzanilide(9)
Benzoic acid(4)(5)
Benzoin(2)(8)
Chlor acetic acid(4)
Dibenzyl(9)
Dibenzoyl ethylene(3)
Hydrobenzoin(9)
Naphthalene(1)
Stilbene(9)
Trichlor acetic acid(4)

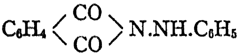
(1) Bernoulli and Sarasin, 1913; (2) Beurath, 1912-13; (3) Grimm, Gunther and Titus, 1931; (4) Kendall and Gibbons, 1915; (5) Passerini, 1924; (6) Pawlewski, 1893; (7) Tammann and Botschwar, 1926; (8) Vanstone, 1909; (9) Vanstone, 1913.

Phthalyl **PHENYL HYDRAZIDE** 
$C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle N.N\left\langle\begin{matrix}H\\C_6H_5.\end{matrix}\right.$

Phthalyl **PHENYL** Methyl **HYDRAZIDE** 
$C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle N.N\left\langle\begin{matrix}CH_3\\C_6H_5.\end{matrix}\right.$

Very careful determinations of the solubilities of the enantrotropic forms of these two compounds in alcohol, chloroform, ethyl acetate, acetone, benzene and in methyl alcohol are given by Chattaway and Lambert (1915).

SOLUBILITY OF THE TAUTOMERIC FORMS OF HYDRAZIDES IN BENZENE AT 5°
Determined by the freezing-point method. (Sidgwick, 1915.)

Compound.	Formula.		Gms. Compound Dissolved per Liter Benzene.
Phthalylphenylhydrazide	 $C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle N.NH.C_6H_5$	*A* form	5.5
		C form	1.1
Phthalylphenylmethylhydrazide	 $C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle N.N(CH_3)C_6H_5$,	*A* form	124

Diphenylene **GLYCOLIC ACID** (ms-Oxyfluorene carbonic acid) $(C_6H_4)_2C(OH)COOH$.

SOLUBILITY IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.
(Knox and Richards, 1919.)

Equivalent Normality.		Equivalent Normality.	
HCl.	$C_{14}H_{10}O_3$.	HCl.	$C_{14}H_{10}O_3$.
0.00	0.01082	5.843	0.00343
1.952	0.00492	7.745	0.00352
3.907	0.00355		

DIPHENIC ACID (o, o′ bibenzoic acid) HOOC (*o*) $C_6H_4.C_6H_4$ (*o*) COOH.

SOLUBILITY OF DIPHENIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Equiv. Normality of HCl.....	0.00	2.103	3.985	5.928	7.748
" $C_{14}H_{10}O_4$.	0.00520	0.00182	0.00144	0.00112	0.00118

BENZOYL PEROXIDE $(C_6H_5CO)_2O_2$.

Freezing-point data for mixtures of benzoyl peroxide and di benzoyl ethane are given by Grimm, Gunther and Titus, 1931.

BENZOIC ANHYDRIDE $(C_6H_5COO)_2O$

Freezing-point data for mixtures of benzoic anhydride with acetamide and with benzamide are given by Kremann, Mauermann and Oswald, 1922.

r-2:4-DINITRO-2'-METHYL DIPHENYL-6-CARBOXYLIC ACID $(NO_2)_2COOHC_6H_2.C_6H_4CH_3$.

SOLUBILITY OF THE r-ACID IN BENZENE.

(Hammick and Williams, 1938.)

Weighed quantities of the r-Acid and benzene were sealed in tubes and the temperatures determined at which the last trace of solid remained in equilibrium with the liquid.

t°	Mol. % of r-Acid	Solid Phase	t°	Mol. % of r-Acid	Solid Phase
5.5	0.0	C_6H_6	134.6	59.0	$2C_{14}H_{10}O_6N_2.C_6H_6$
115.3	22.9	$C_{14}H_{10}O_6N_2.C_6H_6$	136.2	63.2	"
128.5	41.0	"	137.1	64.3	"
129.6	51.0	"	138.3	67.9	$C_{14}H_{10}O_6N_2$
128(1)	55.0	" $+2C_{14}H_{10}O_6.N_2.C_6H_6$	140.6	72.0	"
132.6(1)	58.2	$2C_{14}H_{10}O_6N_2.C_6H_6$	147.8	83.7	"
			155.5	100.0	"

(1) Estimated from author's diagram.

TANNIC ACID

When a sample of tannic acid of apparently very good quality was added to water at room temperature, the solution increased so greatly in viscosity, that even before the saturation point was reached, it became evident that a satisfactory separation of liquid and solid could not be made. The solubility in water is variously given in the pharmaceutical literature from about 20 to 300 gms. tannic acid per 100 gms. of water. Similarly, the quoted results for the solubility in alcohol vary from about 50 to 400 gms. acid per 100 gms. of alcohol. (Seidell, 1910.)

100 gms. glycerol dissolve 48.8 gms. tannin at 15-16°. (Ossendowski, 1907.)

100 gms. trichlorethylene dissolve 0.012 gm. tannin at 15°. (Wester and Bruins, 1914.)

3-METHYL ACRIDINE $C_{13}H_8N.CH_3$.

Freezing-point data are given for:

3-Methyl acridine + Acridine	(Pascal, 1914.)
" " + Anthracene	(Pascal, 1921.)

DESYL CHLORIDE $C_6H_5CHClCOC_6H_5$.

Freezing-point data for mixtures of desyl chloride and methyl desoxy benzoin are given by Preiswerk and Erlenmeyer, 1934.

BENZIL α and β MONO-OXIME $C_6H_5COC(:NOH)C_6H_5$.

Results for equilibrium in the systems benzil α and β mono-oximes and benzene are given by Taylor and Marks, 1930.

STILBENE $C_6H_5CH:CH.C_6H_5$.

Freezing-point data for mixtures of stilbene and *p* dimethoxystilbene are given by Pascal and Normand (1913).

Freezing-point data are given for mixtures of:

Stilbene + Azobenzene (Pascal and Normand, 1913; Beck. 1904.)
" + Benzil (Vanstone, 1913.)
" + Benzal aniline (Pascal and Normand, 1913.)
" + Bibenzyl " " " "; Bruni, 1898; Garelli, and Colzolari, 1899.)
" + Picric acid (Jefremow, 1918.)
" + Styphnic acid (Jefremow, 1918, 1919a.)
" + Azo toluene (Pascal and Normand, 1913.)

DIHYDRO ANTHRACENE 9,10-$C_6H_4:(CH_2)_2:C_6H_4$.

Freezing-point data for mixtures of dihydro anthracene and anthracene are given by Grimm, Gunther and Titus, 1931.

BENZALAZINE (Benzaldehyde azine) $C_6H_5CH:NN:CHC_6H_5$.

Freezing-point data are given by Pascal, 1914, 1921, for mixtures of benzalazine and each of the following compounds: Cinnamylidene aniline, dibenzyl hydrazine, dimethyl hydrazine, diphenyl butadien, diphenyl diacetylene, diphenyl hydrazine, furfuralizine, naphthalene and α naphtholazine. Results are also given for mixtures of Thio phenyl alazine and cinnamylidene.

ACETYL BIPHENYL (Biphenyl methyl ketone) $C_6H_5C_6H_4COCH_3$.

Freezing-point data are given for mixtures of acetyl biphenyl with β naphthylamine and with p toluylic acid by Pfeiffer, Angern, Wang, Seydel and Quehl, 1930.

Phenyl Glyoxal**PHENYL HYDRAZONE**, α and β forms, $C_6H_5.CO.CH:N.NHC_6H_5$

SOLUBILITY OF PHENYL GLYOXAL HYDRAZONE IN SEVERAL SOLVENTS.
(Sidgwick and Ewbank, 1921.)

The determinations were made by the synthetic method. In the case of alcohol as the solvent, the α form of the compound is transformed into the β form before saturation is reached. Hence results could be obtained only for the β form in alcohol. M. pt. of α form = 114-117°; of β form = about 145-146°.

RESULTS OF THE SOLUBILITY DETERMINATIONS IN :

Ethyl Alcohol.		Benzene.			
t°.	Gms. β form of the cmpd. per 100 gms sat. sol.	t°.	Gms. β form of the cmpd. per 100 gms. sat. sol.	t°.	Gms. α form of the cmpd. per 100 gms. sat. sol.
70	8.8	3.0	0.322	3.0	5.84
83.4	19.6	26	4.8	8.0	10.4
93.5	39.5	44.2	10.4	29.0	19.9
98.0	55.2	59.1	19.9	40.8	30.2
103.4	74.9	67.2	30.2	50.0	38.6
113.5	90.2	74.3	38.6	56.0	45.0
128.5	100.0	79.5	45.0	75.3	89.8
		98.0	70.8		
		115.1	89.8		

IN NORMAL HEPTANE:

t°.	Gms. compd. per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. compd. per 100 gms. sat. sol.	Solid Phase.
71.7	1.89	β form	58.[illegible]	4.64	α form
80.81	4.63	"	[illegible].8	10.1	"
93.5	10.1	"	84.[illegible]	17.0	"
103.2	17.0	"	94.0	33.4	"
111.0	33.4	"	96.0	44.9	"
113.0	55.9	"			"

SOLUBILITY OF THE TWO FORMS, EACH DETERMINED SEPARATELY IN SEVERAL SOLVENTS AT 32°.

Solvent.	Gms. per 100 gms. sat. sol.		Ratio.
	α form.	β form.	
Benzene	24.1	8.0	3.1 to 1.0
Heptane	1.7	0.5[illegible]	3.1 to 1.0
Carbon tetrachloride	8.8	2.9	3.0 to 1.0
Cyclo Hexane	5.56	1.56	3.5 to 1.0

BENZOIN (Benzoyl phenyl carbinol) $C_6H_5CH(OH)COC_6H_5$.

SOLUBILITY OF BENZOIN IN WATER, PYRIDINE AND AQUEOUS 50% PYRIDINE AT 20-25°.

(Dehn, 1917.)

Solvent.	Gms. Benzoin per 100 gms. Solvent.
Water	0.03
Aq. 50 % Pyridine	6.63
Pyridine	20.20

100 gms. 95% formic acid dissolve 3.06 gms. benzoin at 18.5°. (Aschan, 1913.)

BENZOIN, Hydro **BENZOIN** and Desoxy **BENZOIN**.

SOLUBILITY OF EACH IN CHLOROFORM AND IN CARBON TETRACHLORIDE AT 20°.

(Pawlewski, 1914, 1926.)

Compound.	Formula.	Gms. compd. dissolved per 100 gms.	
		$CHCl_3$.	CCl_4.
Benzoin	$C_6H_5CH(OH)CO.C_6H_5$	4.01	0.30
Hydrobenzoin	$(C_6H_5.CHOH)_2$	1.60	0.105
Desoxybenzoin	$C_6H_5CH_2COC_6H_5$	38.96	17.13

Freezing-point data are given for mixtures of Benzoin and:

Azobenzene(7)
Benzanilide(7)
Benzil(2)(6)
Benzylaniline(7)
Benzylidene aniline(7)
Bibenzyl(7)
Hydrazo benzene(7)
Hydro benzoin(3)
Methyl desoxy benzoin(5)
Naphthalene(1)
Resorcinol(4)

Results for mixtures of Hydrobenzoin and benzil(7)

(1) Bernoulli and Sarasin, 1930; (2) Beurath, 1912-13; (3) Carre and Mauclere, 1931; (4) Dischendorfer, 1933; (5) Preiswerk and Erlenmeyer, 1934; (6) Vanstone, 1909; (7) Vanstone, 1913.

PHENYL ANISYL KETONE $C_6H_5COCH_2OC_6H_4$.

Freezing-point data for mixtures of phenyl anisyl ketone and tri chlor acetic acid are given by Kendall and Gibbons, 1915.

BENZILIC ACID $(C_6H_5)_2.C(OH).COOH$.

SOLUBILITY OF BENZILIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Gm. equivalents per liter		Gm. equivalents per liter		Gm. equivalents per liter	
HCl.	$C_{14}H_{12}O_3$.	HCl.	$C_{14}H_{12}O_3$.	HCl.	$C_{14}H_{12}O_3$.
0.00	0.00769	4.440	0.00182	8.803	0.00167
1.537	0.00332	5.934	0.00172	10.25	0.00195
2.977	0.00233	7.356	0.00150	11.69	0.00217

SOLUBILITY OF BENZILIC ACID IN AQUEOUS SOLUTIONS OF SODIUM FORMATE AT 25°.

(Larsson, 1927.)

Normality of aq. HCOONa solution	$(C_6H_5)_2COHCOOH$ per liter sat. sol.	
	Gm. Mols.	Gms.
0.0 (= H_2O)	0.00619	1.412
0.05	0.0258	5.885
0.10	0.0378	8.662

DISTRIBUTION OF BENZILIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $C_{14}H_{12}O_3$ per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.2305	0.2885	1.25
0.460	0.96	2.08
0.604	1.75	2.74

Water and Ether.

Millimols. $C_{14}H_{12}O_3$ per liter		
H_2O layer (C_1).	Ether layer (C_2).	$\frac{C_2}{C_1}$.
0.050	0.83	16.60
0.0775	1.55	20.00
0.1200	2.72	22.65
0.1600	4.44	27.7
0.300	9.22	30.7

Water and Xylene.

Millimols. $C_{14}H_{12}O_3$ per liter		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.448	0.133	0.30
0.757	0.363	0.479
1.029	0.643	0.625
1.252	0.975	0.788

Freezing-point data for mixtures of *benzimidazol* + Pyramidon are given by Pfeiffer and Angern, 1926.

DISTRIBUTION OF BENZILIC ACID AT 25° BETWEEN:

(Smith and White, 1929.)

Water and Chloroform

Gm. Mols. $C_{14}H_{12}O_3$ per liter	
H_2O layer	$CHCl_3$ layer
0.00238	0.00290
0.00284	0.00363
0.00323	0.00436
0.00340	0.00462
0.00363	0.00500
0.00374	0.00528
0.00385	0.00550

Water and Toluene

Gm. Mols. $C_{14}H_{12}O_3$ per liter	
H_2O layer	$C_6H_5CH_3$ layer
0.00112	0.00528
0.00125	0.00607
0.00139	0.00674
0.00178	0.00950
0.00198	0.0114
0.00224	0.0128
0.00251	0.0145

Freezing-point data for mixtures of benzilic acid and naphthalene are given by Bernoulli and Sarasin, 1930.

N-ANISAL ANILINE (Anisylidene aniline) $CH_3OC_6H_4CH:NC_6H_5$.

Freezing-point data for mixtures of N-Anisal aniline and benzilidene aniline are given by Pascal, 1923a.

NITRO DIMETHYL SULPHONIUM (and Selonium) PICRATE $NO_2C_6H_4S(CH_3)_2.C_6H_2(NO_2)_3OH$.

SOLUBILITY OF THE ISOMERIC SULFONIUM AND SELONIUM SALTS IN WATER AT 13°.

(Baker and Moffitt, 1930.)

Isomeride	Gms. per 100 cc sat. solution	
	Sulfonium salt	Selenium salt
p	0.061	0.070
m	0.050	0.050
m + p	0.165	0.105

ACRIFLAVINE (10-chloro methyl, 3.6 diamino acridine hydrochloride) $C_{13}H_{11}N.CH_3Cl.HCl$.

SOLUBILITY OF MIXTURES OF ACRIFLAVINE AND THE NEUTRAL HYDROCHLORIDE OF DIAMINO ACRIDINE IN WATER AT 20°.

(Galliot, 1934.)

Gms. per 100 gms. of dry mixture		Gms. of mixture dissolved per 100 cc saturated solution
Chloro methylate of diamino acridine	Neutral hydrochloride of diamino acridine	
100	0	0.4
80	20	1.2
60	40	2.1
50	50	2.1
40	60	2.1
20	80	1.6
0	100	0.8

The above experiments and similar ones made with other mixtures show that acriflavine does not possess the solubility and other properties mentioned by the British Pharmacopoeia. Analyses of samples purchased as the chlor methylate contained only 55 to 70 percent of this product. The experiments made with various mixtures of acriflavine and diamino acridine show that those containing from 45 to 55 percent of the hydro chloride of the chloro methylate of diamino acridine correspond in solubility with the figure given in the British Pharmacopoeia. The pure compound is considerable less soluble than commercial samples.

BIBENZYL $C_6H_5CH_2CH_2C_6H_5$.

100 gms. sat. solution of Bibenzyl in liquid sulfur dioxide contain 28 gms. $C_{14}H_{14}$ at ? t°. (DeCarli, 1927.)

Freezing-point data are given for mixtures of Bibenzyl and:

Azobenzene(7)(2)(9)(10)
Benzal aniline(7)
Benzoin(8)
Benzo phenone(6)
Benzyl phenol(7)
Biphenyl(5)
Diphenyl disulfide(3)
Hydrazo benzene(7)
Nitro toluene(6)
Phenyl benzyl ether(7)
Picric acid(4)
Stilbene(1)(2)(7)
Styphnic acid(4)
Tolan(7)

Results for mixtures of Bibenzyl β Naphthylamine and Sarcosine anhydride are given by (4)

(1) Bruni, 1898; (2) Garelli and Calzolari, 1899; (3) Grimm, Gunther and Titus, 1931; (4) Jefremow, 1918, 1919, 1919a; (5) Lee and Warner, 1935; (6) Malotaux and Straub, 1937; (7) Pascal and Normand, 1913; (8) Vanstone, 1913; (9) Bruni and Gorni, 1899; (10) Hasselblatt, 1913.

BENZYL SULFIDE $(C_6H_5CH_2)_2S$.

100 gms. $CHCl_3$ dissolve 133.91 gms. $(C_6H_5CH_2)_2$ S at 20°.
" " CCl_4 " 73.16 " " " " " (Pawlewski, 1914.)

BI TOLYL $CH_3C_6H_4C_6H_4CH_3$.

Freezing-point data are given by Grimm, Gunther and Titus, 1931, for mixtures of Bitolyl with benzidine, with dichloro biphenyl and with biphenol.

AZOTOLUENE $CH_3C_6H_4N:NC_6H_4CH_3$.

Freezing-point data are given by Pascal and Normand, 1913, for mixtures of azotoluene with azobenzene and with stilbene.

CYSTINE *l* $C_{14}H_{14}N_2O$.

100 cc. sat. sol. of cystine in water contain 0.0168 gm. $C_{14}H_{14}N_2O$ at 21°.
» in 0.02 mol. $(NH_4)_2SO_4$ » 0.0054 » »

The method followed by Pfeiffer and Angern, 1924, in making the above determinations is described under Alanine, p. 199

CYSTINE

Solubility of Cystine in Various Aqueous Solutions of Different Hydrogen Ion Concentration at 25°. (Sano, 1926.)

The desired p_H value of the solution was always secured with only such acids and bases as form easily soluble salts with the amino acid. In all cases the solid phase was the amino acid. A large excess of cystine was shaken at 25° with the solvent and the sat. solution, after filtration, was used for the determination of p_H by means of the hydrogen electrode and of the dissolved amino acid by a nitrogen determination.

Solvent.	p_H of sat. sol.	Gms. N per liter sat. sol.
Aq. 0.333 n HCl.....	0.83	1.565
" 0.100 " "	1.15	0.3861
" 0.020 " "	1.70	0.06275
" 0.010 " "	2.10	0.02770
" 5.0 n CH_3COOH + 0.10 n CH_3COONa..	2.99	0.01310
Aq. 1.0 n CH_3COOH + 0.20 n CH_3COONa..	3.76	0.01278
Aq. 0.1 n CH_3COOH + 0.1 n CH_3COONa...	4.59	0.01310
Aq. 0.1 n CH_3COOH + 1.0 n CH_3COONa...	5.88	0.0135
Aq. 0.33 mol sec phosphate + 0.333 " prim "	7.12	0.0193
Aq. 0.33 mol sec phosphate.	7.98	0.0276
" 0.001 n NaOH...	8.55	0.0653
" 0.01 " " ...	8.78	0.1017
" 0.02 " " ...	9.05	0.1924
" 0.10 " " ...	9.85	1.4990

The solubility minimum is at p_H 3.76 and the sat. solution contains 0.01278 gm. N, corresponding to 0.1097 gm. cystine.

HYDROBENZOIN $C_6H_5CHOH.CHOHC_6H_5$.

Freezing-point data for mixtures of the isomeric hydrobenzoins are given by Böseken and Elsen, 1928, and by Read and Steele, 1927.

AZOANISOLE $C_6H_4OCH_3N.NC_6H_4OCH_3$.

Freezing-point data for mixtures of p Azoanisole with azoxyanisole, with azoanisol phenetol, with azo phenetol and with methyl propyl azophenol are given by Bogojawlausky and Winogrodow, 1907.

p AZOXYANISOLE $(C_6H_3OHOCH_3)_2N_2$

Freezing-point data are given for mixtures of p azoxyanisole and:

p Azoanisole(1)
p Azoanisole phenol(1)
p Azoxy phenetol(4)(5)
Benzene(2)
Benzo phenone(3)
Ethylene bromide(2)
Hydroquinone(3)
p Methoxy cinnamic acid(3)
Nitro benzene(2)
p oxybenzal p anisidine acetate(6)

(1) Bogojawlawski and Winogrodow, 1907; (2) Bogojawlawski, Winogrodow and Bogolubow, 1906; (3) de Kock, 1904; (4) Prins, 1909; (5) Ratinjanz and Rotaiski, 1906; (6) Robberecht, 1938.

METHYL ORANGE $(CH_3)_2NC_6H_4N:NC_6H_4SO_3Na$.

SOLUBILITY OF METHYL ORANGE IN WATER AT 18°.

(von Euler and Rudberg, 1924.)

pH of the solution	Gm. Mol. Methyl Orange per liter	pH of the solution	Gm. Mol. Methyl Orange per liter
5.0	0.00022	3.6	0.00004
4.2	0.00010	2.5	0.00003
4.0	0.00005	1.1	0.000042

The authors also found that one liter of an aqueous 0.02 normal solution of glycocoll dissolves 0.00032 gm. mol. (= 0.0966 gm.) methyl orange at 17.5°.

DI p TOLYL AMINE $(CH_3C_6H_4)_2NH$.

Freezing-point data for mixtures of di p tolyl amine and phenyl p tolyl amine are given by Chapman and Perrott, 1930.

6-AMINO, 3,4'-DIMETHYL AZOBENZENE $CH_3C_6H_4N:NC_6H_3(CH_3)NH_2$.

Freezing-point data for mixtures of 6, Amino, 3,4-dimethyl azobenzene and sarcosine anhydride are given by Pfeiffer, Angern, Wang, Seydel and Quehl, 1930.

p DIMETHYL AMINO AZOBENZENE $(CH_3)_2NC_6H_4N:NC_6H_5$.

Experiments showing the distribution of p dimethyl amino azobenzene between aqueous solutions of sodium salts of fatty acids (soaps)+ether, and of the effect of varying concentrations of methyl alcohol upon this distribution, are given by Smith, 1932a.

100 cc sat. solution of p dimethyl amino azobenzene in ethyl ether contain 2.99 gms. $C_{14}H_{15}N_3$ at 15.5°.
The following results are also given of the solubility of p dimethyl amino azobenzene in aqueous solutions of methyl alcohol.

Percent CH_3OH in aq. solvent	Gms. $C_{14}H_{15}N_3$ per liter	Percent CH_3OH in aq. solvent	Gms. $C_{14}H_{15}N_3$ per liter
0	0.00032	20	0.00195
5	0.00041	30	0.00335
15	0.0010	40	0.0102

Freezing-point data for mixtures of p dimethyl amino azobenzene with m dinitro benzene, with p nitro toluene, with 2,4-dinitro toluene and with 2,4,6-tri nitro toluene are given by Giua and Reggiani, 1925.

N-METHYL p TOLUENE SULFON ANILIDE $CH_3C_6H_4SO_2N(CH_3)C_6H_5$.

SOLUBILITY OF N-METHYL p TOLUENE SULFON ANILIDE IN AQUEOUS SOLUTIONS OF ACETIC ACID.

(Bradfield and Williams, 1929.)

(See Benzanilide p. 725)

Gms. CH_3COOH per 100 gms. aq. solvent	Gms. $CH_3C_6H_4SO_2N(CH_3)C_6H_5$ dissolved per 100 gms. solvent at: 20°	25°	30°	35°
0.0	Almost insolubile			
26.9	0.02	..	..	..
52.4	0.18	..	..	..
76.8	1.83	2.36	3.05	3.94
85.0	3.6	4.4	5.7	7.4
91.3	5.6	6.9	8.9	11.8
99.0	9.0	11.2	14.3	19.2

DIBENZYL HYDRAZINE $C_6H_5CH_2.NH-NHCH_2C_6H_5$.

Freezing-point data for mixtures of dibenzyl hydrazine with benzalazine and with cinnamylidene aniline are given by Pascal, 1914.

DIMETHOXY BENZIDINE 3,3'$[CH_3ONH_2C_6H_3]_2$.

Freezing-point data for mixtures of dimethoxy and diethoxy benzidines are given by Ingold and Kidd, 1933.

AMYL CUMARIC (and Cumarinic) **ACID** 1 $C_{14}H_{18}O_3$.

One liter sat. sol of Amyl cumaric acid in H_2O contains 0.0197 gms. $C_{14}H_{18}O_3$ at 25°.

One liter sat. sol. of Amyl cumarinic acid in H_2O contains 0.113 gms. $C_{14}H_{18}O_3$ at 25°. (Roth and Stoermer, 1913.)

ACETYLENE ETHYL TETRA CARBONATE $[CH(CO_2C_2H_5)_2]_2$.

Freezing-point data for mixtures of acetylene ethyl tetra carbonate with ethylene cyanide are given by Timmermans and Mme. Vesselovsky, 1931

UNDECYL MALONIC ACID $CH(C_{11}H_{22})(COOH)_2$.

100 gms. C_6H_6 dissolve 0.0139 gm. $CH(C_{11}H_{23})(COOH)_2$ at 25°. (Verkade and Coops, Jr., 1930a

ETHYL SEBACATE $(CH_2)_8(COOC_2H_5)_2$.

100cc H_2O dissolve 0.008 gm. $(CH_2)_8(COOC_2H_5)_2$ at 20°. (Sobotka and Kahn, 1931.

MYRISTIC ACID $CH_3(CH_2)_{12}COOH$.

The melting-point depressions of mixtures of myristic and other fatty acids as a method of estimating the percentages of individual fatty acids in mixtures are reported by Wenzel, 1934.

Results for the freezing-points of mixtures of myristic and palmitic acids are given by Kulka and Sandin, 1937.

TRIMYRISTIN $C_3H_5[CH_3(CH_2)_{12}COO]_3$.

SOLUBILITY OF TRIMYRISTIN IN SEVERAL SOLVENTS.

(Loskit, 1928.)

The determinations were made by the thermic, the sealed tube and the analytical method. The author's results were plotted and the following table constructed from the curves.

t°	Gms. $C_3H_5[CH_3(CH_2)_{12}COO]_3$ per 100 gms. sat. solution in:			
	C_6H_6	$(C_2H_5)_2O$	$CHCl_3$	CS_2
0	—	—	10.0	0.5
5	5.0	0.4	15.0	1.6
10	5.0	1.0	21.0	5.0
15	13.5	2.5	27.5	12.5
20	25.0	6.5	34.0	24.0
25	36.0	15.0	41.5	36.0
30	47.5	31.5	49.0	49.0
35	60.0	49.5	58.0	60.0
40	71.0	64.0	67.0	70.0
45	80.0	76.5	76.0	79.0
50	89.0	88.0	86.5	89.0

PHENACYL MYRISTATE $CH_3(CH_2)_{12}COO.CH_2COC_6H_5$ etc.

SOLUBILITY OF PHENACYL, BROMO PHENYLACYL AND CHLORO PHENYLACYL MYRISTATES IN 95% ETHYL ALCOHOL.

(Hann, Reid and Jameson, 1930.)

Myristate	Formula	Gms. Myristate per 100cc 95% alcohol at	
		20°	25°
Phenacyl Myristate	$CH_3(CH_2)_{12}COO.CH_2COC_6H_5$	1.698	1.749
p Bromo "	$CH_3(CH_2)_{12}COOCH_2COC_6H_4Br$	0.160	0.2092
p Chloro "	$CH_3(CH_2)_{12}COOCH_2COC_6H_4Cl$	0.2472	0.3071

FLAVONE $C_6H_4OC(C_6H_5):CHCO$.

Freezing point data are given for mixtures of flavone +

Primetine (Ashina, 1933.)
Chrysine(5,6-dioxy flavone)(Ashina and Yokoyama, 1935.)
Tri acetylapigenine(5,7,4 tri acetoxyflavone)(Ashina and Yokoyama, 1935.)
Di acetyl primetine(5,6 diacetoxy flavone " " " "
Methyl primetine(5, oxy, 6, methoxy flavone) " " " "
Methyl baicaleine(5,6,7-tri methoxy flavone) " " " "

METHOXY ANTHRAQUINONE $C_6H_4(CO)_2C_6H_3OCH_3$.

Freezing-point data for mixtures of methoxy anthraquinone with β Naphthyl amine and with p toluylic acid are given by Pfeiffer, Angern, Wang, Seydel and Quehl, 1930.

QUERCETIN $C_{15}H_{10}O_7.2H_2O$ (m. pt. 310°-311°).

QUERCETRIN $C_{21}H_{20}O_{11}$ (m.pt.174°-176°) (The yellow glucoside of Loranthus).

SOLUBILITY OF EACH SEPARATELY IN SEVERAL SOLVENTS AT 16°.
(Wester, 1921.)

The quercetin was prepared by hydrolysis of quercetrin in 3 per cent sulfuric acid.

Solvent.	Gms. per 100 gms. sat. sol.	
	Quercetin	Quercetrin
Water	0.006	0.0064
Aq. 49 % alcohol	0.079	0.891
Aq 95 % alcohol	1.419	4.040
Ether (commercial)	0.211	0.006
Methyl Alcohol	1.30	8.94
Aq. 50 vol. % methyl alcohol	0.027	0.274
Ethyl Acetate		0.020

1-AMINO, 2-METHYL ANTHRAQUINONE $CH_3C_6H_3(CO)_2C_6H_3NH_2$.

Freezing-point data for mixtures of 1-amino, 2 methyl anthraquinone and 1-chloro, 2-methyl anthraquinone are given by Grimm, Gunther and Titus, 193

CHALCONE (Benzal aceto phenone) $C_6H_5CH:CHCOC_6H_5$.

Freezing-point data are given for mixtures of Chalcone and:

Naphthols (Giua, 1916.)
Nitro phenols (Asahina, 1934.)

OXY CHALCONE (2' and 4' Oxy benzal aceto phenone) $C_6H_4(OH)CH:CHCOC_6H_5$.

Freezing-point data for mixtures of 2' and 4' Oxy benzal acetophenone wit 2,4,6-tri nitro phenol are given by Asahina, 1934.)

CINNAMYLIDENE ANILINE $C_6H_5CH:CH.CH:NC_6H_5$.

Freezing-point data for mixtures of cinnamylidene aniline with benzalazine with dibenzyl hydrazine, with diphenyl butadien and with diphenyl diacetylene are given by Pascal, 1914.

DIBENZYL ACETONE $(C_6H_5CH_2)_2CO$.

Freezing-point data for mixtures of dibenzyl acetone and chloro acetic acid are given by Kendall and Gibbons, 1915.

METHYL DESOXY BENZOIN $C_6H_5CH(CH_3)COC_6H_5$.

Freezing-point data for mixtures of methyl desoxy benzoin and benzoin are given by Preiswerk and Erlenmeyer, 1934.

BENZYL CARBONATE $(CH_2C_6H_5)_2CO_3$.

Freezing-point data for mixtures of benzyl carbonate and nitrite are given by Erlenmeyer and Leo, 1933.

GUAIACOL CARBONATE $[C_6H_4(OCH_3)O]_2CO$.

SOLUBILITY IN WATER, ALCOHOL, ETC. (U. S. P. VIII.)

Solvent.	t°.	Gms. per 100 Gms. Solvent. Guaiacol.	Gms. per 100 Gms. Solvent. Guaiacol Carbonate.
Water	25	1.89	...
Alcohol	25	...	2.08
Chloroform	25	...	66.6
Ether	25	...	7.69
Glycerol	25	100	...

The coefficient of distribution of guaiacol carbonate between olive oil and water at 25° is given as $\frac{S_{oil}}{S_w} = 3.7$ by Boësekcn and Waterman, 1911, 1912.

ANISAL AMINO ACETOPHENONE $C_{15}H_{15}O_2N$.

Freezing-point data are given by Robberecht, 1938, for mixtures of anisal amino acetophenone with p azoxy phenol ethyl carbonate and with cholesterol propionate.

DIMETHYL DIPHENYL UREA $N(CH_3)_2N(C_6H_5)_2.CO$.

Freezing-point data for mixtures of dimethyl diphenyl urea with nitro mannitol, with nitro penta erythritol and with tri methylene tri nitramine are given by Urbanski, 1933, and Urbanski and Rabek-Gawronska, 1934.

DI TOLYL THIO UREA o $(CH_3C_6H_5NH)_2CS$.

100 gms. CCl_4 dissolve 0.10 gm. $C_{15}H_{18}SN_2$ at 20°.
" " $CHCl_3$ " 9.54 " " " " (Pawlewski, 1914, 1926.)

SANTONIN $C_{15}H_{18}O_3$.

SOLUBILITY IN SEVERAL SOLVENTS.

Solvent	t°	Gms. $C_{15}H_{18}O_3$ per 100 Gms. Solvent	Authority
Water	20-25	0.02+	(Dehn, 1917.)
Alcohol (90%)	15	about 2.3	(Greenish and Smith,
Trichlor Ethylene	15	2.46	(Wester and Bruins,
Pyridine	20-25	12.72	(Dehn, 1917.)
Aq. 50% Pyridine	20-25	12.35	" "
Benzene	25	5.2	(Warren, 1933.)
CCl_4	25	0.3	" "
Pet. Ether	25	0.015	" "

Freezing-point data for mixtures of stereoisomeric santonin salts are given by Levi-Malvano and Mannino, 1908.

BENZENE TRIETHYL CARBOXYLATE 1,3,5-$(CO_2C_2H_5)_3C_6H_3$.

Freezing-point data for mixtures of benzene tri ethyl carboxylate with 1,3,5 trizazine tri carbonic acid tri ethyl ester and with 1,3,5 tri phenyl tri azine are given by Pascal, 1925.

β EUCAINE $C_{15}H_{21}NO_2$ and Salts.

100 cc. H_2O dissolve 0.296 gm. anhydrous β eucaine at 20°.						(Zalai, 1910)
100 cc. oil of sesame dissolve 3.49 gms. anhydrous β eucaine at 20°.						
100 cc. aniline oil dissolve 66.6 gms. anhydrous β eucaine at 20°.						(Squire and Caines, 1905)
100 cc. H_2O	dissolve	2.5	gms. β eucaine	hydrochloride	at 15-20°	
100 cc. 90% alcohol	"	9	" "	"	"	
100 cc. H_2O	"	25	" "	lactate	"	
100 cc. 90% alcohol	"	12.5	" "	"	"	
100 cc. $CHCl_3$	"	20	" "	"	"	

PHYSOSTIGMINE (Eserine) $C_{15}H_{21}N_3O_2$.

Water dissolves only traces of physostigmine. 100 gms. of a solvent composed of 3 gms. H_3BO_3 per 100 cc. of aq. 50% glycerol dissolve 2.5 gms. $C_{15}H_{21}N_3O_2$ at room temp. (Baroni and Borlinetto, 1911)

PHYSOSTIGMINE SALICYLATE $C_6H_4(OH)COOH.C_{15}H_{21}N_3O_2$ and Physostigmine Sulfate $H_2SO_4(C_{15}H_{21}N_3O_2)_2$.

SOLUBILITY OF EACH IN WATER, ALCOHOL, ETC.
(U. S. P. VIII)

Solvent.	t°.	Gms per 100 Gms Solvent	
		Salicylate.	Sulfate
Water	25	1.38	very soluble
Water	80	6.66	"
Alcohol	25	7.87	"
Alcohol	60	25	"
Chloroform	25	11.6	"
Ether	25	0.57	0.083

SPARTEINE $C_{15}H_{26}N_2$.

SOLUBILITY OF SPARTEINE IN WATER AND IN AQUEOUS 5 PER CENT SOLUTIONS OF SODIUM CARBONATE. (Valeur, 1917, 1919.)

The temperatures were determined at which clouding occurs in solutions of sparteine in water and in aqueous 5% Na_2CO_3 solutions. Recently distilled sparteine of rotation −2° 46″ in a 5 dcm tube was used.

Results for water		Results for Aq. 5 % Na_2CO_3 solutions			
t° of clouding.	Gms. $C_{15}H_{26}N_2$ per 100 cc. sat. sol.	t° of clouding	Gms. $C_{15}H_{26}N_2$ per 100 cc. sat. sol.	t° of clouding.	Gms. $C_{15}H_{26}N_2$ per 100 cc. sat. sol.
10.8.....	0.556	23.4.....	0.21	39.8.....	0.12
12.5.....	0.496	24.0.....	0.19	43.5.....	0.105
18.0.....	0.32*	25.0.....	0.18	47.0.....	0.09
22.0.....	0.31	28.6.....	0.165	53.0.....	0.075
32.0.....	0.28	33.5.....	0.15	60.2.....	0.060
38.0.....	0.20	36.5.....	0.135	72.5.....	0.045
50.0.....	0.18				

*This determination made by direct saturation and analysis of the solution by precipitation of the sparteine as picrate or phosphotungstate.

SPARTEINE SULFATE $C_{15}H_{26}N_2.H_2SO_4.5H_2O$.

100 gms. H_2O dissolve about 200 gms. sparteine sulfate at 15–20°.
100 cc. 90% alcohol dissolve about 20 gms. sparteine sulfate at 15–20°.

(Squire and Caines, 1905.)

NAPHTHALENE PICRATE $C_6H_2(NO_2)_3O.C_{10}H_7$.

SOLUBILITY OF NAPHTHALENE PICRATE IN BENZENE AND IN TETRALINE. (Piatti, 1931.)

The results are given in the form of a diagram from which the following values were taken.

t°	Gms. $C_6H_2(NO_2)_3O.C_{10}H_7$ per 100 gms. sat. solution in:	
	C_6H_6	Tetralin ($C_{10}H_{12}$)
5	8.1	—
10	9.2	3.6
20	12.7	5.8
30	17.0	8.6
40	24.6	12.3
45	29.5	—
50	—	17.3
60	—	24.0

Freezing-point data for mixtures of naphthalene picrate and methyl naphthalene picrate are given by Meyer and Meyer, 1919.

PYRENE $C_{16}H_{10}$

SOLUBILITY IN TOLUENE AND IN ABSOLUTE ALCOHOL.

100 gms. toluene dissolve 16.54 gms. pyrene at 18°.
100 gms. absolute alcohol dissolve 1.37 gms. pyrene at 10° and 3.08 gms. at b. pt.

DIPHENYL BIACETYLENE (Diphenyl butadiyne) $C(C_6H_5):CC:C(C_6H_5)$.

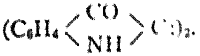
Freezing-point data for mixtures of diphenyl biacetylene with benzaldehyde and with diphenyl butadien are given by Pascal, 1914.

Freezing-point data for mixtures of diphenyl diacetylene and cinnamylidene aniline are given by Pascal, 1914.

FLUORANTHENE $C_{16}H_{10}$.

Freezing-point data are given by Shinomiya, 1940, for mixtures of fluoranthene and each of the following compounds: dinitro phenol, dinitro toluene, picramide, picryl chloride, trinitro anisole, trinitro benzene, trinitro cresol and trinitro toluene.

INDIGO



$(C_6H_4\left\langle\begin{matrix}CO\\NH\end{matrix}\right\rangle C:)_2$.

100 gms. 95% formic acid dissolve 0.14 gm. indigo at 19.8°. (Aschan, 1913.)

CONGO RED $[C_6H_4.N:N.C_{10}H_5(NH_2)SO_3Na]_2$.

100 gms. H_2O dissolve 11.6 gms. congo red at 20°-25°. (Dehn, 1917.)
100 gms. pyridine dissolve 0.29 gm. congo red at 20°-25°. "
100 gms. aq. 50% pyridine dissolve 7.32 gms. congo red at 20-25°. "

DIBENZOYL ETHYLENE cis and trans $C_6H_5COCH:CHCOC_6H_5$.

Freezing-point data for mixtures of cis and of trans dibenzoyl ethylene with azodibenzoyl are given by Grimm, Gunther and Titus, 1931.

ATOPHAN (Cinchophen) Phenylcinchoninic Acid $(2)(C_6H_5).C_9H_5N.(4)COOH$.

Solubility in Several Solvents at 25°. (Leech, Rabak and Clark, 1919.)

Solvent	Gms. Atophan per 100 gms. sat. sol.
Water	0.0160
95 % Ethyl alcohol	0.8343
48.5 % "	0.0875
Chloroform	0.1075
Ethyl acetate (81.6 %) + alcohol, etc. (10 %)	1.4151

METHYLENE DIOXY BENZAL ACETOPHENONE (Methyl dioxy chalcone) $3.4\text{-}CH_2O_2C_6H_3CH:CHCOC_6H_5$.

Freezing-point data are given by Asahina, 1934, 1934a, for mixtures of methylene dioxy benzal aceto phenone and each of the following compounds: β Naphthol, o, m and p Nitrophenols, o Nitro toluene, 2,4,6 trinitro phenol and 2,4,6 Trinitro toluene.

PHENYL VERONAL (Barbital) $\underline{NHCONHCOC(C_6H_5)_2CO}$.

100 gms. benzene dissolve 0.057 gm. barbital at 25°. (Warren, 1931.)
" " CCl_4 " 0.007 " " " " " "

Freezing-point data for mixtures of phenyl veronal with antipyrine, with pyramidon, and with sarcosine anhydride are given by Pfeiffer and Seydel, 1928a.

PIPERONAL ACETO PHENONE $CH_2O_2C_6H_3CH:CHCOC_6H_5$.

Freezing-point data for mixtures of piperonal acetophenone and p iodo biphenyl are given by Pfeiffer, Schmitz and Inoue, 1929.

METHYL DIPHENYL TRIAZINE $CH_3(C_6H_5)_2C_3N_3$.

Freezing-point data for mixtures of methyl diphenyl triazine with 1,3,5, triphenyl benzene and with 1,3,5-triphenyl triazine are given by Pascal, 1925.

α BROMO β METHOXY BENZAL ACETO PHENONE $C_6H_5COCBr:C(OCH_3)C_6H_5$

SOLUBILITY OF THE ISOMERS, A AND B
EACH SEPARATELY, IN LIGROIN AND IN ETHYL ALCOHOL.
(Dufraisse and Gillet, 1929.)

Solvent	t°	Gms. per 100 gms. sat. sol. Isomer A (m.pt.102°)	Gms. per 100 gms. sat. sol. Isomer B (m.pt.71-72°)
Ligroin (b.pt. 80°-85°)	19	2.84	2.24
Ethyl Alcohol	19	9.9	6.1(17°)

BENZOYL TETRA HYDRO QUINALDINE

Freezing-point data for mixtures of the d and l form are given by Adriani, 1900.

VINYL PHENYL CARBINOL p NITRO BENZOATE $C_6H_5CHO(COC_6H_4NO_2)CH{=}CH_2$.

Freezing-point data are given for mixtures of Vinyl phenyl carbinol p nitro benzoate +

Cinnamic p nitro benzoate	(Meisenheimer and Schmidt, 1933.)
Cinnamic, 3,4,5-tri bromo benzoate	(Meisenheimer and Schafer, 1933.)

DIPHENYL BUTADIENE

Freezing-point data are given for mixtures of diphenyl butadiene and:

Benzalazine	(Pascal, 1914.)
Diphenyl acetylene	" "
Diphenyl hydrazine	" "
Dimethyl fumerate	(Kuhn and Wagner-Jauregg, 1929.
Picryl chloride	" " " "
Cinnamylidene aniline	(Pascal, 1914.)
" β naphthylamine	" "

DIBENZOYL ETHANE $(C_6H_5COCH_2)_2$.

Freezing-point data for mixtures of 1,2 dibenzoyl ethane with 1,2 dibenzyl hydrazine and with benzoyl superoxide are given by Grimm, Gunther and Titus, 1931.

DIMETHOXY STILBENE pp' $(CH_3OC_6H_4CH)_2$.

Results for the freezing-points of mixtures of dimethoxy stilbene and tetra methyl diamino benzophenone(Michler's ketone) are given by Pfeiffer, 1924, and Pfeiffer, Goebel and Angern, 1925.

DIXYLYL AMINE $(C_6H_3(CH_3)_2)_2N$.

Freezing point data for mixtures of dixylyl [illegible] results are [illegible] by Morgan and Pettet, 1935.

METHYLENE BLUE $(CH_3)_2N\cdot C_6H_3\cdot NS\cdot C_6H_3\cdot N(CH_3)$ [illegible]

100 gms. H_2O	dissolve	4.36	gms. methylene	[illegible] 25° (Sudan, 19[illegible])
" pyridine	"	0.26	"	"
" aq. 50% pyridine	"	0.74	"	"

Data for the distribution of methylene blue betw[illegible] and water are given by Pelet-Jolivet (1909).

100 gms. sat. solution of methylene blue in wa[illegible] contain 4.1 gm. of anhydrous compound at 25°. The solid phase in [illegible] with water and aqueous alcohol retains approximately 17% H_2O, [illegible] corresponding to a mole of H_2O of crystallization. Attempts to reach eq[illegible] from superna[illegible] tion were unsuccessful since the excess solid [illegible] used to separate e[illegible] after 48 days.

100 gms. sat. solution of methylene blue in et[illegible] alcohol of [illegible] at 25° contain 1.47 gm. of the anhydrous comp[illegible] (Schnell and Rosin, 1911.)

AZOPHENETOL (p) $(C_2H_5OC_6H_4)_2N_2$.

SOLUBILITY IN 100 PER CENT ACETI[illegible]

(Dreyer and Rotarski, Chem. Centr. 76, II, 1015.)

t° →	89.2	91	93	95.6	[illegible]	99.6
Mols. per liter.	0.153	0.176	0.185	0.2012	[illegible]	[illegible]

A break in the curve at 94.7° corresponds to the transit[illegible] of the α modification into the β modification.

Freezing point data are given for mixtures of [illegible] and

Anisal azoxy phenetol	(Rotinjanz and Rot[illegible])
p Azoanisole	(Bogojawlowsky and [illegible])
p Azoanisol phenetol	" "
p Azoxy phenetol	" "
Di propyl azo phenetol	" "

p AZOXY PHENETOL $(C_2H_5O(O)C_6H_3)_2N_2$.

Freezing point data are given for mixtures of p[illegible] and

Azo anisol phenetol	(Bogojawlowsky and [illegible])
Azo phenetol	"
Azoxy anisole	(Prins, 1909; Rotin[illegible])
Cholesterine benzoate	(Prins, 1909.)
" iso butyrate	" "
" propionate	" "
Methoxy cinnamic acid	" "

PHENYL ETHYL AMINE MANDELATES etc. $C_{16}H_{19}O_3N$.

SOLUBILITIES OF OPTICALLY ISOMERIC SALTS IN WATER.

(Ingersoll, Babcock and Burns, 1933.)

Optically active salt	m.pt.	t°	Gms. salt dissolved per 100 gms. H_2O
d-α Phenyl ethyl amine-l-mandelate(1)	177	30	4.91
d-α " " " -d- "	—	30	18.0
dl-α " " " -d- "	176	30	5.81
dl-α " " " -dl- "	138	30	12.29
dl-α p Tolyl ethyl amine-dl-mandelate(2)	136	25	4.89
d-α " " " -l- "	146	25	5.18
d-α " " " -d- "	140	25	7.12
l-α Phenyl ethyl amine-d-α-bromo camphor π sulfonate(3)	205	25	5.40
dl-α " " " -dl-α " "	155	25	2.05
d-α " " " -dl-α " "	170	25	3.11
α p Tolyl ethyl amine-α- " " (4)	165	25	2.10
" " " " " "	232	25	2.96
d-α " " " d-α " "	165	25	2.12
dl-α " " " dl-α " "	161	25	3.38

(1) $C_{16}H_{19}O_3N$, (2) $C_{17}H_{21}O_3N$, (3) $C_{18}H_{26}O_4NSBr.H_2O$, (4) $C_{19}H_{28}O_4NSBr.H_2O$.

DIETHOXY BENZIDINE $[C_2H_5O(NH_2)C_6H_3]_2$.

Freezing-point data for mixtures of diethoxy and dimethoxy benzidines are given by Ingold and Kidd, 1933.

HOMATROPINE HYDROBROMIDE $C_{16}H_{21}NO_3.HBr$.

SOLUBILITY IN WATER, ETC.

(U. S. P. VIII.)

100 gms. water dissolve 17.5 gms. salt at 25°.
100 gms. alcohol dissolve 3.08 gms. salt at 25°, and 11.5 gms. at 60°.
100 gms. chloroform dissolve 0.16 gm. salt at 25°.

PALMITIC ACID $CH_3(CH_2)_{14}COOH$.

SOLUBILITY IN AQ. AND ABSOLUTE ETHYL ALCOHOL.

(Falciola, 1910.)

t°.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 cc.: Absolute Alcohol.	Aq. 75% Alcohol.	Aq. 50% Alcohol.
10	2.8	0.24	0.05
20	9.2	0.43	0.08
30	...	1.19	0.12
40	31.9	3.59	0.31

100 cc. sat. solution of palmitic acid in methyl alcohol of 94.4 vol. % (d = 0.8183) contain 1.03 to 1.17 gms. at 0.2°, equilibrium being approached from above. The mixtures were simply allowed to stand in an ice chest for from 12 to 156 hours.

(Hehner and Mitchell, 1897.)

SOLUBILITY OF PALMITIC ACID IN SEVERAL ALCOHOLS.

(Timofeiew, 1894.)

Alcohol.	t°.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 Gms. Sat. Sol.	Alcohol.	t°.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 Gms. Sat. Sol.
Methyl Alcohol	0	0.72	Propyl Alcohol	0	2.92
"	21	5.1	"	21	13.8
"	36	20.5	Isobutyl Alcohol	0	2.2
Ethyl Alcohol	0	2	"	21	12.8
"	21	10.1			

One hundred gms. of aq. 5% solution of bile salts dissolve about 0.1 gm. palmitic acid. 100 gms. aq. 5% solution of bile salts containing 1% of lecithin dissolve 0.6 gms. palmitic acid. (Moore, Wilson and Hutchinson, 1909.)

SOLUBILITY OF PALMITIC ACID IN AQUEOUS ETHYL ALCOHOL.

(Ekwall, and Mylius, 1932.)

t°	Vol. % C_2H_5OH in aq. solvent	Gms. $CH_3(CH_2)_{14}COOH$ per 100cc solvent	t°	Vol. % C_2H_5OH in aq. solvent	Gms. $CH_3(CH_2)_{14}COOH$ per 100cc solvent
7.0	70	0.09	7.0	95	1.38
12.5	"	0.14	12	"	1.95
19.5	"	0.32	16	"	3.09
24.5	"	0.48	19	"	3.85
6.5	80	0.24	20	"	3.97
13.0	"	0.47	8	96	1.80
19.0	"	0.76	12	"	2.21
25.0	"	1.45	19	"	4.60
6.0	90	0.82	20	"	4.74
12.0	"	1.12	10	99.9	0.61
20.0	"	2.48	0	"	1.56
			+17	"	5.53

SOLUBILITY OF PALMITIC ACID IN AQUEOUS ETHYL ALCOHOL AT 0°.

(Ku, 1937.)

Vol. % C_2H_5OH in aq. solvent	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. sat. sol.	Vol. % C_2H_5OH in aq. solvent	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. sat. sol.
54.84	0.027	76.05	0.105
59.61	0.041	80.33	0.165
70.19	0.054	90.14	0.449

PALMITIC ACID $CH_3(CH_2)_{14}COOH$.

SOLUBILITY OF PALMITIC ACID IN CARBON TETRACHLORIDE AND IN CARBON TETRACHLORIDE SOLUTIONS OF LAURINIC ACID AT 0°.

(Waentig and Pescheck, 1919.)

Gms. Laurinic Acid per 100 gms. CCl_4.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. sat. sol.	Gms. Laurinic Acid per 100 gms. CCl_4.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. sat. sol.
0.0 (= CCl_4 alone)	0.471*	3.312	1.0043
0.0 "	0.5457	4.996	1.7960
0.984	1.0080	5.914	1.8111
2.150	1.2644	5.801	1.8479

* It appears probable that in this case saturation was approached from below and all the others from above.

SOLUBILITY OF PALMITIC ACID IN SEVERAL SOLVENTS AT 25°.

(Kröber, 1919.)

Solvent.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. solvent.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 cc. solvent.	Solvent.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. solvent.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 cc. solvent.
Methyl formate.......	2.5	2.3	Methyl butyrate......	10.0	8.9
" acetate.......	7.8	7.2	Ethyl "	10,5	9.1
Ethyl "	10.7	9.6	Propyl "	10.6	9.2
Amyl "	16.6	14.3	Ethyl ether..........	32.8	23.2
Methyl propionate...	9.9	9.0	" alcohol.......	11.0	9.4
Ethyl "	10.5	9.3	" chloracetic acid.	1.1	1.3

The author does not describe the method used and does not claim high accuracy for the results.

SOLIDIFICATION POINTS OF MIXTURES OF PALMITIC AND STEARIC ACIDS.

(De Visser, 1898.)

Fifty gram samples of each mixture were used and great care taken to insure accuracy of the determinations.

t° of Solidification.	Gms. Stearic Acid per 100 Gms. Mixture.	t° of Solidification.	Gms. Stearic Acid per 100 Gms. Mixture.	t° of Solidification.	Gms. Stearic Acid per 100 Gms. Mixture.
69.32	100	57.2	55	54.85 Eutec.	30
67.02	90	56.42	50	55.46	25
64.51	80	56.38	45	56.53	20
61.73	70	56.11	40	59.31	10
58.76	60	55.62	36	62.62	0

Additional determinations on this system by Dubowitz (1911) are, for the most part, in good agreement with the above. According to Carlinfanti and Levi Malvano (1909), however, the eutectic could not be located and there were indications of the existence of solid solutions.

The melting-point depression of mixtures of palmitic, stearic, oleic, myristic and other fatty acids were used by Wenzel, 1934, as a method of estimating the content of individual fatty acids in unknown mixtures.

Freezing-point data are given for mixtures of:

Palmitic acid + Apocholic acid(11)
" " + Arachidic acid(19)
" " + Cholic acid(12)
" " + Desoxy cholic acid (11)
" " + Elaidic(17)
" " + Erythritol(10)
" " + Glycerol(10)
" " + Hydnocarpic acid(1)
" " + Hyodesoxy cholic acid(12)
" " + Iso oleic acid(18)
" " + Linoleic(18)
" " + Mannitol(10)
Palmitic acid + Myristic acid(8)
" " + Margaric acid(13)(16)
" " + Oleic acid(2)(3)(5)(17)(18)
" " + Stearic acid(4)(5)(6)(7)(13)
" " + Tri palmitin(6)(7)
Palmitic acid Cetyl Ester + Paraffin(9)
Palmitic acid ester + Naphthalene(14)
Tri palmitin + Stearic acid(6)
" " + Tri olein(8a)
" " + Tri stearin(6)
Ethyl palmitate + Ethyl Stearate(15)

(1) Cole and Cardoso, 1937; (2) Dubovitz, 1911; (3) Fokin, 1912; (4) Giua, 1916; (5) Jefremow, 1927a; (6) Kremann and Klein, 1913; (7) Kremann and Kropsch, 1914; (8) Kulka and Sandin, 1937; (8a) Kremann and Schoulz, 1912; (9) Palazzo and Battelli, 1883; (10) Puschin and Dezelic, 1932; (11) Rheinboldt, Flume and König, 1929; (12) Rheinboldt and Lauber, 1929; (13) Schriner,Fulton and Burks, 1933; (14) Battelli and Martinelli, 1885; (15) Smith, 1931; (16) Smith, 1936, (17) Smith, 1939; (18) Koczy and [illegible] von Meyer, Brod and Sozka, 1913.

PALMITIC ANHYDRIDE $(C_{15}H_{31}CO)_2O$.

100 gms. abs. alcohol dissolve 0.18 gm. $(C_{15}H_{31}CO)_2O$ at 20°. (Whitby, 1926.)

PALMITAMIDE $CH_3(CH_2)_{14}CONH_2$.

Freezing-point data are given by Guy and Smith, 1939, for mixtures of:

Palmitamide + Stearamide
Palmitanilide + Stearanilide
Methyl palmitate + Methyl stearate

TRI PALMITIN $C_3H_5[CH_3(CH_2)_{14}COO]_3$.

SOLUBILITY OF TRIPALMITIN IN SEVERAL SOLVENTS.
(Loskit, 1928.)

The determinations were made by the thermic, the sealed tube and the analytical method. The author's results were plotted and the following table constructed from the curves.

t°	Gms. $C_3H_5[CH_3(CH_2)_{14}COO]_3$ per 100 gms. sat. solution in:		
	C_6H_6	$(C_2H_5)_2O$	$CHCl_3$
5	—	—	4.5
10	—	—	8.5
15	2.5	—	14.0
20	6.7	0.7	20.0
25	13.5	2.4	27.0
30	25.0	6.5	34.0
35	39.0	15.5	41.5
40	51.0	32.2	50.0
50	72.5	70.5	68.0
60	90.0	90.0	88.0

β BUTYRO Dipalmitin (β Butyryl αα'-dipalmityl glyceride) $C_{41}H_{74}O_6$.

100 gms. absolute ethyl alcohol dissolve 0.55 gm. of the cmpd at. 20°. (Whitby, 1926.)

PHENACYL PALMITATE $CH_3(CH_2)_{14}COO.CH_2COC_6H_5$ etc.

SOLUBILITY OF PHENACYL, BROMO PHENACYL AND CHLORO PHENACYL PALMITATES IN 95% ETHYL ALCOHOL.
(Hann, Reid and Jameson, 1930.)

Palmitate	Formula	Gms. Palmitate per 100 cc 95% alcohol at:	
		20°	30°
Phenacyl Palmitate	$CH_3(CH_2)_{14}COO.CH_2COC_6H_5$	0.5136	0.7880
p Bromo " "	$CH_3(CH_2)_{14}COO.CH_2COC_6H_4Br$	0.0512	0.0684
p Chloro " "	$CH_3(CH_2)_{14}COOCH_2COC_6H_4Cl$	0.0784	0.1020

HEXADECYL IODIDE $CH_3(CH_2)_{14}CH_2I$

Freezing-point data for mixtures of hexadecyl iodide and octa decyl iodide are given by Smith, 1932b.

CETENE (Hexadecane) $C_{16}H_{34}$.

MUTUAL SOLUBILITY OF CETENE AND LIQUID SULFUR DIOXIDE.

(Seyer and Hugget, 1924.)

The cetene was prepared from spermaceti (cetyl palmitate) by destructive distillation at 300°, and purified by fractional vacuum distillation. The fraction having a melting-point close to that of cetene was redistilled 8 times. The bulb method was used for the determination of the freezing-points and the solubility.

t° of complete miscibility.	Gms. $C_{16}H_{34}$ per 100 gms. mixture.	t° of complete miscibility.	Gms. $C_{16}H_{34}$ per 100 gms. mixture.
— 2.2 (f. pt.)	100.00	42.5	44.73
+ 9.5	79.23	42.7 (crit. t.)	35.13
20.5	69.16	42.6	17.40
28.1	61.90	32.1	6.64
34.8	53.42	24.0	3.97
—38.4	50.19	72.7 (m. pt. SO_2).	0.00

Freezing-point data are given for mixtures of:

Hexadecane + Octadecane (Smith, 1932b.)
" + Heptadecane (Carey and Smith, 1933.)

CETYL ALCOHOL $C_{16}H_{33}OH$.

100 gms. methyl alcohol dissolve 95.9 gms. $C_{16}H_3OH$ at 23.9°. (Timofeiew, 1894.)
" ethyl " " 102.2 " " " " "
" " " " 410 " " " 37 "
" propyl " " 405 " " " 39 "

SOLUBILITY OF CETYL ALCOHOL IN LIQUID SULFUR DIOXIDE.

(Seyer and Ball, 1925.)

The bulb method was used. The temperatures were determined at which a small crystal of the alcohol just failed to dissolve and at which it just disappeared. The average of the two temperatures was taken as the temperature of solubility.

t° of Solubility.	Gms. $C_{16}H_{33}OH$ in 100 gms. mixture.	t° of Solubility.	Gms. $C_{16}H_{33}OH$ per 100 gms. mixture.
48.0 (m. pt.)	100.0	23.5	31.18
41.6	95.85	23.8	28.34
30.9	69.00	22.7	11.20
27.8	66.27	22.7	10.40
25.5	57.46	22.2	7.70
24.8	46.39	5.3	0.42
23.9	34.87		

Freezing-point lowering data for mixtures of *n* cetyl alcohol and diphenyl amine are given by Giua and Cherchi, 1919.

Freezing-point data are also given for mixtures of cetyl alcohol and

Apocholic acid(3)
Chlor acetic acid(2)
Cholic acid(4)
Desoxy cholic acid(3)
Diphenyl amine(3)
Hepta decyl alcohol(1)
Hyodesoxy cholic acid(4)
Octa decyl alcohol(1)(5)

(1) Carey and Smith, 1933; (2) Mamelli and Mannesier, 1913; (3) Rheinboldt, Flume and König, 1929; (4) Rheinboldt and Lauber, 1929; (5) Smith, 1931.

CETYL PALMITATE and STEARATE

Solubilities of [illegible]

Compound	Formula	Solvent	t°	[illegible]
Cetyl palmitate	[illegible]	Ether abs.	[illegible]	[illegible]
			[illegible]	[illegible]
"		Alcohol abs.	[illegible]	[illegible]
"		Acetic acid glacial	[illegible]	[illegible]
" stearate	[illegible]	Ether abs.	[illegible]	[illegible]
"			[illegible]	[illegible]
		Alcohol abs.	[illegible]	[illegible]
		Acetic acid glacial	[illegible]	[illegible]

β NAPHTHYL BENZOATE $C_6H_5COOC_{10}H_7$

100 gms. 95% formic acid dissolve 0.25 gm. $C_6H_5COOC_{10}H_7$ at 18.5°.
(Aschan, 1913.)

Freezing point data for mixtures of β Naphthyl benzoate and salol are given by Angelletti, 1927.

BETOL (β-Naphthylsalicylate) $HOC_6H_4COOC_{10}H_7$

Freezing point data including super solubility curves, are given for mixtures of betol and salol by Miers and Isaac, 1907.

BENZYLIDENE NAPHTHYLAMINE $C_{10}H_7N:CHC_6H_5$

Freezing point data for mixtures of the α and β forms are given by Pascal and Normand, 1914, and by Rheinboldt and Kirchheisen, 1926.

α BENZYL NAPHTHALENE (Methane α Naphthyl phenyl) $C_{10}H_7CH_2C_6H_5$

Freezing point data are given for:

α Benzyl naphthalene + picric acid(Pfeiffer and Angern, 1925.; Jefremow, 1918, 1919a.)
" " + styphnic acid(Puschin, 1925; Jefremow, 1918, 1919a.)

DIBENZYL ACETONE (Styryl ketone)$(C_6H_5CH:CH)_2CO$

Freezing point data are given for mixtures of:

Dibenzyl acetone + Acetic acid(Puschin and Konig, 1928.)
" " + Naphthols " " " "
" " + Resorcinol " " " "
" " + Phenyl acetic acid (Pfeiffer, 1924.)

CINNAMYLIDENE ACETO PHENONE $C_4H_4(CHC_6H_5)_2$

Freezing point data are given for mixtures of Cinnamylidene acetophenone and:

Acenaphthene(1)
Amino aceto phenone(3)
Azo benzene(1)
Bromo dinitro phenol(3)
Bromo nitro benzene(3)
Chloro nitro benzene(3)
Dinitro benzene(3)
Diphenyl amine(2)
β Naphthol ethyl ether(1)
Thymo quinone(3)
Trinitro toluene(1)

(1) Giua, 1916; (2) Giua, 1917; (3) Giua, 1925.

ETHOXY BENZAL ACETOPHENONE $C_2H_2(COC_6H_5)(C_6H_4OC_2H_5)$.

Freezing-point data for mixtures of ethoxy benzal aceto phenone with 2,4,6-tri nitro phenol are given by Asahima, 1934.

DIMETHYL AMINO BENZAL ACETO PHENONE $(CH_3)_2NC_6H_4CH:CHCOC_6H_5$.

Freezing-point data for mixtures of dimethyl amino benzal aceto phenone and naphthol are given by Pfeiffer, Goebel and Angern, 1925.

EUGENOL BENZOATE $C_6H_3(1)(CH_2.CH:CH_2)(3)OCH_3(4)OC_7H_5O$.
Freezing-points of mixtures of eugenol benzoate and isoeugenol benzoate are given by Mc Kie, 1921.

APO MORPHINE $C_{17}H_{17}NO_2$.

100cc H_2O dissolve 0.12 gm. $C_{17}H_{17}NO_2$ at 15°. (Kolthoff, 1925.)
100cc Olive Oil dissolve 4.5 gm. $C_{17}H_{17}NO_2$ at 25°. (Walton, 1935.)

APOMORPHINE HYDROCHLORIDE $C_{17}H_{17}NO_2.HCl$.

100 gms. water dissolve 1.7 gms. salt at 15° and 2 gms. at 25°.
100 gms. 90% alcohol dissolve 2 gms. salt at 25°.

(Dott, 1906; Squires and Caines, 1905.)

αα′ Diphenyl **PIPERIDINES** $C_{17}H_{19}N$.

SOLUBILITIES OF THE ACID SALTS OF *αα′* DIPHENYL PIPERIDINE AND OF ISO *αα′* DIPHENYL PIPERIDINE IN WATER AT 25°.

(Scholtz, 1901.)

Piperidine Base.	Gms. per 100 Gms. Sat. Solution:			
	HCl Salt.	HBr Salt.	HI Salt.	H_2SO_4 Salt.
α, α′ Diphenyl Piperidine, m. pt. 71°	0.85	0.90	0.12	6.31
Iso *α, α′* Diphenyl Piperidine, liquid	3.02	1	0.72	easily soluble

PIPERINE $C_{17}H_{19}NO_3$. (See also under Pilocarpine, page 690.)

SOLUBILITY IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $C_{17}H_{19}NO_3$ per 100 Gms. Solvent.	Authority.
Water	20–25	0.01	(Dehn, 1917.)
Ethyl Alcohol	9.5	2.9	(Timofeiew, 1894.)
Methyl "	9.5	4.4	"
Propyl "	9.5	2.94	"
Trichlor Ethylene	15	9.83	(Wester and Bruins, 1914.)
Pyridine	20–25	22.46	(Dehn, 1917.)
Aq. 50% Pyridine	20–25	11.39	"

1000 cc. sat. solution of piperine in water contain $1.4.10^{-3}$ gm. mol. or 0.400 gm. $C_{17}H_{19}NO_3$ at 18°. (Kolthoff, 1925.)

100 gms. abs. alcohol dissolve 6.66 gms. piperine at 20-25°.
» Quinoline » 13.66 » »
» Equi. mol. mixture of alcohol and quinoline dissolve 18.81 gms. piperine at 20-25°.

(Pucher and Dehn, 1921.)

MORPHINE $C_{17}H_{19}NO_3.H_2O$.

SOLUBILITY OF MORPHINE IN WATER AT 18°.

A detailed discussion and calculation of the dissociation constants of morphine as a base and as an acid is given by Kolthoff, 1925. This author also reports a series of determinations of the solubility of morphine in buffer mixtures composed of 0.2 mol. Na_2CO_3 and 0.2 mol. $NaHCO_3$. A minimum solubility of 5.6.10^{-4} mols or 0.165 gm. morphine per liter was found at pH 9.1. This is in good agreement with the value of Maas, which is 5.2.10^{-4} mol. or 0.154 gm. per liter. The result found by Heiduschka and Faul (1917) for water of conductivity of 2.10^{-6} rec. ohms is 6.1.10^{-4} or 0.181 gm. morphine per liter at 18°. As a mean Kolthoff chooses 5.10^{-4} mol. or 0.152 gm. morphine per liter at 18°.

1000 gms. H_2O sat. with finely powdered morphine base by constant shaking for 2 to 4 weeks at 20° contain 0.149 gm. $C_{17}H_{19}NO_3$ as determined by titration with 0.01 n HCl using methyl red as indicator.

(Baggesgaard Rasmussen and Reimers, 1935.)

SOLUBILITY OF MORPHINE IN WATER AT DIFFERENT HYDROGEN ION CONCENTRATIONS AT 20°.

(Baggesgaard Rasmussen and Reimers, 1935.)

An excess of finely powdered morphine base was shaken for periods of 8 to 10 days with a series of buffer solutions of pH varying from 6.6 to 10.3. The morphine in the saturated filtered solution thus obtained was calculated from nitrogen determinations made by the Kjeldahl method.

Buffer Mixture	pH of the Sat. Solution	Gm. Mol. Morphine per liter	Buffer Mixture	pH of the Sat. Solution	Gm. Mol. Morphine per liter
Phosphate	6.66	0.01188	Borate + HCl	8.38	0.00075
"	6.72	0.01150	" "	8.54	0.00068
"	6.80	0.01001	" "	8.78	0.00053
"	6.90	0.00852	" "	9.00	0.00051
"	7.08	0.00537	" "	9.10	0.00056
"	7.12	0.00450	Borate + NaOH	9.18	0.00057
"	7.26	0.00332	" "	9.42	0.00069
"	7.51	0.00219	" "	9.62	0.00098
"	8.00	0.00109	" "	9.86	0.00138
Borate + HCl	8.15	0.00088	" "	10.27	0.00200

SOLUBILITY OF MORPHINE IN AQUEOUS SOLUTIONS OF SALTS AND BASES AT ROOM TEMPERATURE, SHAKEN EIGHT DAYS.

(Dietrich, [illegible].)

Aq. Salt or Base.	In N/10 Salt or Base. Grams per Liter Salt or Base.	In N/10 Salt or Base. Grams per Liter Morphine.	In N/1 Salt or Base. Grams per Liter Salt or Base.	In N/1 Salt or Base. Grams per Liter Morphine.
NH_4OH	3.51	0.20	35.08	0.505
$(NH_4)_2CO_3$	4.80	0.031	48.03	0.040
KOH	4.62	2.78	46.16	
K_2CO_3	6.92	0.20	69.15	0.379
$KHCO_3$	10.02	0.024	100.16	0.040
NaOH	4.00	3.33	40.05	...
Na_2CO_3	5.30	0.09	53.03	0.14
$NaHCO_3$	8.41	0.032	84.06	0.044
$Ca(OH)_2$ (sat.)	...	1.00 (25°)	...	...

SOLUBILITY OF MORPHINE IN AQUEOUS SOLUTIONS OF AMMONIA.

(Heiduschka and Faul, 1917.)

An excess of finely ground crystalline morphine was constantly agitated with the ammonia solutions in a thermostat. The saturated solutions were analyzed by evaporating and weighing the residues dried at 100°.

Normality of aq. ammonia.	t°.	Gms. $C_{17}H_{19}NO_3.H_2O$ per 100 cc. sat. sol.	Normality of aq. ammonia.	t°.	Gms. $C_{17}H_{19}NO_3.H_2O$ per 100 cc. sat. sol.
0.1	18	0.0882	0.588 (= 1% NH_3)	18	0.2480
0.1	25	0.0974	0.588 (= 1% NH_3)	25	0.2550
0.2	18	0.1226	2.941 (= 5% NH_3)	18	0.4316
0.2	25	0.1240	2.941 (= 5% NH_3)	25	0.4406
1.0	18	0.3086	5.88 (=10% NH_3)	18	0.6380
1.0	25	0.3242	5.88 (=10% NH_3)	25	0.7100

SOLUBILITY OF MORPHINE IN AQUEOUS SOLUTIONS OF METHYL ALCOHOL AT 20°.

(Baggesgaard-Rasmussen and Reimers, 1935.)

The dissolved morphine was titrated directly in the alcoholic solution using methyl red as indicator and as soon as the color changed to reddish yellow 4 to 5 volumes of water were added and the titrations continued until a red end point was reached.

Wt. % CH_3OH in aq. solvent	Gms. $C_{17}H_{19}NO_3$ per 100 gms. sat. solution	solvent
26	0.0388	0.0388
50	0.135	0.135
75	0.373	0.375
90	0.710	0.715
100(approx.)	5.382	5.688

SOLUBILITY OF MORPHINE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 20°.

(Baggesgaard-Rasmussen and Reimers, 1935.)

Wt. % C_2H_5OH in aq. solvent	Gms. $C_{17}H_{19}NO_3$ per 100 gms. sat. sol.	solvent	Wt. % C_2H_5OH in aq. solvent	Gms. $C_{17}H_{19}NO_3$ per 100 gms. sat. sol.	solvent
5	0.0200	0.0200	60	0.243	0.243
10	0.0214	0.0214	70	0.294	0.293
20	0.0325	0.0325	80	0.326	0.327
30	0.0596	0.0596	90	0.342	0.343
40	0.114	0.114	95	0.411	0.413
50	0.178	0.178	99.1	0.995	1.094
			100	2.549	2.616

SOLUBILITY OF MORPHINE IN SEVERAL SOLVENTS.

(U. S. P., Muller, W., 1903.)

Solvent.	Gms. Morphine per 100 Gms. Solution		
	At 18°-22°.	At 25°.	At 80°.
Water	0.0283	0.030	0.0961
Alcohol	...	0.600	1.31 (60°)
Ether	0.0131	0.0224	...
Ether sat. with H_2O	0.0004	...	...
H_2O sat. with Ether	0.0447	...	...
Benzene	0.0025	...	...
Water	0.0254 (20°) (Winterstein, 1909.)		
Chloroform	0.0504 (20°) "		
Water	0.0288 (15°) (Guerin, 1913.)		
Acetone	0.128 (15°) "		
Aq. 50 Vol. % Acetone	0.132 (15°) "		
Water	0.0217 (20°) (Zalai, 1910.)		
Water	0.0192 (20°) (Guild, 1907.)		

Solvent.	Gms. Morphine per 100 Gms. Solution	
	At 18°-22°.	At 25°.
Chloroform	0.0655	0.0555
Amyl Alcohol	...	0.8810
Ethyl Acetate	0.1861	0.1905
Petroleum Ether	0.0854	...
Carbon Tetrachloride	0.0136	0.032 (17°)
Glycerol	0.45 (15.5°)	...
CCl_4	0.025 (20°) (Gori, 1913.)	
Aniline	6.1 (20°) (Scholtz, 1912.)	
Pyridine	16 (20°) "	
Piperidine	19.8 (20°) "	
Diethylamine	7.41 (20°) "	
50% Aq. Glycerol + 3% H_3BO_3	5.2 (t. temp.)	(Baroni and Barlinetto, 1911.)

SOLUBILITY OF MORPHINE AT 20° IN MIXTURES OF CHLOROFORM AND:

(~~Baggesgaard-Rasmussen~~ and Reimers, 1935.)

Ethyl Alcohol

Wt. % C_2H_5OH(1) in solvent mixture	d15/15 of sat. sol.	Gms. $C_{17}H_{19}O_3$ per 100 gms. sat. sol.
0.0(=$CHCl_3$)(2)	1.590	0.021
10	1.367	1.004
20	1.268	1.925
30	1.183	2.286
35	1.146	2.288
40	1.110	2.267
50	1.040	2.055
60	0.981	1.762
80	0.878	1.337
100	0.7957	1.175
25(3)	1.226	1.898
50	1.042	1.763
75	0.902	1.221
100	0.797	1.004

Iso Propyl Alcohol

Wt. % $CH_3CHOHCH_3$ in solvent mixture	d 15/15 of sat. sol.	Gms. $C_{17}H_{19}O_3$ per 100 gms. sat. sol.
0.0(=$CHCl_3$)(2)	1.497	0.011
15	1.317	0.386
25	1.213	0.562
35	1.146	0.650
50	1.043	0.575
75	0.915	0.372
100	0.800	0.207

(1) 99.35 Wt. %; (2) Ordinary commercial
(3) 99.1 Wt. % C_2H_5OH was used.

100cc Olive oil dissolve 0.005 gms. morphine at 25°. (Walton, 1935.)

SOLUBILITY OF MORPHINE IN SEVERAL SOLVENTS AT 25°.

(Schaefer, 1913.)

Solvent.	Gms. $C_{17}H_{19}NO_3.H_2O$ per 100 cc. Solvent.	Solvent.	Gms. $C_{17}H_{19}NO_3.H_2O$ per 100 cc. Solvent.
Ethyl Alcohol	0.388	1 Vol. C_2H_5OH + 4 Vols. $CHCl_3$	0.66
Methyl Alcohol	6.66	" + 4 Vols. C_6H_6	0.2
Chloroform	0.04	1 Vol. CH_3OH + 4 Vols. $CHCl_3$	4.54
Benzene	insol.	" + 4 Vols. C_6H_6	2.5

SOLUBILITY OF MORPHINE IN ETHYL ETHER AT 5.5°.

(Marchionneschi, 1907.)

Solvent.	Gms. Morphine per 100 Gms. Sat. Sol.	Solid Phase.
Washed and Distilled Ether	0.049	$C_{17}H_{19}NO_3.H_2O$
Ether Purified by Distillation over Na	0.263	"
" " " "	0.56	$C_{17}H_{19}NO_3$

MORPHINE ACETATE $CH_3COOH.C_{17}H_{19}NO_3.3H_2O$, Morphine Hydrochloride $HCl.C_{17}H_{19}NO_3.3H_2O$, Morphine Sulphate $H_2SO_4.(C_{17}H_{19}NO_3)_2.5H_2O$, and Apo Morphine Hydrochloride $HCl.C_{17}H_{17}NO_2$.

SOLUBILITY IN SEVERAL SOLVENTS.

(U. S. P.)

Solvent.	Grams per 100 Grams of Solvent.							
	Acetate.		Hydrochloride.		Sulphate.		Apo M. Hydrochloride.	
	25°.	80°.	25°.	80°.	25°.	80°.	25°.	80°.
Water	44.9	50.0	5.81	200.0	6.53	166.6	2.53	6.25
Alcohol	4.6	40.0*	2.4	2.8*	0.22	0.53*	2.62	3.33
Chloroform	0.21	...	...	...	...	...	0.026	...
Ether	...	...	...	...	...	...	0.053	...
Glycerine	19.2	...	20.0†	...	...	...	...	...

* 60°. † 15.5°.

100 gms. H_2O dissolve 1.69 gms. apo morphine hydrocloride at 15.5°, and 2.04 gms. at 25°.

100 gms. 90% alcohol dissolve 1.96 gms. apo morphine hydrochloride at about 15.5°. (Dott, 1906.)

100 gms. H_2O dissolve 4.17 gms. morphine hydrated sulfate $.5H_2O$ at 15°. (Power, 1882)

MORPHINE SALTS

SOLUBILITY IN WATER AND IN 90% ALCOHOL AT ORD. TEMP.

(Squire and Caines, 1905.)

Morphine Salt.	Gms. Salt per 100 cc.		Morphine Salt.	Gms. Salt per 100 cc.	
	H_2O.	90% Alcohol.		H_2O.	90% Alcohol.
Morphine Acetate	...	1	Diacetyl Morphine (Heroine)	0.11	2.5
" Hydrochloride	...	2	" " HCl	50	9.1
" Sulfate	...	0.143	Ethyl Morphine HCl (Dionin)	14.3	20
" Tartrate	10	0.172			

100 gms. 4% $HClO_4$ solution dissolve 0.44 gm. morphine perchlorate at 15°. (Hofmann, Roth, Höbald and Metzler, 1910.)

SOLUBILITY OF MORPHINE SALTS IN SEVERAL SOLVENTS AT 25°.

(Schaefer, 1913.)

Gms. of Each Salt Separately per 100 cc. of Each Solvent.

Solvent	Morphine Hydrochloride	Morphine Sulfate	Diacetyl Morphine	Diacetyl Morphine HCl	Ethyl Morphine HCl
95% Ethyl Alcohol	0.606	0.2	3	9.1	4
85% Ethyl Alcohol	1.2	0.4			...
80% Ethyl Alcohol	2	0.77			...
Methyl Alcohol	...		4	11.1	66.6
Chloroform	Insol.	Insol.	66.6	33.3	0.526
Benzene	Insol.	Insol.	12.5	Insol.	Insol.
1 Vol. C_2H_5OH + 4 Vols. $CHCl_3$	0.18	0.0164	66.6	4.5	5
" + 4 Vols. C_6H_6	0.089	0.0133	25	0.71	1.14
1 Vol. CH_3OH + 4 Vols. $CHCl_3$		0.22	66.6	20	20
" + 4 Vols. C_6H_6	0.253	0.066	25	6.6	8.33

MORPHINE HELIANTHATE $C_{17}H_{19}NO_3.C_{14}H_{15}N_3SO_3$.

1000 cc. water dissolve 0.3 gm. morphine helianthate at 20-25°.

(Stark and Dehn, 1918.)

MORPHINE PICRATE $C_{17}H_{19}NO_3.OH.C_6H_2(NO_2)_3$.

SOLUBILITY OF MORPHINE PICRATE IN SEVERAL SOLVENTS AT 20°.

The saturated solutions containing precipitated crystals were allowed to stand in an incubator at 20° for two days and then analyzed by evaporation and weighing the residues dried at 100°. (Maplethorpe and Evers, 1925.)

Solvent	Gms. Picrate per 100 gms. Sat. Sol.
Water	0.12
Abs. alcohol	0.13
Acetone	14.86

MICHLER'S KETONE (Tetramethyl p-diaminobenzophenone) $CO(C_6H_4(4)N(CH_3)_2)_2$.

100 gms. H_2O	dissolve 0.04 gm. of ketone at 20-25°.		(Dehn, 1917.)
" pyridine	" 9.92 "	" "	"
" aq. 50% pyridine	" 4.89 "	" "	"

100 gms absolute alcohol dissolve 0.61 gm. Michler's Ketone at 20-25°.
" quinoline " 9.71 " " " "
" equi mol. mixture of alcohol and quinoline dissolve 6.86 gms. Michler's Ketone at 20°-25°. (Parker and Dehn, 1921.)

Freezing-point data are given for mixtures of Michler's Ketone and:

Dimethoxy stilbene(1)
Menthol(1)
Naphthoic acid(1)
Naphthols(1)
Naphthylamine(1)
Neroline(1)
Resorcinol(1)
Skatol(1)
Veronal (Barbital)(2)

(1) Pfeiffer, 1928; (2) Pfeiffer and Angern, 1926.

Results for mixtures of Dimethyl amino benzo phenone and β naphthol are given by Pfeiffer, 1928.

DIETHYL DIPHENYL UREA $N(C_2H_5)_2N(C_6H_5)_2CO$.

SOLUBILITY OF DIETHYL DIPHENYL UREA IN WATER AND IN AQUEOUS ETHYL ALCOHOL.

(Desvergnes, 1928.)

Solvent		Gms. $N(C_2H_5)_2N(C_6H_5)_2CO$ per 100 gms. solvent at:		
Vol. % C_2H_5OH	d_{15} of solvent	0°	20°	50°
0.0(= H_2O)	—	0.003	0.008	0.012(0.3 at 85°)
29.9	0.9656	trace	0.027	—
37.3	0.9556	0.041	0.193	—
52.4	0.9310	0.424	1.690	—
68.6	0.8939	3.225	9.857	—
77.1	0.8724	6.537	21.126	—
87.1	0.8430	12.979	43.080	403.28
92.0	0.8272	16.646	55.581	428.33
95.2	0.8145	24.262	65.359	462.66
100.0	0.7944	28.352	72.673	545.26

At a temperature of 50° and concentrations of alcohol below 77 vol. percent two liquid layers are formed. Results for several of these are given.

SOLUBILITY OF DIETHYL DIPHENYL UREA IN SEVERAL SOLVENTS.

(Desvergnes, 1928.)

Solvent	Gms. $N(C_2H_5)_2N(C_6H_5)_3CO$ per 100 gms. solvent at			Solvent	Gms. $N(C_2H_5)_2N(C_6H_5)_2CO$ per 100 gms. solvent at		
	0^{00}	20°	50^{c}		0°	20°	50°
$CH_3COOC_2H_5$	36.92	76.84	—	$(C_2H_5)_2O$	31.40	71.37	—
$(CH_3)_2CO$	34.11	63.59	—	C_5H_5N	52.81	97.35	444.66
C_2H_5OH	28.35	72.67	515.26	CS_2	28.32	74.07	—
CH_3OH	25.20	101.75	799.49	CCl_4	27.67	50.23	185.12
C_6H_6	61.03	101.55	414.93	$C_6H_5CH_3$	45.98	72.90	298.28
$CHCl_3$	74.90	146.18	—	m $C_6H_4(CH_3)_2$	26.47	58.14	450.00

Freezing-point data are given for mixtures of Diethyl Diphenyl Urea and:

Bromo dinitro phenol(1)
Dinitro toluene(1)
Diphenyl amine(1)
Nitro mannitol(3)
Nitro penta erythritol(3)
Nitro toluene(1)
Phenol(2)
Tri methylene nitramine(4)
Tri nitro phenol(1)
Tri nitro toluene(1)

(1) Giua and Guastalla, 1933; (2) Medard, 1930-1; (3) Urbanski, 1933; (4) Urbanski and Rabek-Gawronska, 1934.

TETRA METHYL DIAMINO BENZO PHENONE $N(CH_3)_2.C_6H_4.CO.C_6H_4.N(CH_3)_2$.

Freezing-point data are given by Pfeiffer, Goebel and Angern, [illegible], for mixtures of tetra methyl diamino benzo phenone and each of the following compounds: acenaphthene, [illegible], [illegible], naphthol, naphthylamine, naphthoic acid, [illegible], [illegible], oxybenzoic acid, phenyl acetic acid, resorcinol and skatole. Results for mixtures with veronal are given by Pfeiffer and Angern, [illegible].

BENZOYL CAMPHOR $C_{17}H_{20}O_2$.

SOLUBILITY OF THE ENOLIC AND KETONIC FORMS IN SEVERAL SOLVENTS AT 19°.
([illegible], [illegible].)

Solvent	Gms. $C_{17}H_{20}O_2$ per 100 gms. Sat. Sol.	
	Enolic Form.	Ketonic Form.
Ethyl alcohol	3.47	4.95
Acetone	14.0	19.4
Benzene	12.3	15.9

Data, in the form of diagrams, are given by [illegible], 1923, for the freezing-points and for the solubilities of the enolic and ketonic forms of mono benzoyl camphor in ether at [illegible], acetone, alcohol, toluene and acetic acid, at 19°.

Solubility data have been used by Dimroth and Mason (1913) for determining the transition of the tautomeric forms into each other. Results are given for the solubility of each form in ether, acetone, ethylacetate, ethyl alcohol and methyl alcohol.

One liter benzene dissolves 256 gms. *enol* benzoylcamphor at 5°, by freezing-point method. ([illegible], 1915.)

COCAINE $C_{17}H_{21}NO_4$ (Benzoyl ecgonine methyl ester).

SOLUBILITY IN WATER. (Kolthoff, 1925.)

By means of colorimetric determinations of the p_H of mixtures of 0.01 molecular cocaine hydrochloride and 0.01 normal sodium hydroxide solutions the dissociation constant was calculated to be $K = 2.6.10^{-6}$. For the determination of the solubility product (L), 10 cc. portions of 0.01 molecular cocaine hydrochloride were mixed in tubes of resistance glass with different amounts of 0.01 normal Na OH, shaken and allowed to stand. With 2.0 cc. of 0.01 normal Na OH crystals separated after 4 hours. From this experiment the solubility product was calculated to be $L = 1.10^{-8}$ at 15°. The concentration of the undissociated alkaloid in the saturated solution is derived thus,

$$[\text{Cocaine OH}]\text{sat.} = \frac{L}{K} = \frac{1.10^{-8}}{2.6.10^{-6}} = 4.10^{-3} \text{ mol.}$$

"The concentration of the dissociated part is 10^{-4} mol., so that the total solubility of cocaine in water is 4.10^{-3} mol."

TropaCOCAINE $C_8H_{14}NO.CO.C_6H_5$.

SOLUBILITY IN WATER. (Kolthoff, 1925.)

The dissociation constant was calculated from the colorimetrically determined p_H curve to be $K = 1.9.10^{-5}$. For the solubility product it was found that 10 cc. of a 0.1 molecular tropacocaine hydrochloride solution + 2 cc. of 0.05 normal Na OH gave a just perceptible precipitate of tropacocaine after standing a day. The p_H of the solution was 8.4 corresponding to a $p_{OH} = 5.8$ and a $[OH] = 1.6.10^{-6}$. From the composition of the solution and the hydroxyl ion concentration the solubility product was calculated to be 8.10^{-8}. From this and the dissociation constant it was calculated that a saturated solution of tropacocaine in water at 15° has a

SOLUBILITY OF COCAINE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $C_{17}H_{21}NO$. per 100 Gms. Solvent.	Authority.
Water	20	0.028	(Zalai, 1910.)
"	±20	0.140	(Baroni and Barlinetti, 1911.)
"	25	0.17	(U. S. P.)
"	80	0.38	"
3 Gms. H_3BO_3 in Aq. 50% Glycerol	±20	8	(Baroni and Barlinetti, 1911.)
Alcohol (92.5 Wt. %)	25	20	(U. S. P.)
Ether	25	26.3	"
"	18–22	11.6	(Müller, 1903.)
Ether sat. with H_2O	18–22	34	"
Water sat. with Ether	18–22	0.254	"
Aniline	20	76	(Scholtz, 1912.)
Carbon Tetrachloride	20	31.94	(Gori, 1913.)
Chloroform	18–22	100+	(Müller, 1903.)
Benzene	18–22	100	"
Ethyl Acetate	18–22	59	"
Petroleum Ether	18–22	2.37	"
Pyridine	20–25	80+	(Dehn, 1917; Scholtz, 1912.)
Piperidine	20	56	(Scholtz, 1912.)
Diethylamine	20	36	"
Sesame Oil	20	4.34*	(Zalai, 1910.)
Olive Oil	25	8.3	(U. S. P.)
Oil of Turpentine	25	7.1	"

* Per 100 cc.

100 cc of Olive oil dissolve 4.5 gms. cocaine at 25°. (Walton, 1935.)

COCAINE HYDROCHLORIDE $C_{17}H_{21}NO_4.HCl$.

100 gms. H_2O dissolve 250 gms. of the salt at 25° and 1000 gms. at 80°. (U. S. P.)
100 gms. 92.3% alcohol dissolve 38 gms. salt at 25° and 71 gms. at 60°. (U. S. P.)
100 gms. chloroform dissolve 5.4 gms. salt at 25°. (U. S. P.)
100 gms. glycerol dissolve 25 gms. salt at 15°. (B. P.)

COCAINE PERCHLORATE $C_{17}H_{21}NO_4.HClO_4$.

100 gms. H_2O (containing 8% free $HClO_4$) dissolve 0.26 gm. perchlorate at 6°. (Hofmann, Roth, Höbold and Metzler, 1910.)

HYOSCINE (Scopolamine) **HYDROBROMIDE,** etc.

SOLUBILITY IN SEVERAL SOLVENTS AT 25°. (U. S. P. VIII.)

Solvent.	Grams per 100 Grams Solvent.		
	Hyoscine Hydrobromide $C_{17}H_{21}NO_4HBr.3H_2O$.	Hyoscyamine Hydrobromide $C_{17}H_{23}NO_3.HBr$.	Hyoscyamine Sulfate $(C_{17}H_{23}NO_3)_2.H_2SO_4$
Water	66.6	very soluble	very soluble
Alcohol	6.2	50	15.6
Ether	...	0.062	0.04
Chloroform	0.133	40	0.043

TETRA METHYL DIAMINO BENZHYDROL $C_6H_5C_6(CH_3)_4(NH_2)_2CHOH$.

Freezing-point data for mixtures of tetra methyl diamino benzhydrol and benzene are given by Schmidlin and Lang, 1912.

$C_{17}H_{23}O_3$

ATROPINE $C_{17}H_{23}NO_3$.

SOLUBILITY IN WATER AT 18°. (Kolthoff, 1925.)

The aqueous solution of atropine is very unstable. The compound saponifies to tropin and tropic acid. The solubility diminishes greatly on long shaking. The author obtained constant values after 1 to 2 hours shaking. The saturated solution was filtered and 10 cc. titrated with 0.01 *n* HCl using methyl red as indicator. The results correspond to a solubility of 5.5×10^{-3} mol. or 1.59 gm. per liter. The dissociation constant was determined by colorimetric *p*H estimations in 5 cc. portions of a 0.01 mol. $C_{17}H_{23}NO_3.HCl$ solution to which increasing amounts of 0.01 *n* NaOH were added. The calculated constant $K = 4.5 \times 10^{-5}$.

ATROPINE $C_{17}H_{23}NO_3$.

SOLUBILITY OF ATROPINE, $C_{17}H_{23}NO_3$, AND OF ATROPINE SULFATE, $(C_{17}H_{23}NO_3)_2.SO_2(OH)_2$, IN WATER AND OTHER SOLVENTS.

(U. S. P.; Müller, 1903.)

Solvent.	t°.	Grams Atropine per 100 Grams Solution.	Grams Atropine per 100 Grams Solvent (U. S. P.).	Grams Atropine Sulfate per 100 Gms. Solvent (U. S. P.).
Water	25	0.182 (20°)	0.222 (0.15*)	263.1
Water	80	...	1.18	454.5
Alcohol	25	...	68.44	27
Alcohol	60	...	111.11	52.6
Ether	25	2.21 (20°)	1.62	0.047
Chloroform	25	38.03 (20°)	64.10	0.161
Benzene	20	3.99	...	...
Carbon Tetrachloride	20	0.661	1.130† (1.70‡)	...
Ethyl Acetate	20	3.88	...	...
Petroleum Ether	20	0.83	...	...
Glycerol	15	...	3	33
Aniline	20	...	34§	...
Diethylamine	20	...	67§	...
Pyridine	20	...	73§	...
Piperidine	20	...	114§	...
50% Aq. Glycerol + 3% H_3BO_3	..	10¶	...	...
Oil of Sesame	20	...	0.25*	...

*Zalai, 1910. †At 17°, Schnidelmeiser, 1901. ‡Gori, 1913. §Scholtz, 1912. ¶Baroni and Borlinetto, 1911.

100 cc of Olive Oil dissolve 1.4 gm. atropine at 25°. (Walton, 1915.)

DISTRIBUTION OF ATROPINE BETWEEN WATER AND CHLOROFORM AT 25°.

(Seidell, 1910-11.)

Gms. Atropine Added per 15 cc. H_2O + 15 cc. $CHCl_3$.	Gms. Atropine Recovered per 15 cc. Aqueous Layer (a).	Gms. Atropine Recovered per 15 cc. Chloroform Layer (b).	$\frac{b}{a}$
0.005	0.0010	0.0057	5.7
0.025	0.0021	0.0256	12.2
0.125	0.0049	0.1246	25.4
0.625	0.0160	0.6267	39.1

ATROPINE METHYLBROMIDE $C_{17}H_{23}NO_3.CH_3Br$.

100 gms. water dissolve 100 gms. of the salt at room temp. (Squire and Caines, 1905.)
100 cc. 90% alcohol dissolve 10 gms. of the salt at room temp. " "

HYOSCYAMINE $C_{17}H_{23}NO_3$.

SOLUBILITY IN SEVERAL SOLVENTS AT 18°–22°.
(Müller, 1903.)

Solvent.	Gms. $C_{17}H_{21}NO_3$ per 100 Gms. Solution.	Solvent.	Gms. $C_{17}H_{21}NO_3$ per 100 Gms. Solution.
Water	0.355	Chloroform	100+
Ether	2.02	Acetic Ether	4.903
Ether sat. with H_2O	3.913	Petroleum Ether	0.098
Water sat. with Ether	3.125	Carbon Tetrachloride	0.059
Benzene	0.769		

Menthyl **MANDELATES.** $C_6H_5CH(OH)COOC_{10}H_{19}$.

SOLUBILITY IN ETHYL ALCOHOL.
(Findlay and Hickmans, 1909.)

Solvent.	t°.	Gms. per 100 Gms. Solvent.		Solid Phase.	Solvent.	t°.	Gms. per 100 Gms. Solvent.		Solid Phase.
		L.	*D.*				*L.*	*D.*	
80% Alcohol	35	...	1.08	*D*	80% Alcohol	10	...	0.287	*D*
"*	35	3.19	...	*L*	"	10	0.595	...	*L*
"	35	0.80	0.80	*R*	"	10	0.184	0.184	*R*
"	35	0.544	1.35	*D+R*	"	10	0.404	0.291	*D+R*
"	35	2.83	0.60	*L+R*	"	10	0.505	0.088	*L+R*
"	25	...	0.595	*D*	Abs. Alcohol	0	...	1.06	*D*
"	25	1.64	...	*L*	"	0	1.93	...	*L*
"	25	0.448	0.448	*R*	"	0	0.625	0.625	*R*
"	25	0.321	0.882	*D+R*	"	0	0.535	0.915	*D+R*
"	25	1.192	0.207	*L+R*	"	0	1.03	0.54	*L+R*

* $d_{25} = 0.8517$.

D = *l* menthyl *d* mandelate, $[\alpha]_D^{17.5} = -9.45°$ in alcohol.
L = *l* menthyl *l* mandelate $[\alpha]_D^{20} = -140.92°$ in alcohol.
R = *l* menthyl *r*-mandelate $[\alpha]_D^{11.3} = -75.03$ in alcohol.

MARGARIC ACID $CH_3(CH_2)_{15}COOH$.

Freezing-point data are given for mixtures of:

Margaric Acid + Palmitic acid (Smith, 1936; Shriner, Fulton and Burks, Jr.,
" " + Stearic acid " " " " " " "
" " + " + Palmitic acid (Shriner, Fulton and Burks, Jr., 1933.)

HEPTA DECANE $CH_3(CH_2)_{15}CH_3$.

Freezing-point data are given by Carey and Smith, 1933, for mixtures of hepta decane with hexaca decane and with octa decane.

HEPTA DECANOL (Heptadecyl alcohol) $CH_3(CH_2)_{16}OH$

Freezing-point data are given by Carey and Smith, 1933, for mixtures of hepta decanol with hexa decanol and with octa decanol.

CHRYSENE $C_{18}H_{12}$.

SOLUBILITY IN TOLUENE AND IN ABS. ALCOHOL

([illegible])

100 gms. toluene dissolve 0.24 gm. $C_{18}H_{12}$ at 18°, and 5.39 gms. at 100°.

100 gms. abs. alcohol dissolve 0.097 gm. $C_{18}H_{12}$ at 16°, and 0.170 gm. at boiling point.

Freezing-point data are given by Pascal, 1921, for mixtures of chrysene with anthracene, with carbazole, with phenanthrene and with both carbazole and anthracene.

TRIPHENYL ARSINE $(C_6H_5)_3As$, etc.

Freezing-point data are given by Pascal, 1912, 1921, for mixtures of:

Triphenyl arsine + Triphenyl bismuthine
" " + Triphenyl phosphine
" " + Triphenyl stibine
" " oxide + Triphenyl phosphine oxide
" " " + Triphenyl stibine sulfide
" " " + Triphenyl arsine sulfide
" " " + Triphenyl amine
" " sulfide + Triphenyl phosphine sulfide
" " " + Triphenyl phosphine oxide
" " " + Triphenyl stibine sulfide
" " " + Triphenyl arsine oxide
" bismuthine + Triphenyl phosphine
" " + Triphenyl arsine
" phosphine + Triphenyl amine
" " + Triphenyl arsine
" " + Triphenyl bismuthine
" " oxide + Triphenyl phosphine sulfide
" " " + Triphenyl stibine sulfide
" " sulfide + Triphenyl thio phosphate
" stibine + Triphenyl arsine

TRIPHENYL TRIAZINE, etc.

Freezing-point data for mixtures of triphenyl triazine and methyl diphenyl triazine and for triphenyl triazine and triazine tricarboxylate of ethyl are given by Pascal, 1925.

TRIPHENYL AMINE $(C_6H_5)_3N$.

100 gms. 96 % ethyl alcohol dissolve 0.74 gm. $(C_6H_5)_3N$ at 19°-20°.5 and 5.5 gms. at 74°.

100 gms. 98.5 % methyl alcohol (d_{15} = 0.7998) dissolve 0.53 gm. $(C_6H_5)_3N$ at 19°-20°.5 and 3.3 gms. at 74°. ([illegible], 1916.)

F.-pt. data are given by Pascal (1912) for the following mixtures.

Triphenylamine + Triphenylarsine
Triphenylamine + Triphenylphosphine
Triphenylarsine + Triphenylphosphine
Triphenylarsine + Triphenyl Stibene
Triphenylarsine + Triphenylbismuthine
Triphenylphosphine + "

PHENYL PHOSPHATE, Thiophosphate, Phosphine Oxide, etc.

Freezing-point lowering data are given by Pascal, 1923, for the following mixtures.

Phenyl phosphate $PO(OC_6H_5)_3$ + Phenyl thiophosphate $PS(OC_6H_5)_3$
" " + Triphenyl phosphine oxide $PO(C_6H_5)_3$
Phenylthiophosphate $PS(OC_6H_5)_3$ + " sulfide $PS(C_6H_5)_3$
Triethylphosphine sulfide $PS(C_6H_5)_3$ + " " "
Phenylphosphate $PO(OC_6H_5)_3$ + Phenylmethylphosphate $C_6H_5PO(OC_6H_5)_2$
Triphenylphosphine oxide $PO(C_6H_5)_3$ + Triphenyl phosphine sulfide $PS(C_6H_5)_3$

DIPHENYL -p- PHENYLENE DIAMINE $N,N'(C_6H_5)_2NC_6H_4NH_2$.

Freezing-point data for mixtures of diphenyl p phenylene diamines are given by Dilthey and Escherich, 1933.

RETENE $C_{18}H_{18}$.

Freezing-point data are given for mixtures of retene and:

Anthracene(6)	Picramide(1)	Tetryl(5)
Phenanthrene(6)	Picryl chloride(1)	Tri nitro cresol(4)
Picric acid(1)	Styphnic acid(1)(3)	" " toluene(2)
		" " xylene(5)

(1) Jefremow, 1918; (2) Jefremow, 1919; (3) Jefremow, 1919a; (4) Jefremow and Tichomirowa, 1927; (5) Jefremow and Tichomirowa, 1928; (6) Pascal, 1921.

VESUVIN (Phenylene bis azo-m-phenylene diamine HCl.)
$C_6H_4[N_2C_6H_3(NH_2)_2]_2.HCl$.

100 gms. water	dissolve	8.5	gms.	vesuvin	at 20–25°.	(Dehn, 1917.)
" pyridine	"	11.1	"	"	"	"
" aq. 50% pyridine	"	31.4	"	"	"	"

SALIPYRINE $C_{11}H_{12}N_2O.C_6H_4.OH.COOH$.

SOLUBILITY OF SALIPYRINE IN AQUEOUS SOLUTIONS OF ANTIPYRINE AND OF SODIUM SALICYLATE AT 18°. (Kolthoff, 1927.)

The determinations were made by electrolytic conductivity measurements. At 18° the conductivity of the saturated solution of salipyrine in water was 1.00×10^{-3} rec. ohms. The p_H of the solution was 2.6 and the calculated $[H^{\cdot}] = 2.5 \times 10^{-3}$.

In Aq. $C_{11}H_{12}N_2O$.

Gm. mols. per liter. $C_{11}H_{12}H_2O$.	Salipyrine.
0.0 (H_2O)	0.0132
0.025	0.00712
0.05	0.00520
0.10	0.00432

In Aq. $C_6H_4OHCOONa$.

Gm. mols. per liter. $C_6H_4OHCOONa$.	Salipyrine.
0.05	0.0114
0.10	0.0122
0.20	0.0126

Freezing-point data are given for mixtures of:

Salipyrine + Acetanilide (Hrynakowski and Adamanis, 1933a.)
" + " + Sulfonal (Hrynakowski and Staszewski, 1936.)
" + Antipyrine + Urea (Hrynakowski, 1934.)
" + Sulfonal (Hrynakowski and Adamanis, 1933a.)
" + " + Urea (Hrynakowski and Szmyt, 1938a.)

AZO BENZOIC ACID ETHYL ESTER p $C_2H_5OOCC_6H_4N{:}NC_6H_4COOC_2H_5$.

Freezing-point data for mixtures of the azo and azoxy benzoic acid ethyl esters are given by de Kock, 1904.

Hexamethyl **MELLITIC ACID** Ester $C_6(COOCH_3)_6$.

Data for the ternary system hexamethyl mellitic acid ester, phenol and water are given by Timmermans (1907)

CODEINE $C_{18}H_{21}NO_3.H_2O$.

CODEINE PHOSPHATE $C_{18}H_{21}NO_3.H_3PO_4.2H_2O$.

CODEINE SULFATE $(C_{18}H_{21}NO_3)_2.H_2SO_4.5H_2O$.

SOLUBILITY OF EACH SEPARATELY IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. per 100 Gms. Solvent. Codeine.	C. Phosphate.	C. Sulfate.	Authority.
Water	25	0.80-1.7	44.9	3.3	(U. S. P., Baroni and Barlattaro,
"	20	0.84			(Zalai 1910) (1911)
"	80	1.70	222	16	(U. S. P.)
Alcohol (92.3 Wt. %)	25	63.7	0.384	0.1	(Schaeffer, 1913, U. S. P.)
" "	60	108.7	1.04	0.25	(U. S. P.)
Methyl Alcohol	25	62.8		0.36	(Schaeffer, 1913)
Chloroform	25	134-151	0.015	0.009	(Schaeffer, U. S. P.)
Carbon Tetrachloride	20	2.04-1.43			(Kozai 1911, Beilstein, Suppl.)
Ether	25	8	0.075		(U. S. P.)
Benzene	25	11.4		Insol.	(Schaeffer, 1913)
Trichlorethylene	15	12			(Wester and Bruins, 1914)
3 Gms. H_3BO_3 per 100 cc. aq. 50% Glycerol	ord. t.	4			(Baroni and Barlattaro, 1911)

100 gms. trichlorethylene dissolve 0.014 gm. codeine hydrochloride at 15°. (Wester and Bruins, 1914.)

Data for the solubility of codeine and codeine sulfate in mixtures of alcohols, benzene and chloroform are given by Schaeffer (1913).

100 gms. Pet. Ether dissolve 0.14-0.22 gm. codeine at 25° (Warren, 1933
100 cc Olive oil dissolve 1.6 gms. codeine at 25° (Walton, 1915.)

CODEINE TRICHLOR ACETATE $C_{18}H_{21}O_3N.CCl_3COOH.2H_2O$

100 gms. sat. solution of codeine trichlor acetate in water contain 2.8 gms. of the salt (?.2H$_2$O) at 15° and 21.91 gms. at 54.5°. (Florence, 192

CODEINE HYDROCHLORIDE $C_{18}H_{21}NO_3.HCl.2H_2O$

100 gms. H_2O dissolve 3.51 gms. $C_{18}H_{21}NO_3.HCl.2H_2O$ at 15°.5. (Wilson, 1922.)

CODEINE PICRATE $C_{18}H_{21}NO_3.HO.C_6H_2(NO_2)_3$ (m. pt. 196°.7).

100 gms. sat. solution of codeine picrate				
in water	contain	0.11	gm. $C_{18}H_{21}NO_3.HOC_6H_2(NO_2)_3$	at 20°
in abs. alcohol	"	0.105	"	"
in acetone	"	4.89	"	"

(Maplethorpe and Evers, 1925.)

BORNYL PHTHALATE acid-d- $C_{10}H_{17}OOC_6H_4COOH$.

Freezing-point data for mixtures of the d and l compound are given by Ross and Somerville, 1926.

LINOLENIC HEXABROMIDE $C_{18}H_{30}Br_6O_2$.

Qualitative determination of the solubility of linolenic hexabromide and of its Ba, Pb, K and Zn salts in 28 solvents are given by Imperial and West, 1926.

LINOLEIC ACID $C_{18}H_{32}O_2$.

Freezing-point data for mixtures of linoleic acid with iso oleic, with oleic , with palmitic and with stearic acids are given by Koczy and Griengl, 1931.

Tri**AMYLOSE** $[C_6H_{10}O_5]_3.4H_2O$, β Hexa**AMYLOSE** $[C_6H_{10}O_5]_6.9H_2O$.

Solubility of Each in Water.

(Pringsheim and Dernikos, 1922.)

The compounds were each dissolved in water by warming and the solutions allowed to stand at 20° untill completely crystallized.

100 gms. of the sat. solution of Tri amylose contain 1.39 gms. of the anhydrous compound.

100 gms. of the sat. solution β-Hexa amylose contain 2.40 gms. of the anhydrous compound.

The accuracy of the above results is questioned by Karrer, 1922, who found no difference in the solubility when the finely powdered compounds were shaken with water at the same temperature.

α ELEOSTEARIC ACID $C_{17}H_{31}COOH$.

Solubility of α Eleostearic Acid in Aqueous Ethyl Alcohol at 0°.

(Ku, 1937.)

Vol. % C_2H_5OH in aq. solvent	Gms. $C_{17}H_{31}COOH$ per 100 gms. sat. sol.	Vol. % C_2H_5OH in aq. solvent	Gms. $C_{17}H_{31}COOH$ per 100 gms. sat. sol.
54.84	0.023	76.05	0.614
59.61	0.070	80.33	0.983
70.19	0.113	90.14	3.28

100 gms. sat. solution of α eleostearic acid in nitro benzene contain 3.75 gms. $C_{17}H_{31}COOH$ at 0°. (Ku, 1937.)

STEAROLIC ACID $CH_3(CH_2)_7C{:}C(CH_2)_7COOH$.

Freezing-point data are given by Rheinboldt and Lauber, 1929, for mixtures of stearolic acid with cholic acid and with hyodesoxy cholic acid.

CHAULMOOGRIC ACID $\underbrace{CH{:}CHCH_2CH_2CH}(CH_2)_{12}COOH$.

Freezing-point data are given by Cole and Cardoso, 1937, for mixtures of chaulmoogric acid with hydnocarpic acid and for mixtures of hydnocarpic acid with palmitic acid.

RAFFINOSE $C_{18}H_{32}O_{16}+5H_2O$.

Solubility of Raffinose in Mixtures of Water and Pyridine at 25°.

(Pucher and Dehn, 1921.)

A high degree of accuracy is not clained for the results. Constant agitation was evidently not employed to insure saturation. The solutions were analyzed by evaporation and weighing the residue.

Per cent C_5H_5N in solvent.	Gms. Raffinose per 100 gms. solvent.	Per cent C_5H_5N in solvent.	Gms. Raffinose per 100 gms. solvent.	Per cent C_5H_5N in solvent.	Gms. Raffinose per 100 gms. solvent.
0.0 (=H_2O)	29.83	60	6.51	92	24.7
10.0	23.12	70	5.32	94	36.9
20	22.16	80	7.40	96	41.9
30	18.88	81.4	4.49	98	45.7
40	13.42	90	24.50	160	79.08
50	9.94	91	24.6		

100 gms. abs. alcohol dissolve 3.6 gms. raffinose at 20-25°.

100 gms. equi. molecular mixture of alcohol and quinoline dissolve 5.04 gms. raffinose at 20-25°.

(Pucher and Dehn, 1921.)

RAFFINOSE $C_{18}H_{32}O_{16}.5H_2O$.

SOLUBILITY OF RAFFINOSE IN WATER.

(Hungerford and Hess, 1934.)

t°	Gms. $C_{18}H_{32}O_{16}.5H_2O$ per 100 gms. Sat. Sol.	Gms. $C_{18}H_{32}O_{16}.5H_2O$ per 100 gms. Water.	t°	Gms. $C_{18}H_{32}O_{16}.5H_2O$ per 100 gms. Sat. Sol.	Gms. $C_{18}H_{32}O_{16}.5H_2O$ per 100 gms. Water.
0.0	3.4	3.5	30	21.4	27.1
10.0	6.2	6.6	40	33.3	49.9
16.38	9.48	10.45	50	47.1	88.9
20.0	12.0	13.6	60	60.6	154.8
25.05	16.28	19.45	70	74.1	286.1
			80.4	84.84	553.54

The solid phase is $C_{18}H_{32}O_{16}.5H_2O$ in all cases.

The solubility of raffinose anhydride at 25° is about 1000 gms. per 100 gms. of H_2O and the solution is too viscous to permit a rapid transition to the penta hydrate which is the stable form below 80°.

OLEIC ACID $C_8H_{17}CH:CH(CH_2)_7COOH$.

SOLUBILITY OF OLEIC ACID IN AQUEOUS ALCOHOL SOLUTIONS AT 25°.

(Seidell, 1910.)

Oleic acid of $d_{25} = 0.8935$ and containing 99.8% acid, determined by titration, was used. It was found that the addition of as little as one drop of this acid to aq. alcohol solutions containing up to 50 wt. % C_2H_5OH caused an opalescence on shaking, therefore, indicating a solubility of less than about 0.05 gm. acid per 100 cc. water or of aq. alcohol. With solutions containing more than 50 wt. % C_2H_5OH the following results were obtained.

Wt. Per cent C_2H_5OH.	cc. Oleic Acid per 100 cc. Aq. Alcohol to produce cloudiness.	Remarks.
51	0.08–0.2	Cloudiness gradually increased.
58.2	0.2 –0.4	" " "
65.5	0.3 –0.6	Cloudiness disappeared when about 1 cc. acid had been added.
70.2	0.6 –1	" " " " 3 cc. " " " "
81.4	∞	No cloudiness appeared at all.

It was found that although the end points obtained by addition of oleic acid to aq. alcohol mixtures are not sharp, they become so when the procedure is changed to addition of H_2O to mixtures of oleic acid and alcohol. By this method perfectly clear liquid may be transformed by one drop of the H_2O to an opalescent mixture which, after standing a few minutes, separates into two liquid layers. Determinations made in this way gave the following observed and calculated quantities.

Gms. of Constituents to Yield Opalescent Mixtures.			Results Calculated from the Plotted Curve.		
Alcohol + Oleic Acid Mixture		H_2O Added to Cause Separation.	Wt. Per cent C_2H_5OH in Aq. Alcohol.	cc. Oleic Acid per 100 cc. Aq. Alcohol.	Gms. Oleic Acid per 100 Gms. Sat. Sol.
C_2H_5OH.	Oleic Acid.				
15.30	1.794	10.4	57	...	0
15.30	3.588	10.2	58.5	0	5
15.30	4.485	9.8	60	11	12.3
15.30	7.175	9.25	62.5	30	20
15.30	11.210	8.05	65	49	30.5
24.42	22.420	10.10	67.5	69	40
15.30	20.810	6.50	70	91	50
1.195	8.969	0.321	75.5	...	68.5
			80	...	88

After standing 24 hours the opalescent mixtures separated into layers which, on analysis, gave the results shown in the following table:

COMPOSITION OF UPPER AND LOWER LAYERS OBTAINED BY THE ADDITION OF WATER TO MIXTURES OF AQUEOUS ALCOHOL AND OLEIC ACID AT 25°.

Composition of Original Mixture.				After Separation into Two Layers:					
				Lower Layer.			Upper Layer.		
Wt. % C_2H_5OH in Aq. Alc. Used.	cc. Aq. Alcohol Mixture.	cc. Oleic Acid.	cc. H_2O to Cause Separation.	cc. Total Vol.	Sp. Gr.	cc. Oleic Acid.	cc. Total Vol.	Sp. Gr.	cc. Oleic Acid.
70.2	25	2	3.90	29	0.893	1.48	1	...	0.35
70.2	25	4	3.70	26	0.890	1.89	6	0.875	1.98
65.5	26.5	5	1.75	22.7	0.891	1.93	9.3	0.875	2.78
70.2	25	8	2.75	16	0.893	0.98	19	0.876	6.59
70.2	25	12.5	1.55	6	0.890	0.37	33.2	0.878	11.87
70.2	35	25	1	4.5	...	0.28	55.5	0.877	24.14

The C_2H_5OH in the two layers could not be determined on account of excessive foaming during distillation of the neutralized solution. Some losses occurred in transferring the original mixtures to the graduated cylinders and differences between final amounts and those originally present are due to these losses.

SOLUBILITY OF OLEIC ACID IN AQUEOUS ETHYL ALCOHOL AT 0°.

(Ku, 1937.)

Vol. % C_2H_5OH in aq. solvent	Gms. $C_{18}H_{34}O_2$ per 100 gms. sat. sol.	Vol. % C_2H_5OH in aq. solvent	Gms. $C_{18}H_{34}O_2$ per 100 gms. sat. sol.
54.84	0.20	73.93	4.06
59.61	0.42	75.07	7.06
70.19	1.82	76.05	28.00
71.87	2.44		

SOLUBILITY OF OLEIC ACID IN AQUEOUS SOLUTIONS OF BILE SALTS.

(Moore, Wilson and Hutchinson, 1909.)

Solvent.	Gms. Oleic Acid per 100 Gms. Sat. Sol.
Water	less than 0.1
5% Aq. Solution of Bile Salts	about 0.5
5% Aq. Solution of Bile Salts+1% Lecithin	4

OLEIC ACID $C_8H_{17}CH : CH(CH_2)_7COOH$.

SOLUBILITY OF OLEIC ACID IN SEVERAL SOLVENTS AT 0°. (Lebrun, 1925, 1930.)

Solvent.	B. pt. of solvent.	Gms. $C_{18}H_{34}O_2$ per 100 gms. solvent.
Dichlor acetylene (cis)	60°.2	>100
" " (trans)	48°.3	>100
Ethyl chloroisocrotonate	-	>100
Bromo butene 2	85°.5–85°.6	>100
" " 2	93°.9	>100
Crotonic nitrile	107°.7–108°.2	39.1
" "	121°.8–122°.2	30.2

DISTRIBUTION OF OLEIC ACID BETWEEN AQUEOUS ALCOHOL AND BENZINE. (Holde,'10.)

Strength of Aq. Alcohol in Vol. Per cent.	Gm. (Approx.) of Oleic Acid in:		Dist. Coef.
	50 cc. Aq. Alcohol Layer.	50 cc. Benzine Layer.	
84.1	0.277	0.723	2.61
76.9	0.112	0.888	7.93
63.7	0.025	0.975	39
50.5	0.006	0.994	166
42.4	0.002	0.998	499

SOLIDIFICATION-POINTS OF MIXTURES OF OLEIC AND STEARIC ACIDS. (Meldrum, '11)

Solidification Temp.	Per cent Oleic Acid in Mixture.	Solidification Temp.	Per cent Oleic Acid in Mixture.
0	54.8	50	44.7
10	53.3	60	41.2
20	51.6	70	36.6
30	49.7	80	30.5
40	47.6		

Additional data for the above system as well as for mixtures of oleic and palmitic acids and for the ternary system oleic, palmitic and stearic acids are given by Carlinfante and Levi-Malvano (1909). Results for Oleic Acid + Stearic acid are also given by Fokin (1912).

Freezing-point data are also given for mixtures of:

Oleic acid + Palmitic acid (Smith, 1939, Koczy and Griengl, 1941.)
" " + Stearic acid " " " " " "
" " + " " + Palmitic (Dubovitz, 1928.)
" " + Elaidic acid (Griffiths and Hilditch, 1932.)
" " + Erythritol (Puschin and Dezelic, 1932.)
" " + Glycerol " " " "
" " + Linoleic acid (Koczy and Griengl, 1941.)

The melting-point depressions of mixtures of oleic acid and other fatty acids were used by Wenzel, 1934, as a method for estimating the percentage of individual fatty acids in mixtures.

TriOLEIN $(C_{18}H_{33}O_2)_3C_3H_5$.

SOLIDIFICATION-POINTS OF MIXTURES OF TRIOLEIN AND OTHER FATS.
(Kremann and Schoulz, 1912.)

Triolein + Tripalmitin. t°.	Wt. Per cent Triolein.	Triolein + Tristearin. t°.	Wt. Per cent Triolein.	Tripalmitin + Tristearin. t°.	Wt. Per cent Tristearin.
−7	100	+28	95.2	60.4	90
+25	93.9	44	85.3	58	75
48.2	78.5	50.7	76.7	57.8	60.4
50	73.9	56	68.8	56	60.2
56.9	53	64.3	47.2	57.2	54
60.9	27.2	64.3	25.4	55.1	44.8
62.6	0	56	0	54.8	41.2
				60.4	8.4

Data for the ternary system, triolein, tripalmitin and tristearin are also given.

PETROSELINIC ACID $CH_3(CH_2)_{10}CH:CH(CH_2)_4COOH$.

Freezing-point data for mixtures of the cis and trans compound are given by Griffiths and Hilditch, 1932.

ELAIDIC ACID $C_8H_{17}CH:CH(CH_2)_7COOH$.

SOLUBILITY OF ELAIDIC ACID IN SEVERAL STERIOISOMERIC SOLVENTS.

(Lebrun, 1925, 1930.)

Solvent	b. pt. of solvent	t°	Gms. $C_{18}H_{34}O_2$ per 100 gms. solvent
Dichlor acetylene (cis)	60.2	0	6.20
" " (trans)	48.3	0	10.97
β Ethyl chloro iso crotonate(cis)	—	20	47.4
Bromo butane-2(cis)	94.9	0	3.68
" " -2(trans)	85.5- 85.6	0	4.10
Crotonic nitrile	107.7-108.2	25	17.45
" "	121.8-122.2	25	12.33

Freezing-point data are given for mixtures of:

Elaidic acid + Erythritol (Puschin and Dezelic, 1932.)
" " + Oleic acid (Griffiths and Hilditch, 1932.)
" " + Palmitic acid (Smith, 1939.)
" " + Stearic acid " "

STEARIC ACID $CH_3(CH_2)_{16}COOH$.

100 gms. H_2O dissolve 0.1 gm. stearic acid at 37°.
100 gms. 5% aqueous solution of bile salts dissolve less than 0.1 gm. stearic acid.
100 gms. 5% aq. sol. of bile salt + 1% lecithin dissolve 0.2 gm. stearic acid.
In the same solvents there is dissolved of sodium stearate, 0.1, 0.2 and 0.7 gm. respectively. (Moore, Wilson and Hutchinson, 1909.)

STEARIC ACID $CH_3(CH_2)_{16}COOH$.

SOLUBILITY OF STEARIC ACID IN AQUEOUS ETHYL ALCOHOL SOLUTIONS.

(Thomas and Yu, 1923; Thomas and Mattikow, 1926.)

Wt. % C_2H_5OH in solvent.	$d\frac{25}{4}$ of Solvent.	Gms. $CH_3(CH_2)_{16}COOH$ per 100 cc. sat. solution at		
		0° ± 1°.0 (a).	10° ± 0°.5 (b).	25° ± 0°.05 (c).
63.07	0.8778	–	0.031	0.087
86.16	0.8236	0.061	0.232	1.014
91.53	0.8094	0.113	0.396	1.803

(a) The mixtures were shaken 4 times daily for 5 1/2 days and the determinations repeated ofter another period of 5 1/2 days.

(b) The mixtures were shaken 2 times daily for 10 days and the determinations repeated ofter another period of 3 days.

(c) Saturation was obtained by constant agitation in a thermostat.

100 gms. methyl formate dissolve 1.3 gms. stearic acid at 25°. (Kröber, 1919.)

SOLUBILITY OF STEARIC ACID IN AQUEOUS ETHYL ALCOHOL AT 0°.

(Ku, 1937.)

Vol. % C_2H_5OH in aq. solvent	Gms. $C_{18}H_{36}O_2$ per 100 gms. sat. sol.	Vol. % C_2H_5OH in aq. solvent	Gms. $C_{18}H_{36}O_2$ per 100 gms. sat. sol.
58.84	0.048	76.05	0.22
59.61	0.070	80.33	0.37
70.16	0.113	90.14	0.88

SOLUBILITY OF STEARIC ACID IN AQUEOUS ETHYL ALCOHOL AT 25°.

([illegible])

Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_{17}H_{35}COOH$ per 100 Gms. Sat. Sol.	Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. $C_{17}H_{35}COOH$ per 100 Gms. Sat. Sol.
0	0.990	0.034	70	0.865	0.80
20	0.967	0.04	80	0.841	1.03
40	0.932	0.10	90	0.818	3.30
50	0.911	0.18	95	0.807	5.55
60	0.888	0.40	100	0.795	8.50

100 cc. sat. sol. in 94.3 Vol. % C_2H_5OH contain 0.0990 gm. $C_{17}H_{35}COOH$ at 0° (d_0 = 0.8418).
100 cc. sat. sol. in 95.1 Vol. % C_2H_5OH contain 0.1130 gm. $C_{17}H_{35}COOH$ at 0° (d_0 = 0.8287).
100 cc. sat. sol. in 95.7 Vol. % C_2H_5OH contain 0.1240 gm. $C_{17}H_{35}COOH$ at 0° (d_0 = 0.8265).

Saturation was approached from above without constant agitation. (Emerson, 1907.)

SOLUBILITY OF STEARIC ACID IN ETHYL ALCOHOL AT SEVERAL TEMPERATURES.

(Falciola, 1910.)

t°.	Gms. $C_{17}H_{35}COOH$ per 100 cc. of		
	Absolute Alcohol.	[illegible] % Alcohol.	[illegible] % Alcohol.
10	0.9	0.15	
20	2	...	0.08 (25°)
30	4.5	0.40	0.10
40	14.8	0.77	0.12

100 cc. sat. solution in 94.4 Vol. % CH_3OH ("methylated alcohol" of d = 0.8183) contain 0.15 gm. $C_{17}H_{35}COOH$ at +0.2°. Saturation was approached from above without constant agitation. (Hehner and Mitchell, 1897.)

SOLUBILITY OF STEARIC ACID IN SEVERAL SOLVENTS AT 25°.

(Seidell, 1910.)

Solvent.	d of Solvent.	d_{25} of Sat. Sol.	Gms. $C_{17}H_{35}COOH$ per 100 Gms. Sat. Sol.
Acetone	d_{18} = 0.797	0.815	4.73
Amyl Alcohol (iso)	d_{20} = 0.817	0.815	9.44
Amyl Acetate	d_{20} = 0.875	0.867	11.19
Carbon Disulfide	d_{20} = 1.259	1.164	19.20
Carbon Tetrachloride	d_{20} = 1.587	1.465	10.25
Chloroform	d_{25} = 1.476	1.332	15.54
Ether (abs.)	d_{25} = 0.711	0.744	20.04
Ethyl Acetate	d_{20} = 0.892	0.805	7.46
Nitrobenzene	d_{25} = 1.205	1.199	1.24
Toluene	d_{15} = 0.872	0.865	13.61

Fusion-point data for stearic acid + tristearin and for stearic acid + tristearin + palmitic acid are given by Kremann and Kropsch (1914).

STEARIC ACID

Freezing-point data are also given for mixtures of Stearic acid and:

Apocholic acid(10)
Arachidic acid(16)
Cholic acid(11)
Desoxy cholic acid(10)
Elaidic acid(14)
Erythritol(9)
Glycerol(9)
Hyodesoxy cholic acid(11)
Iso oleic acid(15)
Linoleic acid(15)
Mannitol(9)
Margaric acid(12)(13)
Margaric acid + Palmitic acid(12)
Naphthalene(2)
Oleic acid(14)(15)
Palmitic acid(5)(6)(12)
" " + oleic(1)(3)(4)(8)
Tri palmitin(7)

(1) Carlinfanti and Levi-Malvano, 1909; (2) Courtonne, 1882; (3) Dubovitz, 1928; (4) Fokin, 1912; (5) Giua, 1916; (6) Jefremow, 1927a; (7) Kremann and Klein, 1913; (8) Meldrum, 1913; (9) Puschin and Dezelic, 1932; (10) Rheinboldt, Flume and König, 1927; (11) Rheinboldt and Lauber, 1929; (12) Shriner, Fulton and Burks, 1933; (13) Smith, 1936; (14) Smith, 1939; (15) Koczy and Griengl, 1931; (16) von Meyer, Brod and Soyka, 1913.

The melting-point depressions of mixtures of stearic and other fatty acids were used by Wenzel, 1934, as a method for estimating individual fatty acids in mixtures.

DISTEARINS

SOLUBILITY OF DI STEARINS IN SEVERAL SOLVENTS.

(Robinson, Roche and King, 1932.)

Ten cc. of the solvent were saturated at 50° with the glyceride and then shaken for several hours at the temperature of the experiment. One cc. of each saturated solution was withdrawn and evaporated to dryness and the residue weighed. All solvents were anhydrous.

Di Stearin	M. pt.	Solvent	t°	Gms. di stearin per 100cc solvent
α Capro-α'β-di stearin	48.2	Acetone	29.0	39.45
β " α,α' "	56.2	"	29.0	2.57
α " α',β "	48.2	Alcohol	27.5	0.22
β " α',α' "	56.2	"	27.5	0.14
α Lauro α' β "	50.6	Pet. Ether	27.5	38.41
β " α,α' "	59.8	" "	27.5	11.42
α Myristo α',β "	58.5	Alcohol	29.0	0.59
β " α!α' "	63.5	"	29.0	0.47
α Palmito α',β "	62.6	"	27.5	0.42
β " α,α' "	68.0	"	27.5	0.10
α " α'β "	62.6	Acetone	27.5	1.82
β " α,α' "	68.0	"	27.5	0.61

TRI STEARIN $C_3H_5[CH_3(CH_2)_{16}CO_2]_3$

SOLUBILITY OF TRISTEARIN IN SEVERAL SOLVENTS.
(Loskit, 1928.)

The determinations were made by the thermic, the sealed tube and the analytical methods. The author's results were plotted and the following values estimated from the curves.

t°	Gms. $C_3H_5[CH_3(CH_2)_{16}CO_2]_3$ per 100 gms. sat. solution in: C_6H_6	$(C_2H_5)_2O$	$CHCl_3$	C_2H_5OH	CS_2
5	0.7	—	1.0	—	—
10	1.0	—	3.5	—	0.2
15	1.5	—	6.7	—	0.5
20	—	0.3	10.5	0.02	1.0
25	4.2	0.5	15.0	—	1.6
30	7.0	2.0	20.0		4.5
35	12.5	5.5	27.0	—	12.0
40	23.0	11.5	38.0	—	28.5
45	37.0	27.5	42.5	—	40.0
50	51.0	41.0	51.0	0.03	51.5
60	75.0	72.5	71.0	0.15	72.0
70	93.0	94.0	94.0	0.6(65°) 1.2(67°)	91.0

Similar results are also given for Tri palmitin, Tri myristin, Tri laurin and Tri caprin. Results for the solubility of Tri acetin, Tri butyrin, Tri capronin and Tri caprylin in benzene are also given by Loskit.

Freezing-point data are given for mixtures of Tri stearin and:

Palmitic acid + stearic acid (Kremann and Kropsch, 1914.)
" " + tri palmitin " " " "
Stearic acid + " " " " " "
Tri olean + " " (Kremann and Schoulz, 1912.)
Tri palmitin (Meldrum, 1911.)

PHENACYL STEARATE $CH_3(CH_2)_{16}COO.CH_2COC_6H_5$ etc.

SOLUBILITY OF PHENACYL, BROMO PHENACYL AND CHLORO PHENACYL STEARATES IN 95% ETHYL ALCOHOL.
(Hann, Reid and Jameson, 1930.)

Stearate	Formula	Gms. Stearate per 100cc 95% alcohol at: 20°	25°
Phenacyl Stearate	$CH_3(CH_2)_{16}COO.CH_2COC_6H_5$	0.2160	0.4550
p Bromo Phenacyl Stearate	$CH_3(CH_2)_{16}COOCH_2COC_6H_4Br$	0.0200	0.0260
p Chloro " "	$CH_3(CH_2)_{16}COOCH_2COC_6H_4Cl$	0.0648	0.1000

100 gms Abs. Alcohol dissolve 13.6 gms stearin at 20-25°. Fischer and Kohn, 1921.
" Quinoline " 5.35 " " " "

STEARAMIDE $CH_3(CH_2)_{16}CONH_2$.

Freezing-point data for mixtures of stearamide and palmitamide are given by Guy and Smith, 1939.

STEARIC ANHYDRIDE $(C_{17}H_{35}CO)_2O$.

100 gms. abs. alcohol dissolve 0.023 gm. stearic anhydride at 20°. (Whitby, 1926.)

ETHYL PALMITATE $CH_3(CH_2)_{14}COOC_2H_5$.

Freezing-point data for mixtures of ethyl palmitate with ethyl stearate and with ethyl margarate are given by Smith, 1931.

Ethylene, Propylene, etc. GLYCOL ESTERS.

Solubility of Stearic, and Palmitic Esters of Ethylene, Propylene and Trimethylene Glycol in Absolute Alcohol at 0° and 15°.

(Howe, 1918.)

Saturated solutions were prepared at a temperature slightly above 15° and these were kept for 16 hours in a thermostat at 15°. About 10 cc. of the clear supernatant solution were withdrawn, weighed accurately and the alcohol evaporated and the residue dried at 95° and weighed. The remainder of the saturated solution was placed in a mixture of melting ice and kept at 0° in a refrigerator for several hours. The supernatant solution was again analyzed as before.

Compound.				Formula.	M. pt.	Gms cmpd. par 100 gms. C_2H_5OH at	
						0°.	15°.
Mono Stearic	Ester of	Ethylene	Glycol	$CH_2OH.CH_2(C_{18}H_{35}O_2)$	58.5	0.67	2.0
Di	»	»	»	$CH_2(C_{18}H_{35}O_2).CH_2(C_{18}H_{35}O_2)$	75.0	0.01	0.02
Mono Palmitic	»	»	»	$CH_2OH.CH_2(C_{16}H_{31}O_2)$	51.5	1.62	10.0
Di	»	»	»	$CH_2(C_{16}H_{31}O_2)CH_2(C_{16}H_{31}O_2)$	68.7	0.018	0.055
Mono Stearic	»	Propylene	»	1.2$CH_3CHOHCH_2(C_{18}H_{35}O_2)$	59.5	0.021	0.034
Di	»	»	»	» $CH_3CH(C_{18}H_{35}O_2)CH_2(C_{18}H_{35}O_2)$	72.3	0.0012	0.0063
Mono Palmitic	»	»	»	» $CH_3CHOH.CH_2(C_{16}H_{31}O_2)$	54.2	0.0193	0.0907
Di	»	»	»	» $CH_3CH(C_{16}H_{31}O_2)CH_2(C_{16}H_{31}O_2)$	68.8	0.0516	0.0115
Mono stearic	»	Trimethylene	»	1.3$CH_2OHCH_2CH_2(C_{18}H_{35}O_2)$	60.5	0.01431	0.0305
Di	»	»	»	» $CH_2(C_{18}H_{35}O_2)CH_2.CH_2(C_{18}H_{35}O_2)$	64.7	0.00126	0.00381
Di Palmitic	»	»	»	» $CH_2(C_{16}H_{31}O_2)CH_2.CH_2(C_{16}H_{31}O_2)$	56.2	0.0244	0.0517

OCTA DECYL IODIDE $CH_3(CH_2)_{16}CH_2I$.

Freezing-point data are given by Smith, 1932b, for mixtures of octa decyl iodide with hexa decyl (cetyl) iodide and with iodo hexa decane.

OCTA DECANE $CH_3(CH_2)_{16}CH_3$.

Freezing-point data are given for mixtures of:

Octa decane + Hexa decane (Smith, 1932b.)
" " + Hepta decane (Carey and Smith, 1933.)

OCTA DECANOL (Octa decyl alcohol) $CH_3(CH_2)_{16}CH_2OH$.

Freezing-point data are given for mixtures of:

Octa decanol + Hexa decanol (Smith, 1931; Carey and Smith, 1933.)
" " + Hepta decanol (Carey and Smith, 1933.)

TRINITRO TRIPHENYL METHANE $p,p',p''\ CH(C_6H_4NO_2)_3$.

Freezing point data for mixtures of trinitro triphenyl methane and sarcosine anhydride are given by Pfeiffer and Angern, 1926.

DIPIPERONAL ACETONE $(CH:CH.C_6H_3O_2CH_2)_2CO$.

Freezing-point data for mixtures of dipiperonal acetone and iodo biphenyl are given by Pfeiffer, Schmitz and Inoue, 1929.

CINNAMYLIDENE β NAPHTHYLAMINE $C_6H_5CH:CH.CH:N.C_{10}H_7$.

Freezing point data for mixtures of cinnamylidene β naphthylamine and diphenyl butadien are given by Pascal, 1914.

BENZOYL DIPHENYL p $C_6H_5.CO.C_6H_4.C_6H_5$.

SOLUBILITY OF BENZOYL DIPHENYL IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25°.

(Hammett and Chapman, 1934.)

Gms. H_2SO_4 per 100 gms. aq. solvent	Gms. $C_{19}H_{14}O$ per 100 gms. sat. sol.
70.46	0.00088
75.55	0.00552
77.80	0.0196
78.70	0.0414
79.77	0.2066

TRIPHENYL BROMO (and Chloro) METHANE $(C_6H_5)_3CBr$.

100 gms. C_6H_6 dissolve 19.5 gms. $(C_6H_5)_3CBr$ at 25°.
" " " " 85.8 " $(C_6H_5)_3CCl$ " " (Balford, 1933.)

Triphenyl **METHANE** $CH(C_6H_5)_3$.

SOLUBILITY IN ANILINE.

(Hartley and Thomas, 1906.)

By synthetic method, see page 291.

t°.	Gms. $CH(C_6H_5)_3$ per 100 Gms. Solution.	Mol per cent $CH(C_6H_5)_3$	Solid Phase	t°.	Gms. $CH(C_6H_5)_3$ per 100 Gms. Solution.	Mol per cent $CH(C_6H_5)_3$	Solid Phase.
23.0	5.4	1.85	$CH(C_6H_5)_3.C_6H_5NH_2$ rhombic	71.3	67.9	44.6	$CH(C_6H_5)_3.C_6H_5NH_2$ rhombic
35.3	9.5	3.8	"	71.6	71.7	49.1	"
43.0	13.5	5.6	"	71.2	76.3	55.1	"
52.1	21.9	9.7	"	70.6	78.3	57.9	"
61.4	30.5	17.8	"	71.6	82.1	63.5	$CH(C_6H_5)_3$ monoclinic
66.0	47.2	25.4	"	74.3	84.9	68.2	"
68.7	54.8	31.0	"	82.1	91.7	80.9	"
70.1	64.6	40.9	"	87.3	96.1	90.2	"

100 gms. sat. solution of triphenyl methane in liquid sulfur dioxide contain 16 gms. $CH(C_6H_5)_3$ at ? t°. (DeCarli, 1927.)

Triphenyl **METHANE**

SOLUBILITY OF TRI PHENYL METHANE IN CARBON BISULPHIDE.

(Etard — Ann. chim. phys. [7] 2, 570, '94; below −80°, Arctowski — Z. anorg. Ch. 11, 273, '95.)

t°.	Gms. $CH(C_6H_5)_3$ per 100 Gms. Solution.	t°.	Gms. $CH(C_6H_5)_3$ per 100 Gms. Solution.	t°.	Gms. $CH(C_6H_5)_3$ per 100 Gms. Solution.
−113.5	0.98	−40	7.5	40	63.7
−102	1.24	−20	13.7	50	72.4
− 91	1.56	0	25.8	60	78.6
− 83	1.91	+10	38.7	70	85.6
− 60	3.4	20	43.2	80	92.2
		30	52.9		

SOLUBILITY OF TRI PHENYL METHANE IN HEXANE AND IN CHLOROFORM. (Etard.)

t°.	Gms. $CH(C_6H_5)_3$ per 100 Gms. Solution in:		t°.	Gms. $CH(C_6H_5)_3$ per 100 Gms. Solution in:	
	Hexane.	Chloroform.		Hexane.	Chloroform.
−50	...	10.5	30	12.5	48.8
−30	1.2	15.2	40	20.0	56.1
−20	1.6	19.0	50	25.8	63.8
−10	2.2	23.5	60	45.7	71.7
0	3.5	28.9	70	62.0	79.8
+10	5.6	35.0	80	78.5	87.2
20	8.3	41.5	90	97.0	...

SOLUBILITY OF TRI PHENYL METHANE IN:

(Hartley and Thomas.)

Pyrrole.				Thiophene.			
t°.	Gms. $CH(C_6H_5)_3$ per 100 Gms. Sol.	Mol. per cent $CH(C_6H_5)_3$.	Solid Phase.	t°.	Gms. $CH(C_6H_5)_3$ per 100 Gms. Solution.	Mol. per cent $CH(C_6H_5)_3$.	Solid Phase.
24.6	24.3	8.1	$CH(C_6H_5)_3.C_4H_4NH$ rhombs	25.7	26.0	10.8	$CH(C_6H_5)_3.C_4H_4S$ rhombs
29.0	29.8	10.4	"	33.5	31.1	13.5	"
31.5	33.4	12.1	"	44.0	43.6	21.1	"
36.8	40.6	15.8	$CH(C_6H_5)_3$ monoclinic	47.6	48.4	24.4	"
42.7	49.1	20.9	"	53.5	58.7	32.9	"
46.9	56.0	25.9	"	57.4	70.2	44.7	"
53.2	63.9	32.8	"	57.6	74.8	50.6	"
60.0	72.3	41.8	"	62.7	78.7	56.0	$CH(C_6H_5)_3$ monoclinic
63.9	76.7	47.4	"	67.0	81.9	60.8	"
68.5	81.9	55.6	"	67.2	82.1	61.3	"
71.1	84.4	59.8	"	74.2	87.4	70.5	"
80.0	91.5	74.8	"	79.0	90.3	76.3	"
80.2	97.6	91.8	"	87.2	96.2	89.9	"

F.-pt. data for triphenylmethane + naphthalene are given by Vignon (1891).

SOLUBILITY OF TRIPHENYL METHANE IN PYRIDINE. (Hartley and Thomas, 1906.)

Synthetic method used, see note, p. 202

t°.	Gms $CH(C_6H_5)_3$ per 100 Gms Solution	Mol per cent $CH(C_6H_5)_3$	Solid Phase.	t°.	Gms $CH(C_6H_5)_3$ per 100 Gms Solution	Mol per cent $CH(C_6H_5)_3$	Solid Phase.
22.8	46.2	22	$CH(C_6H_5)_3$	59.3	75.6	50.3	$CH(C_6H_5)_3$
31.7	53.3	27.2	" monoclinic	67.8	81.9	59.7	"
37.9	57.6	30.7	"	72.8	85.7	66.4	"
48.7	66.6	39.5	"	80.0	91.5	77.2	"
53.1	70.1	43.5	"	86.8	95.8	88.1	"

SOLUBILITY OF TRI PHENYL METHANE IN BENZENE.

(Linebarger — Am. Ch. J. 15, 45, '93.) (Hartley and Thomas.)

t°.	Gms $CH(C_6H_5)_3$ per 100 Grams C_6H_6	Solid Phase.	t°.	Gms $CH(C_6H_5)_3$ per 100 Gms Solution	Mol per cent $CH(C_6H_5)_3$	Solid Phase.
3.9	3.90	$C_6H_6 + CH(C_6H_5)_3.C_6H_6$	33	12.6	4.4	$CH(C_6H_5)_3.C_6H_6$ rhombic
4.0	4.06	$CH(C_6H_5)_3.C_6H_6$	49.4	24.0	8.8	"
12.5	5.18	"	65.0	38.9	17.2	"
16.1	6.83	"	73.8	57.5	30.2	"
19.4	7.24	"	77.1	67.4	39.7	"
23.1	8.95	"	77.9	76.3	50.7	"
37.5	10.48	$(C_6H_5)_3CH.C_6H_6 + CH(C_6H_5)_3$	77.5	80.2	56.4	"
42.0	19.01	$CH(C_6H_5)_3$	76.2	84.1	62.8	"
44.6	22.64	"	74.6	87.5	69.1	$CH(C_6H_5)_3$ monoclinic
50.1	30.64	"	76.0	89.0	72.2	
55.5	40.51	"	78.8	90.5	75.3	"
71.0	140.00	"	82.3	93.1	81.3	"
76.2	319.67	"	86.6	95.7	87.8	"

Hartley and Thomas call attention to the inaccuracy of Linebarger's results and to the correctness of the determinations of Kuriloff (1897a). According to Kuriloff the tr. pt. $(C_6H_5)_3CH.C_6H_6 + C_6H_6$ is at 4.2° and 1.28 mol % $(C_6H_5)_3CH$, the m. pt. of $(C_6H_5)_3CH.C_6H_6$ is 78.2° and the tr. pt. $(C_6H_5)_3CH.C_6H_6 + (C_6H_5)_3CH$ is at 74° and 69.4 mol. % $(C_6H_5)_3CH$.

Freezing-point data are given for mixtures of Triphenyl Methane and:

Aniline(4)
Anthracene(9)
Biphenyl(9)
Dichlor benzene(7)
Dinitro phenol(3)
Hydroquinone(4)
Naphthalene(9)
Naphthols(4)
Naphthylamines(4)
Nitrophenols(4)
Phenol(4)
Phenylene diamines(3)(4)(10)
Picric acid(1)(4)(10)
Pyrocatechol(4)
Pyrogallol(4)
Quinone(5)
Resorcinol(4)
Sarcosine anhydride(8)
Styphnic acid(1)(2)
Toluidine(4)
Triphenyl carbinol(3)
" guanidine(6)

(1) Jefremow, 1918; (2) Jefremow, 1919a; (3) Kremann, Mauermann, Müller and Rösler, 1923; (4) Kremann, Odelga and Zawodsky, 1921; (5) Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922; (6) Lautz, 1913; (7) Morris and Cook, 1935; (8) Pfeiffer and Angern, 1926; (9) Vignon, 1891; (10) Rheinboldt and Kirscheisen, 1926.

TRIPHENYL CARBINOL $(C_6H_5)_3COH$.

100 gms. C_6H_6 dissolve 16.5 gms. $(C_6H_5)_3COH$ at 25°. (Halford, 1931.)

Freezing-point data are given for mixtures of Triphenyl Carbinol and:

- Dinitro benzenes(1)
- " phenols(2)
- " toluene(1)
- Hydroquinone(4)
- Naphthalene(2)
- Naphthols(4)
- Naphthylamine(4)
- Nitrophenols(1)
- Phenol(4)
- Phenylene diamine(1)
- Picric acid(1)
- Pyrocatechol(4)
- Pyrogallol(1)
- Quinone(3)
- " + nitrophenol(3)
- Resorcinol(4)
- Toluidine(4)
- Trinitro benzene(1)
- Trinitro toluene(1)
- Triphenyl methane(2)

(1) Kremann, Höhl and MüllerII, 1921; (2) Kremann, Mauermann, Müller II and Rösler, 1923; (3) Kremann, Sutter, Sitte, Strzlba and Dobotzky, 1922; (4) Kremann and Wlk, 1919.

α Tri Phenyl**GUANIDINE** $C_6H_5N:C(NHC_6H_5)_2$.

SOLUBILITY IN MIXTURES OF ALCOHOL AND WATER AT 25°. (Holleman and Antusch, '94.)

Vol. % Alcohol.	Gms. $C_6H_5N:C(NHC_6H_5)_2$ per 100 Gms. Solvent.	Density of Solutions.	Vol. % Alcohol.	Gms. $C_6H_5N:C(NHC_6H_5)_2$ per 100 Gms. Solvent.	Density of Solutions.
100	6.23	0.8021	80	1.06	0.8572
95	3.75	0.8158	75	0.67	0.8704
90	2.38	0.8309	70	0.48	0.8828
85	1.58	0.8433	60	0.22	0.9048

See remarks under α Acetnaphthalide, p. 705

Freezing-point lowering data are given by Lautz, 1913, for mixtures of triphenyl guanidine and each of the following compounds: acetamide, phthalide, and triphenyl methane.

CINNAMYLIDENE BENZAL ACETONE $C_6H_5CH:CH.CH:CHCOCH:CHC_6H_5$.

Freezing-point data are given for mixtures of cinnamylidene benzal acetone and diethyl barbuturic acid (veronal) by Pfeiffer and Angern, 1926.

DIANISAL ACETONE $(CH_3OC_6H_4CH:CH)_2CO$.

Freezing-point data are given for mixtures of dianisal acetone and:

- Acenaphthene(2)
- Benzoic acid(2)
- Biphenyl(3)
- Iodo biphenyl(3)
- Naphthols(2)
- Naphthylamine(2)
- Nerolin(2)
- Nitraniline(2)
- Phenyl acetic acid(1)(2)
- Resorcinol(2)

(1) Pfeiffer, 1924; (2) Pfeiffer, Goebel and Angern, 1925; (3) Pfeiffer Schmitz and Inoue, 1929.

$C_{19}H_{21}O_3$

THEBAINE (Para Morphine) $C_{19}H_{21}NO_3$.

SOLUBILITY IN SEVERAL SOLVENTS.

Solvent	t°.	Gms. Thebaine per 100 Gms. Solvent.	Authority.
92 Wt. % Alcohol	25	0.1	
Ether	10	0.71	
Aniline	20	30	(Scholtz, 1912.)
Pyridine	20	9	"
Piperidine	20	2	"
Diethylamine	20	0.7	

100 gms. Olive Oil dissolve 0.8 gm. thebaine at 25°. (Walton, 1915.)

THEBAINE $C_{19}H_{21}NO_3$.

SOLUBILITY OF THEBAINE IN WATER. (Kolthoff, 1925.)

The dissociation constant was calculated, from colorimetric p_H measurements in mixtures of 0.01 *n* thebain hydrochloride and 0.01 *n* NaOH solutions, to be $K = 9.10^{-7}$. For the determination of the solubility product it was found that a mixture of 5 cc. of a 0.01 *n* thebaine hydrochloride solution and 0.2 cc. of 0.01 *n* NaOH gave a slight crystalline deposit after 2 hours. The p_H of the solution was 7.6. Calculating from this experiment, $L_{thebaine} = 2.10^{-9}$. From this value and the dissociation constant, the solubility of thebaine in water was calculated to be $2.2.10^{-3}$ mols. or 0.685 gms. per liter at 15°.

THEBAINE PICRATE $C_{19}H_{21}NO_3.HOC_6H_2(NO_2)_3$.

100 gms. sat. sol. of Thebaine picrate in water contain 0.020 gm. of the salt at 20°.
" " " " " " abs. alcohol " 0.110 " " " " "
" " " " " " acetone " 10.1 " " " " "

(Maplethorpe and Evers, 1925.)

CINCHONIDINE $C_{19}H_{22}N_2O$.

SOLUBILITY IN WATER AT 15°. (Kolthoff, 1925.)

In determining the solubility product it was found that 5 cc. of a 0.0086 normal cinchonidine sulfate solution + 1.2 cc. 0.01 normal NaOH just yielded a few crystals. The $p_H = 7.6$ and $p_{OH} = 6.6$, corresponding to $[OH'] = 2.5.10^{-7}$. $L_{cinchonidine} = 1.38.10^{-9}$. The calculated solubility in water is 9.10^{-4} mols. or 0.265 gm. per liter.

A saturated solution of CINCHONIDINE SULFATE in water was found to have a concentration of 0.0324 normal or 1.286 gm. $(C_{19}H_{22}N_2O)_2.H_2SO_4.6H_2O$ per liter at 15°.

CINCHONIDINE HELIANTHATE $C_{19}H_{22}N_2O(C_{14}H_{15}N_3SO_3)$.

1000 cc. H_2O dissolve 0.196 gm. of the salt at 20-25°. (Stark and Dehn, 1918.)

CINCHONINE $C_{19}H_{22}N_2O$.

SOLUBILITY IN WATER AT 15°. (Kolthoff, 1925.)

In determining the solubility product it was found that 5.0 cc. of a 0.00975 molecular cinchonine sulfate solution + 0.2 cc. of 0.01 normal NaOH gave a precipitate only after long standing. With 0.3 cc. or 0.4 cc. of 0.01 *n* NaOH the precipitate appeared immediately. All the solutions had a p_H of 6.0 or a p_{OH} of 8.2, corresponding to $[OH'] = 6.4.10^{-9}$. The calculated solubility product, $L_{cinchonine} = 6.10^{-11}$. Calculating from this and the first dissociation constant $K_1 = 1.4.10^{-6}$, the solubility of cinchonine in water is $4.8.10^{-5}$ mols. or 0.0144 gm. per liter.

A saturated solution of Cinchonine Sulfate in water was found to have a concentration of 0.039 normal or 1.41 gm. $(C_{19}H_{22}N_2O)_2.H_2SO_4.2H_2O$ per liter at 18°. The saturated solution had a p_H of 5.8 and first dissociation constant $K_1 = 1.4.10^{-6}$ and second dissociation constant $K_2 = 1.2.10^{-10}$.

SOLUBILITY OF CINCHONINE, CINCHONIDINE, QUININE, AND QUINIDINE IN SEVERAL SOLVENTS. (Müller, 1903; see also Prunier, 1879.)

Solvent.	Grams of the Alkaloid per 100 Grams Solution.				
	Cinchonine $C_{19}H_{22}N_2O$.	Cinchonidine $C_{19}H_{22}N_2O$.	Quinine $C_{20}H_{24}N_2O_2$.		Quinidine $C_{20}H_{24}N_2O_2$.
			Hydrate.	Anhydride.	
Ether	0.10	0.211	1.619	0.876	0.776
Ether sat. with H_2O	0.123	0.523	5.618	2.794	1.629
H_2O sat. with Ether	0.025	0.0306	0.0667	0.0847	0.031
Benzene	0.0545	0.099	0.2054	1.700	2.451
Chloroform	0.6979	9.301	100+	100+	100+
Acetic Ether	0.0719	0.3003	4.65	2.469	1.761
Petroleum Ether	0.0335	0.0475	0.0103	0.0211	0.0241
Carbon Tetra Chloride	0.0361	0.0508	0.203	0.529	0.565
Water	0.0239	0.0255	0.574	0.0506	0.0202
Glycerine (15.5°)	0.50		0.50	...	...

SOLUBILITY OF CINCHONINE AND CINCHONIDINE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. Alkaloid per 100 Gms. Solvent.		Authority.
		Cinchonine.	Cinchonidine.	
Water	ord. temp.	0.0043	...	(Hatcher, 1902.)
"	20	0.0131	...	(Scholtz, 1912.)
"	25	0.0113	0.021	(Schaefer, 1910.)
Aq. 10% Ammonia	20	0.025	...	(Scholtz, 1912.)
Aq. 85% C_2H_5OH + 10% Am.	20	0.41	...	"
Aniline	20	1.6	...	"
Pyridine	20	1.4	7.78	(Scholtz, 1912; Dehn, 1917.)
50% Aq. Pyridine	20–25	...	10	(Dehn, 1917.)
Aq. 85% C_2H_5OH ($d_{20}=0.832$)	20	0.86	...	(Scholtz, 1912.)
C_2H_5OH (95%)	20	0.80	5	(Wherry and Yanovsky, 1918.)
C_2H_5OH (prob. 92.3 wt. %)	25	0.62	5.1	(Schaefer, 1913.)
Abs. C_2H_5OH	19	0.874	...	(Timofeiew, 1894.)
Abs. C_2H_5OH	25	0.89	...	(Sill, 1905.)
Benzene	25	0.057	0.127	(Schaefer, 1913.)
Acetone	25	0.091	...	(Sill, 1905.)
Chloroform	17	0.014	...	(Oudemans, 1872.)
"	25	0.606	19	(Schaefer, 1913.)
"	50	0.565	...	(Köhler, 1879.)
Ether	25	0.055	...	(Sill, 1905.)
"	32	0.264	...	(Köhler, 1879.)
Isoamyl Alcohol	25	1.10	...	(Sill, 1905.)
Isobutyl Alcohol	19	1.09	...	(Timofeiew, 1894.)
Methyl Alcohol	25	0.785–1.17	7.39	(Schaefer, 1913; Sill, 1905.)
Piperidine	20	3.5	...	(Scholtz, 1912.)
Diethyl Amine	20	1.3	...	"

Results for the solubility of cinchonine and cinchonidine in mixtures of ethyl and methyl alcohols with benzene and with chloroform are given by Schaefer (1913).

It is pointed out by Schaefer (1910), that if the saturated solution is analyzed by shaking out with chloroform or ether, variable results, depending on the age and method of manufacture of the alkaloid, will be obtained.

Except in the case of the results by Sill in the above table, the saturated solutions were obtained by agitating at intervals, instead of constantly at the given temperature.

CINCHONA ALKALOIDS

SOLUBILITY OF CINCHONINE, CINCHONIDINE AND CINCHOTINE SALTS IN WATER.

Salt	t°.	Gms. per 100 Gms. H₂O			Authority.
		Cinchonine Salt	Cinchonidine Salt	Cinchotine Salt	
Hydrobromide	25	1.7	1.66	. . .	(Schaefer, 1910.)
Bihydrobromide	25	55.8	14.5		
Hydrochloride	25	4.5[1]	4.8[2]	2.12[3]	(Schaefer, 1910; Forst and Böhringer, 1881.)
Bihydrochloride	25		62.5		(Schaefer, 1910.)
Sulfate	25	1.57[4]	1.58[5]	3.28[6]	(Schaefer, 1910; Forst and Böhringer, 1881.)
Sulfate	80	3.1	4.8		(U. S. P.)
Bisulfate	25	66.6	100		(Schaefer, 1910.)
Perchlorate	19	0 (solvent = aq. 6% HClO₄)			(Hofmann, Roth, Höbold and Metzler, 1910.)
Salicylate	25	0.17	0.075		(Schaefer, 1910.)
Tannate	25	0.091	0.055		"
Tartrate	25	3.12[7]	. . .	1.76[8]	(Schaefer, 1910; Forst and Böhringer, 1881.)
Bitartrate	10	0.99	. . .	1.58	(Forst and Böhringer, 1881.)
Oxalate	10	0.96		1.10	"

[1] 4.16 at 10°. [2] 4 at 15°. [3] at 10°. [4] 1.52 at 15°. [5] 1 at 15°. [6] at 15°. [7] 3 at 16°. [8] at 16°.

SOLUBILITY OF CINCHONINE SULFATE AND OF CINCHONIDINE SULFATE IN ALCOHOL AND OTHER SOLVENTS.

Solvent.	t°.	Gms. per 100 Gms. Solvent.		Authority.
		$(C_{19}H_{22}N_2O)_2.H_2SO_4.2H_2O$	$(C_{19}H_{22}N_2O)_2.H_2SO_4.3H_2O$	
Ethyl Alcohol (92.3 wt. %)	25	9.8 (10)	0.85 (1.4)	(Schaefer, 1913; U. S. P.)
" " "	60	(19.2)	(4.1)	(U. S. P.)
Methyl Alcohol	25	83.9	15.9	(Schaefer, 1913; U. S. P.)
Chloroform	25	0.66 (1.45)	<0.1 (0.11)	(Schaefer, 1913; U. S. P.)
Ether	25	0.04	0.02	(U. S. P.)
Glycerol	15	6.7		

Results for mixtures of alcohol, chloroform and benzene are given by Schaefer, '13.

Very carefully determined data for the solubility of Cinchonine in ethyl alcohol, methyl alcohol, amyl alcohol and acetone solutions of various concentrations of a large number of organic acids and of phenols are given by Sill, 1905.

SOLUBILITY OF CINCHONINE SULFATE IN CHLOROFORM CONTAINING INCREASING AMOUNTS OF ETHYL ALCOHOL.

(Hatcher, 1924.)

An excess of cinchonine sulfate was added to the solvents and the mixtures shaken from time to time at room temperature (20°?) for 24 hours. The dissolved cinchonine sulfate was determined by evaporation and weighing.

Gms. C_2H_5OH per 100 gms. solvent	d_{20} of solvent	Gms. cinchonine sulfate per 100 gms. solvent
trace	1.4862	0.114
0.15	1.4841	0.212
0.5	1.4797	0.89
1.0	1.4732	2.11
2.16	1.4681	4.89

CUPREINE SULFATE. $C_{19}H_{20}N_2(OH)_2 \cdot H_2SO_4$.

A sample twice recrystallized from H_2O gave a solubility of 1.85 · 10⁻³ nor or 0.666 gm. anhydrous cupreine sulfate per liter at 18°. The sat. solution h a p_H of 5.8. The dissociation constant was K_1 = 2.7.10 . Kolthoff, 1

PHENYL HYDRAZINE HELIANTHATE $C_6H_8N_2.C_{14}H_{15}N_3SO_3$.

1000 cc. H_2O dissolve 0.135 gm. phenyl hydrazine helianthate at 20-25°. (Stark and Dehn, 1918.)

DIONINE (Ethyl Morphine) $C_{19}H_{23}NO_3$.

100 cc. H_2O dissolve 0.2613 gm. $C_{19}H_{23}NO_3$ at 20° (Zalai, 1910.)
100 cc. oil of sesame dissolve 0.5144 gm. $C_{19}H_{23}NO_3$ at 20°. "

100 cc. H_2O	dissolve	0.208 gm.	$C_{17}H_{17}OH(OH)(OC_2H_5)$	at 25°.	(Schaeffer, 1912.)
" alcohol	"	1.33 gms.	"	"	"
" ether	"	66.6 "	"	"	"

Ethyl MORPHINE HYDROCHLORIDE (Dionin) $C_{17}H_{17}NO(OH)(OC_2H_5).HCl.2H_2O$

Solubility in Water and in Alcohol. (Schaeffer, 1912.)

t°.	Gms. Ethyl Morphine HCl per 100 cc. Water.	Gms. Ethyl Morphine HCl per 100 cc. Alcohol.
15	8.7	3.85
25	12.5	5
40	25	12.1
50	40	20

These results differ from similar data for commercial samples of Dionin.

The differences are believed to be due to the impurities (amorphous salts of the by-products of the ethylation) in commercial products.

100 cc. H_2O dissolve 10 gms. ethyl morphine hydrochloride at ord. temp. (Dott, 1912.)

MONOTROPITOSIDE $C_{19}H_{26}O_{12}.H_2O$.

Solubility of Monotropitoside in Several Solvents at 18-20°.
(Bridel and Picard, 1926.)

This compound is the glucoside which generates methyl salicylate and is formed by the union of 1 mol. of methyl salicylate, 1 mol. of glucose and 1 mol. of xylose, with elimination of 2 mols of water.

Solvent.	Gms. $C_{19}H_{26}O_{12}$ per 100 gms. solvent.	Solvent.	Gms. $C_{19}H_{26}O_{12}$ per 100 gms. solvent.
Water	8.09	Anhydrous ethyl acetate	0.172
95 % alcohol	0.665	» acetone	0.154
Abs. alcohol	0.344	» ethyl ether	0.008
Chloroform	0.100		

METHYL STEARATE $CH_3(CH_2)_{16}COOCH_3$.

Freezing-point data for mixtures of methyl stearate and methyl palmitate are given by Guy and Smith, 1939.

ETHYL MARGARATE $CH_3(CH_2)_{15}COOC_2H_5$.

Freezing-point data are given by Carey and Smith, 1933, for mixtures of ethyl margarate with ethyl palmitate and with ethyl stearate.

IODOEOSIN (Sodium tetra iodofluorescein) $C_{20}H_6I_4O_5Na_2$.

100 gms. H_2O dissolve 90 gms. iodoeosin at 20-25°. (Dehn, 1917.)
100 gms. pyridine dissolve 4.63 gms. iodoeosin at 20-25°. "
100 gms. aq. 50% pyridine dissolve 71.6 gms. iodoeosin at 20-25°. "

FLUORESCEIN $C_{20}H_{12}O_5$.

100 gms. H_2O dissolve 0.005 gm. fluorescein at 20°-25°. (Dehn, 1917.)
100 gms. pyridine dissolve 13.20 gms. fluorescein at 20°-25°. "
100 gms. aq. 50% pyridine dissolve 37.22 gms. fluorescein at 20°-25°. "

PONCEAU (Free Acid) $C_{10}H_7N:N.C_{10}H_4(OH)(SO_3H)_2.9H_2O$

SOLUBILITY IN SEVERAL SOLVENTS AT 23.° (Sisley, 1902.)

Solvent	Gms. Ponceau per Liter.
Water	209.6
" + 5 Gms. H_2SO_4 per Liter	180
" Sat. with Amyl Alcohol	195
Amyl Alcohol	73.4
Ether, pure	none

Data are also given for the distribution of ponceau between water and amyl alcohol at 18°.

PHENOLPHTHALEIN $(C_6H_4OH)_2CO.C_6H_4CO$.

100 gms. H_2O dissolve 0.0175 gm. phenolphthalein at 20°. (Acree and Slagle, 1909.)
" " " 0.04 " " at 20°-25°. (Dehn, '17.)
" Pyridine " 790. gms. " " "
" aq. 50% pyridine " 300 " " " "

PHENOL PHTHALEIN $(OHC_6H_4)_2CO.C_6H_4CO$.

SOLUBILITY OF PHENOLPHTHALEIN IN SEVERAL SOLVENTS AT 15°-20°. (?) [illegible], 1920.)

Solvent	Gms. $C_{20}H_{14}O_4$ per 100 gms. solvent	Solvent	Gms. $C_{20}H_{14}O_4$ per 100 gms. solvent	Solvent	Gms. $C_{20}H_{14}O_4$ per 100 gms. solvent
Water........	0.0033	Chloroform......	1.06	Carbon tetrachloride	trace
Ethyl alcohol...	20.91	Carbon disulfide	0.13	Xylene..........	0.18
Methyl alcohol..	14.18	Ether......	1.91	Toluene..........	0.61
Acetone.......	26.69	Benzene.......	0.16	Nitrobenzene......	1.41
				Ethyl acetate......	6.57

100 gms. abs. alcohol dissolve 10.34 gms. $C_{20}H_{14}O_4$ at 20°-25°.
" quinoline " 0.12 " " "
" equi. mol. mixture of alcohol and quinoline dissolve 0.10 gm. $C_{20}H_{14}O_4$ at 20°-25°. (Fischer and Dehn, 1921.)

100 gms. Pet. Ether dissolve 0.017 gm. phenol phthalene at 25°. (Warren, 1933.)

NITRON $C_{20}H_{16}N_4$.

100 gms. carbon tetrachloride dissolve 2.25 gms. nitron at 20°. (Pawlowski, 1914, 1926.)
" chloroform " 0.01 " " "

NITRON NITRATE $C_{20}H_{16}N_4.HNO_3$.

SOLUBILITY OF NITRON NITRATE IN AQUEOUS SOLUTIONS OF NITRIC ACID AT 25°.
(Brucker, 1929.)

Gm. Equiv. HNO_3 per liter	Gms. $C_{20}H_{16}N_4.HNO_3$ per liter	Gm. Equiv. HNO_3 per liter	Gms. $C_{20}H_{16}N_4.HNO_3$ per liter
0.000	0.4155	0.02449	0.0923
0.00761	0.1509	0.04790	0.0755
0.01327	0.1185	0.08763	0.0569

5-PHENYL-10-METHYL ACRIDIUM HYDROXIDE $(C_6H_4)_2C(OH)(C_6H_5)N(CH_3)$.

SOLUBILITY OF 5-PHENYL-10-METHYL ACRIDIUM HYDROXIDE IN AQUEOUS SALT SOLUTIONS AT 25°.

(Aston and Montgomery, 1931.)

Aqueous Solution of:	Gm. Mols. per 1000 gms. Solution	
	Salt	$C_{20}H_{16}NOH$
H_2O alone	0.0	0.000083
$BaCl_2$	0.00296	0.000096
"	0.0444	0.000116
NH_4Cl	0.0193	0.000234
"	0.0187	0.000231
KCl	0.0388	0.000097
"	0.0399	0.000110
"	0.0675	0.000106
"	0.0739	0.000115
"	0.138	0.000129
"	0.141	0.000141

TRIPHENYL ACETIC ACID $C(C_6H_5)_3COOH$.

SOLUBILITY OF TRIPHENYL ACETIC ACID IN AQUEOUS SOLUTIONS OF ACETIC ACID AT 25°.

(Dittmar, 1929.)

Normality of aq. CH_3COOH	Gms. $C(C_6H_5)_3COOH$ per 100 cc solution
0.000	0.0050
1.529	0.0045
2.875	0.0060
4.590	0.0045
5.923	0.0100
8.824	0.0090
10.912	0.0305
11.661	0.0440
14.433	0.1500
17.365	0.6105

ROSOLIC ACID $C_{20}H_{16}O_3$.

100 gms. H_2O dissolve 0.12 gm. $C_{20}H_{16}O_3$ at 20°–25°. (Dehn, 1917.)
100 gms. pyridine dissolve 160 gm. $C_{20}H_{16}O_3$ at 20°–25°. "
100 gms. aq. 50% pyridine dissolve 80 gm. $C_{20}H_{16}O_3$ at 20°–25°. "

DIBENZOYL METHYL TARTRATE $(CHOCOC_6H_5CO_2CH_3)_2$.

Freezing-point data for mixtures of the d and r compound are given by Findlay and Campbell, 1928.

ROSANILINE $C_{20}H_{21}N_3O$.

100 gms. H_2O dissolve 0.03 gm. $C_{20}H_{21}N_3O_4$ at 20°–25°. (Dehn, 1917.)
100 gms. pyridine dissolve 41.5 gms. $C_{20}H_{21}N_3O_4$ at 20°–25°. "
100 gms. aq. 50% pyridine dissolve 35.1 gms. $C_{20}H_{21}N_3O_4$ at 20°–25°. "

Triphenyl *p* ROSANILINE HYDROCHLORIDE $(C_6H_4.NH.C_6H_5)_3C(OH).HCl$.

SOLUBILITY IN SEVERAL SOLVENTS AT 23°.

(v. Szathmary de Szachmar, 1910.)

Solvent.	Gms. Triphenyl *p* Rosaniline HCl per 100 Gms. Sat. Sol.
Methyl Alcohol	0.447
Ethyl "	0.285
Amyl "	0.11
Acetone	0.19
Aniline	0.518

PAPAVERINE $C_{20}H_{21}NO_4$.

100 gms. carbon tetrachloride dissolve 0.203 gm. at 17°. (Schindelmeiser, 1901.)

100 gms. carbon tetrachloride dissolve 0.518 gm. at 20°. (Gori, 1913.)

100 gms. ethyl ether dissolve 0.38 gm. at 10°.

100 gms. of each of the following solvents dissolve the stated amount of papaverine at 20°. Aniline, 29 gms.; pyridine, 8 gms.; piperidine, 1 gm.; diethylamine, 0.4 gm. (Scholtz, 1912.)

100 gms. quinoline dissolve 7.66 gms. papaverine at 20-25°. (Pascher and Dehn, 1921.)

PAPAVERINE PICRATE $C_{20}H_{21}NO_4.OH\,C_6H_2(NO_2)_3$.

100 gms. sat. sol. of papaverine picrate in water contain [illegible] gm. of the cmpd. at 20°,
" " " " acetone " 1.84 " " "
" " " " abs. alcohol " 0.013 " " "
(Maplethorpe and Evers, 1925.)

HELIANTHINE PHENOLATE $C_{14}H_{15}N_3SO_3.C_6H_5OH$.

1000 cc. H_2O dissolve 0.157 gm. helianthine phenolate at 20-25°. (Stark and Dehn, 1918.)

NARCOTINE $C_{22}H_{23}NO_7$.

SOLUBILITY IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. Narcotine per 100 Gms. Solvent.	Authority.
Water	15	0.1*	(Guérin, 1913.)
Water	20	0.00445	(Zalai, 1910.)
Acetone	15	41.96*	(Guérin, 1913.)
Aq. 50 Vol. % Acetone	15	0.7*	"
Aniline	20	25	(Scholtz, 1912.)
Pyridine	20	2.3	"
Piperidine	20	1.7	"
Diethylamine	20	0.4	"
Carbon Tetrachloride	20	1.04	(Gori, 1913.)
Trichlor Ethylene	15	6.5	(Wester and Bruins, 1914.)
Oil of Sesame	20	0.086	(Zalai, 1910.)

* Per 100 cc. solvent.

100 gms. C_6H_6 dissolve 4.5 gm. narcotine at 25°. (Warren, 1935.)
100 gms. Pet. Ether dissolve 0.023 gm. narcotine at 25°. (Warren,

PHENACYL ARACHIDATE $CH_3(CH_2)_{18}COO.CH_2COC_6H_5$.

SOLUBILITY OF PHENACYL, BROMOPHENACYL AND CHLOROPHENACYL ARACHIDATE IN 95 % ETHYL ALCOHOL.
(Hann, Reid and Jameson, 1930.)

Arachidate	Formula	Gms. arachidate per 100cc 95% alcohol at: 20°	25°
Phenacyl arachidate	$CH_3(CH_2)_{18}COOCH_2COC_6H_5$	0.1148	0.2060
p Bromo Phenacyl arachidate	$CH_3(CH_2)_{18}COOCH_2COC_6H_4Br$	0.0080	0.0106
p Chloro " "	$CH_3(CH_2)_{18}COOCH_2COC_6H_4Cl$	0.0100	0.0125

$C_{20}H_{24}O_2$

QUININE $C_{20}H_{24}N_2O_2.3H_2O$.

SOLUBILITY OF QUININE IN WATER AT 15°. (Kolthoff, 1925.)

The *dissociation constants* as estimated by the colorimetric titration curve, using 0.01 mol. quinine hydrochloride and 0.01 *n* Na OH, also by means of the quinhydrone electrode, were found to be $K_1 = 1\ 08.10^{-6}$ and $K_2 = 2.10^{-10}$ at 15°.

The *solubility product* calculated from a precipitation experiment made by adding just enough of 0.01 *n* Na OH (1.6 to 1.8 cc.) to 5 cc. of 0.05 molecular quinine .H Cl to give a trace of opalescence, was found to be, $L_{quinine} = 4.4.10^{-9}$. From this and the K_1 dissociation constant the solubility of quinine in water was calculated to be $4.05.10^{-3}$ gms. mols. per liter. From another experiment in which 0.01 mol. quinine .HCl was used instead of 0.05 mol., a value of 2.10^{-9}, corresponding to a solubility of $1.9.10^{-3}$ mol. per liter was found. Even this value is, however, too high according to the experiments of Mauz (Dissertation, Stuttgart) who found a saturated solution of quinine in water at 18° to have a concentration of 6.10^{-4} mol. per liter. Other experiments with quinine containing .3 H_2O of crystallization gave $6.55.10^{-4}$ mol. per liter. From these and the first dissociation constant it is evident that the *true* solubility of quinine is about 7.10^{-10} mol. per liter.

DISTRIBUTION OF QUININE BETWEEN WATER AND ETHYL ETHER AT 0°.
(Treadwell, 1923.)

To 100 cc. of purified ether + 100 cc. of CO_2 free water, different amounts of purified quinine were added and the mixtures shaken in melting ice for one hour. After separation of the two layers 25 cc. portions of the aqueous layers were conductometrically titrated with 0.005 *n* H Cl.

Gms. Quinine per 100 cc.			Gms. Quinine per 100 cc.		
H_2O layer. C_2.	Ethereal layer. C_1.	$\frac{C_1}{\sqrt{C_2}}$.	H_2O layer. C_2.	Ethereal layer. C_1.	$\frac{C_1}{\sqrt{C_2}}$.
0.5611	0.0390	0.0520	1.1142	0.0547	0.0518
0.6274	0.0410	0.0410	1.2378	0.0577	0.0518
0.7074	0.0435	0.0517	1.2901	0.0590	0.0519
0.9013	0.0491	0.0516	1.3457	0.0603	0.0520
0.9083	0.0492	0.0517	1.4281	0.0622	0.0520
1.0018	0.0519	0.0518	1.5387	0.0647	0.0522

The observed C_1 values were plotted on a large scale diagram and the above results read by the author from the curve. The constancy of the ratio $\frac{C_1}{\sqrt{C_2}}$ shows that quinine exists in the ethereal layer in double the size molecules that it has in the H_2O layer.

100 cc. sat. solution of quinine in pure acetone contain 2.32 gms. of the alkaloid at 15°. (Harvey and Back, 1921.)

100 gms Alcohol (Abs.) dissolve 166.6 gms. Quinine at 20-25°.

100 gms. Quinoline dissolve 22.28 gms. Quinine at 20-25. (Puchor and Dehn, 1921.)

100 gms. Equimol. mixture of Alcohol and Quinoline dissolve 30.04 gms. Quinine at 20-25°. (Pucher and Dehn 1921.)

100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 0.33 gms. Quinine at 20°.
» 98.5 » ($d = 1.2645$) » 0.96 » »
(Holm, 1921, 1922.)

Hydro QUININE

SOLUBILITY OF HYDROQUININE IN WATER AT 15°. (Kolthoff, 1925.)

The *dissociation constant* was found to be $K_1 = 4.7.10^{-6}$. In determining the *solubility product* it was found that 10 cc. of 0.005 molecular hydroquinine H Cl + 0.1 cc. 0.1 *n* Na OH gave a trace of crystals. The $p_H = 8.3$ and the $p_{OH} = 5.9$. From this $L_{Hydroquinine} = 4.10^{-3} \times 1.25.10^{-6} = 5.10^{-9}$. From K_1 and L the solubility in water was calculated to be about 0.29 gm. hydroquinine per liter.

SOLUBILITY OF QUININE IN AQUEOUS SOLUTIONS OF CAUSTIC ALKALIES.

(Doumer and Deraux, 1895.)

METHOD.—A one per cent solution of quinine sulfate, containing a very small amount of HCl, was gradually added to 200 cc. portions of the caustic alkali solutions of the various concentrations stated, and the point noted at which a precipitate of the appearance corresponding to that of 1 cc. of milk in 100 cc. of water, remained undissolved.

In Aq. Ammonia.		In Aq. Sodium Hydroxide.		In Aq. Pot. Hydroxide.	
Gms. NH_3 per 200 cc. Solution.	Gms. Anhydrous Quinine Dissolved.	Gms. NaOH per 200 cc. Solution.	Gms. Anhydrous Quinine Dissolved.	Gms. KOH per 200 cc. Solution.	Gms. Anhydrous Quinine Dissolved.
0.52	0.084	0.007	0.092	0.612	0.088
0.65	0.084	0.012	0.091	1.512	0.082
4.50	0.096	0.740	0.090	3.456	0.068
13.08	0.122	2.160	0.079	10.944	0.040
18.88	0.144	3.188	0.056	44.704	0.006
25.10	0.174	6.172	0.044		
35.79	0.184	8.547	0.021		
		17.074	0.015		

SOLUBILITY OF QUININE IN SEVERAL SOLVENTS.

Solvent.	t°.	Anhydrous Quinine Gms. per 100 Gms. Solvent.	Anhydrous Quinine Gms. per 100 cc. Solvent.	Hydrated Quinine Gms. per 100 Gms. Solvent.	Authority.
Water	18-22	0.051	...	0.0574	(Müller, 1903.)
"	25	0.057	0.033	0.065	(U. S. P., Schaefer, 1913.)
"	80	0.125	...	0.129	(U. S. P.)
Ethyl Alcohol	20	100	...		(Wherry and Yanovsky, 1918.)
" "	25	166.6	...	166.6	(U. S. P.)
" "	25	...	133.3		(Schaefer, 1913.)
Methyl Alcohol	20	...	66.6	...	
Benzene	25	...	0.55	0.205	(Schaefer, Müller, 1903.)
"	20	0.5	...	...	(Wherry and Yanovsky, 1918.)
"	18-22	1.7	...	...	(Müller, 1903.)
Aniline	20	14.5	...		(Scholtz, 1912.)
Carbon Tetrachloride	20	0.54	...	0.204	(Gori, 1913; Müller, 1903.)
Chloroform	25	50-52.6	...	62.5	(Schaefer, 1913; U. S. P.)
"	18-22	100+	...	100+	(Müller, 1903.)
Diethylamine	20	57	...		(Scholtz, 1912.)
Ether	25	22.2	...	76.9	(U. S. P.)
" (*d*=0.72)	18-22	0.876	...	1.62	(Müller, 1903.)
" sat. with H_2O	18-22	2.8	...	5.62	"
H_2O sat. with Ether	18-22	0.085	...	0.067	"
Ethyl Acetate	18-22	24.7	...	4.65	"
Petroleum Ether (b. pt. 50°-64°)	18-28	0.021	...	0.010	"
Oil of Sesame	20	...	0.0453	0.053	(Zalai, 1910.)
Glycerol	25	0.633	...	0.472	(U. S. P., Ossendowski, 1907.)
Piperidine	20	119	...	...	(Scholtz, 1912.)
Pyridine	20	101	...	...	"
Aq. 50% Pyridine	20-25	59.4	...	...	(Dehn, 1917.)
7.65 gms. H_3BO_3 per 100 cc. aq. 50% Glycerol	room temp.	20	...	...	(Baroni and Barlinetto, 1911.)
15.3 gms. H_3BO_3 per 100 cc. aq. 50% Glycerol	room temp.	40	...	...	"

SOLUBILITY OF QUININE IN BENZENE, DETERMINED BY THE SYNTHETIC (SEALED TUBE) METHOD.

(van Iterson-Rotgans, 1914.)

t°.	Wt. % Quinine.	Solid Phase.	t°.	Wt. % Quinine.	Solid Phase.	t°.	Wt. % Quinine.	Solid Phase.
5.4	0	C_6H_6	53-5	4.81		137	80	$C_{20}H_{24}N_2O_2$
5.3*	...	" +	63	6.09	Mixed phase,	142	83.04	"
17	0.72	$C_{20}H_{24}N_2O_2.C_6H_6$	91	30.01	probably a	146	85.26	"
29	1.48	"	102	43.4	colloid or sol-	152	87.44	"
38.5	2.36	"	104.5	45.9	ution of high	158.5	91.4	"
49	5.22	" unstable	109	51.8	viscosity.	166	95.02	"
±70	28.9	" "	130	75.46		174.7	100	"

* Eutec.

Freezing-point data are given for mixtures of Quinine and:

Acetanilide(4)
Antipyrine(1)(3)
" + Phenacetine(2)
Menthol(1)(3)
Phenacetine(1)(3)
" + Antipyrine(2)
Salol(1)(3)
Urea(1)(3)
Urethan (3)

(1) Adamanis, 1933; (2) Hrynakowski, 1934; (3) Hrynakowski and Adamanis, 1933; (4) Hrynakowski and Adamanis, 1933a.

SOLUBILITY OF QUININE SALTS IN WATER.

(Regnault and Willejean, 1887.)

Salt.	t°.	Gms. Salt per 100 Gms. H_2O.	Salt.	t°.	Gms. Salt per 100 Gms. H_2O.
Brom Hydrate (basic)	14	2.06	Salicylate (basic)	15	0.114
" (neutral)	12	12.33	Sulfate "	14	0.139
" "	14	13.19	" "	16	0.153
" "	16	14.79	" "	18	0.160
" "	15	14.20	" (neutral)	15	8.50
Chlor Hydrate (basic)	12	3.80	" "	17	8.90
" "	14	4.14	" "	18	9.62
" "	15	4.25	Valerate (basic)	12-16	2.59
Lactate (basic)	15	10.03			
" "	37	16.18			

SOLUBILITY OF QUININE SALTS IN WATER AT 25°.

(Schaefer, 1910.)

Salt.	Gms. Salt per 100 Gms. H_2O.	Salt.	Gms. Salt per 100 Gms. H_2O.
Acetate	2	Hypophosphite	2.85
Anisol	0.042	Lactate, basic	16.6
Arsenate	0.154	Nitrate	1.43
Benzoate	0.278	Oxalate	0.071
Bihydrobromide	20	Phosphate	0.125
Bihydrochloride	143 (133)	Picrate	0.029
Bihydrochloride + Urea	100	Quinate	28.6
Bisulfate	11.78	Salicylate	0.048
Chlorhydrosulfate	77 (50)	Sulfate	0.143
Chromate	0.032	Bisulfoguiacolate	200
Citrate	0.121 (0.083)	Sulfophenate	0.4
Glycerophosphate, basic	0.1178 (insol.)	Urate	0.182
Hydrobromide	2.33	Phenylsulfate	0.147
Hydrochloride	4.76	Tartrate	0.105
Hydroferrocyanide	0.05	Tannate	0.05(*)
Hydroiodide	0.49	Valerate	1.25

* Insol.

It is pointed out that different values for the solubility may be obtained depending on the method used for preparing the saturated solution.

Results in parentheses are by Squire and Caines (1905), and are for 15°-20° instead of 25°

Solubility of Quinine Salts in Several Solvents.

(Phelps and Palmer, 1917.)

Salt.	M. pt. (uncorr.)	Solubility, Parts per 100 Parts Solvent in: CCl_4.	$CHCl_3$ (Alcohol free).	Ethyl Acetate (Alcohol free). Cold	Hot.
Quinine racemic lactate	165.5	0.00715	28.6	0.286	3.33
" *d* lactate	175	0.0111	...	0.25	...
" *l* "	171	0.00476	...	0.20	...
" formate	110–113	0.00625	...	...	...
" acetate	124–126	0.05	...	...	...
" propionate	110–111	0.238	...	...	...
" butyrate	77.5	4	...	...	...
" succinate	192	0.001	...	...	0.4
" tartrate	202.5	0.0004	...	...	0.0333
" malate	177.5	0.0008	...	...	0.5
" citrate	183.5	0.00167	...	...	0.0833
" sulfate	214	0.0025	0.0333	0.00715	0.0133
Quintoxime lactate	...	0.11	...	...	...

Saturation was obtained by shaking at intervals by hand, during 72 hours. In case of the determination at "hot," the solutions were boiled under a reflux condenser for 18 hours.

QUININE TRICHLOR ACETATE $C_{20}H_{24}O_2N_2.CCl_3COOH.4H_2O$.

100 gms. sat. solution of quinine trichlor acetate in water contain 3.43 gms. of the salt (?.$4H_2O$) at 15° and 20.98 gms. at 58°. (Florence, 1927.)

QUININE FORMATE (basic) $C_{20}H_{24}O_2N_2.HCOOH.H_2O$.

Solubility of Quinine Formate in Aqueous Solutions of Antipyrine and of Urethan at 15°.

(Manno and Monnet, 1936.)

Results for aqueous solutions of:

Antipyrine: Gms. per 100cc solution Antipyrine	$C_{20}H_{24}O_2N_2.HCOOH.H_2O$	Urethan: Gms. per 100cc solution Urethan	$C_{20}H_{24}O_2N_2.HCOOH.H_2O$
5.0	7.5	0.0	5.0
10.0	8.4	5.0	6.3
15.0	9.9	10.0	7.6
20.0	12.0	20.0	12.9
30.0	15.2	30.0	17.2
40.0	18.4	40.0	20.0
50.0	20.9	50.0	22.8

QUININE HYDROCHLORIDE $C_{20}H_{24}N_2O_2.HCl.2H_2O$.

100 cc. sat. solution of quinine hydrochloride in water contain 3.207 gms. $C_{20}H_{24}N_2O_2.HCl.2H_2O$ at 18°, 4.911 gms. at 25° and 9.242 gms. at 35°. Constant agitation was employed and the saturated solutions were analyzed by the Volhard titration method for chlorine.

(Oliveri-Mandala and Carli, 1925, Oliveri-Mandala, 1926.)

100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 14.3 gms. Quinine hydrochloride at 20°
" 98.5 % " ($d = 1.2645$) " 16.8 " "

(Holm, 1921, 1922.)

SOLUBILITY OF QUININE HYDROCHLORIDE IN AQUEOUS SALT SOLUTIONS AT 16°

(Tarugi, 1914.)

The determinations were made by adding an aqueous solution of quinine hydrochloride to the aqueous salt solution until turbidity occurred. From the volumes involved, the solubility per 100 cc. was calculated.

In Aq. NaCl. Gms. per 100 cc. Sol. NaCl.	Q.HCl.	In Aq. $NaNO_3$. Gms. per 100 cc. Sol. $NaNO_3$.	Q.HCl.	In Aq. KCl. Gms. per 100 cc. Sol. KCl.	Q.HCl.	In Aq. $CaCl_2$. Gms. per 100 cc. Sol. $CaCl_2$.	Q.HCl.
2.02	2.6	0.677	2.85	2.63	2.545	6.37	1.028
2.49	1.94	0.970	1.96	3	1.882	7.03	0.951
3.40	1.22	2.008	0.67	5.57	0.804	7.75	0.879
8.34	0.54	3.65	0.43	8.26	0.531	7.96	0.765
11.40	0.205	9.31	0.292	10.42	0.407	34.42	0.183
15.56	0.140	19.12	0.168	17.87	0.205		
19.83	0.085	31.78	0.0663	25.74	0.0997		

100 cc. 90% alcohol dissolve 20 gms. Q. bihydrochloride at 15°–20°.
" chloroform " 14.3 " " " "
" 90% alcohol " 14.3 " Q. hydrochlorosulfate at 15°–20°.
" " " " 0.5 " Q. glycerophosphate at 15°–20°.
(Squire and Caines, 1905.)

100 gms. H_2O dissolve 1.3 gms. anhydrous Q. glycerophosphate at 100°.

(Rogier and Fiore, 1913.)

SOLUBILITY OF QUININE HYDROCHLORIDE IN AQUEOUS SOLUTIONS OF ANTIPYRINE.

(Oliveri-Mandala and Carli, 1925.)

Constant agitation in a thermostat was employed and the saturated solutions were analyzed for chlorine by the Volhard method.

Results at 18°. Gms. per 100 cc. sat. sol. Antipyrine.	$C_{20}H_{24}N_2O_2.HCl.2H_2O$.	Results at 25°. Gms. per 100 cc. sat. sol. Antipyrine.	$C_{20}H_{24}N_2O_2.HCl.2H_2O$.	Results at 35°. Gms. per 100 cc. sat. sol. Antipyrine.	$C_{20}H_{24}N_2O_2.HCl.2H_2O$.
4.001	8.712	1.992	7.128	1.992	12.038
5.546	11.206	4.004	9.900	4.004	14.732
6.504	12.553	5.546	12.513	5.546	17.424
		6.504	14.414	6.504	19.166

NOTE. — There is some uncertainty in regard to the terms in which the results of Oliveri-Mandala and Carli are expressed.

SOLUBILITY OF QUININE HYDROCHLORIDE IN AQUEOUS SOLUTIONS OF ANTIPYRINE AND OF URETHAN AT 15°.

(Musso and Monnet, 1935.)

Results for aqueous solutions of:

Antipyrine. Gms. per 100cc solution Antipyrine	$C_{20}H_{24}O_2N_2.HCl.2H_2O$	Urethan. Gms. per 100cc solution Urethan	$C_{20}H_{24}O_2N_2.HCl.2H_2O$
0	3.9	0	3.9
5	10.7	2.5	6.0
10	16.8	5	8.5
15	25.0	10	15.0
20	31.0	15	30.2
25	36.0	20	40.8
40	47.0	25	50.2

SOLUBILITY OF QUININE HYDROCHLORIDE IN AQUEOUS SOLUTIONS OF URETHAN AT 20°.

(Malquori, 1932.)

Gms. per 100 gms. solution	
$NH_2COOC_2H_5$	$C_{20}H_{24}O_2N_2.HCl.2H_2O$
6.90	14.15
10.50	22.00
13.70	28.10

The author also gives results for the freezing-points of mixtures of Quinine hydrochloride and Urethan as well as the densities and refractive indices of aqueous quine hydrochloride urethan solutions.

QUININE GLYCERO PHOSPHATE $(OC_3H_7O_2)OPO.O(C_{20}H_{24}N_2O_2)_2.4H_2O$.

100 gms. H_2O dissolve 1.28 gms. of the anhydrous compound at 100°.

(H. Rogier, *These*, Paris, 1912.)

QUININE HELIANTHATE $C_{14}H_{15}N_3SO_3.C_{20}H_{24}N_2O_2$.

1000 cc. H_2O dissolve 0.185 gm. quinine helianthate at 20-25°.

(Stark and Dehn, 1918.

QUININE Hypo **PHOSPHITE** $C_{20}H_{24}N_2O_2.H_3PO_2.2H_2O$.

100 gms. sat. solution of quinine hypophosphite in water contain 4.07 gms. $C_{20}H_{24}N_2O_2.H_3PO_2.2H_2O$ at 15°.6 (Dott, 1922.)

QUININE ETHYL CARBONATE

100 gms. C_6H_6 dissolve 29.8 gm. quinine ethyl carbonate at 25°. (Warren, 1933.)
" " Pet. ether " 1.22 " " " " " " " "

QUININE IODO BISMUTHATE $C_{20}H_{24}O_2N_2(BiI_3)_2.2HI$.

SOLUBILITY OF QUININE IODO BISMUTHATE IN ACETONE.

(Picon, 1934.)

Completely dried quinine iodo bismuthate when dissolved in anhydrous acetone forms two layers. The composition of the original salt and of the residue obtained by evaporation of the acetone solution are identical, thus showing that dissociation does not occur. The presence of very small amounts of H_2O increases greatly the amount of salt dissolved; with 4% H_2O two layers are no longer formed. Commercial samples of the salt give results differing from those of the pure compound. Evidence was obtained that the iodo bismuthate combines with six molecules of acetone and the product looses its powder form and becomes a perfectly clear viscous liquid. The iodo bismuthate is soluble in cyclo hexane and in diethylene glycol in all proportions and cyclo hexane can be employed for extracting quinine iodo bismuthate precipitated in aqueous solutions.

	Lighter layer		Heavier layer	
t°	Density	Gms. $C_{20}H_{24}O_2N_2(BiI_3)_2.2HI$ per 100 cc sat. sol.	Density	Gms. $C_{20}H_{24}O_2N_2(BiI_3)_2.2HI$ per 100 cc sat. sol.
9	0.8159	2.64	1.473	94.20
19	0.8063	1.97	1.544	104.9
29	0.7981	1.54	1.609	115.3
39	0.7882	1.11	1.673	123.2
49	0.7793	0.8	1.732	130.2

QUININE SALICYLATE $C_{20}H_{24}N_2O_2.C_6H_4(OH)COOH.2H_2O$.

SOLUBILITY IN AQUEOUS ALCOHOL AT 25°.
(Seidell, 1909, 1910.)

Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. Q. Sal. $2H_2O$ per 100 Gms. Sat. Sol.	Wt. % C_2H_5OH in Solvent.	d_{25} of Sat. Sol.	Gms. Q. Sal. $2H_2O$ per 100 Gms. Sat. Sol.
0	0.999	0.065	60	0.896	2.45
10	0.982	0.080	70	0.876	3.25
20	0.966	0.200	80	0.854	4.20
30	0.952	0.48	90	0.832	4.71
40	0.935	1	92.3	0.826	4.62
50	0.916	1.70	100	0.797	3.15

QUININE SULFATE $(C_{20}H_{24}N_2O_2)_2H_2SO_4.7H_2O$.

100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 0.71 gms. Quinine sulfate at 20°
» 98.5 » ($d = 1.2645$) » 1.31 » »
(Holm, 1921, 1921 *a*, **1922.**)

SOLUBILITY OF QUININE SULFATE IN SEVERAL SOLVENTS AT 25°.
(Schaefer, 1913.)

Solvent.	Gms. Q. Sulfate per 100 cc. Solvent.	Solvent.	Gms. Q. Sulfate per 100 cc. Solvent.
Ethyl Alcohol	0.4	1 vol. C_2H_5OH+4 vols. $CHCl_3$	12.5
Methyl Alcohol	3.12	1 vol. C_2H_5OH+4 vols. C_6H_6	0.53
Chloroform	0.27	1 vol. CH_3OH+4 vols. $CHCl_3$	20
Benzene	insol.	1 vol. CH_3OH+4 vols. C_6H_6	4.76

100 gms. trichlorethylene dissolve 0.07 gm. Q. sulfate at 15°. (Wester and Bruins, 1914.)

QUININE TANNATES True and False

SOLUBILITY IN WATER AND IN AQUEOUS HCl AT 37°. (Muraro, 1908.)

Tannate.	Formula.	Gms. Q. Tannate per 100 Gms.		
		H_2O.	Aq. 1% HCl.	Aq. 3% HCl.
True Tannate I	$C_{20}H_{24}N_2O_2.C_{10}H_{14}O_9.4H_2O$	0	0.984	3.656
True Tannate II	$(C_{20}H_{24}N_2O_2)_2.(C_{10}H_{14}O_9)_3.8H_2O$	0	1.210	4.756
False Tannate	$(C_{20}H_{24}N_2O_2.H_2SO_4)_2(C_{10}H_{14}O_9)_5.14H_2O$	0.313	0.847	1.560

The work of Muraro is criticized by Biginelli (1908).

100 cc. 90% alcohol dissolve 33.3 gms. Q. tannate at 15°–20°. (Squire and Caines, 1905.)

QUININE PYROTARTRATES *l*, *i*, *d*.

SOLUBILITIES IN ALCOHOL AT 18°. (Ladenburg and Herz, 1898.)

100 gms. alcohol dissolve 15 gms. of the *l* pyrotartrate, 3.2 gms. of the *i* and 4.2 gms of the *d* compound. The results show that the *i* acid is not a mixture of *d* and *l* acid, and, therefore, that the *i* quinine compound is a salt of the racemic acid.

SOLUBILITY OF QUININE AND OF QUININE SALTS IN WATER AND OTHER SOLVENTS. (U. S. P. VIII.)

Compound.	Gms. Quinine Compound per 100 Gms. Solvent in:					
	Water.		Alcohol.	Ether.	Chloroform.	Glycerol.
	At 25°.	At 80°.	At 25°.	At 25°.	At 25°.	At 25°.
$C_{20}H_{24}N_2O_2$	0.057	0.123	166.6	22.2	52.6	0.633
$C_{20}H_{24}N_2O_2.3H_2O$	0.065	0.129	166.6	76.9	62.5	0.472
$C_{20}H_{24}N_2O_2HCl.2H_2O$	5.55	250	166.6	0.417	122	12.2
$C_{20}H_{24}.N_2O_2.C_6H_4(OH).-COOH.\frac{1}{2}H_2O$	1.30	2.86	9.09	0.91	2.70	6.25
$(C_{20}H_{24}N_2O_2)_2.H_2SO_4.7H_2O$	0.139	2.22	1.16	...	0.25	2.78
$C_{20}H_{24}N_2O_2.H_2SO_4.7H_2O$	11.77	147	5.55	0.056	0.109	5.55
$C_{20}H_{24}N_2O_2.HBr.H_2O$	2.5	33.3	149.2	6.2	...	12.5

QUINIDINE $C_{20}H_{24}N_2O_2.?H_2O$.

SOLUBILITY OF QUINIDINE IN WATER AT 18°. (Kolthoff, 1925.)

The first and second *dissociation constants*, as estimated by colorimetric titration curve of p_H, were found to be $K_1 = 3.7.10^{-6}$ and $K_2 = 1.0.10^{-10}$.

The *solubility product* of quinidine was determined by adding 0.01 *n* Na OH to 4 cc. of a 0.013 molecular quinidine sulfate solution untill a precipitate just appeared after a period of 1 day; 0.08 cc. were required and the p_H of the solution was 7.6, hence the $p_{OH} = 6.6$ and $[OH'] = 2.5.10^{-7}$. From this

$$L_{Quinidine} = [Quinidine.OH^{\cdot}]\,[OH'] = 2.5.10^{-9}.$$

Calculating from this and the first dissociation constant the solubility of quinidine in water is $6.7.10^{-4} + 0.5.10^{-4} = 7.2.10^{-4}$ gm. mols. per liter.

A saturated solution of *quinidine sulfate* in water at 18° was found to have a concentration of 0.026 gm. mol. per liter and a p_H of 5.9.

SOLUBILITY OF QUINIDINE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $C_{20}H_{24}N_2O_2$ per 100. Gms. Solvent.	Gms. $C_{20}H_{24}N_2O_2$ per 100. cc. Solvent.	Authority.
Water	18-22	0.020	...	(Müller, 1903.)
Water	25	...	0.0145	(Schaefer, 1910.)
Ethyl Alcohol (95%)	20	4	...	(Wherry & Yanovsky, 1918.)
Ethyl Alcohol	25	...	2.22	(Schaefer, 1913.)
Methyl Alcohol	25	...	0.66	"
Benzene	25	...	1.10	"
Benzene	18-22	2.45	...	(Müller, 1903.)
Carbon Tetrachloride	18-22	0.557	...	"
Chloroform	18-22	100+	...	"
Chloroform	25	...	25	(Schaefer, 1913.)
Ether (d = 0.72)	18-22	0.78	...	(Müller, 1903.)
Ether sat. with H_2O	18-22	1.63	...	"
H_2O sat. with Ether	18-22	0.031	...	"
Ethyl Acetate	18-22	1.76	...	"
Pet. Ether (b. pt. 59°-64°)	18-22	0.024	...	"
1 vol. C_2H_5OH+4 vols. $CHCl_3$	25	...	33.3	(Schaefer, 1913.)
1 vol. C_2H_5OH+4 vols. C_6H_6	25	...	12.5	"
1 vol. CH_3OH+4 vols. $CHCl_3$	25	...	25	"
1 vol. CH_3OH+4 vols. C_6H_6	25	...	6.6	"

QUINIDINE SALTS

SOLUBILITY IN WATER AT 25°.

(Schaefer, 1910.)

Quinidine Salt.	Gms. Salt per 100 Gms. H_2O.	Quinidine Salt.	Gms. Salt per 100 Gms. H_2O.
Q. Hydrobromide	0.526	Q. Sulfate	1.05
Q. Hydrochloride	1.160	Q. Tannate	0.0477
Q. Hydroiodide	0.082	Q. Tartrate	2.86
Q. Salicylate	0.060	Q. Bitartrate	0.323

SOLUBILITY OF QUINIDINE SULFATE IN SEVERAL SOLVENTS AT 25°.

(Schaefer, 1913.)

Solvent.	Gms. Q. Sulfate per 100 cc. Solvent.	Solvent.	Gms. Q. Sulfate per 100 cc. Solvent.
Ethyl Alcohol	5	1 vol. C_2H_5OH+4 vols. $CHCl_3$	33.3
Methyl Alcohol	40	1 vol. C_2H_5OH+4 vols. C_6H_6	8.33
Chloroform	8.33	1 vol. CH_3OH+4 vols. $CHCl_3$	33.3
Benzene	Insol.	1 vol. CH_3OH+4 vols. C_6H_6	20

METHYL PROPYL AZO PHENOL $[C_6H_2(CH_3)(C_3H_7)OH]_2N_2$.

Freezing-point data are given for mixtures of methyl propyl azo phenol and azo anisol phenetol by Bogojawleusky and Winogradow, 1907.

AMYGDALIN $C_{20}H_{27}NO.3H_2O$.

100 gms. trichlorethylene dissolve 0.029 gm. amygdalin at 15°. (Wester and Bruins, 1914.)

ELATERIN $C_{20}H_{28}O_5$.

100 cc. 90% alcohol dissolve 0.09 gm. elaterin at 15–20. (Squire and Caines, 1905.)
100 cc. chloroform dissolve 4 gms. elaterin at 15–20. " "

ARACHIDIC ACID $CH_3(CH_2)_{18}COOH$.

Freezing-point data are given by von Meyer, Brod and Soyka, 1913, for mixtures of arachidic acid with stearic, palmitic and lignoceric acid.

ETHYL STEARATE $CH_3(CH_2)_{16}COOC_2H_5$.

Freezing-point data are given for:

Ethyl Stearate + Ethyl Margarate (Carey and Smith, 1933.)
" " + Ethyl Palmitate (Smith, 1931.)

HYDROBENZAMIDE $(C_6H_5CH)_3N_2$.

100 gms. absolute alcohol dissolve 1.99 gms. $(C_6H_5CH)_3N_2$ at 20-25° (Pucher and Dehn, 1921.)
» quinoline » 3.94 » » » »
» equimol mixture of alcohol and quinoline dissolve 2.56 gms. $(C_6H_5CH)_3N_2$ at 20-25°

TRI BENZYL AMINE $(C_6H_5CH_2)_3N$.

Freezing-point data for mixtures of tribenzyl amine and bromo toluene are given by Paterno and Ampola, 1897.

METHYLENE ANILINE (s Triazine hexa hydro, 1,3,5-triphenyl) $(C_6H_5N.CH_2)_3$.

Freezing-point data for mixtures of methylene aniline and mercaptobenzothiazol are given by Kojima and Nagai, 1931.

HYDRASTINE $C_{21}H_{21}NO_6$.

SOLUBILITY OF HYDRASTINE IN WATER AT 15°. (Kolthoff, 1925.)

From colorimetric p_H determinations made in mixtures composed of 0.01 *n* hydrastine hydrochloride and 0.01 *n* NaOH solutions the dissociation constant was calculated to be $K = 1.7.10^{-8}$. It was found that 5 cc. of hydrastine HCl + 1.0 cc. of 0.01 *n* NaOH gave a trace of crystalline deposit after one day. The sat. sol. had $p_H = 5.7$ and $p_{OH} = 8.5$. From this and other determinations it was concluded that solid hydrastine was in equilibrium with a solution which was 7.10^{-3} normal with respect to hydrastine salt and had a hydroxyl ion concentration of 2.10^{-9}. Therefore, the solubility product $L_{\text{hydrastine}} = 1.4.10^{-11}$ and from this and K the solubility of hydrastine in water was calculated to be $8.2.10^{-4}$ mols. per liter at 15°.

SOLUBILITY OF HYDRASTINE AND OF HYDRASTININE HYDROCHLORIDE IN SEVERAL SOLVENTS.

(U. S. P. VIII; at 18°–22°, Müller, 1903.)

Solvent.	Gms. $C_{21}H_{21}NO_6$ per 100 Gms. Solution.		Solvent.	Gms. per 100 Gms. Solution at 18°–22°.	
	At 18°–22°.	At 80°.		$C_{21}H_{21}NO_6$.	$C_{11}H_{11}NO_2.HCl$.
Water	0.033	0.025	Ether	0.51	0.078 (25°)
Alcohol	0.74 (25°)	5.9 (60°)	Ether+H_2O	0.80	...
Benzene	8.89	...	Chloroform	100+	0.35 (25°)
Ethyl Acetate	4.05	...	CCl_4	0.123	...
Petroleum Ether	0.073				

STRYCHNINE $C_{21}H_{22}N_2O_2$.

SOLUBILITY OF STRYCHNINE IN WATER. (Kolthoff, 1925.)

The dissociation constantes calculated from p_H values determined colorimetrically in mixtures of dilute standard solutions of strychnine nitrate and sodium hydroxide, were $K_1 = 10.10^{-7}$ and $K_2 = 2.2.10^{-12}$. For the determination of the solubility product 5 cc. of 0.025 molecular strychnine nitrate solution gave a faint trace of crystalline precipitate with 0.75 cc. of 0.01 *n* Na OH solution. The precipitated strychnine was, accordingly, in equilibrium with a 0.02 *n* strychnine nitrate solution which was found to have a p_H value of 6.5. This corresponds to a p_{OH} of 7.7 or a [OH] of $2.10\ ^{8}$ and the solubility product $L_{Strychnine} = 4.10^{-10}$. Calculating from K_1 and L the concentration of a saturated aqueous solution of strychnine is $4.2.10\ ^{4}$ mol. per liter at 15°. A direct determination of the solubility of strychnine in water, made by Mauz, gave $2.7.10^{-4}$ mol. strychnine per liter at 15°.

100 cc. of sat. sol. of Strychnine in pure acetone contain 0.132 gms. $C_{21}H_{22}N_2O_2$ at 15°
» » » in Ether of $d = 0.720$ » 0.034 » »

(Harvey and Back, 1921.

100 gms. *p* cymene dissolve 0.71 gm. strychnine at 30° and 0.95 gm. at 100°.

(Wheeler, 1920.)

SOLUBILITY OF STRYCHNINE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. $C_{21}H_{22}N_2O_2$ per 100 Gms. Solvent.		Solvent.	t°.	Gms. $C_{21}H_{22}N_2O_2$ per 100 Gms. Solvent.	
Water	ord. t.	0.014	(1)	Carbon Tetrachloride	20	0.158	(5)
"	20	0.0125	(2)	" "	20	0.22	(9)
"	20	0.0143	(3)	" "	17	0.645	(10)
"	25	0.016	(4)	Chloroform	25	10.25	(6)
"	20	0.021	(5)	"	25	16.6	(14)
Aq. 10% NH_3	20	0.033	(3)	Diethylamine	20	1.7	(3)
Aq. 3% H_3BO_3 in 50% Glycerol	ord. t.	3.5	(1)	Ethyl Acetate	20	0.197	(5)
C_2H_5OH ($d=0.83$)	15–20	0.71	(7)	Ether	20	0.043	(5)
" ($d=0.83$)	20	0.833	(3)	"	25	0.018	(4)
" ($d=0.83$)	25	0.91	(4)	" sat. with H_2O	20	0.051	(5)
" " +10% NH_3	20	0.256	(3)	Glycerol	15	0.25	
" ($d=0.785$)	25	0.70	(6)	Petroleum Ether	20	0.0093	(5)
CH_3OH ($d=0.796$)	25	0.49	(6)	Piperidine	20	0.7	(3)
Aniline	20	20	(3)	Pyridine	20	1.5	(3)
Amyl Alcohol	25	0.55	(4)	"	26	1.24	(11)
Benzene	20	0.77	(5)	Aq. 50 % Pyridine	20–25	2.43	(8)
"	25	0.76	(6)	Water sat. with Ether	20	0.017	(5)
				Oil of Sesame	20	0.061	(2)

(1) Baroni and Barlinetto (1911); (2) Zalai (1910); (3) Scholtz (1912); (4) U. S. P. 8th ed.; (5) Müller (1903); (6) Schaefer (1913); (7) Squire and Caines (1905); (8) Dehn (1917); (9) Gori (1913); (10) Schindelmeiser (1901); (11) Holty (1905).

100cc Olive oil dissolve 0.32 gms. strychnine at 25°. (Walton, 1935.)

Data showing the effect of increasing amounts of several gum arabic sols upon the solubility of strychnine in water are given by

SOLUBILITY OF STRYCHNINE IN AQUEOUS ALCOHOL AT 15°-20°.

(Squire and Caines, 1905.)

Per cent Alcohol in Solvent	20	45	60	70	90
Gms. $C_{21}H_{22}N_2O_2$ per 100 cc. solvent	0.024	0.125	0.25	0.40	0.59

SOLUBILITY OF STRYCHNINE IN MIXTURES OF ETHER AND CHLOROFORM AT 25°.

(Marden and Dover, 1916.)

Per cent $CHCl_3$ in Mixed Solvent.	Gms. $C_{21}H_{22}N_2O_2$ per 100 Gms. Mixed Solvent.	Per cent $CHCl_3$ in Mixed Solvent.	Gms. $C_{21}H_{22}N_2O_2$ per 100 Gms. Mixed Solvent.
100	15.3	50	0.35
90	7.1	30	0.21
80	2.77	20	0.15
70	1.5	10	0.09
60	0.65	0	0.02

SOLUBILITY OF STRYCHNINE IN MIXED SOLVENTS AT 25°.

(Schaefer, 1913.)

Mixture.	Gm. $C_{21}H_{22}N_2O_2$ per 100 cc. of Mixture.
One volume of C_2H_5OH + 4 vols. $CHCl_3$	25
One volume of C_2H_5OH + 4 vols. C_6H_6	5
One volume of CH_3OH + 4 vols. $CHCl_3$	25
One volume of CH_3OH + 4 vols. C_6H_6	6.7

DISTRIBUTION OF STRYCHNINE BETWEEN WATER AND CHLOROFORM AT 25°.

(Seidell, 1910a.)

Gm. $C_{21}H_{22}N_2O_2$ Added per 15 cc. H_2O+15 cc. $CHCl_3$.	Gms. $C_{21}H_{22}N_2O_2$ Recovered per 15 cc: H_2O Layer (*a*).	Gms. $C_{21}H_{22}N_2O_2$ Recovered per 15 cc: $CHCl_3$ Layer (*b*).	$\frac{(b)}{(a)}$.
0.005	0.0006	0.0103(?)	...
0.025	0.0010	0.0253	25.2
0.125	0.0021	0.1299	61
0.625	0.0099	0.6225	64

STRYCHNINE TRICHLOR ACETATE $C_{21}H_{22}N_2O_2.CCl_3COOH.3H_2O$.

100 gms. sat. solution of strychnine trichlor acetate in water contain 4.03 gms. $C_{21}H_{22}N_2O_2.CCl_3COOH.(?).3H_2O$ at 15° and 20.75 gms. at 52°.

(Florence, 1927.)

STRYCHNINE ARSENATE $C_{21}H_{22}N_2O_2.H_3AsO_4.\frac{1}{2}H_2O(.1\frac{1}{2}H_2O)$.

100 gms. sat. solution in water contain 4.53 gms. $C_{21}H_{22}N_2O_2.H_3AsO_4$ at 25°. (Puckner and Warren, 1910.)

100 gms. $CHCl_3$ dissolve 0.085 gm. $C_{21}H_{22}N_2O_2.H_3AsO_4$ at 15°. (Hill, 1910.)

STRYCHNINE FORMATE $C_{21}H_{22}N_2O_2.HCOOH.2H_2O$.

SOLUBILITY IN WATER AND IN ALCOHOL.

(Hampshire and Pratt, 1913.)

Solubility in Water. t°.	Solubility in Water. Gms. Salt per 100 Gms. H_2O.	Solubility in Abs. Alcohol. t°.	Solubility in Abs. Alcohol. Gms. Salt per 100 Gms. C_2H_5OH.
19.5	30.59	18.5	10
24	39.68	20	10.3
27	44.25	22	10.64

STRYCHNINE BENZOATE $C_{21}H_{22}N_2O_2.C_6H_5COOH$.

SOLUBILITY OF STRYCHNINE BENZOATE AND OF A SERIES OF SUBSTITUTED BENZOATES IN WATER AT SEVERAL TEMPERATURES.

(Poe, Suchy and Baker, 1934.)

The saturated solutions were analyzed by evaporating to dryness on the water bath and weighing the residue.

Strychnine Salt	Gms. Strychnine Salt per 100 cc sat. solution at:						
	20°	30°	40°	50°	60°	75°	95°
Benzoate	0.433	0.578	0.784	1.156	1.607	2.311	3.460
o Chloro Benzoate	1.783	1.995	2.211	2.770	3.410	4.793	10.725
m " "	0.176	0.229	0.349	0.509	0.669	0.944	1.376
p " "	0.264	0.302	0.330	0.425	0.551	0.688	1.158
o Bromo "	1.063	1.204	1.410	1.846	2.470	3.818	6.751
m " "	0.092	0.115	0.141	0.201	0.402	0.576	0.835
p " "	0.211	0.244	0.299	0.351	0.528	0.744	0.915
o Iodo "	0.526	0.582	0.653	0.768	1.122	1.514	2.116
p " "	0.167	0.195	0.229	0.341	0.475	0.606	0.840
o Nitro "	0.521	0.621	0.724	0.928	1.320	1.970	3.140
m " "	0.447	0.565	0.706	0.896	1.359	2.452	4.138
p " "	0.183	0.222	0.266	0.328	0.467	0.698	0.970
o Hydroxy "	0.250	0.297	0.402	0.606	0.964	1.470	2.500
m " "	0.179	0.185	0.335	0.432	0.562	0.872	1.517
p " "	0.149	0.188	0.241	0.339	0.517	0.875	1.432
o Methyl "	0.519	0.634	0.984	1.331	1.958	2.807	4.142
m " "	0.869	0.992	1.181	1.688	2.350	3.856	7.765
p " "	0.560	0.578	0.625	0.828	0.931	1.250	1.808
o Amino "	0.297	0.378	0.462	0.710	0.984	1.590	2.602
m " "	1.092	1.204	1.437	2.107	2.971	4.786	7.963
p " "	0.371	0.652	0.986	1.324	2.046	3.586	7.136
3,5-Dinitro "	0.136	0.163	0.197	0.271	0.384	0.599	0.951
2,4- " "	0.249	0.298	0.389	0.557	0.821	1.230	1.610
2,4,6 Trinitro"	0.075	0.098	0.116	0.165	0.273	0.450	0.717
5-Iodo Salicylate	0.037	0.045	0.057	0.079	0.126	0.215	0.374
3,5-Dinitro "	0.025	0.041	0.063	0.088	0.116	0.422	1.064
Di iodo "	0.020	0.023	0.031	0.032	0.046	0.071	0.127

STRYCHNINE HYDROBROMIDE $C_{21}H_{22}N_2O_2.HBr$.

100 cc. H_2O dissolve 1.54 gms. of the salt at 15°-20°. (Squire and Caines, 1905.)
100 cc. 90% alcohol dissolve 1.04 gm. of the salt at 15°-20°. " "

STRYCHNINE HYDROCHLORIDE $C_{21}H_{22}N_2O_2.HCl$.

100 cc. H_2O dissolve 2.86 gms. of the salt at 15°-20°. (Squire and Caines, 1905.)
100 cc. 90% alcohol dissolve 1.37 gms. of the salt at 15°-20°. " "
100 gms. $CHCl_3$ dissolve 0.592 gm. of the salt at 15°. (Hill, 1910.

STRYCHNINE HYDRO IODIDE $C_{21}H_{22}N_2O_2.HI.H_2O$.

100cc sat. solution of strychnine iodide in water contain 0.287 gm. $C_{21}H_{22}N_2O_2.HI.?H_2O$ at 25°. (Hargreaves, 1931.)

STRYCHNINE HELIANTHATE $C_{14}H_{15}N_3SO_3.C_{21}H_{22}N_2O_2$.

1000 cc. H_2O dissolve 0.481 gm. strychnine helianthate at 20-25°.
(Stark and Dehn, 1918.)

STRYCHNINE SULFONPROPIONATE *d* and *l* $C_3H_6O_5S.C_{21}H_{22}N_2O_2H_2O$.

SOLUBILITY OF THE DEXTRO AND OF THE LAEVO SALTS, SEPARATELY, IN WATER AT 24°.6. (Franchimont and Backer, 1920.)

Compound.	Formula.	Gms. anhydrous compound per 100 gms. sat. sol
d Strychnine Sulfonpropionate..	$C_3H_6O_5S.C_{21}H_{22}N_2O_2.H_2O$	6.0
l »	»	27.7

STRYCHNINE NITRATE $C_{21}H_{22}N_2O_2.HNO_3$.

SOLUBILITY IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. Salt per 100 cc. Solvent.	Solvent.	t°.	Gms. Salt per 100 cc. Solvent.
Water	15	1.4 (1)	CH_3OH	25	0.345 (3)
"	15–20	1.6 (2)	$CHCl_3$	25	1.25 (3)
"	25	2.38 (4)	1 vol. C_2H_5OH+4 vols. $CHCl_3$	25	5 (3)
"	80	12.5 (4)	1 vol. C_2H_5OH+4 vols. C_6H_6	25	0.66 (3)
90% C_2H_5OH	15–20	0.83 (2)	1 vol. CH_3OH+4 vols. $CHCl_3$	25	4 (3)
" "	15	0.77 (1)	1 vol. CH_3OH+4 vols. C_6H_6	25	1 (3)
" "	b. pt.	3.45 (1)	Glycerol	25	1.66 (4)
100% C_2H_5OH	25	0.37 (3)			

(1) Dott (1910); (2) Squire and Caines (1905); (3) Schaefer (1913); (4) U. S. P. VIII ed.

DISTRIBUTION OF STRYCHNINE NITRATE BETWEEN WATER AND CHLOROFORM AT 25°.
(Seidell, 1910a.)

Gms. $C_{21}H_{22}N_2O_2.HNO_3$ Added per 15 cc. H_2O + 15 cc. $CHCl_3$.	Gms. $C_{21}H_{22}N_2O_2.HNO_3$ per 15 cc.: H₂O Layer (a).	Gms. $C_{21}H_{22}N_2O_2.HNO_3$ per 15 cc.: $CHCl_3$ Layer (b).	$\frac{a}{b}$.
0.005	0.0051	0.0030 (?)	...
0.025	0.0222	0.0042	5.3
0.125	0.1017	0.0243	4.2
0.625	0.3250	0.1698	2

STRYCHNINE OXALATE

100 gms. H_2O dissolve 1.13 gms. of the anhydrous salt at about 15°.
(Dott, 1910.)

STRYCHNINE PERCHLORATE $C_{21}H_{22}N_2O_2.HClO_4$.

100 gms. H_2O dissolve 0.022 gm. perchlorate at 15°.
(Hofmann, Roth, Höbold and Metzler, 1910.)

STRYCHNINE SULFATE $(C_{21}H_{22}N_2O_2)_2.H_2SO_4.5H_2O$.

SOLUBILITY IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. Salt per 100 cc. Solvent.	Solvent.	t°.	Gms. Salt per 100 cc. Solvent.
Water	15–20	2.08 (1)	$CHCl_3$	15	0.05 (4)
"	25	3.23 (2)	"	25	0.31 (2)
"	80	16.6 (2)	"	25	0.43 (3)
90% C_2H_5OH	15–20	0.74 (1)	1 vol. C_2H_5OH+4 vols. $CHCl_3$	25	12.8 (3)
94% "	25	1.9 (2)	1 vol. C_2H_5OH+4 vols. C_6H_6	25	0.725 (3)
94% "	60	6.2 (2)	1 vol. CH_3OH+4 vols. $CHCl_3$	25	25 (3)
100% "	25	0.8 (3)	1 vol. CH_3OH+4 vols. C_6H_6	25	12.5 (3)
CH_3OH	25	8.33 (3)	Glycerol	15	18 (2)

(1) Squire and Caines (1905); (2) U. S. P. VIII; (3) Schaefer (1913); (4) Hill (1910).

STRYCHNINE TARTRATE

SOLUBILITY OF *d*, *l* AND OF RACEMIC STRYCHNINE TARTRATE IN WATER.

(Dutilh, 1912.)

t°.	Gms. of Each Separately per 1000 gms. H_2O.		
	d Tartrate.	*l* Tartrate.	Racemic Tartrate.
7.35	14.14	9.48	14.02
16	17.72	11.50	19.12
25	22.9	14.52	24.70
27	...	15.60	...
30	...	17.02	...
40	35.18	22.90	38.42

SOLUBILITY OF MIXTURES OF *d* AND *l* TARTRATES AND OF RACEMIC STRYCHNINE TARTRATE IN WATER.

(Ladenburg and Doctor, 1899.)

Results for *d* + *l* Tartrate.			Results for Racemic Tartrate.		
t°.	Gms. Anhydrous Salt per 100 Gms. H_2O.	Solid Phase.	t°.	Gms. Anhydrous. Salt per 100 Gms. H_2O.	Solid Phase.
7	1.48	50% *d*+5% *l*	7	1.39	Racemic Tartrate
19	1.95	"	19	1.90	"
27	2.38	"	27	2.33	"
35	3.02	"	35	3.17	"
42	3.75	"	42	3.92	"

100 gms. sat. solution in water contain 0.45 gm. anhydrous strychnine acid tartrate at about 15°. (Dott, 1910.)

DIACETYL MORPHINE (Heroin) $C_{17}H_{17}(CH_3COO)_2NO$.

100cc H_2O dissolve 0.06 gm. diacetyl morphine at 25°.
100cc Olive oil dissolve 1.0 gm. diacetyl morphine at 25°. (Walton, 193

CRYPTOPINE PICRATE $C_{21}H_{23}NO_5.HO.C_6H_2(NO_2)_3$ (m. pt. 161°-3°).

100 gms. sat. solution in water contain 0.007 gm. of the compound at 15°.
» » C_2H_5OH » 0.022 » » » »
» » acetone » 0.162 » » » »

(Maplethorpe and Evers, 1925.)

TOLUIDINE HELIANTHATES *o* and *m* $C_7H_9N.C_{14}H_{15}N_3SO_3$.

1000 cc. water dissolve 0.270 gm. *o* Toluidine Helianthate at 20-25°
» » 0.162 » *m* » »

(Stark and Dehn, 1918.)

YOHIMBINE (Quebrachine) $C_{21}H_{26}N_2O_3$.

100 gms. C_2H_5OH dissolve 4.0 gms. $C_{21}H_{26}N_2O_3$ cold and 10.0 gms. at b. pt.
» » H_2O » 0.735 gms. $C_{21}H_{26}N_2O_3.HCl$ cold and 3.33 gms. at b. pt.
» » » » 0.36 gm. $(C_{21}H_{26}N_2O_3)_2C_2H_2O_4$ (oxalate) at the b. pt.
» » C_2H_5QH » 0.27 gm. $(C_{21}H_{26}N_2O_3)_2C_4H_7O_6.6H_2O$, (tartrate) cold and 0.625 gm. at the b. pt. (Fourneau and Page, 1914.)

α NAPHTHOL AZINE $C_{10}H_7CH:N.N.CHC_{10}H_7$.

Freezing-point data for mixtures of α Naphthol azine and Benzalazine are given by Pascal, 1914.

METHYL (and Other) ETHER OXIDES

SOLUBILITY OF METHYLIC, ETHYLIC AND OF PROPYLIC ETHER OXIDES OF PHENYL ETHINYLDIPHENYL CARBINOLS IN SEVERAL SOLVENTS.
(Moureu, Dufraisse and Blatt, 1924.)

	Gms. per 100 gms. sat. solution.					
Solvent	t°.	Cmpd. A.	t°.	Cmpd. B.	t°.	Cmpd. C.
Methyl alcohol............	15.8	0.2	15.9	2.7	16.2	4.7
Ethyl »	15.8	0.2	15.9	3.4	16.2	4.8
Propyl »	15.9	0.5	15.9	7.0	16 2	9.9
Petroleum ether (b. pt. 50-60°)...	16.0	0.9	16.0	27.3	16.0	62.5

Cmpd. A = $C_6H_5.C \equiv C.C.(C_6H_5)_2.OCH_3$;
Cmpd. B = $C_6H_5.C \equiv C.C.(C_6H_5)_2.OC_2H_5$;
Cmpd. C = $C_6H_5.C \equiv C.C.(C_6H_5)_2.OC_3H_7$ (normal).

GNOSCOPINE PICRATE (m. pt. 185°.5). $C_{22}H_{23}NO_7.HOC_6H_3(NO_3)_2$.

100 gm sat. sol of gnoscopine picrate in water contain 0.009 gm of the cmpd. at 15°.
» » » » » » alcohol » 0.04 » » »
» » » » » » acetone » 2.34 » » »

(Maplethorpe and Evers, 1925.)

Methyl **CRYPTOPINES**, *A*, *B* and *C* forms, $C_{22}H_{25}O_5N$.

The solubilities of the three forms in benzene, determined by lowering of the freezing-point, are: 5 gms. *A* form per liter at 5°, 30 gms. *B* form and 110 gms. *C* form. (Sidgwick, 1915.)

NARCOTINE $C_{22}H_{23}NO_7$.

SOLUBILITY OF NARCOTINE ($C_{22}H_{23}NO_7$) IN WATER AT 18°. (Kolthoff, 1925.)

The dissociation constant was found to be $K = 1.5.10^{-8}$ The determination was beset with difficulties due to the extremely slight solubility of narcotine. The addition of a trace of alkali precipitates narcotine from a very dilute solution. As the result of many experiments it was found that narcotine was in equilibrium with a narcotine hydrochloride solution which was 0.00092 normal and had a p_H of 5.0. That is a p_{OH} of 9.2 or $[OH']$ of $6.4.10^{-10}$. From this the solubility product of narcotine $L_{Narcotine} = 9.2.10^{4}.6.4.10^{-10} = 6.10^{-13}$. From L and K the solubility in water was calculated to be 4.10^{-5} mol., corresponding to 0.020 gms. narcotine per liter. A direct determination by Mauz gave 0.0174 gm. per liter.

NARCOTINE PICRATE $C_{22}H_{23}NO_2.OH.C_6H_2(NO_2)_3$.

100 gms. sat. sol. of Narcotine picrate in water contain 0.02 gm of the cmpd. at 20°.
» » abs. Alcohol » 0.13 » »
» » Acetone » 30.0 » »

See remarks under Morphine picrate, p. 774 (Mapelthorpe and Evers, 1925.)

COLCHICINE $C_{22}H_{25}NO_6$.

SOLUBILITY IN SEVERAL SOLVENTS.
(Müller, 1903; U. S. P.)

Solvent.	t°.	Gms. $C_{22}H_{25}NO_2$ per 100 Gms. Solvent.	Solvent.	t°.	Gms. $C_{22}H_{25}NO_6$ per 100 Gms. Solvent.
Water	18–22	9.6	Water sat. with Ether	18–22	12.05
"	25	4.5	Benzene	18–22	0.94
"	80	5	Benzene	25	1.15
"	82	13.7*	Chloroform	18–22	100+
Ether	18–22	0.13	Carbon Tetrachloride	18–22	0.12
"	25	0.64	Ethyl Acetate	18–22	1.34
" sat. with H_2O	18–22	0.18	Petroleum Ether	18–22	0.06

* Beilstein.

COLCHICINE SALTS.

Name.	Formula.	Solvent.	t°.	Gms. Salt per Liter Sat. Sol.	Authority.
Colchicine Iodohydrate	$C_{22}H_{25}NO_6.HI$	Water	30	0.84	(Pfannl, 1911.)
Iso Colcnicine Iodohydrate	"	"	30	3.86	"
Colchicine Silicotungstate	$(C_{22}H_{25}NO_6)_4SiO_2.12WO_3.2H_2O$	"	15	0.083	(Jensen, 1913.)
		Aq. 1% HCl	15	0.007	"

NARCEINE $C_{22}H_{27}NO_8$.

SOLUBILITY OF NARCEINE IN WATER AT 18° (Kolthoff, 1925.)

Narceine hydrochloride is so strongly hydrolyzed that it does not dissolve in water. A 0.01 mol. solution yields crystals on cooling. The dissociation constants determined in very dilute solutions were: basic constant $K_b = 2.10^{-11}$, acid constant $K_S = 5.10^{-10}$. Hence narceine is a stronger acid than base The isoelectric point is near $p_H = 6.4$ and here the narceine has a minimum solubility, which was calculated to be $1.3.10^{-3}$ mol. per liter.

The solubility product as a base is $L_{\text{Narceine OH}} = [\text{Narc}^{\cdot}][\text{OH}'] = 2.6.10^{-14}$.
» » an acid is $L_{\text{Narceine H}} = [\text{Narc}'][\text{H}^{\cdot}] = 6.5.10^{-13}$.

NARCEINE PICRATE.

100 gms. sat. sol. of Narceine picrate in water contain 0.027 gm of the cmpd. at 20°.
» » abs. Alcohol » 0.01 » »
» » Acetone » 5.23 » »

See remarks under Morphine picrate, p. 774 (Mapelthorpe and Evers, 1925.)

BENZYL PALMITATE, STEARATE, SULFIDE, etc.

SOLUBILITY IN SEVERAL SOLVENTS.

Compound.	Formula.	Solvent.	t°.	Gms. cmpd. per 100 gms. solvent.	Authority.
Benzyl Palmitate......	$C_6H_5CH_2.CH_3(CH_2)_{14}COO$	C_2H_5OH	16	3.30	(Whibey, 1926.)
Benzyl Stearate.......	$C_6H_5CH_2.CH_3(CH_2)_{16}COO$	»	16	0.685	»
Benzyl Sulfide.	$(C_6H_5CH_2)_2S$	$CHCl_3$	20	133.91	(Pawlewski 1914.)
» »	»	CCl_4	20	73.16	»
Benzyl Camphoroxime.	–	$CHCl_3$	20	93.68	»
» »	–	»	20	18.87	»

BEHENOLIC ACID $CH_3(CH_2)_7C\vdots C(CH_2)_{11}COOH$.

Freezing-point data for mixtures of behenolic with cholic and with hyodesoxycholic acid are given by Rheinboldt and Lauber, 1929.

ERUCIC ACID $C_8H_{17}CH:CH(CH_2)_{11}COOH$.

SOLUBILITY IN ALCOHOLS.

(Timofeiew, 1894.)

Alcohol.	t°.	Gms. Erucic Acid per 100 Gms. Sat. Sol.	Alcohol.	t°.	Gms. Erucic Acid per 100 Gms. Sat. Sol.
Methyl Alcohol	−2	2.25	Ethyl Alcohol	+21.4	63.4
" "	+18	60.4	Propyl Alcohol	−2	10.2
" "	21.4	62	" "	+18	60.5
Ethyl Alcohol	−2	8.24	" "	21.4	63

100 cc. of a sat. solution of erucic acid in 91.53 wt. per cent C_2H_5OH contain 2.356 gms. $C_8H_{17}CH:CH(CH_2)_{11}CO.OH$ at 0°. (Thomas and Mattikow, 1926.)

BEHENIC ACID $C_{21}H_{43}COOH$.

Solubility in Aqueous Solutions of Ethyl Alcohol at 0° and 25°.

(Thomas and Mattikow, 1926.)

Wt. per cent C_2H_5OH in solvent.	Gms. $C_{21}H_{43}COOH$ per 100 cc. sat. sol. at 0°.	25°.
63.07	0.002	0.010
86.16	0.010	0.111
91.53	0.013	0.206

Freezing-point data are given for mixtures of:

Behenic acid + Erusic acid(3)
" " + Isoerusic acid(3)
" " + Brassidic acid(3)
" " + Iso behenic acid(4)
Methyl behenate + Methyl iso behenate(4)

Brassidic acid + Erusic acid(1)(2)(3)
" " + Iso erusic acid(3)
" " + Cholic acid(5)
" " + Hyodesoxycholic acid(5)
" " + Ethyl brassidate(2)
" " + Methyl " (2)

(1) Griffiths and Hilditch, 1932; (2) Keffler and Maiden, 1936; (3) Mascarelli and Sauna, 1915; (4) von Meyer, Brod and Soyka, 1913; (5) Rheinboldt and Lauber, 1929.

ROTENONE $C_{23}H_{22}O_6$

Solubility of Rotenone in Various Solvents at 20°.

(Jones and Smith, 1930.)

The determinations of the concentration of the saturated solutions was based upon the optical activity of the compound. The specific rotation of rotenone in the various solvents was first determined and the concentration of the saturated solution estimated by extrapolation from the values obtained upon solutions of known concentration. The saturated solutions were prepared by constant agitation for 7 hours.

Solvent	d_{20} of sat. sol.	Gms. $C_{23}H_{22}O_6$ per 100 gms. sat. sol.	Solvent	d_{20} of sat. sol.	Gms. $C_{23}H_{22}O_6$ per 100 gms. sat. sol.
Acetone	0.825	8.0	Chloro benzene	1.127	12.0
Acetic acid	1.057	2.2	Chloroform	1.430	33.0
n Butyl Alcohol	0.814	0.3	s-β Dichloro ethyl ether	1.228	6.1
Ethyl alcohol	0.792	0.3	Ethyl ether	0.721	0.5
Iso propyl "	0.790	0.2	Ethyl acetate	0.916	5.2
Methyl "	0.796	0.3	Ethylene chlor hydrine	1.210	9.4
Amyl acetate	0.872	1.8	Ethylene di chloride	1.270	26.1
Benzene	0.908	8.8	n Propyl formate	0.915	6.6
Carbon disulfide	1.270	1.3	Toluene	0.890	7.2
Carbon tetra chloride	1.587	0.4	Tri chloro ethylene	1.447	11.4
			Xylene	0.878	3.8

TETRA METHYL DIAMINO TRIPHENYL CARBINOL $C_6H_5COH[C_6H_4N(CH_3)_2]_2$.

Results for the freezing-points of the modifications of this compound from Ether and from Ligroin with tetra methyl diamino triphenyl methyl amine are given by Grimm, Gunther and Titus, 1931.

BRUCINE $C_{21}H_{20}(OCH_3)_2N_2O_2.4H_2O$.

Kolthoff, 1925, reports that the solubility of brucine in water, as determined by Mauz (Dissertation, Stuttgart, 1904), using the $.4H_2O$ compound is $1.33.10^{-3}$ gm. mol. per liter. From this value and the first dissociation constant ($K_1 \quad 9.2.10^{-7}$) he calculates the solubility product of brucine to be

$$L_{\text{Brucine}} = 9.2.10^{-7} \times 1.33.10^{-3} = 1.22.10^{-9}.$$

SOLUBILITY OF BRUCINE IN MIXTURES OF ALCOHOL AND QUINOLINE AT 20-25°.

(Pucher and Dehn, 1921.)

Per cent C_7H_9N in solvent.	Gms. Brucine per 100 gms. solvent.	Per cent C_7H_9N in solvent.	Gms. Brucine per 100 gms. solvent.	Per cent C_7H_9N in solvent.	Gms. Brucine per 100 gms. solvent.
0.0	3.5 (2.35)	47.5	34.6	80.0	75.00
10.0	3.86	50.0	36.5	90.0	78.7
23.2	10.87	60.0	44.6	100.0	79.0
37.5	15.09	70.0	68.20		

100 gms. equi. mol. mixture of alcohol and quinoline dissolve 43.51 gms. brucine at 20-25°. (Pucher and Dehn, 1921.)

BRUCINE $C_{21}H_{20}(OCH_3)_2N_2O_2.4H_2O$.

SOLUBILITY OF BRUCINE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. Brucine per 100 Gms. Sat. Sol.	Authority.
Water	18–22	0.056–0.125	(Müller, 1903; Squire and Caines, 1905; Zalai, 1910.)
Aniline	20	12	(Scholtz, 1912.)
Benzene	18–22	1.11–1.86	(Müller, 1903; Schaefer, 1913.)
Carbon Tetrachloride	18–22	0.08	" "
" "	20	1.96	(Schindelmeiser, 1901; Gori, 1913.)
Chloroform	25	11.6	(Schaefer, 1913.)
Trichlor Ethylene	15	2.5	(Wester and Bruins, 1914.)
Ether	18–22	0.75	(Müller, 1903.)
Ethyl Acetate	18–22	4.26	"
Ethyl Alcohol	25	45.2	(Schaefer, 1913.)
Diethylamine	20	1.6	(Scholtz, 1912.)
Methyl Alcohol	25	55.6	(Schaefer, 1913.)
Petroleum Ether	18–22	0.055–0.088	(Müller, 1903; Zalai, 1910.)
Glycerol	18–22	2.2	(Müller, 1903.)
Pyridine	20	28	(Scholtz, 1912.)
"	20–25	21.9	(Dehn, 1917.)
Aq. 50% Pyridine	20–25	31.6	"
Piperidene	20	1	(Scholtz, 1912.)

Results for the solubility of brucine and brucine sulfate in mixtures of alcohol, chloroform and benzene are given by Schaefer (1913).

BRUCINE Per **CHLORATE** $C_{21}H_{20}(OCH_3)_2N_2O_2.HClO_4$.

100 gms. $H_2O(+2\%HClO_4)$ dissolve 0.15 gm. of the salt at 18°.

(Hofmann, Roth, Höbold and Metzler, 1910.)

BRUCINE TRICHLORACETATE $C_{23}H_{26}N_2O_4.CCl_3COOH.3H_2O$.

100 gms. sat. solution of brucine trichlor acetate in water contain 4.02 gms. $C_{23}H_{26}N_2O_4.CCl_3COOH.(?).3H_2O$ at 15° and 25.25 gms. at 53°.(Florence, 19

BRUCINE HELIANTHATE $C_{23}H_{26}N_2O_4.C_{14}H_{15}N_3SO_3.H_2O$.

100 gms. H_2O dissolve 0.245 gms. $C_{23}H_{26}N_2O_4.C_{14}H_{15}N_3SO_3H_2O$ at 20-25°.

(Stark and Dehn, 1918.)

BRUCINE SULFATE.

100 cc. methyl alcohol	dissolve 0.28 gm. brucine sulfate at 25°.		(Schaefer, 1913.)
" ethyl "	" 1.66 " " " "		(Schaefer, 1913.)
" chloroform	" 0.6 " " " "		(Schaefer. 1913.)

BRUCINE *d*, *l*, and *i* TARTRATE.

Solubility of Each Optical Isomer in Water (Dutilh, 1912.)

t°.	Gms. per 100 Gms. Water.		
	d Tartrate.	*l* Tartrate.	Racemic Tartrate.
20	...	...	1.38
25	1.008	1.84	...
35	1.272	3.24	...
44	1.590	4.64	...
50	1.854	6.56	...

NARCEINE $C_{23}H_{27}NO_8 + 3H_2O$.

100 gms. H_2O dissolve 0.078 gm. narceine at 13°; 100 gms. 80% alcohol dissolve 0.105 gm. at 13°.

100 gms. CCl_4 dissolve 0.011 gm. narceine at 17° (Schindelmeiser, 1901); 0.002 gm. at 20° (Gori, 1913).

LIGNOCERIC ACID $C_{23}H_{47}COOH$.

Solubility of Lignoceric Acid in Aqueous Alcohol at 25°.
(Thomas and Chai Lan Yu, 1923.)

The saturation was obtained by constant agitation and the saturated solutions were analyzed by evaporation and weighing the residue dried at 80°.

Solvent.	$d_{\frac{25}{4}}$ of Sat. sol.	Gms. Lignoceric Acid dissolved	
		100 cc. sat. sol.	100 gms. solvent.
Aq. 63.07 Wt. % C_2H_5OH........	0.87783	0.011	0.013
» 86.16 » »	0.82356	0.092	0.112
» 91.53 » »	0.80935	0.182	0.226

Freezing-point data for mixtures of lignoceric with arachidic acid and othe compounds are given by von Meyer, Brod and Soyka, 1913.

TRIPHENYL BENZENE $C_6H_3(C_6H_5)_3$.

Freezing-point data for mixtures of triphenyl benzene with triphenyl triazine and with methyl diphenyl triazine are given by Pascal, 1925.

DIPHENYL BENZIDINE $C_6H_5.NH.C_6H_4.C_6H_4.NH.C_6H_5$.

Solubility of Diphenyl Benzidine in Aqueous Solutions of Hydrochloric Acid.
(Kolthoff and Sarver, 1930.)

Normality of aq. HCl	Gms. $C_{24}H_{22}N_2$ per liter
0.1	0.00007
0.25	0.00009
0.5	0.00012
1.0	0.00017
2.0	0.00028

DIPROPYL AZOPHENOL $[C_6H_2(C_3H_7)_2OH]_2N_2$.

Freezing-point data for mixtures of dipropyl azophenol with azophenetol and with azoanisol phenetol are given by Bogojawlenski and Winogrado, 1907.

CHOLIC ACID $C_{24}H_{40}O_5$.

Freezing-point data are given for mixtures of:

Cholic acid + Cetyl alcohol(3)
" " + Behenolic acid(3)
" " + Brassidic acid(3)
" " + Palmitic acid(3)
" " + Stearic acid(3)
" " + Stearolic acid(3)
Desoxy cholic acid + Cetyl alcohol(2)
" " " + Palmitic acid(2)
" " " + Stearic acid(2)
Allocholic acid + Cholanic acid(1)
Apocholic acid + Montanic acid(4)
" " + Palmitic acid(2)
" " + Stearic acid(2)
Hyodesoxy cholic acid + Cetyl alcohol(3)
" " " + Palmitic acid(3)
" " " + Stearic acid(3)

(1) Bonstedt, 1932; (2) Rheinboldt, Flume and König, 1929; (3) Rheinboldt and Lauber, 1929; (4) Rheinboldt, Pieper and Zervas. 1926.

STEARANILIDE $CH_3(CH_2)_{16}CONHC_6H_5$.

Freezing-point data for mixtures of Stearanilide and palmitanilide are given by Guy and Smith, 1939.

PHENACYL LIGNOCERATE $CH_3(CH_2)_{20}COOCH_2COC_6H_5$.

SOLUBILITY OF PHENACYL, BROMOPHENACYL AND CHLOROPHENACYL LIGNOCERATES IN 95% ETHYL ALCOHOL.

(Hann, Reid and Jameson, 1930.)

Lignocerate	Formula	Gms. Lignocerate per 100cc 95% alcohol at	
		20°	25°
Phenacyl Lignocerate	$CH_3(CH_2)_{22}COOCH_2COC_6H_5$	0.1209	0.1816
p Bromo " "	$CH_3(CH_2)_{22}COOCH_2COC_6H_4Br$	0.0040	0.0070
p Chloro " "	$CH_3(CH_2)_{22}COOCH_2COC_6H_4Cl$	0.0054	0.0072

Tetraphenyl **ETHYLENE** $(C_6H_5)_2C:C(C_6H_5)_2$.

Freezing-point data for tetraphenyl ethylene + silicotetraphenyl are given by Pascal and Normand (1913).

NARINGEN $C_{27}H_{32}O_{14}\cdot 2H_2O$.

SOLUBILITY OF NARINGEN IN WATER.

(Pulley, 1936.)

The saturated solutions were prepared by intermittent agitation during two hours and the dissolved solid was determined by evaporation, drying the residue at 110°, and weighing.

t°	Gms. $C_{27}H_{32}O_{14}$ per liter sat. sol.	Solid Phase	t°	Gms. $C_{27}H_{30}O_{14}$ per liter sat. sol.	Solid Phase
6	0.17	$C_{27}H_{32}O_{14}\cdot 6H_2O$(?)	45	1.96	$C_{27}H_{30}O_{14}\cdot 2H_2O$(?)
20	0.50	"	55	7.16	"
35	0.79	"	65	42.21	"
			75	108.24	"

ERGOSTEROL $C_{27}H_{42}O$.

Freezing-point data are given for mixtures of:

Allo-α-ergostan + Cholestan (Bonstedt, 1932.)
" " + Cholestanol " "
" " + Stigmastan " "
Dihydro ergosterol + Epidihydro ergosterol (Lettre, 1930.)

CHOLESTEROL $C_{27}H_{45}OH$.

100 gms. H_2O dissolve 0.26 gm. cholesterol at 20–25°. (Dehn, 1917.)
" pyridine " 68.10 gms. " " " "
" 50% aq. pyridine " 1.10 " " " " "
100 cc. H_2O dissolve 0.0006 gm. cholesterol-digitonide at b. pt. (Mueller, 1917.)
100 cc. ether dissolve 0.0007 gm. cholesterol-digitonide at room temp. "

SOLUBILITY OF CHOLESTEROL IN AQUEOUS BILE SALT SOLUTIONS AT 37°.

(Bashour and Bauman, 1937.)

Recrystallized commercial cholesterol in large excess was constantly shaken with the bile salt solutions for 4 days. After standing 2 days the supernatant solution was filtered and the dissolved cholesterol determined by a modified gravimetric method and the total solids by evaporation and drying at 100° and at 138°. The bile salts were prepared by titration of the bile acids in dilute alcoholic solution with sodium hydroxide, evaporating to dryness and recrystallizing. The results are given only in the form of a diagram from which the following approximate values were estimated.

Gms. Bile salt per 100 gms. aq. solution	Gms. Cholesterol dissolved per gram of (Sodium): Tauro cholate	Glycoholate	Taurodesoxy cholate	Diolate	Glycodesoxy cholate	Desoxy cholate
2	0.003	0.005	0.008	0.022	0.035	0.036
4	0.007	0.010	0.016	0.027	0.040	0.050
6	0.011	0.014	0.024	0.028	0.040	0.056
8	0.013	0.019	0.029	0.028	0.040	0.059
10	0.014	0.022	0.036	0.028	0.040	0.059
12	0.0145	0.023	0.038	—	0.040	0.0595
14	0.015	0.024	0.0385	—	0.040	0.060

SOLUBILITY OF STEARIC ACID ESTER OF CHOLESTEROL IN OILS AT 37° AND VICE VERSA. (Filehne, 1907.)

The determinations were made by adding small weighed amounts of the ester to the oil at 60° and cooling to 36–37° while stirring continually. The additions of the ester were repeated until a clouding just appeared at 36–37°. In the case of the solubility of the oils in cholesterol, the composition of the sat. solution was estimated by means of the specific gravity and the melting point.

Solvent.	t° of Clouding.	Gms. Ester per 100 Gms. Oil.	Solute.	Gms. Oil or Acid per 100 Gms. Sat. Solution in Ester, Det. by: Sp. Gr.	M. pt.
Olive Oil	37.6	3.35	Olive Oil	25.5	33.8
Castor Oil	37.6	0.26	Oleic Acid	37	40
Oleic Acid	37.5	4.11	Castor Oil	5	1.85
Ricinic (Oil) Acid	37	0.33	Ricinic Acid	20	16
Pseudo Ricinic Acid	36.2	0.85	Pseudo Ricinic Acid	10	12
Crotonic (Oil) Acid	36.5	0.87	Crotonic Acid	(5)	5

SOLUBILITY OF CHOLESTEROL IN SOLVENT MIXTURES AT 20°.

(Weichherz and Marschik, 1932.)

Results for mixtures of:

Water + Ethyl Alcohol

Wt. % C_2H_5OH in Solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent
55.15	0.0207
76.53	0.1629
100.0	1.5524

Water + Dioxane

Wt. % $C_4H_8C_2$ in solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent
60.72	0.0291
80.83	0.8589
100.0	11.2588

Dioxane + Ethyl Alcohol

Wt. % $C_4H_8O_2$ in solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent
24.42	3.2413
46.33	5.1172
65.93	6.8794
84.12	8.9430

Benzene + Dioxane

Wt. % C_6H_6 in solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent
0.0	11.2588
36.19	16.2642
55.93	19.2046
77.29	18.8614
87.24	16.8454
100.0	14.2449

Benzene + Hexane

Wt. % C_6H_6 solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent
0.0	1.9237
24.35	7.6756
46.20	16.0599
66.06	21.1094
76.54	22.0439
83.83	19.5527

Ethyl Alcohol + Hexane

Wt. % C_2H_5OH solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent
0.0	1.9237
22.39	22.5148
43.81	23.9777
63.83	15.8880
82.68	6.4291
100.0	1.5524

Ethyl Alcohol + Benzene

Wt. % C_2H_5OH in solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent	Wt. % C_2H_5OH in solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent
0.0	14.2449	37.73	28.6971
9.19	26.3662	47.42	24.5236
18.49	33.2489	57.74	17.7339
23.25	32.6185	78.50	5.8785

Dioxane + Hexane

Wt. % $C_4H_4O_2$ in solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent
33.50	24.2723
43.05	31.2329
60.67	23.0814
82.08	26.3415

The authors also give the following values for the solubility of cholesterol in other solvents at 20°.

Solvent	Gms. $C_{27}H_{45}OH$ per 100 gms. solvent
Methyl alcohol	0.6500
Furfural	0.3342
Iso butyl alcohol	6.3444
n Amyl alcohol	10.5397

SOLUBILITY OF NON-RADIATED CHOLESTEROL IN LIQUID AMMONIA.

(Gustavson and Goodman, 1927.)

t°	Gm. $C_{27}H_{45}OH$ per 100 cc NH_3	t°	Gm. $C_{27}H_{45}OH$ per 100 cc NH_3
-38	0.000	28	0.1172
0	0.00616	35	0.2322

Freezing-point data are given for mixtures of:

Cholesterol + Antipyrine	(Pfeiffer and Seydel, 1928.)
" + Dimethyl amino antipyrine	" " " "
" + Pyramidon	" " " "
" + Sarcosine anhydride	" " " "
" + Oleic acid	(Partington, 1911,)
" + Palmitic acid	" "
" + Stearic acid	" "
Cholesterol acetate + Phytosterol (α and β)	(Jaeger, 1907.)
" formate + Cholesterol Butyrate	(Robberecht, 1938.)
" " + " Valerianate	" "
" valerianate+ " Acetate	" "
" butyrate + " "	" "
" " + " Formate	" "
" benzoate + p Azoxy phenetol	(Prins, 1909.)
" propionate + " " "	" "
" iso butyrate + " " "	" "
" " " + Anisal amino acetophenone	(Robberecht, 1938.)
Cholestan + Sitostan	(Bonstedt, 1932.)
" + Sitostanol	" "

DESOXY BENZOIN PINACONE $[C_6H_5CH_2C(OH)C_6H_5]_2$.

Freezing-point data for mixtures of desoxy benzoin pinacone and tetra phenyl butadien are given by Bergmann, Winter and Schreiber, 1933.)

PORPHYRINS $C_{33}H_{34}N_4O_3$.

Determinations of the distribution coefficients of six pure porphyrins between ethyl ether and aqueous solutions of hydrochloric acid, varying from 0.025 to 10% HCl, made by fluorescent measurements, are given by Keys and Brugsch, 1938.

CEPHAELINE Salts.

SOLUBILITY IN WATER. (Carr and Pyman, 1914.)

Salt.	Formula.	t°.	Gms. Hydrated Salt per 100 cc. Sat. Sol.
Cephaeline Hydrochloride	$C_{28}H_{38}O_4N_2.2HCl.7H_2O$	17–18	26.5
“ acid “	$C_{28}H_{38}O_4N_2.5HCl$	18	about 50
“ Hydrobromide	$C_{28}H_{38}O_4N_2.2HBr.7H_2O$	17–18	5.4 (dried at 100°)

CELLOBIOSE Octa ACETATE $C_{12}H_{14}O_{11}(CH_3COO)_8$.

DISTRIBUTION BETWEEN CHLOROFORM AND AQUEOUS SOLUTIONS OF CALCIUM THIOCYANATE.

(Herzog and Bergonthun, 1923.)

Ten cubic centimeter portions of chloroform and of aqueous calcium thiocyanate were shaken 12 hours (at room temp.,?) with the quantities of cellobios octa acetate shown. The acetate present in 5 cc. portions of the chloroform before and after the period of shaking, was determined by evaporation and weighing the residue.

Results for aqueous $Ca(SCN)_2$ solutions of

9.08 Normality		8.68 Normality		7.00 Normality	
Gms. Acetate used per 10 cc.	Distribution coef.	Gms. Acetate used per 10 cc.	Distribution coef.	Gms. Acetate used per 10 cc.	Distribution coef.
0.0478	3.20	0.0525	0.58	0.0525	0.03
0.0966	3.86	0.1018	0.56	0.1018	0.06
0.1912	3.61	0.2000	0.56	0.2000	0.04
0.3314	3.38	0.3506	0.56	0.3506	0.05

AZOANISOLE PHENETOL $(C_6H_4OCH_3.C_6H_4OC_2H_5)_2N_2$.

Freezing-point data are given by Bogojawleusky and Winogradow, 1907, for mixtures of azoanisole phenetol with each of the following compounds: azoanisole, azoxyanisole, azooxy phenetol, azo phenetol, dipropyl azo phenol and methyl propyl azo phenol.

CHRYSAROBIN $C_{30}H_{36}O_7$.

SOLUBILITY IN SEVERAL SOLVENTS.
(U. S. P.)

Solvent.	Gms. per 100 Gms. Solvent at: 25°.	80°.	Solvent.	Gms. per 100 Gms. Solvent at 25°.
Water	0.021	0.046	Chloroform	5.55
Alcohol	0.324	0.363 (60°)	Ether	0.873
Benzene	4	...	Amyl Alcohol	3.33
			Carbon Disulfide	0.43

EMETINE $C_{30}H_{40}N_2O_4$.

SOLUBILITY IN WATER. (Kolthoff, 1925.)

The dissociation constants were found to be $K_1 = 2.3.10^{-7}$ and $K_2 = 1.7.10^{-6}$. The solubility product, calculated as a mono acid base is $L_{\text{Emetine OH}} = 3.7.5.10^{-9}$. From this and K_1 the solubility was calculated to be 2.10^{-3} gm. mol. per liter at 15°.

100cc Olive Oil dissolve 1.0 gm. emetine at 25°. (Walton, 1935.)

EMETINE Salts.

SOLUBILITY IN WATER.
(Carr and Pyman, 1914.)

Salt.	Formula.	t°.	Gms. Hydrated Salt per 100 cc. Sat. Sol.
Emetine Hydrochloride	$C_{29}H_{40}O_4N_2.2HCl.7H_2O$	18	13.1
" Hydrobromide	$C_{29}H_{40}O_4N_2.2HBr.4H_2O$	17–18	1.9
" Nitrate	$C_{29}H_{40}O_4N_2.2HNO_3.3H_2O$	17–18	3.7
" Sulfate	$C_{29}H_{40}O_4N_2.H_2SO_4.7H_2O$	17–18	more than 100

100 gms. sat. solution of Emetine hydrochloride in water contain 16.53 gms. $C_{29}H_{40}N_2O_4.2HCl$ at 25°. (Schnellbach and Rosin, 1931.)

PICROTOXIN $C_{30}H_{34}O_{13}$.

100 gms. H_2O dissolve 0.41+ gm. picrotoxin at 20–25°. (Dehn, 1917.)
" pyridine dissolve 102 gms. " " "
" aq. 50% pyridine " 81 " " " "

CARYOPHYLLIN $C_{30}H_{48}O_3$.

APPROXIMATE SOLUBILITY IN SEVERAL SOLVENTS. (Dodge, 1918.)

Solvent.	t°.	Gms. $C_{30}H_{48}O_3$ per 100 gms. solvent.	Solvent.	t°.	Gms. $C_{30}H_{48}O_3$ per 100 gms. solvent.
95 % alcohol......	20	0.943	Ether............	20	1.538
95 % alcohol......	b. pt.	2.857	Chloroform.......	20	0.847
Acetone..........	20	0.555	Methyl alcohol....	20	0.425

URSON $C_{30}H_{48}O_3.2H_2O$.

100 gms. 95 % alcohol dissolve about 0.9 gm. Urson at 20° and 2.8 gms. at the b. pt.

100 gms. Ether dissolve about 1.5 gm. Urson at 20°. (Dodge, 1918.)

ANDROMEDOTOXINE $C_{31}H_{51}O_{10}$.

SOLUBILITY IN SEVERAL SOLVENTS AT 12° AND AT THE BOILING-POINTS OF THE SOLVENTS.

(Zaayer, 1886.)

Solvent.	Gms. $C_{31}H_{51}O_{10}$ per 100 Gms. Sat. Sol. at: 12°.	B. Pt.
Water	2.81	0.87
Ethyl alcohol ($d_{12} = 0.821$)	11.70	...
Amyl alcohol	1.14	...
Chloroform	0.26	0.26
Commercial ether	0.07	0.07
Benzine	0.004	...

VERATRINE (Cevadine) $C_{32}H_{49}NO_9$.

SOLUBILITY OF VERATRINE IN WATER. (Kolthoff, 1925.)

The *dissociation constant* was calculated from colorimetric p_H measurements in mixtures of 0.01 *n* veratrine hydrochloride and 0.01 *n* Na OH to be $K = 7.2.10^{-6}$. It is, therefore, a fairly strong base. For the determination of the *solubility product* it was found that a mixture of 5.0 cc. of 0.05 *n* veratrine hydrochloride + 0.8 cc. 0.01 *n* Na OH gave no precipitate after standing 1 day. With 0.9 cc. 0.1 *n* Na OH a crystalline deposit appeared. The p_H of the saturated solution was 8.5. The $[OH] = 2.10^{-6}$. The veratrine salt conc. $= 3.10^{-2}$ *n* and the calculated solubility product, $L_{\text{Veratrine}} = 6.10^{-8}$. From K and L the solubility of veratrine was calculated to be 8.10^{-3} gm. mols. per liter at 15°.

SOLUBILITY OF VERATRINE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms. Veratrine per 100 Gms. Solvent.	Authority.
Water	25	0.057	(U. S. P. VIII.)
Water	20	0.114	(Zalai, 1910.)
3% H_3BO_3 in Aq. 50% Glycerol	ord.	6	(Baroni & Barlinetto, 1911.)
Aniline	20	37	(Scholtz, 1912.)
Pyridine	20	175	"
Piperidine	20	83	"
Diethylamine	20	271	"
Oil of Sesame	20	1.39	(Zalai, 1910.)

DICETYL (Dotriacontane) $CH_3(CH_2)_{30}CH_3$.

The critical solution temperature of mixtures of dicetyl and sulfur dioxide is 110°. (Seyer and Todd, 1931)

Freezing-point data are given for mixtures of dicetyl and:

- Benzene(1)
- Butane(2)
- Cyclohexane(1)
- Decane(1)
- Dodecane(1)
- Hexane(1)
- Octane(1)
- Propane(2)

(1) Seyer, 1938; (2) Seyer and Fordyce, 1936.

ACONITINE $C_{34}H_{45}NO_{11}$.

SOLUBILITY OF ACONITINE IN WATER AT 15°.

(Kolthoff, 1925.)

The author first determined the dissociation constant of aconitine. For this purpose the p_H values were estimated colorimetrically for a 0.01 molecular solution of aconitine chloride to which increasing amounts of 0.01 normal NaOH were added. From this series of determinations the dissociation constant K, for aconitine was found to be $1.3.10^{-6}$.

The solubility product was next estimated by adding 0.1 cc. of 0.01 normal NaOH to 5.0 cc. of 0.01 molecular aconitine chloride solution, and after seeding, allowing to stand 24 hours. Only a very slight precipitation occurred and it was concluded that the aconitine was in equilibrium with a solution which was 8.10^{-3} normal with respect to aconitine chloride and had a hydroxyl ion concentration of $6.4.10^{-8}$ These values correspond to a solubility product of 5.10^{-10}. The solubility is, therefore, $5.10^{-10} \div 1.3.10^{-6} = 4.10^{-4}$ or 260 milligrams aconitine per liter.

The author also states that he found a saturated solution of *Aconitine Nitrate* in water to have a concentration of $2.6.10^{-4}$ mol. per liter at 15°.

ACONITINE (Amorphous) $C_{34}H_{47}NO_{11}$.

SOLUBILITY IN SEVERAL SOLVENTS.

(At 25° U.S.P.; at 18°–22°, Müller — Apoth.-Ztg. 18, 2, '03.)

Solvent.	Gms. $C_{34}H_{47}NO_{1}$ per 100 Gms. Solvent at:		Solvent	Gms. $C_{34}H_{47}NO_{11}$ per 100 Gms. Solvent at:	
	18°–22°.	25°.		18°–22°.	25°.
Water	0.054	0.031	Benzene	..	17.85
Alcohol	...	4.54	Carbon Tetrachloride	1.99	...
Ether	1.44	2.27	Petroleum Ether	0.023	0.028

100 gms. H_2O dissolve 0.0226 gm. aconitine at 22° (Dunstan and Umney, 1892.)
" " abs. alcohol " 2.7 " " " " (Jürgens, 1885.)
" " " ether " 1.56 " " " " "

INULIN $(C_6H_{10}O_5)_6.H_2O$.

SOLUBILITY OF INULIN IN WATER.

(Yanovsky and Kingsbury, 1933.)

The saturated solutions were prepared by intermittent shaking by hand and analyzed on successive days for reducing sugars and inulin. Equilibrium was approached very slowly. The results indicate that inulin from the dahlia and from chicory each exist in two modifications. One of the modifications of chicory inulin is unstable and gradually changes to the less soluble form.

Source of Inulin	Gms. Inulin dissolved per 100cc solution at:		
	6°	20°	30°
Dahlia Inulin	0.02	0.15	0.48
" " (1)	—	0.03	—
Chicory Inulin	0.49	0.76	3.0
" " (1)	—	0.12	—

(1) Recrystallized from water.

XANTHALINE (Mono) **PICRATE** (m. pt. 212°.5). $C_{37}H_{36}N_2O_9 . HOC_6H_3(NO_2)_3$.

100 gms. sat. solution of Xanthaline Picrate in water contain 0.01 gm. of the compd. at 15°.

100 gms. sat. solution of Xanthaline Picrate in abs. alcohol contain 0.022 gm. of the compd. at 15°.

100 gms. sat. solution of Xanthaline Picrate in acetone contain 0.34 gm. of the compd. at 15°. (Maplethorpe and Evers, 1925.)

LECITHIN $C_{42}H_{84}NPO_9$.

100 gms. of sat. solution in aqueous 5% bile salts contain 4.5 gms. lecithin at 15°-20° and 7 gms. at 37°. Lecithin is practically insoluble in water.

(Moore, Wilson and Hutchinson, 1909.)

Solubility of Lecithin in Aqueous Ethyl Alcohol.

(Vita and Bracaloni, 1934.)

The saturated solutions were prepared by intermittent agitation and analyzed by evaporation and weighing the residues dried at 100°. The sample of lecithin was prepared from egg yolk and contained 2.06% N and 3.94% P.

Vol. % C_2H_5OH in solvent	Gms. Lecithin dissolved per 100cc alcoholic solution at:				
	-15°	-4°	0°	+7°	+15°
75.84	1.27	1.32	1.34	1.62	2.14
79.91	1.96	2.03	2.15	2.96	4.08
82.75	2.85	3.16	3.47	5.36	9.04
85.31	4.11	5.15	5.60	9.35	27.05
86.95	6.05	8.43	9.49	19.08	46.91
87.92	8.51	11.82	13.67	50.03	54.52
88.86	10.86	13.48	19.60	52.92	—
92.15	22.43	29.15	42.58	—	—

SOLANINE $C_{52}H_{93}NO_{18}$.

Solubility of Solanine in Water at 15°.

(Kolthoff, 1925.)

This alkaloid is extraordinarily insoluble. In order to determine its *dissociation constant*, the p_H was measured colorimetrically in mixtures of 5 cc. of 0.0108 *n* solanine chloride solution + 50-100 cc. of water + 0.54 to 2.7 cc. of 0.01 *n* Na OH. From these measurements it was calculated that $K = 2.2.10^{-7}$. For the determination of the *solubility product* it was found that a mixture of 5 cc. of 0.0108 *n* solanine chloride solution, 50 cc. of water and 0.5 cc. of 0.01 *n* Na OH just gave a slight precipitate on standing. The p_H of the solution was 6.0 and the calculated $(OH) = 6.4.10^{-9}$. From this the solubility product $L_{Solanine} = 6.4.10^{-12}$. Calculating from L and K the solubility of solanine in water corresponds to a concentration of 3.10^{-5} mol. or about 0.025 gm. per liter.

ALOIN.

Squires and Caines (1905) found the solubility of aloin in water at room temperature to be 0.83 gm. per 100 cc. and in 90% alcohol, 5.55 gms. per 100 cc.

According to Wester and Bruins (1914) 100 gms. trichloroethylene dissolve 0.013 gm. aloin at 15°.

CARMINE.

100 gms.	H_2O	dissolve	0.13 gm. carmine	at 20-25°.	(Dehn, 1917.)
"	pyridine	"	3.34 gms. "	" " "	"
"	50% aq. pyridine	"	2.03 " "	" " "	"

HELIANTHIN (Methyl Orange, Tropaeolin).

100 cc. H_2O dissolve 0.0055 to 0.0225 gm. helianthin. (Dehn, 1917a.)
100 cc. pyridine dissolve 0.75 gm. helianthin. "
100 cc. 50% aq. pyridine dissolve 62.5 gms. helianthin. "

Results for other solvents and observations on the state of colored compounds in solution are given.

DYES.

Data for the distribution of 12 dyes between water and isobutyl alcohol at 25°, are given by Reinders and Lely, Jr. (1912).

Data for the solubility of thirty new azo dyes similar to oil scarlet, in carbon tetrachloride and in toluene are given by May and Hunt, 1928.

Data for the solubility of yellow AB (benzene-azo-β Naphthylamine) and of scarlet X 9995 (benzene-azo-β Naphthol), in aqueous solutions of stable protective colloids (soap or other detergents) are given by McBain and Woo, 1938.

FATS, OILS and WAXES.

CRITICAL SOLUTION TEMPERATURES OF FATS AND OILS IN GLACIAL ACETIC ACID.

(Grimme, 1919, 1920.)

When a solution of a fat in a suitable solvent cools, it is observed that at a given temperature, which depends both upon the solvent and the nature of the selected fat, a sudden cloudiness of the solution develops. The temperature at which this takes place is the CRITICAL SOLUTION TEMPERATURE. The author gives a review of previous work upon this determination and subjects the method to a critical study. He used glacial acetic acid instead of alcohol in order to be able to work with open tubes instead of closed ones. He also tested the effect of cooling with and without an air bath. It was found that a bath of glycerol cooled so slowly that too much time was required for the determinations.

	Critical temperature of solution using:			
	1.0 part of oil + 2.0 parts CH_3COOH.		1.0 part of oil + 1.0 part CH_3COOH.	
Oil or Fat used.	Without air bath.	With air bath.	Without air bath.	With air bath.
Apricot oil	90.0	97.5	91.5	92.0
Pea nut oil	71.0	71.5	93.5	91.25
Almond oil	100.0	102.0	97.5	100.5
Olive oil	45.5	45.0	72.5	73.5
Adansonia oil	85.0	88.5	92.5	92.5
Seed oil	79.0	82.5	100.0	102.0
Cotton seed oil	87.5	80.0	96.5	96.75
Rape seed oil	104.0	104.0	98.5	96.5
Sesame oil	86.5	87.5	96.5	95.0
Rice oil	85.5	85.0	89.0	88.0
Wood oil	85.0	81.5	94.5	97.5
Flax seed oil	93.0	92.0	102.5	102.0
Indian laurel oil	52.0	51.5	61.5	61.5
Marotti oil	72.0	84.5	88.5	87.0
Palm oil (Kamaroon)	76.0	78.0	87.0	87.0
» » (Togo)	77.0	74.5	88.5	85.5
Cocoa butter	66.0	62.0	65.5	68.0
» »	64.0	63.0	69.0	68.5
» » (old)	66.0	62.5	70.5	65.0
Cocoa nut fat	39.0	44.5	60.0	60.0
Butter fat	64.0	65.0	68.5	68.0
Cod liver oil	79.5	78.5	88.5	86.5
Beef tallow	80.5	79.5	96.0	97.5
Hog lard	94.0	94.0	94.0	95.0

SOLUBILITY OF THE FATTY ACIDS OBTAINED FROM SEVERAL SOURCES IN ALCOHOL AND IN BENZENE. (Dubois and Pade, 1885.)

Crude Fatty Acid of:	Gms. Fat per 100 Gms. Abs. Alcohol at: 0°.	10°.	26°.	Gms. Fats per 100 Gms. Benzene at 12°.
Mutton	2.48	5.02	67.96	14.70
Beef	2.51	6.05	82.23	15.89
Veal	5	13.78	137.10	26.08
Pork	5.63	11.23	118.98	27.30
Butter	10.61	24.81	158.2	69.61
Margarine	2.37	4.94	47.06	13.53

MISCIBILITY OF FATS AND 90 VOL. PER CENT ALCOHOL AT 37°. (Vandevelde, 1911.)

Mixtures of fats and alcohol in various proportions were shaken twice daily for 8 days and the volume of each layer, as well as its composition, determined.

Mixture.	Composition of Mixture. cc. Alcohol	cc. Fat	Volume after Agitation. cc. Alcohol	cc. Fat	Gms. Fat per 100 Gms. Alcohol Layer	Gms. Alcohol per 100 Gms. Fat Layer.
Alcohol + Cocaline	25	5	25.4	4.6	4.9	19.4
" "	20	10	19.2	10.8	5.6	16.2
" "	15	15	13	17	7.2	13.5
" "	10	20	6.7	23.3	9.1	12.2
" "	5	25	1.1	28.9	13	11.4
Alcohol + Butter Fat	25	5	25.1	4.9	3.5	17.4
" "	20	10	19.2	10.8	3.5	14.1
" "	15	15	13	17	4	14.1
" "	10	20	7.1	22.9	5.7	11.4
" "	5	25	2	28	14.1	9.5
Alcohol + Olive Oil	25	5	24.7	5.3	2.3	11.2
" "	20	10	19.2	10.8	2.4	8.7
" "	15	15	13	17	2.4	8.7
" "	10	20	7.5	22.5	2.5	8.8
" "	5	25	2.2	27.8	7	7.6

For other data on the solubility of fats see Ewers (1910) and Louise (1911).

SOLUBILITY OF COCOANUT AND PALM KERNAL OIL IN ALCOHOL AND IN ACETIC ACID (Van Kregten, 1919, 1920.)

Solvent.	Per cent Concentration of solvent.	Critical solution temp. for Cocoa nut oil.	Palm kernal oil.
Ethyl Alcohol of d_{15}^{15} = 0.7942	99.96	20.2	28.7
" " " = 0.7981	99.16	30	38.8
" " " = 0.8001	98.75	35.5	44.2
" " " = 0.8020	98.36	39.5	47.9
Acetic Acid " = 1.0573	99.05	17.9	32.5
" " " = 1.0579	99.05	26.0	41.5
" " " = 1.0584	98.85	30.9	46.5

1 gm. of oil + 5 cc. of solvent were employed for each determination. The cocoanut oil contained 0.032 %, of fatty acids and the palm kernel oil, 0.060 per cent. The critical solution temperatures of various mixtures of the two oils are also given.

SOLUBILITY OF SEVERAL OILS IN ALCOHOL (d_{15} = 0.795) AT 14–15°. (Davidsohn and Wrage, 1915.)

Oil.	Gms. Oil per 100 Gms. Sat. Sol.
Linseed Oil	3.32
Rape Oil	1.36
Cotton Seed Oil	3.61
Olive Oil	2.25

Results are also given for the solubility of mixtures of oils and fatty acids in alcohol. The following results at 22°, in terms of approx. volume of oil dissolved by 100 volumes of 80% alcohol, are given by Aubert (1902). Nigella oil, 4.3; oil of boldo leaves, more than 100; matico oil, about 20; cascarilla oil, 5; weldmint oil, 66.

Miscibility curves for various oils with acetone, petroleum and aniline are given by Louise (1911). The use of this data for the identification of oils and

Results for the solubility temperatures of separation of mixtures of Castor Oil (alone and containing up to 10% of Sesame oil) and 89.9 Vol.% Ethyl alcohol are given by Meerburg, 1929.

Data showing the miscibility at 25° of 90% and of absolute Ethyl Alcohol with the following oils; almond, apricot kernel, China wood, cod liver, corn, linseed, neat's foot, olive, peach kernel, rape seed, sesame, soy bean, sunflower, walnut and whale, are given by Taylor, Larson and Johnson, 1936.

Data for the reciprocal solubility of sulfonated castor oil, mineral oil and oleic acid are given by Hart, 1929.

SOLUBILITY OF SEVERAL VOLATILE OILS IN AQUEOUS ALCOHOL AT 22-25°.

(Wood, 1920.)

The determinations were made by gradually adding water to an alcoholic solution of the oil untill opalescence appeared. Since the volatile oils are mixtures the results are of only approximate accuracy.

Per cent concentration of alcohol.	Cc. of each oil (determined separately), soluble in 100 cc. of alcohol of the concentration shown in the first column.					
	Anise oil.	Cinnamon oil.	Clove oil.	Eugenol.	Peppermint oil.	Sassafras oil.
30	0.05	-	0.02	-	0.02	0.07
40	0.08	-	0.10	0.30	0.09	0.10
50	0.10	0.20	0.40	5.8	0.03	0.20
60	0.25	0.40	2.0	16.0	0.06	1.30
65	0.80	1.10	10.0	-	0.07	2.30
70	1.50	2.20	21.75		0.10	4.00
75	4.00	7.0	-		0.17	7.00
80	7.5	-			0.35	11.00

RECIPROCAL SOLUBILITY OF SEVERAL OILS AND FATS IN LIQUID SULFUR DIOXIDE.

(Weisz and Opalski, 1922.)

Mixtures of weighed amounts of the oils and sulfur dioxide were sealed in high pressure glass tubes and the temperatures determined at which the mixture just became homogeneous or just showed a faint clouding. The sulfur dioxide contained 98.85 % SO_2 + 0.56 % H_2O + 0.67 % oily residue.

Castor oil + SO_2.		Lin seed oil + SO_2.		Rape seed oil + SO_2.		Olive oil + SO_2.	
t° of demixing.	Per cent oil in mixture.	t° of demixing.	Per cent oil in mixture.	t° of demixing.	Per cent oil in mixture.	t° of demixing.	Per cent oil in mixture.
-19....	2.05	- 6.25..	2.99	39.75..	4.41	28.5..	7.95
- 8....	7.23	+ 0.5...	7.79	45.5...	10.94	34.0..	11.12
-11.5..	28.74	- 2.0...	22.49	44.5...	26.22	8.5..	47.86
-21.0..	54.31	- 6.75..	37.79	18.0...	47.56	21.5..	79.07
-21.5..	63.04	-14.0...	64.50	7.75..	52.17		
-22....	86.82	-16.0..	70.85	± 0.0...	80.34		

Tallow + SO_2.		Bone oil + SO_2.		Oleic acid + SO_2.		Stearin + SO_2.	
t° of demixing.	Per cent tallow in mixture.	t° of demixing.	Per cent oil in mixture.	t° of demixing.	Per cent oleic acid in mixture.	t° of demixing.	Per cent stearin in mixture
21.75..	1.10	15.5....	1.87	14......	4.43	34.....	6.72
43.75..	10.97	35.75...	25.72	22......	9.84	37.....	8.86
25.5...	43.07	28.75...	37.64	22.5....	18.26	37.5...	13.82

It is ponited out by Fontein, 1923, that the H_2O in the SO_2 used, affects the temperature of demixing.

An extensive series of observations on the solubility of water in oils and on the water content of various oils is given by Umney and Bunker (1912).

Freezing-point data for oil of helianthus annus + stearic acid are given by Fokin (1912).

WAXES

Diagrams and numerical data are given by Pickett, 1929 for the solubility of Bees wax, Candelilla wax, Carnauba wax and Montau wax, each separately, in naphtha, turpentine, No. 22 thinner, (terpene hydro carbons + gasoline) solvenol (terpene hydro carbons + saturated hydro carbons), pine oil, sulfonated castor oil and mixtures of pine oil and sulfonated castor oil.

The effect of variations in precedure upon the solubility of Shellac in diethyl ether is reported by Gardner and Harris, 1934, and used as an illustration of the misleading results which are obtained unless precautions are taken to avoid important sources of error.

GASOLINE (Petrol. Essence) See also Heptane and Hexane.

Solubility of Motor Gasoline (66° Be) and Casing Head Gasoline (81° Be) in Water at 25°. (Milligan, 1924.)

Gasoline vapor mixed with air was shaken for 2 minutes with distilled water previously saturated with air. The mixture was analyzed by means of a Haldane gas analysis apparatus before and after contact with water, and the amount of gasoline dissolved by the water found by difference. The solubility coefficient α_{25} represents the volume of gas (reduced to 0°) which dissolves in one volume of water at 25° when the pressure of the gas over the water is 760 mm.

Using motor gasoline (66° Be) of average composition C_7H_{16} (Heptane) the result was $\alpha_{25} = 0.017$.

Using casing head gasaline (81° Be) of average composition C_6H_{14} (Hexane) the result was $\alpha_{25} = 0.012$.

From these values for gasoline vapors, corresponding in composition to heptane and hexane, the solubility of liquid heptane and hexane in water at 25° was calculated to be approximately 0.0007 and 0.0014 volumes, respectively, per 100 volumes of H_2O.

Solubility of Mixtures of Gasoline and Benzene and of Gasoline and Xylene in 92 wt. per cent Ethyl Alcohol at 20°. (Ormandy and Craven, 1921.)

Gasoline + Benzene Mixtures.		Gasoline + Xylene Mixtures.			
Vol. % C_6H_6 in mixture.	Gms. mixture per 100 gms. sat. sol. in 92 wt. % alcohol.	Vol. % $C_6H_4(CH_3)_2$ in mixture.	Gms. mixture per 100 gms. sat. sol. in 92 wt. % alcohol.	Vol. % $C_6H_4(CH_3)_2$ in mixture.	Gms. mixture per 100 gms. sat sol. in 92 wt. % alcohol.
15	63.4	0.0	(Gasoline) 37.3	55.6	77.6
30	81.4	7.7	42.5	62.5	79.0
40	84.9	25.0	63.1	71.4	80.2
50	87.3	33.3	70.0	76.9	80.9
60	88.3	41.7	73.7	83.3	81.4
80	90.3	45.4	74.8	90.0	82.3
100	93.1	50.0	76.2	100.0	84.6

Similar results for mixtures of ether and xylene and ether and kerosene are also given.

PETROLEUM ETHER.

100 cc. H_2O dissolve 0.005 cc. petroleum ether at 15°. (Groschuff, 1910.)

LIGRÖIN.

100 cc. H_2O dissolve 0.341 cc. ligröin at 22°, Vol. of solution = 100.34, Sp. Gr. 0.9969.

100 cc. ligröin dissolve 0.335 cc. H_2O at 22°, Vol. of solution = 100.60, Sp. Gr. 0.6640. (Herz, 1898.)

PETROLEUM

Qualitative data upon the miscibility of samples of Pennsylvania and Texas petroleum oil and of paraffin wax with 27 solvents at 10°, 21°, and higher temperatures are given by Poole, 1929. Similar results for an additional 26 solvents are given by Poole and others, 1931. These and many quantitative results show that the number of solvents which may be used for dewaxing is very large.

Quantitative results are given by Poole, 1929, for the solubility of lubricating oils and of paraffin wax in acetone, butanol, ethyl acetate, butyl acetate, chloro benzene and toluene.

Quantitative determinations of the solubility of Pennsylvania petroleum and of paraffin wax in naphtha, turpentine, ethylene dichloride, methyl ethyl ketone, n butyl aldehyde, iso propyl alcohol, n amyl alcohol, alcohol, pentasol and paraldehyde, as well as results showing the effect of petroleum oil upon the solubility of paraffin wax in butanol, butyl acetate and chloro benzene are given by Poole and others, 1931. The results are useful in permitting the separation of paraffin wax from liquid hydro carbons by solubility differences.

Results showing the effect of temperature and of oil-solvent ratio upon the solubility of paraffin wax in butyl formate, n butyl aldehyde and diethyl carbinol are given by Poole and Mangelsdorf, 1932.

SOLUBILITY OF PETROLEUM IN LIQUID SULFUR DIOXIDE.

(Zerner, Weisz and Opalski, 1922.)

Mixtures of known amounts of the two products were sealed in resistance glass tubes and the temperatures determined at which a homogeneous mixture or slight clouding occurred. The SO_2 consisted of 98.85 % SO_2, 0.56 % H_2O and 0.67 % oily residue. The petroleum was an American commercial sample which began to boil at 175°; 30.9 % distilled at 175°-200°, 47.9 % at 200°-225° and 15.6 % at 225°-250°. The $d_{18} = 0.8102$ and $n \frac{15°}{D} = 1.4514$.

t° of Demixing.	Per cent Petroleum.	t° of Demixing.	Per cent Petroleum.	t° of Demixing.	Per cent Petroleum.
−12.6	0.6	44.0	22.10	13.25	73.6
+13.0	2.40	43.0	29.3	3.0	79.0
24.5	4.23	38.5	48.4	0.5	85.1
36.0	8.54	34.25	56.5	−3.5	86.9
39.75	11.14	28.0	63.6		

The solutions were colored yellow to brown. At lowest concentrations of SO_2 a brown resin separates.

The above experiments are criticised by Fontein, 1923 who points out that the water present in the SO_2 affects the temperature of demixing.

The use of sulfur dioxide in the refining of petroleum is discussed in detail by Edeleanu, 1923.

PARAFFINS.

Data for the solubility of several samples of paraffin in a large number of solvents are given by Sachanen, 1925. The samples of paraffin varied in melting-point from 41°-42°, 53 1/2°-55°, 56°-57°, 57°-58 1/2 and 78°-80°. The solvents included benzine, kerosene, paraffin oil of several densities, machine oil, mazout (containing and free from paraffin) benzoin, abs. alcohol, methyl alcohol and iso amyl alcohol. In each case the solubility begins at less than 1 per cent at a temperature of 0° or less and rises very rapidly to 50 per cent or more with increase of temperature to about 50°.

PARAFFINS

SOLUBILITY OF PARAFFIN WAX IN PURE HYDROCARBONS.

(Weber and Dunlap, 1928.)

The sample of paraffin wax was carefully recrystallized three times from benzene. That part which first crystallized was taken for the next crystallization each time. The final sample was about 25 percent of the original amount. This product undoubtedly contained several constituents. Its melting point was 56° and density at 20/40° = 0.775. The hydrocarbons were very carefully purified.

Hydrocarbon	b.pt.	$d\frac{20^\circ}{4}$	Gms. Paraffin dissolved per 100cc Hydrocarbon at:					
			0°	5°	10°	15°	20°	25°
n Pentane	36.1-36.3	0.631	—	—	5.11	6.94	9.53	17.16
n Hexane	68.9-69.2	0.661	2.77	3.69	4.81	6.07	8.31	10.23
n Heptane	98.2-98.4	0.684	1.37	2.18	3.55	5.06	7.18	14.36
n Octane	124.5-124.6	0.706	0.99	1.69	2.90	4.24	5.93	11.66
Iso decane	159.8-160.1	0.721	—	0.94	1.44	2.74	4.98	9.17

The curves of solubility of a commercial paraffin wax from mid-continent crude petroleum, and of several samples obtained by repeated fractionation of this paraffin, in petroleum ether and in a number of mid-continent petroleum oils of varying viscosities, are reported by Sullivan, McGill and French, 1927. It was found that the solubility of paraffin waxes increases as the melting point of the wax decreases. The solubility decreases with increasing viscosity of the solvent. These differences were found to be less at the lower temperatures.

Determinations of the solubility relations of commercially refined paraffin waxes in petroleum distillates are reported by Berne-Allen and Work, 1938. It was found that the average boiling-points of the petroleum fractions and the melting-points of the paraffin waxes are directly related to the molecular weights of the solvents and solutes respectively. An empirical equation was established to express the relationship between m. pt. of the wax, b. pt. of the solvent and the solution temperature equilibrium.

SOLUBILITY OF OZOKERITE PARAFFIN OF MELTING POINT 64°-65° AND SP. GR. AT 20° = 0.917 IN SEVERAL SOLVENTS AT 20°

(Pawlewski and Filemonowicz, 1888.)

Solvent.	Gms. Paraffin per 100		Solvent.	Gms. Paraffin per 100	
	Gms. Solvent.	cc. Solvent.		Gms. Solvent.	cc. Solvent.
Carbon Disulfide	12.09	...	Acetone	0.262	0.209
Benzine, boiling below 75°	11.73	8.48	Ethyl Acetate	0.238	...
Turpentine, b. pt. 158°-166°	6.06	5.21	" Alcohol	0.219	...
Cumol, com. b. pt. 160°	4.26	3.72	Amyl Alcohol	0.202	0.164
" frac. 150°-160°	3.09	3.39	Propionic Acid	0.165	...
Xylene, com. b. pt. 135°-143°	3.95	3.43	Propyl Alcohol	0.141	...
" frac. 135°-138°	4.39	3.77	Methyl Alcohol	0.071	0.056
Toluene, com. b. pt. 108°-110°	3.88	3.34	Methyl Formate	0.060	...
" frac. 108°-109°	3.92	3.41	Acetic Acid	0.060	0.063
Chloroform	2.42	3.61	" Anhydride	0.025	...
Benzene	1.99	1.75	Formic Acid	0.013	0.015
Ethyl Ether	1.95	...	Ethyl Alcohol 75%	0.0003	...
Isobutyl Alcohol, com.	0.285	0.228			

Freezing-point data for mixtures of paraffin and naphthalene and paraffin + stearin are given by Palazzo and Battelli (1883).

CELLULOSE ESTERS

SOLUBILITY OF CELLULOSE ESTERS IN VARIOUS ORGANIC SOLVENTS.

(Mardles, 1923.)

" Cellulose esters dissolve in numerous organic liquids to form clear, viscous, colloidal solutions, from which the ester can be recovered unchanged. Some liquids appear to be better solvents than others, dissolving the cellulose acetate more rapidly and yielding less viscous solutions. Similarly a mixture of liquids often forms a better solvent than either taken singly. " Saturation cannot be obtained in the ordinary way on account of the rapid rise of viscosity with concentration. The author has chosen a method based upon the observation of Schützenberger (*Compt. rend.*, 68, 814, 1869) that the triacetate of cellulose dissolves in nitrobenzene on warming and precipitates in a gelatinous form on cooling the solution. " The method of observing this transition temperature of the dispersion medium, from a complete solvent to a partial or non-solvent, has been used to appraise the relative solvent powers of liquids for cellulose esters. The point of precipitation is marked by the appearance of turbidity or opalescence, as in the case when a mixture of liquids is cooled below the temperature of complete miscibility, indicating the transition from a true solution to a coarse dispersion. " About 5 cc. of a solution of a concentration of 5 grams per 100 cc., contained in a test-tube, was cooled with stirring, and the temperature noted at which opalescence appeared.

Results for Cellulose Acetate (Rhone).

Solvent.	t° of opalescence for a concentration of 5 gm. per 100 cc.
Benzyl alcohol	25°
»	35
Cyclo hexanol	95
o Methyl cyclo hexanol	109
p Methyl cyclo hexanol	115
m Methyl cyclo hexanol	123
Cyclohexanone	−17
Cresyl acetate	42
Phenyl acetate	33
Tolyl alcohols	47

Results for $(C_{12}H_{13}O_8Cl_3)_x$, believed to be Cellulose Chlor Acetate.

Solvent.	t° of opalescence. for a concentration of 5 gm. per 100 cc.
Amyl benzoate	90°
Benzyl alcohol	57
Tolyl alcohols	75
Methyl butyrate	less than -65
Tolyl ethyl ethers	110
Cresyl methyl ethers	125
Tolyl methyl ethers	70
Amyl acetate	-60
Diacetone alcohol	27

Cellulose nitroacetate in benzyl alcohol (5 gm. per 100 cc.) gives opalescence at 25° and at higher temperatures, depending upon the nitrogen content of the sample.

The author found that for very dilute solutions the temperature of opalescence rises with concentration, but eventually remain nearly constant over a wide range of concentration, and then falls with further increase.

Data for the solubility in binary and ternary systems of solvents are also given

An indirect method of determining the solubility consists in comparing the effect upon various solvents of the addition of different amounts of an indifferent miscible non-solvent, such as petroleum ether, upon the temperature of precipitation of the cellulose ester. The non solvent, which was usually the heptane fraction of petroleum spirit, was added from a buret to about 5 cc. of the solution (of 5 gms. per 100 cc.) contained in a test-tube kept at 20°, untill the incipient turbidity persists. An extensive series of such measurements is given.

NITROCELLULOSE (Soluble Pyroxylin, Tetra and Penta Nitrate).

SOLUBILITY IN ETHER-ALCOHOL MIXTURES.

(Matteoschat, 1914; see also Stepanow, 1907.)

A sample of gun cotton containing 12.95% N was used. The compound was first covered with alcohol and then the amount of ether to yield the desired composition of solvent was added. Lower results were obtained with ready prepared ether-alcohol mixtures.

Ratio of Ether : Alcohol.	Gms. Gun Cotton Dissolved per 100 Gms. Solution in Mixtures Prepared with:			
	99.5 Vol. % Alcohol.	95 Vol. % Alcohol.	90 Vol. % Alcohol.	80 Vol. % Alcohol.
1 : 2	34.4	...	...	...
1 : 1	52.3	42.3	28.7	14.2
2 : 1	40.5	52.4	53.9	45
3 : 1	25	42.4	53	57.5

NITROCELLULOSE.

Experiments upon the solubility of nitrocellulose in mixtures of alcohol and ether are described by de Bruin, 1921, and in mixtures of alcohol and ethylacetate by Wilkie, 1921. It was found by de Bruin that the solubility decreased as the per cent of nitrogen in the sample increased. 384 samples were tested with the following results.

Mean per cent of N..	11.38	12.25	12.45	12.64	12.74	12.85	12.93	13.19
Mean solubility.....	97.5	95.6	85.6	66.8	48.2	34.3	23.8	8.2

The exact terms in which the results are given are not-stated. The solvent consisted of approximately 33 vol. per cent C_2H_5OH and 66 vol. per cent $(C_2H_5)_2O$. It was found by Wilkie that four different samples of nitrocellulose each showed a slight maximum solubility in a mixture of about 60 per cent ethyl acetate in alcohol, but the differences between the several samples were greater than the variations in solubility of any sample in increasing concentrations of ethyl acetate in alcohol.

TURPENTINE OIL

SOLUBILITY IN ETHYL ALCOHOL.

(Vezes and Mouline, 1904, 1905–06.)

Spirit of turpentine and absolute alcohol are miscible in all proportions and the mixture may be cooled to a very low temperature without ceasing to be homogeneous. In the case of alcohol containing a small amount of water, the mixture, which is uniform at ordinary temperature, separates into two layers when cooled. The following data were obtained for mixtures of 98 vol. % alcohol (= 0.968 gm. C_2H_5OH per 1 gm. aq. alcohol) and spirits of turpentine and for mixtures of 95 vol. % alcohol (= 0.924 gm. C_2H_5OH per 1 gm. aq. alcohol) and spirits of turpentine.

Results for 98 Vol. % Alcohol.				Results for 95 Vol. % Alcohol.			
t° of Separation.	Gms. 98 Vol. % Alcohol per 100 Gms. Mixture.	t° of Separation.	Gms. 98 Vol. % Alcohol per 100 Gms. Mixture.	t° of Separation.	Gms. 95 Vol. % Alcohol per 100 Gms. Mixture.	t° of Separation.	Gms. 95 Vol. % Alcohol per 100 Gms. Mixture.
−35.6	2.7	−20.9	32.9	+20.7	2.4	29.6	48.3
−23	4.8	−26.1	42.6	42.2	3.4	23.9	52.8
−20.9	9.5	−30	48.2	53	7.2	16.3	61.4
−18.1	13.2	−45.3	58	53.1	10.2	−15.5	76.6
−17.8	16	−79.2	71.9	44	20.3	−24	81.1
−18.8	24.4			37.2	30.6	−63	87.1

Data in regard to the sample of spirits of turpentine which was used, are not given.

CAOUTCHOUC.

SOLUBILITY IN ORGANIC SOLVENTS. (Hanausek, 1884.)

	Gms. Caoutchouc Dissolved per 100 Gms. Solvent.		
Solvent.	Ceara.	Tete Noire.	Sierra Leone.
Ether	2.8	3.6	4.5
Turpentine	4.5	5	4.0
Chloroform	3	3.7	3
Petroleum	1.5	4.5	4
Benzene	4.4	5	4.7
Carbon Disulfide	0.4	0	0

SOLUBILITY OF CAOUTCHOUC IN MIXTURES OF BENZENE AND ALCOHOL. (Caspari, 1915.)

(Freshly prepared solutions of determined caoutchouc in benzene were titrated with alcohol to the appearance of two phases. The end point is sharp to within one drop of precipitant, especially at low concs. of caoutchouc. For purposes of converting the weight of caoutchouc to volume, the factor 0.91 may be taken.)

Results at 20°.

Gms. Caoutchouc.	cc. C_6H_6.	cc. Abs. C_2H_5OH.	Gms. Caoutchouc.	cc. C_6H_6.	cc. 95% C_2H_5OH.	Gms. Caoutchouc.	cc. C_6H_6.	cc. 92% C_2H_5OH.
[illegible]	40	17	0.260	40	11	0.80	40	9.6
[illegible]	40	15.8	0.81	40	10.8	2.01	40	8.8
[illegible]	40	14.8	2.04	40	10.2	3.20	40	8.1
2.44	40	14.6	3.22	40	9.8			
4.002	40	[illegible]						

Results at 40°.			Results at 60°.		
Gms. Caoutchouc.	cc. C_6H_6.	cc. Abs. C_2H_5OH.	Gms. Caoutchouc.	cc. C_6H_6.	cc. Abs. C_2H_5OH.
[illegible]	40	18.8	0.2	40	21.6
1	40	15.1	1	40	23.3
[illegible]	40	15.4	2.1	40	24.4

SOLUBILITY OF CAOUTCHOUC IN MIXTURES OF BENZENE AND ACETONE. (Caspari, 1915.)

Results at 20°.			Results at 40°.			Results at 60°.		
Gms. Caoutchouc.	cc. C_6H_6.	cc. $(CH_3)_2CO$.	Gms. Caoutchouc.	cc. C_6H_6.	cc. $(CH_3)_2CO$.	Gms. Caoutchouc.	cc. C_6H_6.	cc. $(CH_3)_2CO$.
0.11	20	24.5	0.10	20	19.6	0.10	20	23
[illegible]	20	[illegible]	0.98	20	17.6	1.01	20	20.4
[illegible]	20	14.7						

The comparative qualitative solubility characteristics of caoutchouc, balata, hydro caoutchouc, polystyrols, polyvinyl acetate, poly iso propenyl methyl ketone and poly vinyl ester in CS_2, $CHCl_3$, CCl_4, C_6H_6, cyclohexane, hexane, tetralin, decalin, pyridine, ether, acetone dioxan, ethyl acetate, methyl alcohol and acetic acid, and for polystyrol and hydro polystyrol in most of the above solvents, are given by Steudinger and Heuer, 1934. The authors also give results for the precipitability of polystyrols of molecular weight 60,000 and 140,000 in various solvents, by the addition of methyl alcohol and of acetone, and the precipitability of a series of polystyrols of molecular weight 2400 to 250,000 dissolved in benzene and in methyl ethyl ketone, by the addition of methyl alcohol and of ethyl alcohol.

EDESTIN.

SOLUBILITY OF EDESTIN IN AQUEOUS SOLUTIONS AT 25°. (Kodama, 1922.)

Crystalline edestin, prepared from hemp seed by the method of Osborne, was used. Into a series of flasks, 0.05 gm. edestin and 10 cc. portions of aqueous HCl or Na OH solutions of various concentrations were placed. The mixtures were kept in a thermostat at 25° for 30 minutes. The p_H was determined by Clark's method. The mixtures were filtered and the dissolved edestin in the filtrates determined nephelometrically. The results show that edestin dissolves as the HCl salt in solutions more acid than p_H 5.9 and as the Na OH salt in solutions more alkaline than p_H 8.0. Between p_H 5.9 and 8.0 the amount dissolved could not be detected by the nephelometric method. The iso electric point of edestin is at p_H 5.9. Neutral Na Cl solutions dissolve edestin only when the concentration of Na Cl is greater than 2.0 normal and the acidity of the solution not more than p_H 5.9.

EDESTIN and Edestin Salts.

SOLUBILITY IN AQ. SALT SOLUTIONS AT 25°.
(Osborne and Harris, 1905.)

The determinations were made by shaking an excess of the air-dry preparation with 20 cc. of the salt solution, allowing the globulin to settle and determining nitrogen in 10 cc. of the clear supernatant solution. The edestin or edestin salt was calculated from the N. The results are given in the form of curves. The following figures were read from the curve for the solubility of neutral edestin in aq. NaCl.

Gms. NaCl per 20 cc. Solvent →	0.468	0.585	0.702	0.818	0.935
Gm. Edestin per 20 cc. Sat. Sol. →	0.25	0.55	0.92	1.25	1.45

Curves are also given for the solubility of edestin in aqueous solutions of many other salts and of the solubility of edestin chloride, bichloride and sulfate in aq. sodium chloride solutions.

100 gms. pyridine dissolve 0.07 gm. edestin at 20-25°. (Dehn, 1917.)
100 gms. aq. 50% pyridine dissolve 9.05 gm. edestin at 20-25°. "

ZEIN (Protein from Corn).

SOLUBILITY IN AQUEOUS ALCOHOL SOLUTIONS AT 25°.
(Galeotti and Giampalmo, 1908.)

Dry powdered zein was added to the alcohol + water mixtures and the solutions kept at 25° and shaken frequently during 24 hrs. The removed undissolved residue was dried to constant weight and weighed.

Vol. % C_2H_5OH in Solvent.	Gms. Zein per 100 Gms. Sat. Sol.	Vol. % C_2H_5OH in Solvent.	Gms. Zein per 100 Gms. Sat. Sol.
10	0.05	60	18.57
20	0.11	70	19.87
30	0.21	80	7.81
40	0.51	90	4.51
50	1.43	100	0.02

Similar results are given for the solubility of zein in mixtures of $C_2H_5OH + H_2O + CHCl_3$ at 20° and $C_2H_5OH + H_2O$ + acetone at 25°.

GLIADIN.

Solubility of Gliadin in Aqueous Solutions of Acids at 25°.

(Tague, 1925.)

The gliadin was prepared from wheat flour by the method of Osborne. One gram per 100 cc. of aqueous acid, containing 5 drops of toluene, were constantly shaken for 8 hours. The mixture was allowed to stand over night and the nitrogen determined in 100 cc. of the clear filtrate. The factor 5.7 was used to convert nitrogen to gliadin.

Normality of aq. acid solution.	Grams of Gliadin per 100 cc. of sat. solution in aq.		
	H Cl.	H_2SO_4.	CH_3COOH.
1.0	0.0550	0.0632	0.1733
0.1	0.0661	0.0741	0.1654
0.01	0.1397	0.1908	0.1309
0.001	0.1357	0.1265	0.1117
0.0001	0.0966	0.0890	0.0816
0.00001	0.0700	0.0716	0.0761

Since the method of preparation and purification has a great deal to do with the physical and chemical characteristics of proteins, the author determined the solubility in aqueous H Cl, of three samples of gliadin prepared by slight modifications of the method of preparation.

Normality of aqueous H Cl.	Gms. Gliadin per 100 cc. sat. solution		
	Sample N° 1	Sample N° 2.	Sample N° 3.
1.0	0.0496	0.0550	0.0442
0.1	0.0584	0.0600	0.0613
0.01	0.3554	0.1297	0.2408
0.001	0.3348	0.1254	0.1972
0.0001	0.1699	0.1083	0.0452
0.00001	0.0923	0.0938	0.0962

The author also gives data which show that :

Moist gliadin is about twice as soluble as dry gliadin.

The amount of gliadin dissolved varies directly with the amount of excess of solid material used for preparing the saturated solution. With 5.0 gms. per 100 cc of solvent there is from 3 to 4 times as much dissolved as when 1.0 gm. per 100 cc. is used.

The solubility increases with time of shaking up to about 72 hours.

The maximum solubility occurs at p_H 2 to 3 and the minimum at p_H 6.5.

Gliadin is slightly soluble in aqueous sodium carbonate solution, with maximum at about 0.009 molar.

The solubility in aqueous solutions of neutral salts is only about 0.001 gm. per 100 cc., except with $Mg\,Cl_2$ solutions, in which it may reach 0.084 gm. per 100 cc. in concentrated solutions.

Gliadin in quite soluble in aqueous methyl alcohol; the maximum being 0.1322 gms. per 100 cc. in alcohol of 70 volume per cent.

Solubility of Gliadin in Aqueous Solutions of Ethyl Alcohol.

(Dill and Alsberg, 1924.)

Solutions of gliadin and the solvent in sealed tubes warmed to 50°, were cooled very gradually and the temperature observed at which turbidity appeared. For each solvent this temperature was practically independant of the gliadin concentration.

Concentration of Gliadin in gms. per 100 gms solution.	Temp. of appearance of Turbidity in aq. Alcohol of		
	50 Vol. per cent.	60 Vol. per cent.	70 Vol. per cent.
0.1 to 0.4	−4°	1° to −2°	0° to −2°
0.4 to 25.0	+5° to +8°	+1° to +2°	3° to 8°

TURBIDITY TEMPERATURES OF 2.5 PER CENT GLIADIN SOLUTIONS IN AQUEOUS MIXTURES OF ETHYL, METHYL AND *n* PROPYL ALCOHOLS.

(Dill and Alsberg, 1925.)

Determinations were made with five different samples of gliadin, and for one of these samples, with the three different alcohols. In every case the amount of gliadin present was the same, namely, 2.5 gms. per 100 gms. of the solution.

	Temperatures at which turbidity appeared in 2.5 per cent solutions of						
					Gliadin No:3 A in		
Vol. per cent of Alcohol.	Gliadin No.1 in aq. C_2H_5OH	Gliadin No.2A in aq. C_2H_5OH.	Gliadin No.2B in aq. C_2H_5OH.	Gliadin No.3B in aq. C_2H_5OH.	aq. C_2H_5OH.	aq. CH_3OH.	aq. *n* C_3H_7OH.
5.0	—	—	—	—	66	70+	70+
7.5	—	—	—	—	56	70	—
10.0	—	—	—	—	44	58	28
20.0	—	—	—	—	33	43	17
30	33	29	32	27	24	34	6
40	23	19	21	18	16	26	—3
50	13	9.5	12	9	7.5	21	—6.5
55	11	7	10	6.5	4	—	—6
60	8.5	4.5	7.5	5.5	2	13	—3
65	10	5.5	9	6	2.5	10	—
70	15	9.5	13	11	5	12	14
80	41	35	38	35.5	31	19	61
82.5	—	—	—	—	41	—	70+
85	—	—	—	—	55	29	—
90	—	—	—	—	70+	70+	—

« The phenomenon appears to be one of peptization rather than of true solution ». The authors also give determinations of the solubility (peptization) of gliadin in aqueous solutions of other compounds. The results show the minimum concentration (mols. per liter) of each compound in water, capable of holding gliadin in solution at 20°, as determined by dilution. KSCN, 1.06; NH_4SCN, 1.09; KI, about 5.0; Urea, 2.03; CH_3OH, 12.1; C_2H_5OH, 5.8; *n* C_3H_7OH, 2.28; isopropyl alcohol, 4.7; chloral hydrate, 3.0.

CASEIN.

The solubility of Casein in water at its iso electric point (pH 4.6) is 0.11 gms. per liter at 25°. (Cohn, 1922, 1923.)

SOLUBILITY OF CASEIN IN DILUTE SOLUTIONS OF SODIUM CHLORIDE AT 18-22°.

(Ryd, 1917.)

An accurately weighed amount of highly purified casein was dissolved in an accurately measured amount of CO_2 free NaOH solution, in an apparatus provided with an efficient stirrer and into which measured amounts of standard NaOH and HCl solutions could be introduced from burets. Provision was made to prevent the introduction of CO_2. An amount of HCl equivalent to the NaOH present was added. If too much casein was present the opalescence and precipitation occurred before the neutral point was reached. If, on the other hand, too little casein was present more acid could be added than corresponded to the used amount of NaOH without causing opalescence. By alternate additions of NaOH and HCl the point could finally be obtained where the last added drop of HCl just produced opalescence. A series of such determinations gave the following results :

Mols NaCl. per liter.	Gms. Casein per liter.	Mols NaCl per liter.	Gms. Casein per liter.	Mols. NaCl per liter.	Gms. Casein per liter.
0.03653	0.64	0.11140	3.46	0.16054	1.87
0.06900	1.43	0.12308	3.37	0.17476	1.65
0.07944	1.86	0.12645	3.11	0.18525	1.55
0.09222	2.48	0.13111	2.97	0.20227	1.50
0.09250	2.68	0.13619	2.82	0.22839	1.40
0.10189	2.87	0.14688	2.52	0.23395	1.39
0.10643	3.24	0.15676	2.09	0.27245	1.32

SOLUBILITY OF ACID PRECIPITATED CASEIN IN AQUEOUS SALT SOLUTIONS.

(McKee and Gould, 1938.)

The sample of casein was prepared by precipitating skim milk with HCl at a pH of 4.1. Since the solubility of casein varies with the excess present in contact with the sat. solution (thus showing the non-homogeneity of casein), all determinations were made with 5 gms. per 50cc of solution and 0.2% phenol was used to prevent bacterial decomposition. All determinations were made at pH 4.6, the iso electric point of casein. The amount of dissolved casein in the filtered saturated solution was determined by precipitation with acetic acid at 35-40°, allowing to stand over night, filtering, washing, drying and weighing.

Aqueous salt solution	Gms. Casein dissolved per 100 gms. solvent at:		
	15°	30°	45°
5.0% Sodium cymene sulfonate	3.0480	5.9390	9.6753
7.5% " " "	5.2999	8.0197	—
2.5% Potassium thiocyanate	1.7850	2.5089	3.4201
5.0% " "	3.5490	—	—
5.0% Sodium benzene sulfonate	0.9778	1.9331	3.0486
10.0% " " "	2.2070	2.7450	4.8202

SOLUBILITY OF CASEIN IN AQUEOUS SOLUTIONS OF SALTS AND ACIDS.

(von Euler and Bucht, 1923.)

An excess of casein was shaken with 50 cc. portions of the aqueous solutions for 2 or 4 hours. The temperature is not stated. The dissolved casein was determined by the addition of sodium acetate or acetic acid and filtering the precipitate and drying in a vacum over H_2SO_4, and then in an ordinary desiccator over solid Na OH.

Solvent.	Concentration of solvent in mols per liter.	Gms. Casein dissolved per 50 cc.	Solvent.	Concentration of solvent in mols per liter.	Gms. Casein dissolved per 50 cc.
Aq. sodium tartrate..	0.005	0.0236	Aq. chlor. acetic ac..	0.005	0.0523
» ..	0.010	0.0264	» ..	0.010	0.1399
» ..	0.020	0.0731	» ..	0.020	0.700
» ..	0.100	0.2544	» ..	0 050	1.0+
Aq. tartaric acid....	0.0045	0.0480	50 % Aq. C_2H_5OH sol.		
»	0.009	0.0943	of chlor acetic acid..	0.002	0.0033
»	0.018	0.1608	» ..	0.005	0.0444
»	0.026	0.2173	» ..	0.010	0.0682
»	0.046	0.3363	» ..	0.020	0.0894

Results are also given for the solubility of casein in chlor acetic acid solutions in aqueous 42.6 % and 58.6 % C_2H_5OH. In these cases the amount of chlor acetic adsorbed by the undissolved casein was also determined. Similar experiments were also made with solutions of α brom propionic acid in aqueous 42.6 % C_2H_5OH, and a series of determinations was made with 0.1 normal monochlor acetic acid in 42.6 % aqueous C_2H_5OH to which increasing amounts of casein were added.

100 gms. abs. alcohol dissolve 0.28 gm. casein at 20-25° (Pucher and Dehn, 1921.)
» quinoline » 0.38 » » » »
» equi molecular mixture of alcohol and quinoline dissolve 0.92 gms. casein at 20-25°.

100 gms. H_2O dissolve 2.01 gms. casein at 20–25°. (Dehn, 1917.)
100 gms. pyridine dissolve 0.09 gm. casein at 20–25°. "
100 gms. aq. 50% pyridine dissolve 0.56 gm. casein at 20–25°. "

An abstract of experiments on the solubility of casein in dilute acids is given by Van Slyke and Winter (1913). Results for the solubility of casein in aqueous solutions of KOH, LiOH and $Ca(OH)_2$ at various temperatures, are given by Robertson, 1908.

GELATIN

SOLUBILITY OF GELATIN IN WATER AND IN AQUEOUS SOLUTIONS OF ACIDS AND BASES AT 15°-17°. (Fairbrother and Swan, 1922.)

One gram quantities of gelatin in 3/4 inch squares were place in conical flasks of 250 cc. capacity together with a few crystals of thymol and 100 cc. of the aqueous solution. The flasks were shaken gently once each day for ten days. The supernatant liquid was filtered through paper and the first two 20 cc. portions of filtrate were rejected. The third 20 cc. portion was neutralized, using methyl red as indicator. It was diluted to 40 cc. with H_2O and 20 cc. of a 1 % solution of tannin were added The precipitate was kept at 0° for 1/2 hour, filtered upon a tared filter, washed with water to remove excess of tannin and then dried at 100° and at 105° and weighed. The method was controlled by means of determinations upon quantities of gelatin between 0.001 and 0.080 gm. per 20 cc. The sample of gelatin employed for the solubility determinations was Coignet's Gelatin Extra (Gold Label). It contained 2.24 % of ash, 16.7 % H_2O and a 1 % solution had $p_H = 5.6$ at 20°.

SOLUBILITY IN WATER :

t°.	0°.	15°-17°.	18°.3.	22°.
Gm. dry gelatin per 100 cc. sat. sol.	0.02	0.05	0.07	0.10

SOLUBILITY IN AQUEOUS SOLUTIONS OF :

Hydrochloric Acid.

Concentration of HCl mols. per liter Initial.	Final.	Gm. Gelatin per 100 cc. final liquor.
0.0002	..	0.03
0.0010		0.01
0.0020	0.0006	0.02
0.0050	0.0009	0.03
0.0067	0.0019	0.05
0.0100	0.0038	0.06
0.0200	0.0134	0.08
0.050	0.045	0.10
0.100	0.097	0.14
0.200	0.1986	0.24
0.500		1.00 (= all)

Sulfuric Acid.

Concentration of H_2SO_4 mols per liter Initial.	Final.	Gm. Gelatin per 100 cc. final liquor.
0.0000	...	0.06
0.0001	—	0.04
0.0005	..	0.03
0.0010	0.0002	0.04
0.0025	0.0005	0.07
0.005	0.0016	0.07
0.010	0.0063	0.09
0.025	0.0219	0.11
0.050	0.0472	0.14
0.100	0.0995	0.23
0.250	—	1.00 (= all)

Nitric Acid.

Concentration of HNO_3 mols. per liter Initial.	Final.	Gms. gelatin per 100 cc. final liquor.
0.0000	—	0.04
0.0002	—	0.05
0.0010	—	0.05
0.0020	0.0005	0.04
0.0051	0.0013	0.05
0.0102	0.0049	0.07
0.0205	0.0152	0.09
0.0512	0.0461	0.12
0.1024	0.0985	0.14
0.2048	0.2019	0.21
0.5125*	—	1.00 (= all)

Acetic Acid.

Concentration of CH_3COOH mols. per liter Initial.	Final.	Gms. gelatin per 100 cc. final liquor.
0.0002	—	0.05
0.0010	—	0.04
0.0020	0.0005	0.05
0.0050	0.0027	0.05
0.0100	0.0072	0.06
0.0200	0.0152	0.06
0.050	0.0401	0.06
0.100	0.0821	0.07
0.200	0.1675	0.09
0.500	0.422	0.14
5.000	—	1.00 (= all)

* The gelatin in this solution gave a turbid red liquid probably due to the xanthoproteic reaction.

SOLUBILITY OF GELATIN AT 15-17° IN AQUEOUS SOLUTIONS OF :

Potassium Hydroxyde. Concentration of KOH mols. per liter, Initial.	Final.	Gms. gelatin per 100 cc. final liquor.	Sodium Hydroxyde. Concentration of NaOH mols. per liter, Initial.	Final.	Gms. gelatin per 100 cc. final liquor.
0.0010	—	0.06	0.0000	—	0.05
0.0050	0.0016	0.07	0.0020	—	0.05
0.0062	0.0024	0.07	0.0050	0.0017	0.06
0.0100	0.0052	0.10	0.00625	0.0024	0.07
0.0125	0.0066	0.12	0.0100	0.0049	0.08
0.0211	0.0137	0.19	0.0125	0.0068	0.11
0.025	0.0178	0.21	0.020	0.0135	0.18
0.050	0.0397	0.42	0.025	0.0188	0.22
0.100	—	1.00 (= all)	1.050	—	1.00 (= all)

SOLUBILITY OF GELATIN IN WATER.

(Mardles, 1930.)

One gram portions of Coignet's best quality gelatin leaf were allowed to soak in 100cc of water at the several temperatures with occasional shaking, for a period of one to two days. The supernatant solution was analyzed by precipitation with 2% tannic acid solution and estimating the content of gelatin from the volume of the precipitate centrifuged under controlled conditions.

t°	Gms. Gelatin per 100cc solution	t°	Gm. Gelatin per 100cc solution	t°	Gm. Gelatin per 100 cc solution
10	0.030	24	0.200	28	0.725
15	0.055	26	0.630	29	0.725
20	0.080	27	0.700	30	0.870

At 26° and above the swollen gelatin broke into small fragments and there is a possibility that a part of it dispersed in the gelatin solution in the form of a suspensoid. The results show that at about 26° a rapid rise in solubility occurs.

Solubility determinations with amounts of gelatin other than one gram per 100 cc are markedly different. Thus with 0.1 gm. gelatin per liter at 15° the solubility was found to be 0.005 gm. per 100 cc and with 4.0 gms. of gelatin per 100 cc it was 0.160 gm. per 100cc. The previous experiments of Mellanby, 1905, of Cohn, 1922, and of Sorensen, 1925, on this property of proteins are described.

The author also gives results on the rate of solution of gelatin, its precipitation from solution with falling temperature and the influence of additions of organic compounds on its solubility.

The following results were obtained for the solubility of gelatin dissolved from one gram portions by 100cc of water containing alcohol and glycerol respectively.

Vol.% alcohol in aq. solvent	Gms. gelatin dissolved per 100cc	Vol.% glycerol in aq. solvent	Gms. gelatin dissolved per 100cc
5	0.029	0.0	0.030
10	0.031	10	0.025
20	0.032	20	0.015

GELATIN

SOLUBILITY OF GELATIN IN WATER.

(Poutilov, 1935.)

Sheets of gelatin were weighed and immersed in water at constant temperature. After attainment of equilibrium, measured portions of the aqueous solution were removed and evaporated to dryness in weighed dishes and the residues dried at 90°-100° and then in a desiccator and weighed. The gelatin sheets which were removed from the water were dehydrated with the aid of alcohol and of ether and weighed. They were then immersed in a fresh portion of water and the above procedure repeated. This was done for a third time.

The successive amounts of gelatin dissolved are as follows:

Weight of gelatin sheet	Gms. gelatin dissolved at 15° per 100cc solution			Gms. gelatin subsequently dissolved at 22° per 100cc solution
	1st	2nd	3rd	
0.5628	0.0752	0.0060	0.0013	0.1290
0.4382	0.0490	0.0047	0.0012	0.0942
0.4005	0.0421	0.0035	—	0.0821
0.2910	0.0399	0.0031	0.0005	0.0582

The gelatin after the third extraction with water at 15° was used for a similar experiment at 22° with results shown in the table. It was also found that although the residues obtained by evaporation of the solutions saturated at 15° redissolved completely in water, those from the solutions saturated at 22° did not redissolve. It was concluded that the gelatin which dissolves at 15° differs from that which dissolves at 22° and thus that micels of different chain length (mol. wt.) are present. The solubilities and the stability of the sols of gelatin depend upon the content of the fraction of lower molecular weight and increases in proportion to the amount of this fraction present in the gelatin. The author does not refer to the previous work of Mardles, 1930.

Attempts to determine the distribution coefficient of gelatin between water and cresylic acid (a mixture of cresols) are described by Woodman and Gallagher, 1929. The system is complicated by the fact that it yields emulsions. It is concluded that gelatin is in a colloidal condition in both solvents.

The curious circumstance was observed by Larson and Greenberg, 1933, that gelatin is soluble in 99.5% Acetic Acid only above certain concentrations and precipitates when the solution is diluted by the addition of more acetic acid. The minimum amount of gelatin which gave a clear solution with acetic acid at 20° was 3.1 gms. per 100 gms. of solution and 2.7 gms. at 25°. Above 80° there is no minimum amount which fails to dissolve. It was found that this curious behavior was not due to the presence of even as much as 5% of H_2O in the acetic acid.

KERATIN.

100 gms. H_2O dissolve 8.71 gms. keratin at 20-25°. (Dehn, 1917.)
100 gms. aq. 50% pyridine dissolve 16 gms. keratin at 20-25°. "
Pyridine mixes with keratin in all proportions at 20-25°. "

GLYCOGEN $(C_6H_{10}O_5)_x$

The solubility of glycogen at various alcohol and NaCl concentrations at 0° and at 22° was studied by Somogyi, 1934, for the purpose of finding the lowest alcohol concentrations applicable in the preparation and purification of glycogen

ALLOPHANATES of STEROLS.

Results for the solubility of allophanates of cholesteryl, dihydro cholesteryl, sito steryl, and of caprosteryl in ethyl ether, Petroleum ether, chloroform, dichlor ethane, benzene, toluene, ethyl alcohol, acetone and pyridine are given by Tange and McCollum, 1928.

FIBRINOGEN

Conditions of acidity and of temperature have been determined by Florkin, 1930 under which fibrinogen may be sufficiently purified of other proteins and its own denaturation products to yield a chemical individual of constant and reproducible solubility. Quantitative results are given for the solubility at 25° of purified fibrinogen in aqueous solutions of NaCl, K_2HPO_4, KH_2PO_6 + K_2HPO_4, and $(NH_4)_2SO_4$.

GLOBULIN (Serum).

SOLUBILITY IN AQUEOUS MAGNESIUM SULFATE SOLUTIONS.

(Galeotti, 1906; Scaffidi, 1907.)

The precipitated globulin (from oxblood) was not dried, but pressed between filter paper, and an excess introduced into each $MgSO_4$ solution. After constant agitation for 12 hours, the saturated solution was filtered, weighed and evaporated to constant weight, the coagulated globulin then washed to disappearance of SO_4 and dried and weighed.

Results for 10°.		Results for 25°.		Results for 40°.		Results for 55°.		Results for 70°.	
Gms. per 100 Gms. Sat. Sol.		Gms. per 100 Gms. Sat. Sol.		Gms. per 100 Gms. Sat. Sol.		Gms. per 100 Gms. Sat. Sol.		Gms. per 100 Gms. Sat. Sol.	
$MgSO_4$.	Globulin.	$MgSO_4$.	Globulin.	$MgSO_4$.	Globulin.	$MgSO_4$.	Globulin.	$MgSO_4$.	Globulin.
0.06	0.07	0.06	0.07	0.06	0.42	0.40	1.14	0.71	0.34
0.18	0.34	0.21	0.61	0.31	1.42	0.88	2.14	2.52	0.55
0.65	1.63	0.63	2.20	0.61	5.39	1.60	3.34	4.74	1.14
2.11	3.35	2.28	5.56	1.92	8.31	5.64	5.06	6.83	1.17
4.32	4.42	3.35	6.07	5.40	8.63	10.81	3.10	9.22	1.76
13.63	2.60	16	4.03	14.72	3	13.84	2.11	13.29	1
20.86	0.37	21.30	0.95	18.47	1.02	17.90	0.69	15.38	0.37
24.18	0.18	25.47	0.03	27.03	0.01			17.67	0.07

The coagulation curve and freezing-point curve are also given.

Using serum albumin and serum pseudo globulin of beef blood, experiments on the variation of solubility with quantity of protein, the limiting solubility, the character of the heterogeneity of proteins and related problems are described by Bonot, 1934.

ALBUMIN (Egg).

100 gms. H_2O dissolve 100 gms. egg albumin at 20–25°. (Dehn, 1917.)
100 gms. pyridine dissolve 0.1 gm. egg albumin at 20°–25°. "
100 gms. aq. 50% pyridine dissolve 6.29 gms. egg albumin at 20°–25°. (Dehn, 1917.)

Results for the solubility of egg albumin in aqueous solutions of ammonium sulfate at various temperatures are given by Sorensen and Hoyrup, 1915-17.

ALBUMIN (Egg)

SOLUBILITY OF EGG ALBUMIN IN AQUEOUS 25 PERCENT ETHYL ALCOHOL AT -5°.

(Ferry, Cohn and Newman, 1936.)

The egg albumin was recrystallized from ammonium sulfate solutions as described by Sorensen, 1917, and subsequently dialyzed in a cellophane membrane to remove $(NH_4)_2SO_4$. Electro dialysis was also used. It was concentrated in negative pressure dialyzers and dried at about 2° in a vacuum over P_2O_5. The solid albumin and the aqueous solvents were rotated from 5 to 7 days. The saturated solutions were filtered through sintered Jena glass filters in an atmosphere of Nitrogen under 15 pounds pressure. The content of protein in a weighed sample was determined by evaporation and weighing the residue in case no salt was present and by coagulating at 100° with 0.5 gm. K_2SO_4, filtering, washing and weighing when salt was present. Four egg albumen preparations were used and the following average results obtained.

Gm. Mols. NaCl per liter Aq. 25 Vol. % C_2H_5OH	Gms. Egg Albumen dissolved per 1000 gms. solvent	Gm. Mols. NaCl per liter Aq. 25 Vol.% C_2H_5OH	Gms. Egg Albumen dissolved per 1000 gms. solvent
0.0	0.13	0.101	1.2
0.00505	0.16	0.201	4.1
0.0101	0.20	0.349	18.4
0.0202	0.26	0.489	41.4
0.0505	0.52		

PLASMA PROTEINS

The evolution of our knowledge concerning the separation and identification of plasma proteins and determinations of their solubility in concentrated phosphate solutions are given by Butler and Montgomery, 1932. Determinations of the effect of pH, of temperature and of the removal of lipids on this solubility are given by Butler, Blatt and Southgate, 1935.

MYOGLOBIN

Determinations of the solubility of carboxy myoglobin, prepared from horse heart, in concentrated aqueous solutions of $(NH_4)_2SO_4$ at 25° and pH 6.6 are given by Morgan, 1935. The results may be expressed by the equation log S (Solubility) = 8.0-0.92 $(\Gamma/2)$ (the ionic strength per

HEMOGLOBIN.

100 gms. H_2O dissolve 15.16 gms. hemoglobin at 20–25°. (Dehn, 1917.)
100 gms. pyridine dissolve 0.15 gm. hemoglobin at 20–25°. "
100 gms. aq. 50% pyridine dissolve 0.77 gms. hemoglobin at 20–25°. "

100 gms. absolute alcohol dissolve 0.37 gm. hemoglobin at 20-25°. } (Pucher and
» quinoline » 0.23 » » » » } Dehn, 1921.)
100 gms. equimol. mixture of alcohol and quinoline dissolve 0.59 gm. hemoglobin at 20-25°.

OXY HEMOGLOBIN

SOLUBILITY OF OXYHEMOGLOBIN IN AQUEOUS POTASSIUM PHOSPHATE SOLUTIONS AT 0°.

(Cohn and Prentiss, 1927.)

Results for solutions of:

pH 6.4			pH 6.6			pH 6.8		
Mols. conc. per liter		Gms. Oxy-hemoglobin per 100 cc	Mol. conc. per liter		Gms. Oxy-hemoglobin per 100 cc	Mol. conc. per liter		Gms. Oxy-hemoglobin per 100 cc
KH_2PO_4 + K_2HPO_4	Mol. % K_2HPO_4		KH_2PO_4 + K_2HPO_4	Mol. % K_2HPO_4		KH_2PO_4 + K_2HPO_4	Mol. % K_2HPO_4	
0.027	22.2	2.51	0.024	32.5	2.62	0.0213	42.8	3.32
0.079	26.6	3.54	0.070	37.1	3.12	0.062	50.0	3.81
0.153	32.0	4.38	0.136	41.9	4.07	0.121	53.7	4.85
0.366	37.2	6.29	0.326	48.2	5.87	0.293	59.4	6.66
			0.495	50.9	7.39			

The solubility of oxyhemoglobin is independent of the amount of protein in the solid phase. It dissolves in successive portions of the solvent to the same extent until the saturating body has been completely dissolved.

CARBOXYHEMOGLOBIN

SOLUBILITY OF CARBOXYHEMOGLOBIN IN AQUEOUS ETHYL ALCOHOL SOLUTIONS CONTAINING SODIUM CHLORIDE AT -5°.

(Ferry, Cohn and Newman, 1936.)

The carboxyhemoglobin was prepared at 2° from horse erythrocytes and in order to be certain that it was always in the carboxy form it was saturated with CO whenever brought into solution. The carboxy hemoglobin was recrystallized from 25% ethyl alcohol. The saturated solutions were prepared in centrifuge tubes and 3 to 6 days rotation allowed for attainment of equilibrium. The dissolved carboxy hemoglobin was estimated by Kjeldal nitrogen determinations using the factor 16.86%

Results for aqueous Ethyl Alcohol of:

25 Volume percent		35 Volume percent	
Gm. Mols. NaCl per liter	Gms. hemoglobin per 1000 gms. solution	Gm. Mols. NaCl per liter	Gms. hemoglobin per 1000 gms. solution
0.0101	0.055	0.0101	0.063
0.0202	0.096	0.0152	0.081
0.0505	0.21	0.0203	0.10
0.101	0.46	0.0507	0.40

CARBOXY HEMOGLOBIN

SOLUBILITY OF CARBOXY HEMOGLOBIN IN POTASSIUM PHOSPHATE SOLUTIONS OF pH 6.6 at 25°.

(Green, 1931.)

Mol. conc. per liter		Density	Gms. carboxy-hemoglobin per liter
$KH_2PO_4 + K_2HPO_4$	Mol. % K_2HPO_4		
1.072	52.6	1.1239	6.59
1.267	52.7	1.1453	2.59
1.267	52.7	1.1434	2.56
1.367	52.7	1.1574	1.64
1.462	52.1	1.1658	1.04
1.462	52.1	1.1646	1.05
1.657	52.7	1.1830	0.388
1.657	52.7	1.1843	0.438

Results at 0° similar to the above are given for carboxy-hemoglobin and for oxyhemoglobin. Results are also given for the solubility of carboxyhemoglobin at 25° in aqueous solutions of Na_2SO_4, $(NH_4)_2SO_4$, $MgSO_4$ and Na citrate.

The author also reviews the literature of the salting out of proteins from aqueous solutions and discusses the expotential equations which have been proposed and tested for their applicability to this phenomenon. Horse hemoglobin was used in the present experiments since it is a chemical individual and is readily separated by crystallization and, being a globulin, can be studied both in dilute and concentrated solutions. Its mol. wt. is approximately 66,800. In later papers by Green, 1931, 1932, results are given for the solubility of horse carboxy hemoglobin in concentrated and in dilute potassium phosphate buffer solutions of varying pH at 25° and of the solubility of carboxy hemoglobin at pH 6.6 in aqueous solutions of NaCl, KCl Na_2SO_4, K_2SO_4, $MgSO_4$ and $(NH_4)_2SO_4$ at 25°.

In a very careful study of the solubility and dissociation tendency of carboxy hemoglobin of the horse in ammonium sulfate solutions, Sorensen and Sorensen, 1933, give results showing that the solubility of carboxy hemoglobin in ammonium sulfate solutions is expressed by the equation $\log s = \alpha . S + \beta$ proposed by Cohn. They also show that with changes in hydrogen ion activity the solubility curve shows two minima of which one is at about pH 6.6 (the isoelectric point of hemoglobin) and the other is at about pH 5.4, corresponding probably to a moderately difficult soluble hemoglobin sulfate of which the sulfuric acid content is about 12-13 mol. per mol. of hemoglobin hydrate.

Determinations by Green, Cohn and Blanchard, 1935, of the solubility of Human hemoglobin in concentrated salt solutions show that it remains dissolved in a phosphate solution in which horse hemoglobin is essentially insoluble. Human hemoglobin behaves much more like an albumin than does horse hemoglobin. The maximum solubility of the latter is 0.052 gm. per liter in 0.33 molar phosphate buffer at pH 6.6 at 25°. Human hemoglobin is as soluble as this in 1.96 molar phosphate buffer, but at this ionic strength the hemoglobin of the horse is only one-thousandth as soluble as that of man.

CHOLESTEROL-DIGITONIDE.

SOLUBILITY IN WATER AND IN ETHYL ETHER. (Mueller, 1917.)

The compound was prepared by precipitating recrystallized cholesterol, made from gall stones, by digitonin, filtering, washing-throughly with alcohol and ether and drying. Some of the resulting compound was shaken with ether for 24 hours at room temperature. After filtering, exactly 100 cc. were evaporated in several portions from a small weighed porcelain dish, the residue was dried at 110° and weighed. The average of 3 determinations gave :

0.0007 gm. Cholesterol-Digitonide per 100 cc. of ether.

Similar determinations, using boiling water as the solvent, gave :

0.0006 gm. Cholesterol-Digitonide per 100 cc. of H_2O.

PEPTONE.

100 gms. H_2O	dissolve	42.2	gms.	peptone	at	20-25°.	(Dehn, 1917.)
“ pyridine	“	0.22	“	“	“		“
“ aq. 50% pyridine	“	12.6	“	“	“		“

UREASE

Determinations of the minimum solubility of crystalline urease in dilute buffer solutions were used by Sumner and Hand, 1929, as a means of finding its iso electric point.

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(1)The following abbreviations are used in the name index.

alc.—alcohol

f.pt.(s)—freezing-point(s)

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