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## CIRCULAR OF INFORMATION TO ACCREDITED SCHOOLS

ISSUED BY THE COMMITTEE ON ACCREDITED SCHOOLS






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## INTRODUCTORY.

Organization is the order of the day. In education, as in commerce, it is indispensable to the greatest efficiency. To prevent wasted energy and discouragements which turn many young people from the pathway of their highest development, demands a closer co-operation of the educational forces of the State. This truth is now generally recognized; and, as a result, the efficiency of education in Missouri has been rapidly increasing. County supervision and articulation of elementary and high schools are phases of a general movement which includes also the affiliation of high schools and University, so that there may be a pathway direct from the primary school of any community to the highest educational opportunities offered by the State. For the same reason that high schools must take the initiative in solving the problem of articulating elementary and secondary schools, the University must take the initiative in solving the problem of affiliating high schools and University. Accordingly, in view of a growing demand for organization, the University presents a plan, modified by several years of careful, direct study of the school situation, whereby graduates of secondary schools may be admitted to the University without entrance examinations.

This plan necessarily includes a definition of conditions for accrediting. In determining these conditions, it has been the policy of the University to consider in the broadest sense the welfare of high schools. Due recognition has been made of the facts that most graduates of secondary schools do not attend institutions of higher learning, that local conditions vary, and that many schools meet with most discouraging difficulties. It is desirable that high schools have the greatest possible freedom consistent with the purpose of affiliation, and it is the intention of the University to cooperate with them rather than arbitrarily to impose conditions upon them. Accordingly, criticisms of the plan here offered are invited. The administration of this plan requires the examination of each school by an educational expert, whose advice may be taken advantage of by local authorities who wish to improve their schools. This method of affiliation has been justified by the rapid development of many Missouri schools under its influence. As mutual understanding, confidence and co-operation more widely increase, even greater progress is promised for the future.

This circular is prepared for the information of superintendents, principals, teachers and members of school boards who wish to co-

operate with the University in this movement. It contains a statement of conditions for the accrediting of secondary schools, outlines of approved subjects and suggestions for the equipment of laboratories and libraries.

Although a clear distinction should be made between conditions for the accrediting of schools and conditions for admission to the University, some brief information in regard to the latter may appropriately be given in this introductory statement. (a) Graduates of an Accredited School who bring proper credentials of the fact that they have completed the subjects required for entrance to the department which they desire to enter will be admitted to the University without examination. For these requirements see table in annual catalogue. The student graduating with the highest honors from any Accredited School will be admitted free of library and incidental fees for the first year. (b) The diploma will not be accepted as a credential. The student must present the proper form of certificate signed by the principal or superintendent of the Accredited School. Blank certificates will be furnished by the Dean of the University Faculty upon application. The University recommends that Accredited Schools do not issue such certificates to any students except those that have graduated. These certificates should be filled out and sent to the Dean of the University Faculty, at any time *not later* than the opening day of the session in September. It is desirable that the certificates be sent in advance in order that possible errors may be detected and the student notified accordingly.

Copies of this circular may be had through the office of the Secretary of the Committee on Accredited Schools, University of Missouri, Columbia, Missouri.

## CONDITIONS FOR THE ACCREDITING OF SECONDARY SCHOOLS.

A school desiring to be placed on the accredited list of the University should present, as early in the school year as possible, an application to be accredited, blank forms of which will be furnished, upon request, by the Secretary of the Committee on Accredited Schools. After the application has been received, the school will be placed on the visiting list and in due time will be inspected by the High School Visitor. No school will be accredited until the report of the Visitor has been passed upon by the University Committee on Accredited Schools.

In order to be fully accredited by the University, a school must meet the following *minimum* requirements:

1. The course of study must be four years long; and the school term, nine months.

2. There must be at least three teachers in the school, one of whom may be superintendent, but the other two must give their entire time to high school work.

No teacher should have more than six periods of teaching a day (a less number would be preferable), and, where any teacher has more than this number, the presumption is against the efficiency of the work.

It is strongly recommended that in the selection of teachers, graduates of universities and colleges of recognized standing, or teachers who have had equivalent training, be preferred. With the large increase in teachers having college training, and with the excellent opportunities now offered by the summer schools, the University cannot afford to accredit any school, seeking affiliation, that shows an indifference to the grade of scholarship of the teachers employed.

3. There must be at least one laboratory of science, sufficiently large and well equipped to permit easily of individual work on the part of the pupils. (See pages 46-72.)

4. There must be good equipment for the teaching of History and English. This means that the school must have an adequate reference library and a sufficient supply of historical maps. (See pages 72-123.)

5. Not less than fifteen (15) units as hereinafter defined must be required for graduation.

6. The school must give satisfactory instruction in the following subjects:

English ..... 3 units.
Mathematics ..... 2 units.
History ..... 2 units.
One Foreign Language (Latin, Greek, French, German or Spanish) ..... 2 units.
*Science (General Biology, Zoology, Botany, †Physiology, Chemistry, Physics, Physical Geography or Agriculture)...2 units.

In addition to the above, at least four (4) units to be selected from the subjects named in the following list, in which the maximum and minimum number of units accepted in each is indicated:

| Subjects | Maximum | Minimum | Subjects | Maximum | Minimum |
|---|---|---|---|---|---|
| English | 4 | 3 | Chemistry | 2 | 1 |
| Algebra | 1½ | 1 | General Biology | 1 | 1 |
| Plane Geometry | 1 | 1 | Zoology | 2 | 1 |
| Solid Geometry | ½ | ½ | Botany | 2 | 1 |
| Trigonometry | ½ | ½ | †Physiology | 1 | 1 |
| ‡Arithmetic (advanced) | ½ | ½ | Physical Geography | 1 | 1 |
| ‡Algebra (advanced) | ½ | ½ | Agriculture | 1 | 1 |
| History | 4 | 1 | Music | 1 | 1 |
| Civil Government | ½ | ½ | Drawing | 2 | 1 |
| Latin | 4 | 2 | Manual Training | 2 | 1 |
| Greek | 3 | 2 | Domestic Science and Art | 2 | 1 |
| German | 3 | 2 | Economics | ½ | ½ |
| French | 3 | 2 | Commercial Geography | ½ | ½ |
| Spanish | 3 | 2 | Bookkeeping | 1 | 1 |
| Physics | 2 | 1 | | | |

* Domestic Science and Art will be accepted as one of the two required units in Science, provided that the other unit is not Agriculture.

† In cases where the study of Physiology has been preceded by a year's study of Biology.

‡ The courses in advanced Arithmetic and advanced Algebra are not approved, if they are not preceded by those in elementary Algebra and Plane Geometry.

By a "unit" is meant a year's work in a subject, with five (5) periods a week. Three (3) periods a week for two years will be accepted as the equivalent of a unit.

By a "period" is meant not less than forty (40) minutes of time devoted to actual teaching. In science and manual arts, of the five (5) periods, at least two (2) double periods of not less than eighty (80) minutes each must be devoted to laboratory work.

Secondary schools which maintain a four years' course of study, but do not fulfill all the requirements for a fully accredited school, may be partially accredited.

*The University reserves the right to cease to accredit, at any time, a school that employs inefficient teachers or that otherwise fails to maintain the required standard.*

## I.

## OUTLINE OF APPROVED SUBJECTS.

### ENGLISH.

FOUR UNITS MAY BE OFFERED.

*Literature.* It is recommended that one-half of the time allotted to English be given to the study of literature, by which is meant not the study of a manual on the history of literature, but literature itself in the selected works of representative authors. Masterpieces as a whole, suited to the attainments of the class, should be read in class and carefully examined, while other works may be assigned as collateral readings, of which reports, written or oral, should be required. In the fourth or last year, in connection with a wider range of reading in literature, a brief history of the literature may conveniently be used.

*Englsh Grammar.* Everywhere pupils enter the high school with an inadequate knowledge of English grammar. The systematic study of grammar, therefore, as the foundation of higher scholarship in English, should be pursued in the high school. An accurate knowledge of grammar and of grammatical analysis is often indispensable to the right interpretation of literature and to confident correctness in composition. Without strict grammatical training the pupil finds himself at a disadvantage in trying to grasp the meaning of an involved sentence as well as in the attempt to express without ambiguity his own thoughts.

The method of teaching grammar should almost invariably be inductive. By making use of the pupil's own words and sentences, his reading, and his composition, one can easily establish the simpler definitions, rules, and principles of grammar. As each point is made, it will be well to refer to a text-book by way of confirmation of what has been found. Following upon this, drill exercises, drawn from the text-book, could be used to advantage. The study of grammar should never become merely formal. All definitions, classifications, and rules should be seen to grow out of, and ever refer back to, words and sentences. The object of the work is not that one may be able to define the parts of speech and state rules, but that he may understand the logic of the sentence. All parsing and analysis should be made a study in relations among words and sentences. Diagrams are of little real aid,

and are likely to create a wrong impression of the purpose of the work. No pupil should be graduated who cannot analyze correctly a normal English sentence of moderate complexity.

*Composition and Rhetoric.* Training in the use of the language should be a part of the work in English throughout the course. The English, spoken and written, of the pupils should be watched and corrected not only in their English classes, indeed, but in all their written work. The principles governing punctuation, the use of words, paragraphs, and the different kinds of whole composition, including letter-writing, should be thoroughly mastered. In the English classes, it is advised that set exercises be required every week for the first two years, and, in the third and fourth years, in addition to these exercises, a carefully prepared paper at least once a month; that a due proportion of the class time be devoted to the discussion of these exercises and to explanation of the simpler rules of good writing; and that the exercises be then re-written with correction of errors. The pupil's work in literature, his other studies, and his daily experiences will furnish abundant topics for these exercises. It is most earnestly urged upon teachers that a certain standard of skill in writing be established for each year, and that no pupil be advanced to a higher class in English until he has reached that standard in his written work.

The list of readings in literature recommended by the National Conference on Uniform Entrance Requirements in English at its last meeting (February 22, 1909) for the years 1913-15, and approved by the English department of the University, is as follows:

"*a.* READING. The aim of this course is to foster in the student the habit of intelligent reading and to develop a taste for good literature, by giving him a first-hand knowledge of some of its best specimens. He should read the books carefully, but his attention should not be so fixed upon details that he fails to appreciate the main purpose and charm of what he reads.

"With a view to large freedom of choice, the books provided for reading are arranged in the following groups, from which at least ten units [1] are to be selected, two from each group:

"I. The *Old Testament*, comprising at least the chief narrative episodes in Genesis, Exodus, Joshua, Judges, Samuel, Kings, and Daniel, together with the books of Ruth and Esther; the *Odyssey*, with the omission, if desired, of Books I, II, III, IV, V, XV, XVI, XVII; the *Iliad*, with the omission, if desired, of Books XI, XIII, XIV, XV, XVII, XXI; Virgil's *Aeneid*. The *Odyssey*, *Iliad*, and *Aeneid* should be read in English translations of recognized literary excellence.

[1] Each unit is set off by semicolons.

For any unit of this group a unit from any other group may be substituted.

"II. Shakespeare's *Merchant of Venice; Midsummer Night's Dream; As you Like It; Twelfth Night; Henry the Fifth; Julius Caesar.*

"III. Defoe's *Robinson Crusoe, Part I;* Goldsmith's *Vicar of Wakefield;* either Scott's *Ivanhoe,* or *Quentin Durward;* Hawthorne's *House of the Seven Gables;* either Dickens's *David Copperfield,* or *Tale of Two Cities;* Thackeray's *Henry Esmond;* Mrs. Gaskell's *Cranford;* George Eliot's *Silas Marner;* Stevenson's *Treasure Island.*

"IV. Bunyan's *Pilgrim's Progress, Part I;* the *Sir Roger de Coverley Papers* in the *Spectator;* Franklin's *Autobiography* (condensed); Irving's *Sketch Book;* Macaulay's *Essays on Lord Clive* and *Warren Hastings;* Thackeray's *English Humorists;* Selections from Lincoln, including at least the two Inaugurals, the Speeches in Independence Hall and at Gettysburg, the Last Public Address, and Letter to Horace Greeley, along with a brief memoir or estimate; Parkman's *Oregon Trail*; either Thoreau's *Walden,* or Huxley's *Autobiography* and selections from *Lay Sermons,* including the addresses on Improving Natural Knowledge, A Liberal Education, and A Piece of Chalk; Stevenson's *Inland Voyage* and *Travels with a Donkey.*

"V. Palgrave's *Golden Treasury* (First Series), *Books II and III,* with especial attention to Dryden, Collins, Gray, Cowper, and Burns; Gray's *Elegy in a Country Churchyard* and Goldsmith's *Deserted Village;* Coleridge's *Ancient Mariner* and Lowell's *Vision of Sir Launfal;* Scott's *Lady of the Lake;* Byron's *Childe Harold, Canto IV,* and *The Prisoner of Chillon;* Palgrave's *Golden Treasury* (First Series), *Book IV,* with especial attention to Wordsworth, Keats, and Shelley; Poe's *Raven,* Longfellow's *Courtship of Miles Standish,* and Whittier's *Snow-Bound;* Macaulay's *Lays of Ancient Rome* and Arnold's *Sohrab and Rustum;* Tennyson's *Gareth and Lynette, Lancelot and Elaine,* and *The Passing of Arthur;* Browning's *Cavalier Tunes, The Lost Leader, How They Brought the Good News from Ghent to Aix, Home Thoughts from Abroad, Home Thoughts from the Sea, Incident of the French Camp, Hervé Riel, Pheidippides, My Last Duchess, Up at a Villa—Down in the City.*

[The list for 1912 differs in many points from that for 1913-15, being nearly the same as that for 1910-11. For the 1911 list, see the University Catalog for 1910-11. Nearly all the publishers of English school texts issue these lists in convenient form, and will send them on application. For the full official report of the 1909 Conference, address Mr. Wilson Farrand, Newark Academy, Newark, N. J.]

"*b.* STUDY. This part of the requirements is intended as a natural and logical continuation of the student's earlier reading,

with greater stress laid upon form and style, the exact meaning of words and phrases, and the understanding of allusions. For this close reading are provided a play, a group of poems, an oration, and an essay, as follows:

"Shakespeare's *Macbeth;* Milton's *L'Allegro, Il Penseroso,* and *Comus;* either Burke's *Speech on Conciliation with America,* or both Washington's *Farewell Address* and Webster's *First Bunker Hill Oration;* either Macaulay's *Life of Johnson* or Carlyle's *Essay on Burns.*"

*The Course of Study.* The suggested course outlined below covers four years, and each year is divided into two terms.

It provides for the study of grammar, composition, and literature in suitable proportions. It attempts also to assign to a suitable place in the four years' course each item in the Conference list of readings. Titles *starred* are recommended for class room study, the others for outside reading. All the literature in the Conference list may well be read in the course of the four years.

Figures following the different subjects indicate the proportion of the whole English time (five periods a week) of the term to be given to each subject. They do not mean that in each week so much time shall be given to grammar, so much to composition, and so much to literature. On the contrary it is better, both in grammar and in literature, to work intensively, giving consecutive class periods to one topic until it is mastered and then proceeding similarly with another. Drill in the conventional usages of composition, on the other hand, involving as it does the acquiring of habits, should be kept up steadily alongside of the other studies.

### FIRST YEAR.

*First Half.*—(Grammar 2, composition 2, literature 1.)

GRAMMAR—The parts of speech; subject and predicate.

COMPOSITION—Exercises in capitalization, punctuation, and sentence form. Invention, oral and written, in connection with the literature read. Letter-writing.

LITERATURE—*The Lady of the Lake*; Treasure Island; Arabian Nights; Ivanhoe; Iliad; Tale of Two Cities; Last of the Mohicans; Old Testament Stories* (H. M. Co.).

*Second Half.*—(Grammar 3, composition 1, literature 1.)

GRAMMAR—Number; case and case relations; transitive and intransitive verbs; complements of the verb; tense; passive voice; compound verb-forms; sentence, clause, and phrase; relatives.

COMPOSITION—Exercises in punctuation and sentence-form continued. Paragraph division and paragraph development. Original work in narration and description on subjects suggested by the literature read.

LITERATURE—*Vision of Sir Launfal*; Snow-Bound*; Odyssey; Kidnapped;* Lamb's *Tales from Shakespeare; Rip Van Winkle;* Franklin's *Autobiography; Quentin Durward; Robinson Crusoe.*

SECOND YEAR.

*First Half.*—(Grammar ½, composition 2, literature 2½.)

GRAMMAR—Classification of sentences (simple, complex, compound; declarative, interrogative, exclamatory).

COMPOSITION—Exercises in sentence form, punctuation, and vocabulary. Correction of vulgar errors of speech and writing. Unity and coherence of paragraphs. Invention, oral and written, on topics drawn from the pupil's experience.

LITERATURE—*As You Like It*; Merchant of Venice*; Southey's Life of Nelson;* Butler's *Gordon* (Macmillan's Men of Action Series); *Kenilworth; House of Seven Gables; The Deserted Village.*

*Second Half.*—(Composition 2, literature 3.)

COMPOSITION—Review of punctuation, with special attention to comma, semicolon, full stops, and quotation marks. Constructive exercises in different types of sentence form. Repetitive exercises upon the literature read, to enlarge the vocabulary.

LITERATURE—*The Ancient Mariner*; The Passing of Arthur*; David Copperfield; Lorna Doone;* the *Aeneid; A Christmas Carol* and *The Chimes; Cricket on the Hearth; Golden Treasury III and IV*.*

THIRD YEAR.

*First Half.*—(Composition 2, literature 3.)

COMPOSITION—Exercises in invention, descriptive or narrative. The whole composition: its theme (unity), and its plan (sequence). Outlines drawn up, and developed both orally and in writing, on topics drawn either from reading or from experience. Study of the connotation of words.

LITERATURE—*Midsummer Night's Dream; Idylls of the King*; Twelfth Night; Sketch Book; Succession of Forest Trees*; Travels with a Donkey; DeCoverley Papers; The Tempest; The Black Arrow; Esther, Ruth.*

*Second Half.*—(Grammar 1, composition 2, literature 2.)

GRAMMAR—Mood and the modal auxiliaries; the participle and the infinitive

COMPOSITION—Exercises in invention, expository and argumentative. The making of outlines by analysis of propositions; paratopic-sentences and their development; transitions; emphasis by arrangement; how to gather material from experience, observation, reading, and reflection; the right use of reading in original composition; the MS. conventions of citation, quotation, and reference; accuracy of diction.

LITERATURE—*Pied Piper and Browning's Shorter Poems*; Sketch Book; Washington's Farewell Address**; Webster's *First Bunker Hill Oration*; Parkman's *Oregon Trail; Golden Treasury II**; Selections from Lincoln; *Dr. Jekyll and Mr. Hyde; Genesis, Exodus, Joshua,* and *Judges.*

FOURTH YEAR.

*First Half.*—(Grammar 1, composition 1, literature 3.)

GRAMMAR—General review of sentence analysis; idioms and vulgarisms; principles of etymology.

COMPOSITION—Original written work confirming the principles and methods learned in the third year, with special attention to vocabulary and thought development.

LITERATURE—History of English literature to Milton; *Macbeth*; Henry V; L'Allegro*; Il Penseroso*; Lycidas*;* Selections from Wordsworth and Burns; Plato's *Apology*†, *Crito,* and *Phaedo*†; *Autocrat of the Breakfast Table;* DeQuincey's *Joan of Arc and The English Mail Coach*.*

*Second Half.*—(Composition 1, literature 4.)

COMPOSITION—Review of the mechanics of written form and the chief details of good use, with drill as found necessary. Rhetorical types of sentences. Original written work based on study and reflection; oral debate.

LITERATURE—History of English literature from Milton to the present; *Beowulf* (in translation); *Golden Treasury I*; Julius Caesar*; Henry VIII; Cotter's Saturday Night;* Carlyle's *Burns; Tintern Abbey*;* Walden; Burke's *Speech on Conciliation with the Colonies*; The Scarlet Letter; Romola.*

*For library equipment, see pages* 75-80.

## MATHEMATICS.

FOUR UNITS MAY BE OFFERED.

The four units which may be offered in mathematics are as follows:

† Pauls More's translation; Houghton, Mifflin.

*Algebra. One unit.* Elementary Algebra, including the elementary operations, fractions, solutions of single and simultaneous linear equations with applications, simple factoring, simple radicals, exponents, and the solution of numerical quadratic equations. Graphical methods should be used wherever they assist in the comprehension of the subject.

*One and one-half units.* Complete elements of Algebra, including the above, and in addition, solution of simultaneous quadratics, chiefly by graphical processes, of higher equations solved as quadratics, of problems whose solution depends upon quadratics; the formation of equations with given roots; the binomial theorem for *positive integral exponents;* practical use of logarithms; ratio and proportion and other simple work on variation. For more detailed outline see the report of the committee of the State Teacher's Association, Joplin meeting, 1907.* The text should cover the ground in the best algebras, preferably the newer books which contain work on graphs. Books which do not contain all the above mentioned material may be sufficient for the first unit, but not for the unit and a half.

*Plane Geometry. One unit.* The work in Plane Geometry, in order to be acceptable, *must cover a full year in some good text.* It is recommended that strong emphasis be placed on a very few of the most important theorems, such as the congruence theorems, the similarity theorems, the Pythagorean theorem, etc., and that the student be led to see that he need not remember many of the lesser theorems provided he knows how to get them whenever he wants them by reference to these larger theorems. The student should thus see that the logic of the subject plays a large part in assisting the memory and in relieving the memory from unnecessary burdens. Original demonstrations should form an important part of the work. It is recommended that informal proofs be accepted for some of the most obvious theorems and that the notion of a strictly logical proof be developed gradually as the student can be led to see the need for such proof. The theory of limits and the proofs for the incommensurable cases may be omitted or only briefly explained by the teacher. It is recommended that part of the year be spent on the applications of Algebra to Geometry and of Geometry to Algebra. The connection

*This can be found in School Science and Mathematics, April, 1908, or may be obtained free from the Secretary of the Missouri Society of Teachers of Mathematics and Science, 208 Thilly Avenue, Columbia, Missouri.

between Algebra and Geometry now established in the graphical and concrete work in Algebra should not be forgotten. The student's knowledge of Algebra may be kept alive and even slightly extended, and his appreciation of its value greatly strengthened by frequent incidental use throughout the course in Geometry. It is highly desirable that the student should gain in the grades and in connection with the concrete work in Algebra an intimate practical acquaintance with many of the facts of Geometry that he may not be confronted with entirely new subject-matter at the same time that he is mastering the logical methods of Geometry. A specially favorable opportunity to make Geometry seem of real value to the student consists in the applications of the theorems on similar triangles to the graphical solution of triangles by drawing them to scale and measuring the unknown parts with ruler and protractor. In this connection the simplest notions of Trigonometry may be introduced with profit. A small ten cent table of logarithms and trigonometric functions may be obtained.* Familiarity with such a table will do much to enliven the work, and incidentally pave the way for an easier understanding of Trigonometry. For a detailed discussion of these questions, see the report on Geometry which will be presented to the National Education Association in the summer of 1911.

*Arithmetic. One-half unit.* This half unit will not be approved unless it is given *after* the completion of the elementary courses in Algebra and Geometry. An extended variety of topics is by no means so desirable as a careful study of the meaning of the simpler and more fundamental processes of Arithmetic, together with application to problems drawn as widely as possible from Geometry, Physics, Mensuration, and other subjects with which the student is already familiar. Algebraic forms of thinking may well be used where these assist in understanding the subject.

*Algebra. Additional half unit.* This half unit will not be approved unless it is given *after* the completion of the elementary courses in Algebra and Geometry. The spirit of the work offered for this half unit should be the same as that indicated in the above outline for Arithmetic. In particular, the close relation of Algebra to Arithmetic and Geometry should be emphasized.

*Solid Geometry. One-half unit.* The work in Solid Geometry should cover a full half year's work. The development of the stu-

*These may be obtained from the Co-operative Store, Columbia, Missouri.

dent's space conception is a valuable aim in the work, and it may well be aided by the construction and study of models and by the experimental verification of theorems.

*Trigonometry. One-half unit.* This is supposed to cover a half year's work. It should include the elementary notions, logarithms, functions of obtuse angles, solution of right-angled triangles, some work in oblique triangles, and some familiarity with the formulas involving two angles.

*For library equipment, see pages* 80-81.

## HISTORY.

FOUR UNITS MAY BE OFFERED.

The course of study recommended consists of a full year's work, five periods a week of forty minutes each, in each of the four fields of history—Ancient, Medieval and Modern, English, and American. In order to develop in the pupils the sense of historical unity and growth, the course of study should be so planned as to have one period or field succeed another in natural sequence. Accordingly, the course should begin with a year's work in Ancient History and this be followed by a second year devoted to Medieval and Modern History. The third year will, naturally, be devoted to English History, and the fourth to American History and Civil Government. If desired, English History may be given in the second year and Medieval and Modern in the third year, without seriously affecting the continuity or value of the instruction. A reason for such transposition may be found in the relative difficulty of the two courses, both from the teacher's and pupil's standpoints.

For a three years' course of study, Ancient History should be followed in the second year by Medieval and Modern History, with attention to English History as a part of the field, or by English History, with attention given to continental European history, and in the third or fourth year American History, or American History and Civil Government, should be studied.

A two years' course should comprise a year's work in Ancient History followed by a year of Medieval and Modern History. Such a brief course, however, is not recommended, and accredited schools offering but two units should make every effort to add another year's work is history to their programme, or, better still, two years additional.

The following brief statements in regard to the several units will serve to indicate the scope of the course and the type of text-books acceptable to the University.

(1) *Ancient History. One Unit.* The completion of a careful and thorough course of study extending over one entire school year in Oriental, Greek, and Roman history. The list of text-books given below will indicate the type of books acceptable as the basis for this course:

Botsford, *Ancient History for Beginners*, Macmillan .....$ 1.50
Goodspeed, *History of the Ancient World*, Scribner..... 1.50
Morey, *Outline of Ancient History*, American Book Co. ..... 1.50
Myers, *Ancient History*, Revised Edition, Ginn & Co..... 1.50
West, *The Ancient World*, Allyn & Bacon ..... 1.50
Wolfson, *Essentials in Ancient History*, American Book Co. .. 1.50

(2) *Medieval and Modern History. One Unit.* A year's study of the history of the European nations and their development and institutions from the period of the Germanic invasions to the close of the nineteenth century. The course should be based on a standard high school text such as:

Adams, *Mediaeval and Modern History*, Macmillan .....$ 1.10
Bourne, *Mediaeval and Modern History*, Longmann, Green.. 1.50
Harding, *Essentials in Mediaeval and Modern History*, American Book Co. ..... 1.50
Munro and Whitcomb, *Mediaeval and Modern History*, Appleton ..... 1.50
Myers, *Mediaeval and Modern History*, Revised Edition, Ginn & Co. ..... 1.50
Robinson, *History of Western Europe*, Ginn & Co. ..... 1.60
Thatcher and Schwill, *General History of Europe*, 350—1900 A. D., Scribner ..... 1.50
West, *Modern History*, Allyn & Bacon ..... 1.50

(3) *English History. One Unit.* A thorough study of English political, governmental, economic and social history extending through one full school year and based on any standard text-book such as:

Andrews, *History of England*, Allyn & Bacon .....$ 1.50
Cheyney, *Short History of England*, Ginn ..... 1.40
Coman and Kendall, *History of England*, Macmillan ..... 1.25
Larned, *History of England*, Houghton, Mifflin ..... 1.25
Terry, *History of England for Schools*, Scott, Foresman (Chicago) ..... 1.40

Tout, *Advanced History of England*, Longmann, Green ..... 1.50
Walker, *Essentials in English History*, American Book Co.... 1.50
Wrong, *History of the British Nation*, Appleton ..... 1.40

NOTE.—A half unit in English History will be given for a shorter course of study based on less advanced texts such as Higginson and Channing's *History of England;* Ransome's *Short History of England*, and Montgomery's *English History*. The half-unit course is not recommended, however, and the half-unit course should be given only when it is impossible to devote a full year to the subject.

(4) *American History. One Unit.* This course should embrace a year of advanced work in American political, social and institutional history with special reference to the period since 1763. The following text-books suggest a standard for this course:

Adams and Trent, *History of the United States*, Allyn & Bacon .....$ 1.50
Ashley, *American History*, Macmillan Co. ..... 1.50
Channing, *Student's History of the United States*, Macmillan 1.40
Hart, *Essentials of American History*, Amer. Book Co. ..... 1.50
Larned, *History of the United States*, Houghton, Mifflin..... 1.40
McLaughlin, *History of the American Nation*, Appleton..... 1.40
Montgomery, *Student's American History*, Ginn ..... 1.40

NOTE.—A half-unit in American History will be given for a briefer, or half year, course of an advanced character but less comprehensive in scope. Such a course is not recommended, however, save in connection with the half-unit in Civil Government.

*For list of maps and library equipment, see pages* 81-93.

## CIVIL GOVERNMENT.

ONE-HALF UNIT MAY BE OFFERED.

*Course of Study.* Systematic instruction in Civil Government should be postponed to the last year of the course of the secondary school. There is a distinct advantage in this plan. If given in the earlier years the work would be largely a review of what had been done in the last year of the elementary school. Still more important is the consideration that the senior in the secondary school is a much better subject for such instruction than are pupils in the first and second years. He will be much more appreciative of the spirit and content of the course.

Civil Government should be given as a distinct course and not as a part of the work in American History. History, however, is

so essential to good results in the teaching of government that credit will not be given for work in Civil Government unless it is preceded by at least one-half year's work in American History. The best plan is to offer Civil Government in the second half of the senior year following American History in the first half of such year. It is recommended, moreover, that during the earlier years of the course much incidental instruction in Civil Government should accompany the work in History and Geography. Emphasis should be placed upon the historical development of political institutions in order that the pupil may be brought to a true understanding of what may otherwise appear arbitrary and irrational.

*Methods of Instruction.* The course should begin with a study of local government. The pupil can be made to understand local institutions much more readily than those of the state or nation since the former come within the range of his personal experience. In his daily life he is brought into contact with organs and activities of local government and these should be seized upon by the teacher as object lessons to illustrate the work of the course. The city will furnish the best and most numerous illustrations of this character. It will be relatively an easy matter to excite the curiosity and arouse the interest of the pupil in governmental organs which he can see and whose activities are brought home to him. In this way he will receive a real training in citizenship. From the institutions of the city it will be possible to proceed in like manner to those of the county, state and nation.

The pupil's interest in the work can be retained and heightened by visits to places which have to do with governmental activities. The city hall, public water and lighting plants, the public library, post-office, the school itself,—all will furnish excellent means for illustrating the work in Civil Government. The pupil should be encouraged to study the government of his city and make reports upon various phases of its organization and work, e. g., the mayor, city clerk, street improvement, lighting, etc. The work in Civil Government may also be supplemented by having the school debating societies discuss questions of civic interest.

A good text-book is desirable. In many cases its arrangement may not correspond to the above plan but it will be possible to take up the parts of the text in a different order from that in which they are presented. The text-book must be largely supplemented by the teacher and by collateral reading and reference work. A small reference library is essential.

*For library equipment, see pages* 93-95.

## LATIN.

FOUR UNITS MAY BE OFFERED.

The student should acquire such a vocabulary and such a knowledge of inflections and syntax as to read readily simple Latin prose with accurate quantitative pronunciation of the words. He should be carefully trained in reading Latin aloud, with proper emphasis and expression, and in rendering Latin into choice, idiomatic English. In connection with the reading, there should be some practice in writing Latin, and in making frequent written translations. Sight reading should be made a frequent exercise.

The *first year* should be spent in thoroughly mastering the elements of the language as given by such beginners' books as Bennett's, Collar and Daniell's, or Pearson's.

During the *second year*, four books of Caesar's *Gallic War* should be read.

An equivalent of Nepos, Viri Romae or Eutropius may be substituted for one book of Caesar, if the pupils need some simple Latin as a bridge. This is not recommended, however, unless it is absolutely necessary. An equivalent amount of Caesar's *Civil War* may be read instead of the *Gallic War*. This is recommended especially in the case of classes in which a large number are going over the year's work a second time. The reading should be accompanied by a careful and systematic review of grammatical forms and by a study of the leading principles of syntax. The latter should be impressed upon the pupil's mind by the translation into Latin of English sentences, based upon the text read. One exercise a week should be given entirely to this composition work, in which the marking of all long vowels should be insisted on.

During the *third year* the following orations of Cicero are usually read: four orations against Catiline, the oration for the Manilian Law, the oration for the Poet Archias. Instead of these, an equivalent may be read in Sallust's *Cataline* or *Jugurtha*. The grammar and composition work of the preceding year should be continued.

It is recommended that the *fourth year* be begun by the reading of about a thousand lines of Ovid's *Metamorphoses*. This is to be followed by four or five books of Vergil's *Aeneid*. If only four are read, an equivalent in the *Eclogues* or *Georgics* should be read. If desired the whole year may be devoted to reading six books of the *Aeneid*. The technique of the Latin hexameter should be taught and its rhythm should be felt as quantitative and not merely translated into an accentual rhythm.

In connection with the reading of Latin, the mythology of the Greeks and Romans and the life and history of the Roman People should be thoroughly taught. Map drawing is valuable for impressing upon the mind the geography of the ancient world.

*For library equipment, see pages* 96-103.

## GREEK,

THREE UNITS MAY BE OFFERED.

The three units that may be offered in Greek are as follows:

*First.* Introductory lessons:

Xenophon's *Anabasis* (20 to 30 pages).

Practice in reading at sight and in writing Greek.

Systematic study of grammar begun.

*Second.* Xenophon's *Anabasis* (continued), either alone or with other Attic Prose (75 to 100 pages).

Practice in reading at sight, systematic study of grammar, thorough grammatical review, and practice in writing Greek, both based on study of Books I and II of the Anabasis.

*Third.* Attic Prose; e. g., Lysias' *Orations*, or Plato's *Apology and Krito*, or Xenophon's *Memorabilia*, with practice in writing Greek; grammar, practice reading at sight.

Homer (2500 to 4000 lines); e. g. *Odyssey* Books I-V, or *Iliad* Books I-III (omitting 11,499-end), and VI-VIII.

Useful text books for the above work are:

1. For the *first year's* work;
Ball's *Elements of Greek*, Macmillan.
White's *First Greek Book*, Ginn.
Gleason and Atherton's *First Greek Book*, Amer. Book Co.
Gleason's *Gate to the Anabasis*, Ginn.

2. For the *second year's* work;
Smith & Bonner, *Xenophon's Anabasis*, D. Appleton.
Goodwin and White's *Xenophon's Anabasis*, Ginn.
Goodwin's *Greek Grammar*, Ginn.
Pearson's *Greek Prose Composition*, Amer. Book Co.

3. For the *third year's* work;
Morgan's *Eight Orations of Lysias*, Ginn.
Wait's *Ten Select Orations of Lysias*, Amer. Book Co.
Bristol's *Ten Selected Orations of Lysias*, Allyn and Bacon.
Adams, *Selected Speeches of Lysias*, Amer. Book Co.
Flagg's *Apology and Krito of Plato*, Amer. Book Co.
Smith's *Xenophon's Memorabilia*, Ginn.

*For library equipment, see pages* 96-103.

## GERMAN.

THREE UNITS MAY BE OFFERED.

(1) The *first unit* should comprise: (a) Careful drill upon pronunciation. (b) Systematic drill upon the elements of grammar, including the inflection of the articles, the noun, the adjective, the pronoun, the verb, strong and weak; also upon the use of the common prepositions, the simpler use of the modal auxiliaries and elementary rules of syntax and word-order. (c) The reading of from 100 to 150 pages of easy texts, chiefly modern prose, with especial stress laid upon acquiring a good working vocabulary. (d) Abundant practice (1) in oral and written reproduction of the text, (2) in the memorizing of colloquial and idiomatic phrases, and (3) in dictation. Thoroughness should be insisted upon rather than quantity. Texts such as the following are recommended: (1) Guerber's *Märchen und Erzählungen I*, (2) Seeligmann's *Altes und Neues*, (3) *Glück Auf*, (4) the easiest of Grimm's *Märchen*.

(2) The *second unit* calls for about 300 pages of moderately difficult reading, chiefly prose, with constant practice in oral and written reproduction of selected portions; also drill upon the more difficult chapters of grammar such as the passive voice, use of cases with prepositions, verbs, adjectives, uses of tenses and modes (especially the infinitive and subjunctive), likewise upon word-order, and word-formation. Thoroughness should be insisted upon rather than quantity. The following texts are among those recommended: (a) For reading, Baumbach's *Sommermärchen* and *Waldnovellen*, Leander's *Träumereien*, Zschokke's *Der zerbrochene Krug*, *Das Wirtshaus zu Cransac*, Storm's *Immensee*, Heyse's *L'Arrabiata;* (b) for composition, Pope's *Composition*, Stern's *Geschichten vom Rhein*, Bacon's *Im Vaterland*.

(3 The *third unit* calls for: (a) The reading of from 400 to 500 pages of good modern prose stories and plays and the ability to use the language effectively as a means of oral and written expression; (b) Abundant practice in the writing of compositions. Among the texts recommended are Benedix' *Der Prozess*, *Die Hochzeitsreise*, Moser's *Der Bibliothekar*, Manley and Allen's *Four German Comedies*, Storm's *Der Schimmelreiter*, Riehl's *Burg Neideck*, Sudermann's *Frau Sorge*, Freytag's *Die Journalisten*, Helbig's *Komödie auf der Hochschule*.

*For library equipment, see pages* 103-106.

## FRENCH.

THREE UNITS MAY BE OFFERED.

In general throughout the course the teacher should aim at quality rather than quantity.

1. The work of the *first year* should aim to give the student: (a) an accurate pronunciation; (b) a knowledge of the rudiments of the grammar; (c) the ability to translate simple sentences into French and to express in idiomatic French simple ideas; (d) the ability to understand simple ideas expressed orally in French; (e) a vocabulary and knowledge of construction sufficient to enable him to read ordinary French with considerable ease.

The drill in pronunciation should begin with the first meeting of the class and should continue unremittingly until the last. It is not only an end in itself but it makes for accuracy in the knowledge of grammatical forms and is a great aid in the retention of vocabulary. As a part of such drill frequent dictations are indispensable.

The grammatical work should include the regular and the more common irregular verbs, the inflection of nouns, adjectives, participles, and pronouns, the use of pronouns, adverbs, prepositions, and conjunctions, sentence-order, and the elements of syntax. The amount studied should be about that covered in Thieme and Effinger's *Grammar*, the first part of Fraser and Squair's *Grammar*, Aldrich and Foster's *Elementary French*, or Chardenal's *First French Course*.

A minimum of about 150 pages should be read. There are a number of readers which present a sufficient variety of graded material and some of the easier of the texts mentioned below as suitable for the *second year* could be used profitably. There should be constant practice in translating into French easy variations of the texts read, and this, in conjunction with the English sentences given in the grammar, will insure an abundance of drill in this respect.

2. The work of the *second year* should include the reading of a minimum of 350 pages of modern prose, including a number of short dramatic works, with constant practice as before in retranslation of variants of the texts read. The drill in pronunciation and the writing of French from dictation should be continued. The grammar work should include a careful review of the ground covered in the *first year*, with drill upon all irregular verbs that are not very rare, the uses of the subjunctive, and a more detailed study of the syntax. There should be constant practice in the construction of sentences. Students should be required to give either orally

or in writing abstracts of portions of the texts read. Any of the following texts, recommended by the Committee of Twelve of the Modern Language Association of America, are suitable for the second year: About's *Le Roi des Montagnes;* Bruno's *Le Tour de la France;* Daudet's easier short tales; La Bédollière's *La Mère Michel et Son Chat;* Erckmann-Chatrian's stories; Foa's *Contes Biographiques* and *Le Petit Robinson de Paris;* Foncin's *Le Pays de France;* Labiche and Martin's *La Poudre aux Yeux* and *Le Voyage de M. Perrichon;* Legouvé and Labiche's *La Cigale chez les Fourmis;* Malot's *Sans Famille;* Mairet's *La Tâche du petit Pierre;* Mérimée's *Colomba;* extracts from Michelet; Sarcey's *Le Siège de Paris;* Verne's stories.

3. The work of the *third year* should include the reading of from 600 to 1000 pages of French, with constant practice in paraphrasing and abstracting portions of the texts *in French* The drill in pronunciation and in the writing of French from dictation should be continued unremittingly. A good grammar should be studied carefully. Students should be drilled in writing simple original themes in French. The texts recommended by the Committee of Twelve are as follows: About's stories; Augier and Sandeau's *Le Gendre de M. Poirier;* Béranger's poems; Corneille's *Le Cid* and *Horace;* Coppée's poems; Daudet's *La Belle-Nivernaise;* La Brète's *Mon Oncle et Mon Curé;* Madame de Sévigné's letters; Hugo's *Hernani* and *La Chute;* Labiche's plays; Loti's *Pêcheur d'Islande;* Mignet's historical writings; Molière's *L'Avare* and *Le Bourgeois Gentilhomme;* Racine's *Athalie, Andromaque,* and *Esther;* George Sand's plays and stories; Sandeau's *Mademoiselle de la Seiglière;* Scribe's plays; Thierry's *Récits des Temps Mérovingiens;* Thiers's *L'Expédition de Bonaparte en Egypte;* Vigny's *Canne de Jonc;* Voltaire's historical writings. It is recommended, however, that only sparing use be made of the classical plays, especially those of Corneille and Racine, which are more suitable for a fourth year.

*For library equipment, see pages* 106-108.

## SPANISH.

THREE UNITS MAY BE OFFERED.

The work in Spanish should aim at a combination of the practical and the esthetic. Emphasis throughout the course should be laid on beauty of expression, the characteristic tone of Spanish literature, historical and literary references, on the one hand, and a sure grasp of grammatical principles, thorough drill in verbs, and independent expression, both oral and written, on the other.

*First year.* The instruction should above all be practical. Drill in variety should be the method, and thoroughness, not quantity, the object. Students, on finishing this course, should be able to read easy texts like Hills' *Spanish Tales for Beginners* (Holt), Valera's *El Pájaro Verde* (Ginn), and Carrión and Vital Aza's *Zaragüeta* (Silver, Burdett). From 150 to 200 pages of connected prose should be read. Drill in pronunciation and dictation might well occupy a portion of each period. Hills and Ford's *Grammar* (Heath) or Monsanto and Languellier's *Grammar* (Amer. Book Co.) is suggested. In the composition work, any ten of the grammar-sentences in each lesson should be sufficient.

*Second year.* A rapid review of the grammar, along with the writing of all the composition work, should be made. The reading of about 350 pages of modern prose, such as that of Galdós' *Marianela* (Heath), Valera's *El Comendador Mendoza* (Amer. Book Co.), Moratín's *El Sí de las Niñas* (Amer. Book Co.), is required. Some attention should be paid to literary qualities. Remy's *Spanish Composition* (Heath), or an equivalent, should be used both for composition and conversation. A Spanish newspaper or periodical would prove of interest and value to students.

*Third year.* Some of the more difficult masterpieces should be taken up, and considerable time devoted to their value as literature. Pupils should be referred to good histories of Spanish literature, such as Fitzmaurice-Kelly's or Ticknor's. Three or four works of the caliber and length of Galdós' *Doña Perfecta* (Heath), Núñez de Arce's *El Haz de Leña* (Heath), Ford's *Selections from Don Quijote* (Heath), and Calderón's *La Vida es Sueño* (Amer. Book Co.) should be read. Umphrey's *Spanish Prose Composition* (Amer. Book Co.) is suitably graded for this year. The ability to converse should be developed. For grammatical reference, Ramsey's unabridged *Text-Book of Modern Spanish* (Holt), and Bello y Cuervo, *Gramática de la Lengua Castellana* (A. Rogers), Paris, are suggested.

*For library equipment, see page* 108.

## PHYSICS.

TWO UNITS MAY BE OFFERED.

The work consists of three closely related parts; namely, class work, lecture-demonstration work, and laboratory work.

The class work includes the study of at least one standard text. It should aim to build up in the pupil's mind clear concepts of physical terms and quantities, and an intuitive appreciation

of the general principles which make up the syllabus given below. The pupil should be trained in the use of those principles in the solution of simple, practical, concrete numerical problems.

In the laboratory, the pupil should perform at least thirty individual experiments, and should keep a careful note book record of them. At least twenty of these should involve numerical work and the determination of such quantitative relations as may be expressed in whole numbers. Such quantitative work should aim to foster the habit of thinking quantitatively, but should not attempt to verify laws with minute accuracy nor to determine known physical constants with elaborate apparatus. The list of topics covered by these quantitative experiments ought not to differ widely from the list of starred topics in the syllabus.

The teacher is not expected to follow the order of topics in the syllabus, unless he wishes to do so. The list is not intended to include all the material for the year's work. It is purposely made short, in order that each teacher may be free to supplement it in a way that fits his individual environment. It does include those topics which all agree are essential to a first course in Physics, and which are capable of comprehension by boys and girls of high school age.

The syllabus of topics is as follows:

*1. Weight, center of gravity.
*2. Density.
*3. Parallelogram of forces.
4. Atmospheric pressure; barometer.
*5. Boyle's law.
6. Pressure due to gravity in liquids with a free surface; varying depth, density, and shape of vessel.
*7. Buoyancy; Archimedes' principle.
*8. Pascal's law; hydraulic press.
9. Work as force times distance, and its measurement in foot-pounds and gram-centimeters.
10. Energy measured by work.
*11. Law of machines: work obtained not greater than work put in; efficiency.
*12. Inclined plane.
*13. Pulleys, wheel and axle.
*14. Measurement of moments by the product of force times arm; levers.
15. Thermometers: Fahrenheit and Centigrade scales.
16. Heat quantity and its measurement in gram calories.
*17. Specific heat.

*18. Evaporation; heat of vaporization of water.
*19. Dew point; clouds and rain.
*20. Fusion and solidification; heat of fusion.
21. Heat transference by conduction and convection.
22. Heat transference by radiation.
23. Qualitative description of the transfer of energy by waves.
24. Wave length and period of waves.
25. Sound originates at a vibrating body and is transmitted by waves in air.
*26. Pitch and period of sound.
*27. Relation between the wave length of a tone and the length of a string or organ pipe.
*28. Resonance.
29. Beats.
30. Rectilinear propagation of light; pin-hole camera.
*31. Reflection and its laws; image in a plane mirror.
*32. Refraction, and its use in lenses; the eye, the camera.
*33. Prisms and dispersion.
34. Velocity of light.
35. Magnetic attractions and repulsions.
*36. Field of force about a magnet.
37. The earth a magnet; compass.
38. Electricity by friction.
39. Conductors and insulators.
*40. Simple galvanic cell.
*41. Electrolysis; definition of the ampere.
*42. Heating effects; resistence; definition of the ohm.
*43. Ohm's law; definition of the volt.
*44. Magnetic field about a current; electromagnets.
*45. Electromagnetic induction.
*46. Simple alternating current dynamo of one loop.
*47. Electromagnetic induction by breaking a circuit; primary and secondary.
48. Conservation of energy.

The notebook should be a concise record of what the pupil has done. The data should be so tabulated that any one familiar with the subject, or the pupil himself some months later, will be able to understand just what was done. It should be neat, clear and accurate, but the notebook is not the object of the course and too much time should not be put on it.

The text-book should be equal in grade to one of the following: Adams, American Book Co.; Carhart & Chute, Allyn & Bacon; Coleman, D. C. Heath & Co.; Hoadley, American Book Co.; Mann and

Twiss, Scott, Foresman & Co.; Millikan and Gale, Ginn & Co.; Mumper, American Book Co.

For the laboratory it is advisable to use a laboratory manual separate from the text-book. There are now a number of excellent manuals published. The use of one of these will in general be much more satisfactory than notes which must be copied by the pupils. The following manuals are suggested: Adams, American Book Co.; Ayres, Appleton & Co.; Crew and Tatnall, Macmillan; Coleman, American Book Co.; Hoadley, American Book Co.; Nichols, Smith and Turton, Ginn & Co.; Millikan and Gale, Ginn & Co.; Twiss, Scott Foresman & Co.

*A second unit* may be given, consisting of a continuation of the laboratory work for another year, or a year's work in a more advanced text together with laboratory work.

*For laboratory equipment, see pages* 47-52.

*For library equipment, see pages* 108-109.

## CHEMISTRY.

TWO UNITS MAY BE OFFERED.

The course should consist of a year's work as outlined in a standard text-book of high school grade. It should consist of two closely related parts; namely, recitations including demonstrations by the teacher, and laboratory work.

Each pupil should be provided with an outfit of apparatus for the laboratory exercises, which should be largely carried out by the pupils working independently. A limited number of experiments, however, may be conducted by two pupils working together. Each pupil should record in a note book what he observes, and should do so at the time the observations are made. The interpretation of observed results and calculations may be recorded in the note book later, if the teacher so prefers.

As Chemistry is an art as well as a science, stress should be laid on handling and setting up apparatus in a neat and orderly manner. In the use of reagents, thought should be given to proportions, and the wasting of materials should be prevented. In experimentation, careful planning and skill of the hand should be emphasized. In this way the laboratory work becomes an interacting process of thinking, doing, and thinking. The pupil, for example, should know why an apparatus should be air tight and how to make it air tight; why gases are washed and dried, and how this operation must be done.

The text and reference books, as a rule, furnish an adequate and systematic account of the chemical changes selected for study, but the equally important feature of the course, the art of Chemistry, is imparted directly by the teacher.

In both laboratory and class work, the materials chosen for study should be restricted to a relatively small number of elements and their chief compounds. Interest in the work may be increased by applications of the facts and generalizations of the text to familiar phenomena in daily life. Visits should be made to the gas works, ice plant, lime kiln, and other chemical industries in the locality. The more important discoveries of Chemistry should become associated with the great masters of the science by anecdote, personal characteristics, or contemporary events.

*A second unit* may be given, consisting of more advanced work in the subject, during the same length of time as required for the first unit.

*For laboratory equipment, see pages* 52-54.
*For library equipment, see page* 110.

## GENERAL BIOLOGY.

ONE UNIT MAY BE OFFERED.

This course should be designed to present a general survey of biological science, including the life processes, the activities, the adaptations, as well as the structure of organisms, treated from the standpoint of their general relations. General Biology is the study of the fundamental properties of living things, as illustrated by a carefully selected series of both animal and plant forms.

The laboratory work guided by suitable directions, should precede text-book work on any subject, and the pupil should be required to make careful drawings and notes on all observations. Accurate observations and records of the normal activities of living animals and plants should be made wherever practicable, both in the laboratory and in the field. Simple experiments upon the behavior of animals are very valuable, and should be made if possible.

The following series of forms for study is suggested:

(1) Amoeba; (2) Paramoecium or Vorticella; (3) Haematococcus; (4) Yeast Plant; (5) Spirogyra; (6) Hydra; (7) Mucor or Penicillium; (8) Earthworm; (9) Crayfish; (10) Grasshopper; (11) Fern; (12) Fresh Water Mussel; (13) Seeds and Seedlings; (14) Flowering Plant; (15) Frog, with metamorphosis. Hunter's Elements of Biology is a good text for this work.

*For laboratory equipment, see pages* 54-57.
*For library equipment, see pages* 110-116.

## BOTANY.

TWO UNITS MAY BE OFFERED.

The work presented for one unit should deal, for the most part, with the seed plants, and should consist of recitations, laboratory work and field studies. While the study of structure is essential, yet most emphasis should be placed on the activities of plants.

The following topics are suggested:

I. *General studies with seed plants.* (1) The parts of a mature plant—roots, stem, leaves, flower; (2) the functions of roots and their modifications; (3) the functions of stems and their modifications; (4) buds; (5) leaves and their work; (6) flowers, parts, functions, adaptations for pollination; (7) fruits, kinds, adaptations for dispersal, value to man; (8) seeds, structure, germination, etc.; (9) relation of plants to light, soil, water, atmosphere; (10) plant families, studies of common representatives of the important plant families, as the roses, legumes, grasses, lilies, composites, etc. Forests and forest trees may well be considered here.

II. *Studies with lower plants.* These should deal almost entirely with gross structures, life habits and economic importance. (1) Algae, general appearance, abundance, local distribution, and relation to water supplies; (2) bacteria, relation to decay, to soils, to disease in plants and animals, to purity of milk and water supplies, to public hygiene; (3) molds, appearance, occurrence, importance in relation to food products; (4) yeasts and fermentation; (5) rusts, smuts, etc., as the cause of plant diseases, parasitic method of living, control of plant diseases; (6) mushrooms, edible and poisonous, cultivation, agents in destruction of timber; (7) liverwort, habits, distribution and life cycle; (8) moss, habits, distribution and life cycle; (9) fern, life cycle, distribution, local types.

Careful drawings, notes and deductions should be made. The student should make his own studies first and then read his text.

This outline is not intended as an essential arrangement, for the latter is best determined by convenience. Any arrangement, however, should enlist the interest of the pupil in the living plant—the plant in action—and laboratory studies should be made to bear this out. It is better, also, to omit some of the topics suggested than to treat them inadequately. The teacher must determine the apportionment of time, and bring out the connection of the topics.

*The second unit* should cover essentially the same ground as is taken up in Coulter's *Plant Structures*, or Bergen and Davis, *Principles of Botany*, Part II, dealing with the morphology, evolution and classification of plants. A careful laboratory study of types of the great groups of plants should be made. The forms selected should be considered largely from the standpoint of evolution.

*For laboratory equipment, see pages* 54-57.
*For library equipment, see pages* 110-116.

## ZOOLOGY.

TWO UNITS MAY BE OFFERED.

The study of each form should include a consideration of the following: (1) habitat; (2) geographical distribution; (3) food; (4) adaptations to environment, including relations to other forms of animal and plant life; (5) general activities; (6) economic relations; (7) life history, and (8) structure.

In Zoology the same methods of instruction should be followed as are outlined above under General Biology.

The following series of forms for study is suggested:

(1) Protozoa (Amoeba, and Paramoecium or Vorticella); (2) A Coelenterate (Hydra); (3) An Echinoderm (Starfish or Sea-Urchin); (4) An Annelid Worm (Earthworm); (5) A Parasitic Worm (Cestode or Trematode); (6) A Decapod Crustacean (Crayfish); (7) An Orthopterous Insect (Grasshopper, and comparison with other Orthoptera); (8) A Coleopterous Insect; (9) A Lepidopterous Insect, with *larva* and *pupa;* (10) A Hymenopterous Insect; (11) A Pelecypod Mollusc (Fresh-water Mussel); (12) An Amphibian (Frog, with metamorphosis).

For high schools equipped to do thoroughly satisfactory work in Zoology, text-books, such as the following, are recommended: Jordan, Kellogg, and Heath's *Animal Studies*, accompanied by Jordan and Price's *Animal Structures* as a laboratory guide.

A book such as French's *Animal Activities* is recommended for schools that are not prepared to offer as extensive a course in Zoology as the above text-books presuppose.

*A second unit* may be given, consisting of more advanced work in the subject, with a study of additional forms, during the same length of time as required for the first unit. For a second unit, Linville and Kelly's *A Text-book in General Zoology* is recommended.

*For laboratory equipment, see pages* 54-57.
*For library equipment, see pages* 110-111 *and* 113-116.

## PHYSIOLOGY.

ONE UNIT MAY BE OFFERED.

Physiology should be preceded by a course in General Biology or by a course either in Zoology or in Botany. At least two double periods a week should be given to laboratory demonstrations by the instructor and to dissections and physiological experiments performed by the student, always under careful supervision. In a high school Physiology course, a certain amount of time should be given to the anatomical study of structures which are to be used later for physiological experiment and demonstration; but the structure should be studied only for the sake of a better understanding of the function. Careful notes and drawings of the structures dissected should be preserved for use as guides in making physiological preparations. Full notes should also be taken in connection with all required physiological demonstrations, and these notes should indicate the observations made directly on the living tissues and organs, and should show the results of the study of mechanical records of experiments on the living organs and tissues, such as muscular contractions, nerve irritability, blood pressure, the heart beat, capillary circulation, respiratory movements, etc.

In the study of digestion, secretion, blood clotting and in the study of composition of the tissues, the elementary phases of physiological chemistry should be presented. Laboratory notes, the original notes taken at the time of the experiments, are to be required.

The text-books and printed guides are numerous and a judicious amount of selection and elimination is necessary. Of the better high school texts may be mentioned, Martin's *Human Body*, revised edition; Huxley's *Lessons in Elementary Physiology*, revised edition; Schenck and Güber's *Human Physiology*, translated by Zoethout; Hewe's *High School Physiology*, which has directions and suggestions for laboratory experiments; Hough and Sedgwick's, *The Human Mechanism;* Walter's *Physiology* and *Hygiene*

*For laboratory equipment, see pages* 57-59.
*For library equipment, see pages* 116-117.

## PHYSICAL GEOGRAPHY.

ONE UNIT MAY BE OFFERED.

The following outline includes only the more essential facts and principles of a unit course. For a fuller definition, see University Bulletin entitled *A Unit in Physical Geography*, by Joseph D. Elliff and Curtis Fletcher Marbut. A copy of this bulletin may be secured free by writing to the Mailing Clerk, University of Missouri, Columbia, Missouri.

*Mathematical Geography.* 1. Review of subject as presented in grammar school geography, including construction of diagrams to show inclination of the earth's axis to the plane of its orbit, perihelion and aphelion, position of equinox and solstice. Measurement of sun's altitude by means of sun board. Determination of latitude by measuring altitude of pole star.

2. The earth considered as a planet. Rotation, proofs, results. Revolution, proofs, results. Magnetism, compass, poles, variation.

*The Atmosphere* 1. Composition, extent and offices of the atmosphere.

2. Temperature, source of temperature, variation of temperature, isotherms, isothermal charts of the world for January and July.

3. Pressure, measurements of pressure, relation of pressure to temperature, study of isobars on United States weather map, distribution of pressure, relation of isobars to isotherms.

4. Atmospheric moisture, source, amount, how measured.

5. Atmospheric movements, winds, classes, direction, cause. Special study of character and paths of storms in the United States.

6. Weather and climate, use of weather maps.

*The Land.* 1. Earth materials. A study of the common rocks and rock forming minerals. A more detailed study of the rocks and soils of the locality.

2. Land forms. Before beginning the study of land forms as presented in the text, the student must be taught to use the Geological Survey Maps. With the use of Geological Survey Maps to illustrate each type of topography, the following should be studied: (a) Plains, simple plain, a plain with valleys, a plain with hills, a plain with hills and valleys. (b) Plateaus, simple plateau, plateau with valleys, plateau with hills, a plateau with hills and valleys. (c) Mountains, a simple mountain, a mountain with valleys.

3. Weathering. Conditions affecting weathering, weathering agents, transportation of material, results of weathering.

4. Special study of the valley. Birth of valley, how it grows, how it gets a stream, limits of growth, accidents that may happen to valleys.

5. Ground water, source, amount, use.

6. The work of streams.

7. Work of ice. Lake ice, river ice, seashore ice, snow line, snow fields, local and permanent. Formation of glacial ice, glacial movements, types of glaciers, work of glaciers, icebergs.

8. The ancient ice sheet, evidence of its existence, how it developed, extent, center of dispersion, unglaciated areas, changes produced by erosion and deposition of material. Characteristics of glaciated areas of United States.

*Volcanoes and Volcanic Phenomena.* General facts, kind and distribution. Study of cone, dyke, crater, fissure, lava.

*The Ocean.* 1. Form, divisions and general characteristics of the ocean.

2. Depth, density, temperature and composition of ocean waters.

3. Characteristics of ocean floor.

4. Distribution of life in ocean.

5. Movements of ocean water. Waves, cause and effect. Currents, causes and effects. More important currents. Tides, character, cause.

6. Special study of shore lines.

*The Earth and Man.* Relation of man, plants and animals to climate, land forms and ocean areas.

*For laboratory equipment, see pages* 59-63.

*For library equipment, see page* 118.

## AGRICULTURE.

ONE UNIT MAY BE OFFERED.

The work should consist of two parts, (1) individual laboratory and field work and (2) recitations based upon the laboratory work, the text-book and assigned readings. Three periods a week should be given to the recitations and two double periods a week to laboratory and field work. As a rule, the laboratory work should precede rather than follow the recitation. Every school should have a small plat of ground, a half acre or more, for a school farm and garden. It is not essential that the topics be studied in the order given below. It is essential, however, that the study

of soils precede the study of plants, and that the problems of farm management come last.

No special list of experiments is required. Each teacher should prepare a list of at least sixty experiments. Practically every topic in the outline may be made the basis of a profitable laboratory or field exercise. The outline here given is an abbreviated statement of the one in the University Bulletin entitled *A Unit in Agriculture* by Joseph Dolliver Elliff. This circular, *A Unit in Agriculture*, contains suggestions concerning the course of study, method of teaching and equipment of laboratories and libraries for teaching Agriculture in Accredited Schools. It may be obtained free by addressing the Mailing Clerk, University of Missouri, Columbia, Missouri. Part II of this circular is also published separately as a pupils' laboratory manual in Agriculture, and copies of it may be secured free by writing to the Secretary of the Committee on Accredited Schools, University of Missouri, Columbia, Missouri.

The outline is as follows:

Farm Crops.—Corn, wheat, oats, the legumes, the grasses, potatoes, and other crops of importance grown in the vicinity of the school.

The following topics for the study of corn will suggest the kind and amount of work to be done in the study of any crop: (1) A grain of corn, an ear of corn, a complete plant; (2) the three types and six principal varieties of corn; (3) corn judging, use of score card; (4) how to select, store and test seed corn; (5) methods of cultivation, preparation of soil, planting, cultivating and harvesting; (6) insect enemies of corn and how to fight them; (7) corn, corn products, importance, value and use.

The Soil.—(1) Origin, formation, composition and kinds of soil; (2) soil water, soil air, soil temperature, soil drainage; (3) meaning and method of tilling the soil.

Plant Propagation.—(1) Propagation by seeds; (2) propagation other than by seeds.

Plant Growth.—(1) Conditions of plant growth; (2) principal elements of plant food—soil-derived and air-derived.

Enemies of Plants.—(1) Insects—biting insects, sucking insects; (2) diseases caused by certain bacteria as fire blight; (3) fungus diseases; (4) spraying to control insects and diseases.

Animal Husbandry.—(1) Origin, brief history, principal types and breeds of horses, cattle, sheep, swine, poultry; (2) live stock judging, use of score card.

Feeding.—(1) Composition of foods, function of each constituent; (2) the balanced ration.

Farm Management.—(1) Choice of farm; (2) the farm house; (3) other farm buildings; (4) maintenance of soil fertility; (5) improvement of farm animals.

Additional Topics for Special Study.—(These may be selected according to the dominant interests of the community.) (1) Any farm crops, as apples, peaches, strawberries, cotton, tobacco; (2) dairying; (3) fertilizers; (4) farm implements.

*For laboratory equipment, see pages* 63-65.

*For library equipment, see pages* 118-119.

## MUSIC.

ONE UNIT MAY BE OFFERED.

In the unit's work in Music, the pupils should acquire the ability to do the following:

1. To sing a selection in the key and time in which it is written, after having had the pitch "C" given to them. Either the "movable do" or "fixed do" methods may be used or better still the syllable "la" as disassociated from either. In the matter of difficulty, the selection should be on a par with songs found in books suitable for High School Choral practice, such as Hoff's *Corona Song Book*, Ripley and Tapper's *Advanced Music Reader* (The Natural Course), Smith's *Fourth Book* (The Modern Music Series), Tomlin's *Laurel Song Book.*

2. To name and qualify (perfect, major, minor, augmented, diminished) intervals struck on the piano, both in succession and combination, by other persons. The pupils should not see the keys as they are struck, but should recognize the intervals by ear. The tests as given under 1 and 2 are for the purpose of a clear recognition of tones and their symbols.

3. To write the chords to figured basses, implying a knowledge of the primary and secondary triads in major and minor and their inversions and of the chord of the dominant seventh with its inversions and resolutions. This work is covered in the first 77 pages of Jadassohn's *A Manual of Harmony.*

If the pupils have not had music in the grades, proficiency in sight reading may be acquired by the use of such books as the following:

*The Modern Music Series*—(Primer, First Book, Second Book, Third Book), Silver, Burdett.

*Educational Music Course*—(First Reader, Second and Third Readers; Fourth and Fifth Readers), Ginn.

*Natural Music Course*—(Primer, First Reader, Second Reader, Third Reader), American Book Co.

For continuing Music in the High Schools, such books as the following will be found serviceable:

*The Laurel Song Book*, (Boston), C. C. Birchard; *The Corona Song Book*, Ginn; *Songs of the Nation*, Silver, Burdett; *Standard Songs and Choruses*, American Book Co.; *The Modern Music Series*—Fourth Book, Silver, Burdett; *Art Songs for High Schools*, American Book Co.

While sight-reading necessarily implies ear-training, special attention may be given to the latter subject by the use of such a book as Heacox's *Ear-Training*, (Philadelphia), Presser.

It is suggested that the work in harmony be based on such a book as Jadassohn's *A Manual of Harmony*, (New York), Schirmer.

## DRAWING.

TWO UNITS MAY BE OFFERED.

The following outline, recently adopted by the North Central Association of Colleges and Secondary Schools, indicates the nature of the work which should be included in the two units of Drawing. While the work is not separated here into a *first* and *second year* program, the more elementary forms of each phase of the subject should be selected for the *first year*. Approximately one-third the time should be given to representative drawing and two-thirds to decorative composition, constructive and decorative design, construction and applied design.

1. Pictorial.—Plant study (flowers, sprays of leaves, seeds, pods, etc.). Object study. Landscape (roof studies, buildings, etc.). Pose drawing. Composition.

2. Decorative Composition.—Plant forms, object study, landscape, post.

3. Decorative Design.—Plant analysis (for the purpose of design). Conventionalized plant forms. Decorative units, borders, surfaces, corners, rosettes, posters, book-coyers, etc. Stencils, wood-block printing. Historic ornament. Arrangement of straight lines, and of straight and curved lines. Geometric design. Lettering, illuminating. Schemes for interior decoration.

4. Constructive Design.—Designs for pottery, leather, metal, book-binding, furniture, cardboard construction, textiles, etc.

5. Crafts.—Pottery, leather work, metal work, book-binding, furniture. (Choice of one or more of the above crafts.)

6. Applied Design.—Design applied to the crafts and to cardboard, textiles, etc.

7. Illustration.

8. Talks on history and industry of art, on civic planning, domestic architecture and decoration.

9. Instrumental drawing to be given as needed to meet the requirements of practical designing and construction.

NOTE.—Mediums used: pencil, charcoal, water colors, crayons, brush and India ink, and a combination of the pure mediums.

It is desirable to accentuate the life interest in these subjects as well as the technical achievement. Taught from the standpoint of their social interest, these topics may be made of great benefit in the adjustment of the student to social life. For example, in constructive design the problem of the house could be studied from the view-points of convenience, suitability, cost, appearance, etc. Under decorative design, schemes for the interior decoration of one or more rooms in the individual pupil's house (as planned above) could be worked out. This idea might be extended to embrace business houses, factories, etc. The pictorial composition could deal largely with the industrial occupations of man, with sketch and pose work made tributary to this end. Complete expression is to be sought; and, whenever possible, the problem should be approached from the side of its relation to the life of the student.

*For library equipment, see pages* 120-121.

## MANUAL TRAINING.

TWO UNITS MAY BE OFFERED.

1. *A Unit in Woodworking.*

In the following outline of a one year course in woodworking, the work has been arranged in groups. Each group contains a number of problems involving the same process. The arrangement provides for the uneven progress of the class, and the teacher is able to keep all members of the class engaged on the same type of work, although working on different objects. A number of supplementary exercises should be provided. The student may be permitted to make almost any object which involves the processes or principles of the group in which the class is working.

The subject-matter is indicated under the heading "Processes."

Group I. Giving the first use of the saw and the laying-out tools, such as the gage, trysquare and rule.

Processes: Measuring, squaring, gaging, sawing, boring, making dowel.

Problem: Game board, counting board, laundry list, puzzle, etc.

Group II. Emphasizing the first use of the plane.

Processes: Planing (1) surface, (2) edge, (3) to dimensions, (4) chamfering.

Problem: Swing-board, hat-rack, bread-cutting board, etc.

Group III. Teaching the first use of the chisel.

Processes: Vertical chiseling, gouging, paring, sharpening chisel.

Problem: Shelf and brush-rack, tray, sleeve-board, etc.

Group IV. Involving "form-work" and the first use of the spokeshave.

Processes: Bow-sawing, modeling, sand papering.

Problem: Coat hanger, tool handle, canoe paddle, etc.

Group V. The construction of objects by means of some form of the groove joint.

Processes: Housing, halving, nailing, carving, finishing.

Problem: Waterwheel, test-tube rack, book-rack, flower-pot stand, loom, sled, box-trap, bracket-shelf, knife-polishing board, towel roller, etc.

Group VI. More exact work in planing in order to make a glue joint.

Processes: Planing joints, gluing, clamping.

Problem: Bread-moulding board, drawing board, bench-hook, etc.

Group VII. Construction by means of the mortise-and-tenon joint.

Processes: Laying out duplicate pieces, cutting a mortise, sawing tenon, finishing.

Problem: Stool, plant-stand, taboret, umbrella rack, table, etc.

Group VIII. Construction involving the mitre joint.

Processes: Planing parallel edges and sides, use of mitre-box, laying out brace.

Problem: Mitre-box, framing a picture, box, bracket, etc.

Group IX. Elementary cabinet making involving the use of panel.

Processes: Plowing, fitting, putting on hinges.

Problem: Sewing cabinet, music cabinet, plate-rack, screen, book-case, etc.

In taking the course outlined, the student should learn the following:

(a) With reference to *tools.*

1. To use the rule in measuring and dividing spaces.
2. How and when to use knife and pencil in laying out work.
3. To use dividers or compasses to draw arcs or divide spaces.
4. To use try-square to lay out work and to test work.
5. To use, adjust and sharpen jack plane and block plane.

6. When and how to use cross-cutting saw, rip saw and back saw. Should know the distinguishing characteristics of these saws and the reasons for these differences.
7. To use and sharpen chisels.
8. To use hammer and nail set.
9. To use screw driver and countersink for setting screws.
10. To use brace and bit—How sizes of bits are designated.
11. How and when to use spoke-shave, file and sand-paper,
12. To use gouge.
13. To name all of the tools used.

(b) With reference to *processes.*

1. To make, mark and use a working corner.
2. To take proper steps in making a board a given length, width and thickness.
3. To detect direction of grain and use this knowledge.
4. To lay out and bore a hole through a board. How to bore to depth.
5. To plane a surface true.
6. To lay out and make a chamfered corner.
7. To lay out and make a rounded corner.
8. To make a "butt" joint.
9. To lay out and make properly a housed or dado joint.
10. To lay out and make properly a cross-lap joint.
11. To lay out and make properly a "mortise and tenon" joint.
12. To make a glue joint.
13. To lay out and make miter joint.
14. To construct a panel.
15. To apply simple finishes.

2. *A Unit in Mechanical Drawing.*

The outline of a unit in Mechanical Drawing is given below. In all pencil drawing with instruments, great care should be taken to make sharp lines with accurate intersections. Do not delay precision till ink is used.

In the first half year such as the following should be studied:

(a) Straight lines; use of T-square, triangles, pencil, ruling pen, dividers, and scale. Conventional lines. Freehand working sketches.

(b) Circles. Use of compasses, center lines, cross hatching.

(c) Tangents. Location of centers and points of tangency.

(d) Planes of projection; elementary principles of projection. Projections of simple geometric figures.

(e) Revolution of objects. "Views" of objects in simple and inclined positions.

(f) Developments: prism, cylinder, pyramid, cone.

In the second half year such as the following should be studied:

(a) Intersections. Axes in the same plane, axes in different planes.

(b) Isometric and cabinet drawing.

(c) Freehand and mechanical lettering; placing, form, slant, spacing, stroke.

(d) Working drawings; furniture.

(e) Working drawings; machine parts.

*For laboratory equipment, see pages* 65-69.

*For library equipment, see pages* 121-122.

## DOMESTIC SCIENCE AND ART.

TWO UNITS MAY BE OFFERED.

One unit may be offered, composed of the most important portions of the two units given below, or each of the units mentioned below may be offered individually.

*A unit in cooking.* This should consist of a practical application of the principle of cooking, designed to teach modern and efficient methods, with scientific explanation sufficient to make the principles rational rather than mechanical. This may include the study of the effects of heat upon foods; experiments with leavening agents; bread making; canning and preserving fruits, vegetables and meats; planning, cooking, and serving meals; waiting on table; cost and market prices of foods, and cost of meals; the family dietary and diet for invalids, convalescents and infants.

*A unit in sewing.* This should consist of practical sewing, dealing essentially with the choosing and making of simple garments, by hand or on the sewing machine, with enough exercises in technique to make the sewing efficient. The course may include the estimation of cost and durability in selection of materials; advantages of various weaves and fibres; detection of adulterations in the common varieties of cloth; the care of clothing, mending and cleaning; draughting, cutting and making; the use and care of sewing machines; the fundamental processes of hand sewing; and the various stitches, and their special uses.

*For laboratory equipment, see pages* 69-72.

*For library equipment, see pages* 122-123.

## ECONOMICS.

ONE-HALF UNIT MAY BE OFFERED.

The course in Economics should not be given earlier than the fourth year in the high school. The subject-matter should include the leading facts and principles of economics, such as division of labor, the factors of production, the laws of diminishing returns, demand and supply, value and price, wages, interest, rent and profit, credit, taxation, regulation of monopolies, and international trade. One of the better grade of texts in current use such as those by Bullock, Clark, Davenport, Ely and Wicker, Johnson, Laughlin, Walker, etc., will serve as a basis for the work, but should be supplemented with discussion and practical exercises. Written exercises are desirable.

*For library equipment, see page* 123.

## COMMERCIAL GEOGRAPHY.

ONE-HALF UNIT MAY BE OFFERED.

The object of this course is to discover the causes of the present territorial distribution of industries and of the location of lines of communication and transportation. It should treat in detail with reference to the United States, and in less detail with reference to the outlying possessions of the United States and to the most important commercial countries, the following topics: (1) the effect of surface, soil, climate, etc., that is, the physical factor in commerce; (2) the influence of race, religion, education, commercial policies, etc., that is, the human factor in commerce; (3) the effect of economic forces on production and commerce; (4) means of transportation and communication. The text-book should be supplemented by map work and assigned readings. The census of manufactures in the United States and other countries would form a valuable reference library, both for the purpose of map work and assigned readings.

It is desirable that for purposes of illustration, samples of commercial staples, lantern slides, stereopticon pictures, etc., should be freely employed; and wherever possible, that visits of inspection be made and informal lectures secured by experts in various industries. Commercial Geography should be preceded by Physical Geography, in case both are given.

*For library equipment, see page* 123.

## BOOKKEEPING.

ONE UNIT MAY BE OFFERED.

The student should become familiar with the meaning of double entry terms, with rules for debit and credit, and the kinds and uses of books. He should acquire the ability to keep a single entry and a double entry set of books. Furthermore, he should become familiar with such standard business forms as bills, receipts, checks, notes, time and sight drafts, endorsements, invoices, accounts sales, deposit tickets, express receipts, bills of lading, statements of account, balance sheets, etc. He should become familiar also with the forms of business letters, beginnings and endings, etc., and should know how to write and answer telegrams and advertisements.

Bookkeeping should be done largely under the eye of the teacher as laboratory work. Good penmanship, neatness in work, accuracy and speed must all be acquired in such laboratory practice. The exercises in some of the texts which are offered by the various publishers on first lessons or elementary principles would naturally form the basis for much of such work, unless the teacher prepares his own exercise work according to a similar plan. The best evidence of good work in this subject is the character of exercise work which the student can present as a result of his laboratory practice.

Some of the best reference works, useful especially to the teacher in charge of elementary work, are Sprague's *Philosophy of Accounts*, Hatfield's *Modern Accounting*, Lisle's *Accounting in Theory and Practice*, Dicksee's *Bookkeeping for Accounting Students*, and Cole's *Accounts—Their Construction and Interpretation.*

## II.

## SUGGESTIONS FOR THE EQUIPMENT OF LABORATORIES.

### GENERAL INFORMATION.

The laboratories of a high school should be on the north side of the building, and the length of the room from east to west should be made much greater than the breadth from north to south. It is an object to have as much north light as possible. This is especially true of Biological work. It is, however, not so necessary for Physics and Chemistry. In the work in Physics, sunlight may often be used to advantage and it is well to have one or two windows exposed to the sun. All laboratory rooms should be supplied with gas and water.

In the construction of a new building that is to contain a laboratory, it is important to remember that the windows should be high, running up to the ceiling; that the rooms should not be so deep from the windows on the north to the opposite wall on the south as to render it difficult for light to get readily across, and that the distance from the top of the window sills to the floor should be the same as the height of the laboratory tables. In horizontal measurement, the windows and intervening spaces of brick or stone should be about equal in width. Therefore, in horizontal measurement the north front of a laboratory should be nearly half glass. Too great care cannot be exercised to secure perfect ventilation. The temperature should be kept uniform.

The class room for the recitations in either Physics or Chemistry should be near the laboratory so that apparatus may be readily transferred to and fro. This room should have a demonstration table at least eight feet long, with both water and gas connections. If electrical power is available, this room should be wired for a lantern. Even if no lantern is available, the room should be curtained with opaque enameled cloth shades so that it can be darkened. In Missouri climate there are enough clear days to warrant special attempts to use sunlight in the class room work in Physics. One of the best arrangements is to place the demonstration table with its end toward a south window. Sunlight can then be thrown the length of the table by a mirror (heliostat) placed in the window.

But good rooms and equipment amount to little without good teachers, and the best teachers cannot do good work if opportunity be denied. Every high school in the State should have at least

one person who does nothing but instruct by the laboratory method, and the larger schools should have two or more such teachers.

It is not possible for one person to meet as many classes a day in the laboratory as in the recitation room. If the quota of work for each teacher is seven recitations a day, the teacher of science should not be expected to have more than four. Careful preparation for each laboratory exercise is indispensable. In the recitation work in Physics, it is essential that carefully planned demonstration experiments be given. These will require considerable time in preparation, but it is time well spent. Few things in a class room are more pleasing and more instructive than a well executed successful experiment, and few things are more disastrous than the failure of a demonstration.

It is not economy to buy too cheap apparatus. It is always best before purchasing to submit lists to the various apparatus companies for bids.

## PHYSICS.

As indicated in the definition of the unit, no special list of experiments is required, each teacher being given considerable latitude in the choice of experiments. Each school should offer about fifty experiments, not attempting to make all the pupils perform the same experiments. Experiments for any particular pupil should be to some extent chosen to meet the individual needs of that pupil. In counting the required thirty experiments, the "preliminary" experiments that appear in some lists must not be included, such experiments as measurements of lengths in centimeters and inches, measurements of areas and experiments designed solely to acquaint the pupil with the fundamental units and their measurement. Each experiment should be planned to illustrate some fundamental principle of Physics and this principle should be clearly brought out.

In equipping the laboratory, it is first necessary for the teacher to choose the laboratory manual and the list of experiments to be offered. When that is done, apparatus to fit that manual and that list can be selected. Apparatus purchased from a list prepared in any other way, will be unsatisfactory, and, in all probability, will not fit the work. The experiments as given in laboratory manuals are usually planned so as to obtain the maximum use of each piece of apparatus, thus reducing the number of pieces necessary to buy. To obtain benefit of this, the apparatus must be selected to fit this plan. If several different experiments are conducted at the same time, not only is the work of the individual pupil more independent, but needless duplication of apparatus is

avoided. Thus a greater variety and better grade of apparatus is rendered available.

It is impracticable to make partial lists that are satisfactory. If only a small amount of money is available for apparatus it is best to buy an equipment covering definite portions of the subject as, for example, mechanics, heat and sound, which is fairly complete as far as it goes. Future additions are not only more likely to be obtained but can be selected more wisely. Under the instruction of the teacher, some of the necessary apparatus can be made at home. Many things can be picked up here and there that are very useful in the laboratory. For example, small scraps of different metals are useful for density or specific heat determinations. Often scrap iron that costs but little can be used in place of the more expensive large iron weights.

The following list is appended merely to give an idea of the cost of apparatus. *This list must be changed to suit the manual and the experiments given in the course.*

LABORATORY EQUIPMENT FOR TWELVE STUDENTS WORKING AT THE SAME TIME.

## MECHANICS AND PROPERTIES OF MATTER.

| | | |
|---|---|---|
| 6 | 30 cm. rulers | $ .18 |
| 6 | Meter rods | 1.60 |
| ½ | lb Annealed iron wire, No. 24, B. & S. Gauge, on spool | .28 |
| ¼ | lb Spring brass wire, No. 27, B. & S. Gauge, on spool | .30 |
| ¼ | lb Spring brass wire, No. 24, B. & S. Gauge, on spool | .25 |
| ½ | lb Bare copper wire, No. 32, B. & S. Gauge | .40 |
| 4 | 8 oz. spring balances, graduated in both English and metric units with flat backs, broad pointers | 3.60 |
| 4 | 64 oz spring balances, graduated in both English and metric units with flat back, broad pointers | 2.00 |
| 6 | White pine rods, straight grained, 41x½x½" | .43 |
| 6 | White pine rods, straight grained, 41x1x½" | .54 |
| 2 | Sets iron weights, 1000 grams to 5 grams | 3.60 |
| 4 | Mounted upwrights 10 cm. scales, divided in mm. | .59 |
| 12 | Hardwood prisms | .54 |
| 1 | Each steel bicycle balls, ¼" & ⅜" dia. | .08 |
| 6 | Pulleys, wooden, cone bearing | 2.50 |
| 3 | Sets rods for same | .27 |
| 1 | Steel rule, 20 cm. long, graduated in mm. & in. | .90 |
| 1 | Jolly balance, all metal | 8.10 |
| 1 | Torsion apparatus after model of Carmen, complete with rods | 12.00 |
| 1 | Micrometer-caliper, metric, 13 mm. | 3.00 |

| | | |
|---|---|---|
| 1 | Vernier caliper, English and metric, inside and outside jaws, depth gauge | 2.25 |
| 1 | Spherometer reading to 1—100 mm. | 3.50 |
| 1 | "Cenco" balance complete (if a good beam balance is not available) | 15.00 |
| 1 | Metal cylinder, iron, about 50 mm. long, 12 mm. diam., for density determinations | .22 |
| 1 | Metal cylinder, brass, about 50 mm. long, 12 mm. diam., for density determinations | .22 |
| 1 | Metal cylinder, aluminum, about 50 mm. long, 12 mm. diam., for density determinations | .22 |
| 2 | Smooth pine boards, 6x24", for friction | .60 |
| 2 | 7" hand screw clamps, No. 14 | .60 |
| 3 | Waterproof cherry blocks, 3x3x1½" | .42 |
| 2 | Platform balances, Harvard trip agate bearing | 12.00 |
| 2 | Sets weights, 1000 to 10 grams | 2.15 |
| 2 | Sets weights, 0.01 to 1 gram | .90 |
| 5 | Waterproof loaded rectangular blocks | 1.00 |
| 1 | lb Sulphur rolls | .10 |
| 6 | Lead sinkers | .70 |
| 5 | Round waterproof rods, 8x½" | .30 |
| 4 | Sp. Gr. bottles, 50 cc. approximately | 1.60 |
| 4 | Glass "J" shaped tubes, closed at one end for Boyle's Law | 2.70 |
| 2 | "Y" tubes of lead | .40 |
| 6 | lb mercury and bot. | 6.00 |
| 12 | Small glass tumblers | .54 |
| 12 | Glass tubes, 50 cm. long, 5 mm. diam. | .40 |
| 6 | Screw pinchcocks | 1.20 |
| 6 | Ft. rubber tubing, ¼" diam. | .60 |
| 2 | Bottles, 2 liters capacity with stoppers, rubber, 1-hole | .60 |
| 1 | Condensing and exhausting pump (if better is not available) | 3.60 |
| 2 | lb Paraffine | .30 |
| 1 | Barometer tube, 80 cm. long, 5 mm. bore, closed at one end | .30 |
| 1 | Nicholson's hydrometer | 1.50 |
| 1 | Jar for hydrometer, 12x2½ | .45 |
| 2 | Board for composition of forces | 3.20 |
| 2 | Cars for inclined plane | 2.00 |
| 2 | Pulleys for same | 1.35 |
| 4 | Iron balls, 25 mm. diam., for pendulum | .29 |
| 1 | Pr. ivory balls, 50 grams and 150 grams | 4.00 |
| | Total for Mechanics and Properties of Matter | $112.37 |

## HEAT.

| | | |
|---|---|---|
| 6 | Flasks, 125 cc. | $ .54 |
| 3 | Air thermometer tubes, 2″ bulb | .46 |
| 12 | Thermometers—10 to 110 c. | 10.80 |
| 2 | Liner expansion apparatus, all metal with N. P. brass tube | 4.80 |
| 5 | lb Shot, No. 6 | .70 |
| 8 | Calorimeters, polished, N. P. | 3.60 |
| 4 | Harvard apparatus "A" new style, with detachable tripod | 9.00 |
| 1 | lb Heavy walled glass tubing, 1 to 2 mm. internal diam. | .54 |
| 3 | Iron supports, 2 rings each | .90 |
| 3 | Sheets brass wire gauze, 4x4″ | .27 |
| 100 | Grams pure paraffine for melting point determination | .10 |
| 2 | Nests beakers, No. 1 to 3 | .84 |
| 4 | Florence flasks, 12 oz. | .56 |
| 4 | Florence flasks, 16 oz. | .72 |
| 4 | Florence flasks, 8 oz. | .48 |
| | Total for Heat | $ 34.31 |

## SOUND.

| | | |
|---|---|---|
| 1 | Kundt's apparatus with brass and steel rod, improved form | $ 3.35 |
| 1 | Sonometer with pulley for weights, 2 strings | 5.00 |
| 2 | Annealed glass resonance tubes, open at both ends about 2.5 cm. diam., 120 cm. long, with sliding rod and piston support | 3.60 |
| 1 | Tuning fork, C 128, 10″ long | 2.70 |
| 2 | Tuning forks, C 256, 7¼″ long | 2.20 |
| 2 | Tuning forks, A 426, 6¼″ long | 2.20 |
| 2 | Tuning forks, C 512, 5⅞″ long | 1.80 |
| | Total for Sound | $ 20.85 |

## LIGHT.

| | | |
|---|---|---|
| 1 | Box to illustrate formation of images | $ .58 |
| 12 | Plane mirrors, 4x15 cm. or 2x6″ | 1.20 |
| 10 | Double convex lenses, 10 cm. focus | 1.50 |
| 10 | Double convex lenses, 15 cm. focus | .80 |
| 6 | Lens supports | .90 |
| 6 | Screen supports | .54 |
| 6 | Pin supports | .54 |
| 6 | Walter Smith school squares, med. | .38 |
| 1 | Double convex lens, 7.5 cm. diam., 18 cm. focus | .90 |

| | | |
|---|---|---|
| 3 | Concave mirrors, brass, N. P. | 1.35 |
| 3 | Triangular glass prisms, 4″ long | .90 |
| 2 | Pieces heavy plate glass for refraction | .50 |
| 4 | lb Paraffine candles, twelves | .80 |
| | Total for Light | $ 10.89 |

MAGNETISM AND ELECTRICITY.

| | | |
|---|---|---|
| 1 | lb fine iron filings | $ .15 |
| 25 | Steel knitting needles | .18 |
| 10 | Bar magnets, 6″ approximately | 2.00 |
| 4 | Compasses, 40 mm. diam., needle 3 cm. long | .90 |
| 3 | Sq. Ft. Heavy zinc sheet, 1-16″ thick | 1.53 |
| 1 | Galvanoscope frame | 1.35 |
| 12 | Lead strips, 1x10 cm., with wire | 1.20 |
| 4 | Sq. Ft. Sheet copper, No. 24 | 2.70 |
| 10 | Glass battery jars, 4x5″ | 1.80 |
| 6 | Porous cups, 5x10 cm. | .80 |
| 4 | Commutators | 2.20 |
| 12 | Double connectors, brass | 1.20 |
| ¼ | lb Copper wire, No. 30 D. C. C. | .57 |
| 1 | lb Copper wire, No. 20, D. C. C. | .70 |
| ¼ | lb German silver wire, No. 30, D. C. C. | 1.15 |
| ¼ | lb German silver wire, No. 24, D. C. C. | .75 |
| 9 | lb Commercial sulphuric acid and GSB | .70 |
| 1 | Slide wire Wheatstone bridge | 3.00 |
| 1 | Set of 8 resistance spools after Hall | 3.00 |
| 6 | Gravity cells, 6x8 complete | 4.80 |
| 10 | lb Copper sulphate | 1.00 |
| 2 | Resistance boxes, 0.1 to 40 ohms, guaranteed accurate to ½ of 1 per cent, wound with manganin wire | 15.00 |
| 1 | Tangent galvanometer | 6.75 |
| 2 | D'Arsonval galvanometers sensitive to 25 megohms with open coil, sight and scale attachment and leveling screws | 12.00 |
| 10 | Empty spools for making resistance coils | 1.00 |
| | Total for Magnetism and Electricity | $ 66.43 |
| | Total for Entire Physics Equipment | 244.85 |

*Dealers in Physical Apparatus.*

Central Scientific Co., 345 West Michigan St., Chicago; Chicago Apparatus Co., 40-42 West Quincy St., Chicago; Wm. Gaertner &

Co., 5347-9 Lake Ave., Chicago; T. W. Gleeson, 106 Sudbury St., Boston; A. W. Hall Scientific Co., 141 Franklin St., Boston; L. E. Knott & Co., 15-17 Harcourt St., Boston; C. H. Stoelting Co., 18 South Green St., Chicago. On demand, some of these firms furnish lists of apparatus to fit particular manuals. Many suggestions are also obtained by consulting their general catalogues.

## CHEMISTRY.

A LABORATORY EQUIPMENT FOR TWENTY-FOUR PUPILS, TWELVE WORKING AT ONE TIME.

### FIXTURES AND PERMANENT EQUIPMENT.

| | | |
|---|---|---|
| 2 | Tables, 12 feet long, 3 feet 6 inches broad, and 3 feet high, tops of white pine, remainder of yellow pine, oil finish. Each table has closet room for twelve and working space for six at one time | $ 50.00 |
| 1 | Hood, 4 feet long, 2 feet deep and 9 feet high, with closet | 24.00 |
| 1 | Wall sink with sewer connection | 12.00 |
| | Gas and water pipes with fittings | 7.00 |
| 1 | Wall shelf for small bottles | 2.00 |
| 15 | 2 liter stock bottles with glass stoppers | 3.75 |
| 52 | ½ liter reagent bottles for tables | 9.75 |
| 24 | 8 ounce glass stoppered bottles ("German tinctures") for side reagents | 2.90 |
| 6 | dozen 4 ounce wide mouthed flint glass bottles for solids (side regents) | 2.90 |
| 6 | Earthenware slop jars | 1.00 |
| 1 | 6 inch mortar | .80 |
| 2 | 6 inch funnels | .50 |
| | Total for fixtures | $115.70 |

### APPARATUS MORE OR LESS PERMANENT.*

30 Nests of beakers, 2½, 4, and 7 ounces, plain Bohemian....
30 Blowpipes, jeweler's, 8 inch .....
6 dozen Flint glass, wide mouthed bottles, 4 ounce.....
18 Flint glass, wide mouthed bottles, 16 ounce .....
24 Bunsen burners with air regulator .....
8 dozen Corks, 7-8 inch .....
4 dozen Corks, 1 1-16 inch .....
12 dozen Corks, assorted .....
18 Nests of Hessian crucibles, "threes" .....
4 dozen 1 1-4 inch porcelain crucibles .....

*These items are not priced as there is considerable variation in prices. A dealer in laboratory supplies will submit an estimate.

24 50 cc. graduated cylinders .....
3 dozen German porcelain evaporating dishes, each 2 1-2 and 3 1-2 inch diameter .....
12 Lead dishes, 2 inch .....
24 Round files, 3 inch .....
24 Three cornered files, 3 inch .....
24 Packages of filter paper, 4 inch .....
30 Flasks, best Bohemian, 4 ounce .....
30 Flasks, best Bohemian, 8 ounce .....
30 Flasks, best Bohemian, 16 ounce .....
3 dozen German glass funnels, 2 1-2 inch .....
24 pairs Steel forceps, 5 inch .....
24 Gas bottles, 8 ounce .....
50 Rubber stoppers, two holes, to fit gas bottles .....
5 pounds Glass tubing, 1-8 and 3-16 inch bore .....
2 pounds Glass rods, 1-8 inch diameter .....
2 quires Test paper, litmus and turmeric .....
24 Mortars, 2 1-2 inch .....
4 feet Platinum wire .....
30 2 ounce retorts with stoppers, best Bohemian .....
48 feet 1-4 inch bore rubber tubing .....
48 feet 3-16 inch bore rubber tubing .....
30 Tin sand baths, 5 inch .....
4 Hand scales, 6 inch beam .....
4 Sets weights, 0.1 gram to 50 grams .....
24 Test tube racks .....
36 dozen Test tubes, 6 inches by 5-8 inch .....
24 Test tube brushes .....
3 dozen Watch glasses, 2 inch .....
2 Coddington lenses .....
24 squares Blue glass .....
48 Hard glass test tubes, 6 inch .....
6 Lamp tips .....
24 Filtering stands, 1 arm, 2 holes .....
2 dozen Iron wire triangles .....
24 Pneumatic troughs, made by fitting half gallon or gallon crock with metal shelf .....
30 Retort stands .....
1 package Filter paper, 10 inch .....

## CHEMICALS.

As the chemicals required will vary somewhat with different text-books, the list recommended by the text selected should be provided.

### SUMMARY OF EQUIPMENT.

| | |
|---|---|
| Fixtures and permanent equipment | $150.00 |
| Apparatus more or less permanent | 200.00 |
| Chemicals | 80.00 |
| Total | $430.00 |

If the teacher can not find time to teach the class in two sections of 12 each, extra tables to accommodate the whole class (24) at once would cost approximately ..... $35.00

### MAINTENANCE.

| | |
|---|---|
| The yearly cost of "apparatus more or less permanent," which must be replaced on account of breakage, will be approximately | $40.00 |
| The yearly cost of chemicals, approximately | 40.00 |
| Total annual expenditure | $80.00 |

*Dealers in Chemical Apparatus.*

Apparatus and supplies may be obtained from the following firms: Eimer and Amend, 295-211 Third Ave., New York City; Wm. Gaertner and Co., 5345-5349 Lake Ave., Chicago; E. H. Sargent and Co., 143-145 Lake Street, Chicago; Henry Heil Chemical Co., 212-214 South Fourth Street, St. Louis; Scientific Materials Co., Pittsburgh, Pa.; Central Scientific Co., 345 West Michigan Street, Chicago; Kewaunee Manufacturing Co., Kewaunee, Wis.; (Desks); L. E. Knott Apparatus Co., Boston, Mass.; Bausch and Lomb Optical Co., Rochester, N. Y.; Woldenberg and Schaar, 387 Wabash Ave., Chicago; C. H. Stoelting Co., 121 North Green Street, Chicago; Max Kohl, Chemnitz, Germany; Drs. Peters and Rost, Chaussee Strasse, Berlin, Germany.

## GENERAL BIOLOGY, BOTANY AND ZOOLOGY.

A LABORATORY EQUIPMENT FOR TWELVE PUPILS WORKING AT THE SAME TIME.

### APPARATUS.

| | |
|---|---|
| 6 Compound microscopes, from $20 to $30 apiece | $..... |
| 2 Laboratory tables, with drawers, 96 inches long, 36 inches wide, 29 inches high, heavy white pine, oiled top..... | 20.00 |

| | | |
|---|---|---|
| 12 | pairs Scissors, fine | 6.00 |
| 12 | Scalpels | 3.00 |
| 12 | pairs Forceps, medium fine, straight points | 4.80 |
| 24 | Dissecting needles | 1.00 |
| 6 | Section razors | 6.00 |
| 12 | Dissecting lenses, one inch focus (or reading glasses 2½ inches in diameter) | 12.00 |
| 1 | Balance, with weights | 4.25 |
| 2 | gross Glass slides, 3x1 inches | 2.00 |
| 4 | ounces Cover glasses, ¾ inch square | 3.20 |
| 24 | Syracuse watch glasses | 1.25 |
| 24 | Pipettes, with rubber bulbs | .75 |
| 2 | pounds Glass tubing, assorted sizes | 1.50 |
| 1 | lot Large flat dishes, glass or porcelain | ..... |
| 24 | Mason fruit jars, quart | 2.00 |
| 24 | Test tubes | .38 |
| 1 | lot Guarded bristles | ..... |
| 1 | Galvanized iron waste can, with cover | 1.25 |
| 1 | lot Battery jars, large | ..... |

## REAGENTS AND CHEMICALS.

| | | |
|---|---|---|
| 10 | pounds Formalin | 2.50 |
| 1 | gallon Alcohol, 95 per cent | 4.00 |
| 1 | quart Absolute alcohol | 1.90 |
| 1 | pound Ether | .85 |
| 1 | pound Mercury | 1.50 |
| 2 | gallons Distilled water | ..... |
| 1 | pound Glycerine | .50 |
| 1 | pound Turpentine | .15 |
| ½ | pound Cedar oil | .75 |
| 3 | ounces Balsam, in xylol | .60 |
| 1 | pound Glacial acetic acid | .50 |
| 1 | pound Sulphuric acid | .30 |
| 1 | pound Hydrochloric acid | .15 |
| 1 | pound Nitric acid | .50 |
| ½ | pound Picric acid, crystals | .75 |
| ½ | pound Corrosive sublimate | .60 |
| 1 | pound Chloroform | .75 |
| 1 | pound Caustic potash | .40 |
| ½ | pound Potassium cyanide, fused lumps | .45 |
| 1 | ounce Iodine, resubl | .60 |
| ½ | ounce Methyl green | .40 |
| 6 | ounces Haemalum, solution | .60 |

| | |
|---|---|
| 3 ounces Acid carmine, solution | .70 |
| ½ ounce Eosin, powder | .45 |
| 1 ounce Pith, for sectioning | .10 |

*All of the above are list-prices, except those for compound microscopes, which are special prices for schools.*

Although all of the articles given in the above lists are recommended, nevertheless good work can be done with a smaller equipment. In the average school much will depend upon the teacher's ingenuity in divising substitutes for apparatus at little or no expense. Aquaria for keeping aquatic forms alive in the laboratory are necessary and for this purpose large battery jars will be found satisfactory. One dozen tumblers, some wide mouthed bottles with corks for water or sand cultures, a few thistle tubes, some rubber stoppers, rubber tubing, beeswax or paraffine, and some bibulous paper will be found helpful additions for any work in plant physiology. A few stoneware saucers will also be found indispensable for work on the germination of seeds. Insect cages may be readily made of wire or cotton netting placed over pans or trays filled with earth in which the plants, used as food by the insects, are growing. These, and many other contrivances, for making observations and experiments upon living animals and plants in the laboratory are of the greatest value, as the chief stress should be laid upon this phase of the instruction.

The following dealers in laboratory supplies and apparatus are recommended:

*Dealers in Animals for Class Work.*

Brimley, H. H. & C. S., Raleigh, N. C. Live and preserved material.

Marine Biological Laboratory Supply Dept., Woods Hole, Mass. Preserved marine material.

McCurdy, B. F. & Co., 312 E. 65th Place, Chicago. Live material.

Powers, H. H., Station A, Lincoln, Neb. Living amoeba, paramoecium, hydra, etc., and miscellaneous slides.

*Zoological Supply Department of the University of Missouri.*

The Department of Zoology of the University of Missouri has frequently received from teachers in all parts of the State requests for dissection and demonstration material to be used in teaching this subject. These requests have been answered with references to dealers in such supplies, or with simple directions regarding the collection and preservation of the material which could be found near at home. But to secure supplies in small quantities from

dealers at a distance was both troublesome and expensive, while the teachers were often unable, or had not the time, to obtain living or properly preserved material from the local fauna. Accordingly, a plan for establishing a zoological supply department at the University was submitted to superintendents of accredited schools. Since only favorable replies were received and since similar plans have been successfully carried out in other states, it was decided to establish the department.

The department is prepared to furnish to the accredited schools of the state living and preserved materials from the local land and fresh-water fauna, and also the marine forms that are ordinarily used. In addition to the forms used for student dissection, simple museum specimens and microscopic preparations may be secured. Furthermore, explanation of methods of collecting and preserving material will be made, in order to assist the schools in obtaining material locally. All supplies will be furnished *at cost*, and the schools will have the further advantage of low transportation charges and prompt delivery.

This department is not in operation between June 1st and October 1st. The current price list and further information may be obtained by addressing the Zoological Supply Dept., 509 South 9th St., Columbia, Mo.

*Dealers in Laboratory Apparatus and Supplies for Botany and Zoology.*

Bausch, Lomb Optical Co., Rochester, N. Y.

*Microscopes and Supplies.*

Cambridge Botanical Supply Co., Cambridge, Mass. General botanical equipment, preserved material and fresh marine algae.

Drury, Miss E. M., 45 Munroe Street, Roxbury, Mass. Slides and botanical material.

Eimer & Amend, 205-211 Third Ave., N. Y.

*Microscopes and Supplies.*

Krafft, Wm., 30 E. 18th St., N. Y.; also 32 Clark St., Chicago. Agent for Leiz Microscopes. Supplies.

Spencer Lens Co., Buffalo, N. Y. Microscopes and supplies.

## PHYSIOLOGY.

The apparatus and chemicals necessary for the accurate measurement and observation of the activity of such organs as the heart, respiratory system, muscles, nerves, etc., and for the chemical study

of the blood, the digestive process, etc., can be had at a comparatively small cost. The lists given below contain some things for which the ingenious teacher may himself make very effective substitutes at little cost, save time and his own labor. The minimum outfit for effective work is as follows:

## GENERAL EQUIPMENT.

| | |
|---|---|
| Student tables, size of top, 34x54, height 34 inches.... | $100 |
| Stools, two to each table ..... | |
| Gas, water and electrical connections with a clock beating seconds ..... | |
| General chemical table and shelves ..... | |
| General supply of chemicals ..... | |
| Simple wall pendulum or clock beating seconds, with mercury contact, etc. ..... | |

## GENERAL APPARATUS, NOT DUPLICATED, FOR DEMONSTRATIONS.

| | | |
|---|---|---|
| 1 | Mercury Manometer and blood pressure outfit..... | $ 5.00 |
| 1 | Circulation model ..... | 4.00 |
| 1 | Respiration model ..... | 2.00 |
| 1 | Artificial eye ..... | 3.00 |
| 1 | Color wheel or a small electric motor, with set of color discs ..... | 8.00 |
| | Assorted glass tubing ..... | 1.00 |
| | Assorted rubber tubing ..... | 1.50 |
| | Assorted corks ..... | 3.00 |
| 1 | Shellac outfit ..... | 1.00 |

## SPECIAL SETS OF APPARATUS AND CHEMICALS

FOR EACH GROUP OF TWO OR FOUR STUDENTS WORKING TOGETHER.

*a. For physiological experiments.*

| | | |
|---|---|---|
| 1 | Table, size 34x54x34 inches .....$10.00 to | $ 20.00 |
| 2 | Stools, height 20 inches ..... | 1.00 |
| 1 | Recording drum and clockwork ..... | 20.00 |
| 1 | Induction coil ..... | 7.00 |
| 1 | Platinum stimulating electrode ..... | 1.00 |
| 2 | Dry batteries ..... | .60 |
| 2 | Porcelain base (knife edge), electric keys ..... | .30 |
| 1 | Muscle lever ..... | 1.15 |
| 1 | Muscle clamp ..... | 1.00 |
| 100 | Weights, 10 gram, lead ..... | .30 |
| 1 | Heart lever, of straw ..... | .00 |

| | | |
|---|---|---|
| 1 | Heart lever holder (use muscle lever holder) | 1.15 |
| 1 | Signal magnet (electric, for the time circuit) | 1.05 |
| 1 | Tuning fork, 100 double vibrations a second | 1.00 |
| 2 | Iron stands, heavy base | 2.00 |
| 2 | Simple clamps, burette | .60 |
| 2 | Burette clamps, universal | .80 |
| 100 | Sheets glazed paper, 6x20 inches | .50 |

*b. For physiological chemical experiments.*

| | | |
|---|---|---|
| 1 | Set chemical apparatus, containing 6-inch file, 100 filter papers, 4-inch funnel, bunsen burner, 100 c. c. graduated cylinder, 4-inch flat bottom evaporating dish, 300 c. c. flask, test tube rack and dozen test tubes, set of 3 beakers, 100° Centigrade thermometer, costing in all about | 6.00 |
| 1 | Set student chemicals containing starch, dextrine, dextrose, acetic acid, nitric acid, hydrochloric acid, picric acid, ammonia, caustic soda or potash, sodium chloride, magnesium sulphate, ammonia sulphate, calcium chloride, copper sulphate, glycerine, pepsin, ptyalin, pancreatin and fibrin, costing in all about.. | 6.00 |
| 1 | Set chemical reagent bottles | 4.00 |

*Dealer in Apparatus.*

Harvard Apparatus Co., Back Bay P. O., Boston, Mass.

## PHYSICAL GEOGRAPHY.

A LABORATORY EQUIPMENT FOR TWELVE PUPILS WORKING AT THE SAME TIME.

### GENERAL EQUIPMENT.

| | |
|---|---|
| A collection of common rocks and minerals | $ 2.50 |
| Sun board | 6.00 |
| Six self-registering maximum and minimum thermometers.. | 3.65 |
| Sight compass | 5.65 |
| Rain gauge | 2.75 |
| Wind vane (made by students) | |
| Anemometer (made by students) | |
| Mason's hygrometer | 5.00 |
| Globe, 12 inch | 6.00 |
| Physical maps of the continents and the United States, in spring roller case | 29.35 |
| Daily and monthly weather maps. The daily maps may be obtained from the nearest weather bureau station, the monthly from the Weather Bureau at Washington, D. C. | |

## TOPOGRAPHIC MAPS.

Order maps from the United States Geological Survey, Washington, D. C. The topographic maps cost five cents each in lots of one hundred. The following list includes all maps mentioned in the bulletin *"A Unit in Physical Geography."* The number of copies of each map needed will depend upon the number of pupils in the class and the plan of work. There should be one map for each two students, whether working in one section or more than one. If the class is divided into groups and each group studies different sheets, fewer copies of each will be needed.

Simple plain or plateau: Thibodeaux, Louisiana; Fargo, North Dakota; Bowling Green, Ohio; Coude, South Dakota; Chicago, Illinois.

Simple mountain ridge: Harrisburg, Pennsylvania; Delaware Water Gap, New Jersey-Pennsylvania.

Plain with young valleys: Wilson, New York; Fostoria, Ohio; Dublin, Ohio.

Mountains with shallow valleys: Shasta, California; Harpers Ferry, Virginia-Maryland.

Plains with well-defined valleys: Palmyra, Missouri; Wicomico, Maryland; Olivet, South Dakota.

Dissected mountains: Mt. Marcey, New York; White Mts., New Hampshire.

Dissected plains: Lancaster, Wisconsin; Versailles, Missouri; Hazard, Kentucky; Ironton, Ohio-Kentucky.

Past mature plains: Clinton, Missouri; Nevada, Missouri; O'Fallon, Missouri.

Plains with hills and valleys: Warrenton, Virginia; Frederick, Maryland.

Plains with hills: Eagle, Wisconsin; Oswego, New York; Baldinsville, New York.

Plains with mountain ridges and valleys: Harrisburg, Pennsylvania.

Maps of valleys: Map of alluvial valley of the Mississippi River; Kansas City, Missouri; Wheeling, West Virginia-Ohio; Niagara Falls, New York; Harpers Ferry, Virginia-Maryland; Albany, New York; Charleston, West Virginia; Hinton, West Virginia; Sullivan, Missouri; Marseilles, Illinois; St. Louis, Missouri; East and West sheets. Map of the United States showing the Mississippi, Potomac, Delaware and other river basins.

Ponded rivers: Norwich, Connecticut; Perch Lake, Michigan.

Drowned valleys: New London, Connecticut; Saybrook, Connecticut; Washington, D. C.; New York City, New York.

River deposits (flood plains): Marshall, Missouri; St. Louis, Missouri-Illinois; Kansas City, Missouri; Thibodeaux, Louisiana; Gibson, Louisiana; The Alluvial Valley of the Mississippi River.

Maps of recently drained lake bottoms or recently uplifted sea bottoms: Fargo, North Dakota-Minnesota; Chicago, Illinois; Fostoria, Ohio; Camden, New Jersey; Edenton, North Carolina; Trent River, North Carolina.

Wind deposits: Kingsley, Kansas; Brown's Creek, Nebraska; Campe Clark, Nebraska; Provincetown, Massachusetts.

Glacial deposits: Moraines: Eagle, Wisconsin; Charleston, Rhode Island; Brooklyn, New York; Plainfield, New Jersey. Drumlins: Oswego, New York; Baldwinsville, New York; Boston, Massachusetts; Sun Prairie, Wisconsin. Sand and gravel plains: Jonesville, Wisconsin; Plainfield, New Jersey; Great Egg Harbor, New Jersey; Lynn, Massachusetts; Boston Bay, Massachusetts; Sandy Hook, New Jersey.

The following maps illustrate some of the erasive effects of glaciers, waves of seas and lakes:

U-shaped valleys: Leadville, Colorado (the high valleys); Watkins, New York; Hammondsport, New York.

Fiords: Methow, Washington; Stehekin, Washington; Juneau, Alaska.

Lakes: Webster, Massachusetts; Franklin, New Jersey; Paradox Lake, New Jersey; Plymouth, Massachusetts, Minneapolis, Minnesota.

Shore cliffs: Sandy Hook, New Jersey; San Francisco, California; Boston Bay, Massachusetts.

Volcanic deposits: Volcanic Cones: Mt. Shasta, California; Lassen Peak, California; Mt. Tabor, New Mexico.

Lava plains and plateaus: Modoc Lava Beds, California; Bisuka, Idaho.

Laccolite mountains: San Rafael, Utah; Henry Mountains, Utah.

Good illustrative maps: Dunlap, Illinois; Kanawha Falls, West Virginia; Hinton, West Virginia; Ocean, West Virginia; Chattanooga, Tennessee; McMinnville, Tennessee; Cleveland, Tennessee; Suwanee, Tennessee; Ringgold, Tennessee; Belchertown, Massachusetts; Northampton, Massachusetts; Springfield, Massachusetts; Charleston, West Virginia; Nichols, West Virginia; Echo Cliffs, Arizona; Tooele Valley, Utah; Kaaterskill,

New York; Mt. Marcy, New York; Catskill, New York; Disaster, Nevada; Granite Range, Nevada; Harrisburg, Pennsylvania; Pine Grove, Pennsylvania.

## CHARTS.

Atlantic Ocean.

Sailing charts, A, B, C, D, each ..... $ .50
General charts of the coast, Nos. 6, 7, 376, 11, 19, 21, each .50
Coast charts, Nos. 105, 106, 120, 121, each ..... .50

Pacific Ocean.

Sailing charts, S. ..... .50
General charts of the coast, Nos. 550, 6,000, 8,100, 8,200, each ..... .50
Harbor chart, No. 5581 ..... .50
One set Tide tables, Atlantic Coast; U. S. Coast and Geodetic Survey ..... .25
One set Tide tables, Pacific Coast; U. S. Coast and Geodetic Survey ..... .25
Weather maps. Order from U. S. Weather Bureau, St. Louis, Missouri.

## ADDITIONAL APPARATUS.

The following additional apparatus, very desirable, but not essential, should be added as soon as possible.

Relief maps, by Prof. Harry Keeler, of the Englewood High School, Chicago, to illustrate typical regions in the different stages of development, making them especially valuable in Physical Geography. It will be noticed that the prices are about 50 per cent of those formerly charged for reliable maps. The following are recommended:

| SUBJECT | Size over all, inches | Horizontal Scale | Vertical Scale | Price. Net | EXAMPLE |
|---|---|---|---|---|---|
| Niagara. ..... | 38"x15.5" | 1 in.=1 mile | 4 to 1. | $20.00 | Water Falls, and Stream Erosion |
| Shasta ... ..... | 22.5"x17" | 1 in.=1 mile | True Scale | 17.50 | A Young Volcanic Mountain |
| Crater Lake ..... | 20"x16" | 1 in.=1 mile | 2 to 1 | 17.50 | A Crater |
| Grand Canyon.... | 20.5"x17.5" | 1 in.=4 miles | 2 to 1 | 17.50 | Weathering and Steam Erosion |
| Marshall, Mo.... | 21"x17" | 1 in.=1 mile | 2 to 1 | 17.50 | A Graded River |
| Ottawa, Ill. . ... | 21"x17 " | 1 in.=1 mile | 2 to 1 | 17.50 | Work of Young Stream |
| Teachers Model... | 24.5x15.5" | | | 15.00 | See Note |

Slated globe 10 in. with movable semi-circle ..... $ 3.00

Series of lantern slides to illustrate the phenomena of Physical Geography. Selected and prepared by Wallace W. Atwood, of the University of Chicago, and Jane Perry Cook, of the Chicago Normal, with descriptive text for each slide. (Circular sent upon application.) Complete set, 550 slides, each ..... .40

College bench lantern with objective, condensing lens and slide carrier. (Illuminant extra depending upon kind wanted.) ..... 27.00

Helidon invented by Prof. J. F. Morse, of the Medill High School, Chicago, an adjustable appliance for demonstrating the apparent path of the sun through the sky at equinox and solstice times with reference to the horizon and zenith of an observer at any latitude. (Circular upon application.) Net ..... 10.00

Soil thermometer ..... 1.10

Barograph (Duty free) ..... 20.00

Thermograph (Duty free) ..... 20.00

*Note.*—Write the Central Scientific Company, 345 to 359 West Michigan Street, Chicago, Illinois, for catalogue X, Agricultural and Physiographical Apparatus. Every teacher of Physical Geography should have a copy of this catalogue.

## AGRICULTURE.

### MATERIAL TO BE COLLECTED BY TEACHER AND STUDENTS AT THE BEGINNING OF THE YEAR.

1 bushel clean sand.

1 bushel sandy loam soil.

1 bushel clay.

8 quarts leaf mold (well rotted).

1 bushel rich soil for use in growing house plants.

Samples of commercial fertilizer, with analysis and prices given.

Collection of economic seeds. (These may be secured free of U. S. Department of Agriculture. In ordering this collection, address U. S. Dept. of Agriculture, Seed Laboratory, Washington, D. C. When ordering send $1.50 to Mackall Bros., 9th and H. Streets, N. E., Washington, D. C. This is to pay for the tray and vials used in packing the collection. Notify the Department that the money has been sent to pay for tray and vials.)

Collections of economic seeds prepared by teacher and students.

1. Seeds of the following trees: oak, walnut, hickory, hazel, apple, pear, peach, cherry, plum, etc.
2. Cereals: corn, wheat, oats, rye, barley, rice, etc.
3. Grasses and clovers: red clover, alsike, white clover, alfalfa, timothy, millet, orchard grass, blue grass, Johnson grass, Bermuda grass, cowpeas, redtop, etc.
4. Common weeds: purslane, morning glory, Jamestown weed, cocklebur, cheat, ragweed, horseweed, etc.

## APPARATUS FOR SOIL STUDIES.

EQUIPMENT FOR TWENTY STUDENTS.

1 pair of balances weighing to grams or quarter ounces. (A four-pound postal scale may be used.)
5 glass tumblers.
10 wide mouthed 8-ounce bottles.
10 pint glass fruit jars.
5 thermometers.
10 student lamp chimneys.
10 shallow pans.
½ lb glass tubing (small sizes).
¼ lb glass rods (small sizes).
Filter paper.
Litmus paper.
5 glass or tin funnels.
5 small sieves of various meshes.
10 six-inch flower pots.

## MATERIAL FOR PLANT STUDIES.

EQUIPMENT FOR TWENTY STUDENTS.

10 heavy dinner plates for seed germination.
10 panes of glass (8x11 inches).
10 small microscopes.
Quantity of heavy cotton cloth for use in seed germination.
10 shallow wooden boxes (12x18x3 inches) for growing cuttings, etc.
Apparatus for Babcock milk test (cost $5.00).
If possible, not less than one-half acre of good land for a school garden and experiment field. (If the school has no such plot, land from a nearby farm may be rented.)

Apparatus now in the physical, chemical, or biological laboratory need not be duplicated for agriculture. Much of the material can be made by the students or brought from their homes. The entire list should be purchased through a local dealer for about $18.00.

## MANUAL TRAINING.

FOR A UNIT IN WOODWORKING.

### MINIMUM INDIVIDUAL EQUIPMENT.

| | | |
|---|---|---|
| 1 | Bench and vise | $ 8.75 |
| 1 | Bailey No. 4 smooth plane | 1.60 |
| 1 | 2', two fold rule | .12 |
| 1 | 12″ back saw | 1.10 |
| 1 | No. 162 Stanley marking gauge | .15 |
| 1 | No. 20 Stanley try square | .20 |
| 1 | Sloyd knife 2½″ blade | .18 |
| 1 | ¼″ firmer chisel | .30 |
| 1 | 1″ firmer chisel | .40 |
| 1 | Spoke shave, Stanley No. 64 | .12 |
| 1 | Maple bench hook | .18 |
| 1 | Bench brush | .25 |
| | Total | $ 13.35 |

### MINIMUM GENERAL EQUIPMENT.

| | | |
|---|---|---|
| 1 | Disston No. 7 or Jenning's crosscut saw, 10 points, 24″ | $ 1.25 |
| 1 | Disston No. 7 or Jenning's rip saw, 8 points, 24″ | 1.25 |
| 1 | Bit brace, 8″ sweep | 1.00 |
| 1 | Miller's Falls hard drill, No. 2 | 1.30 |
| 1 | Keyhole saw | .40 |
| 1 | 14″ turning saw with frame | .90 |
| 1 | Screw driver, 4″ blade | .18 |
| 1 | Screw driver, 6″ blade | .20 |
| 2 | 6″ wing dividers | .30 |
| 2 | 6″ T bevels | .40 |
| 2 | Adz eye claw hammers, 10 oz. | 1.00 |
| 6 | ¾″ gouges, outside ground | 3.00 |
| 1 | Set auger bits | 3.00 |
| 3 | Scrapers | .25 |

| | |
|---|---|
| 3 Nail sets, assorted | .20 |
| 4 10″ hand screws | 2.70 |
| 6 7″ hand screws | 2.50 |
| 1 Mounted oil stone | .75 |
| 1 Steel oiler | .10 |
| 1 Mounted grindstone | 6.00 |
| Total | $ 26.68 |

MEDIUM INDIVIDUAL EQUIPMENT.

| | |
|---|---|
| 1 Bench and vise | $ 10.00 |
| 1 Jack plane, Bailey No. 5 | 1.80 |
| 1 Block plane, Stanley No. 220 | .45 |
| 1 2' two fold boxwood rule | .12 |
| 1 12″ back saw | 1.10 |
| 1 2½″ mallet | .15 |
| 1 Marking gauge, Stanley No. 162 | .15 |
| 1 Try square, 6″ blade, Stanley No. 20 | .20 |
| 1 6″ wing dividers | .15 |
| 1 Sloyd knife, 2½″ blade | .18 |
| 1 Screw driver, 4″ blade | .18 |
| 1 ¼″ dowel bit | .20 |
| 1 ½″ dowel bit | .30 |
| 1 ¼″ firmer chisel | .30 |
| 1 ½″ firmer chisel | .35 |
| 1 1″ firmer chisel | .40 |
| 1 Spoke shave, Stanley No. 64 | .12 |
| 1 Maple bench hook | .18 |
| 1 Bench brush, bristle | .25 |
| Total | $ 16.58 |

MEDIUM GENERAL EQUIPMENT.

| | |
|---|---|
| 3 Disston No. 7 or Jenning's crosscut saws, 10 points, 24″ | $ 3.75 |
| 3 Disston No. 7 or Jenning's rip saws, 8 points, 24″ | 3.75 |
| 1 Set auger bits, 3-16″ to 1″, inclusive | 3.00 |
| 1 Miller's Falls hand drill, No. 2 | 1.30 |
| 1 Keyhole saw | .40 |
| 1 14″ turning saw | .90 |
| 1 Screw driver, 6″ blade | .20 |
| 4 6″ T bevels | .80 |
| 3 Nail sets, assorted | .20 |

| | |
|---|---|
| 4 10 oz. adz eye claw hammers | 2.00 |
| 3 Bit braces, 8″ sweep | 3.00 |
| 6 ¾″ gouges, outside ground | 3.00 |
| 1 Set J. S. Addis carving tools | 4.00 |
| 1 Framing square | 1.10 |
| 4 Scrapers | .35 |
| 6 10″ hand screws | 4.00 |
| 6 7″ hand screws | 2.50 |
| 2 Carpenter's steel clamps, 48″ | 3.60 |
| 2 Mounted oil stones | 1.50 |
| 2 Steel oilers | .20 |
| 1 Mounted grindstone | 9.00 |
| Total | $ 48.55 |

VERY COMPLETE INDIVIDUAL EQUIPMENT.

| | |
|---|---|
| 1 Bench and vise, with lockers | $ 16.50 |
| 1 Stanley "Bed Rock" jack plane, No. 605 | 2.10 |
| 1 Stanley block plane, No. 15 | .80 |
| 1 2′ two fold rule | .12 |
| 1 12″ back saw | 1.10 |
| 1 Disston No. 7 or Jenning's crosscut saw, 22″, 10 points | 1.25 |
| 1 Disston No. 7 or Jenning's rip saw, 22″, 8 points | 1.25 |
| 1 Ratchet bit brace, 8″ sweep | 1.50 |
| 1 10 oz. adz eye claw hammer | .50 |
| 1 2½″ mallet | .15 |
| 1 Stanley marking gauge, No. 165 | .28 |
| 1 Stanley try square, 6″ blade | .20 |
| 1 6″ T bevel | .20 |
| 1 6″ wing dividers | .15 |
| 1 Sloyd knife, 2½″ blade | .18 |
| 1 Screw driver, 4″ blade | .18 |
| 1 ¼″ dowel bit | .20 |
| 1 ½″ dowel bit | .30 |
| 1 ¼″ firmer chisel | .30 |
| 1 ½″ firmer chisel | .35 |
| 1 1″ firmer chisel | .40 |
| 1 Spoke shave, Stanley No. 64 | .12 |
| 1 Nail set | .08 |
| 1 Maple bench hook | .18 |
| 1 Bench brush (Bristle) | .25 |
| Total | $ 28.64 |

## VERY COMPLETE GENERAL EQUIPMENT.

| | | |
|---|---|---|
| 1 | Disston No. 7 or Jenning's crosscut saw, 8 points, 26" | $ 1.50 |
| 1 | Disston No. 7 or Jenning's rip saw, 6 points, 26" | 1.50 |
| 1 | Set auger bits, 3-16" to 1", inclusive | 3.00 |
| 1 | Clark's expansive bit | 1.00 |
| 1 | Miller's Falls hand drill No. 2 | 1.30 |
| 3 | Keyhole saws, assorted | .80 |
| 2 | 14" turning saws with frames | 1.80 |
| 1 | Langdon mitre box with saw | 9.35 |
| 1 | Drawing knife, 8" blade | .95 |
| 1 | Framing square, rustless | 1.10 |
| 1 | Stanley universal plane with bits | 12.00 |
| 6 | 1" gouges, outside ground | 3.60 |
| 6 | ¾" gouges, outside ground | 3.00 |
| 1 | Set J. S. Addis carving tools, No. 12 | 5.75 |
| 6 | Scrapers, assorted | .50 |
| 6 | Brad awls, assorted | .25 |
| 1 | Bailey No. 8 jointer | 3.00 |
| 6 | 10" hand screws with iron screws | 4.80 |
| 6 | 8" hand screws with iron screws | 4.40 |
| 4 | Carpenter's steel clamps, 48" | 7.20 |
| 2 | Oil stones, mounted | 1.50 |
| 2 | Steel oilers | .20 |
| 1 | Mounted grindstone, treadle attachment | 12.00 |
| | Total | $ 80.50 |

*Note.*—In making an estimate of the cost of an equipment, about 10 per cent should be added to the estimate given here. This will be needed for extras and unforeseen wants.

*Dealers.*

Schroeter Bros., Hardware Co., 717-719 Washington Ave., St. Louis, Mo.; Simmons Hardware Co., St. Louis, Mo.; Orr & Lockett Hardware Co., 71-73 Randolph St., Chicago, Ill.; E. H. Sheldon & Co., 320 North May St., Chicago, Ill.; Hammacher, Schlemmer & Co., 4th Ave. & 13th St., New York City; The Chas. A. Strelinger Co., 96 Bates St., Detroit, Mich.

### FOR A UNIT IN MECHANICAL DRAWING.

EQUIPMENT FOR A CLASS OF TWENTY PUPILS WORKING AT THE SAME TIME.

| | | |
|---|---|---|
| 20 | Sets of drawing instruments | $ 60.00 |
| 20 | T-squares. Cherry | 8.00 |

| | |
|---|---|
| 20 Xylonite Triangles, 45, 7 in. | 8.00 |
| 20 Xylonite Triangles, 30x60, 7 in. | 7.00 |
| 20 White pine drawing boards, 20x25 inches | 18.00 |
| 20 Architects triangular scales | 8.50 |

Each pupil should possess the following:

| | |
|---|---|
| 1 Dozen thumb tacks | $ .05 |
| 1 Pencil and ink eraser | .05 |
| 1 Sponge eraser | .10 |
| 1 Sketch book, for pencil | .10 |
| 1 Pencil, soft, finest grade, No. 2 | .10 |
| 1 Pencil, 4 H, for mechanical drawing | .05 |
| 1 Bottle Higgins' black drawing ink | .25 |

Drawing paper in large sheets, size 19x24, of good quality, for mechanical drawing, may be had from 2 to 5c per sheet.

*Dealers in Drawing Material.*

The following firms are reliable: Eugene Dietzgen Co., Chicago; F. Weber & Co., St. Louis; A. S. Aloe Co., St. Louis; Keuffel & Esser Co., St. Louis.

## DOMESTIC SCIENCE AND ART.

The first consideration in planning a laboratory for Domestic Science is the use to which it is to be put. If it is to be used for food work only, the tables should be only 2 ft. wide; if it is to be used for both food work and sewing, the tables should be from 2½ to 3 ft. wide, and the stoves should be placed on them so as to be reached easily from the side on which the student works, and to be removed easily when the tables are to be used for sewing purposes.

As to the arrangement of tables, for the cheaper equipments long tables so placed as to form a hollow square are probably the most satisfactory. The table tops, if of wood, should be well oiled so as not to absorb stains of any kind. Tile tops are, of course, to be preferred for the food work, but are much more expensive. A drawer should be provided for the individual equipment of each pupil, and, if sewing is to be given also, a separate drawer should be provided for this. A sufficient number of cases should be furnished for storing general equipment and supplies.

The floor and walls should be so finished as to be easily kept clean. If an old floor is to be used, the cracks should be filled and the floor painted. The walls should be painted or covered with one of the various kinds of sanitary paper.

## COOKING.

Suggestions are given below for one of the cheapest equipments for schools where gas is not available and where the equipment must be portable so as to be got out of the way when not in use, and also for an equipment where a room can be set apart exclusively for the work and where gas is available.

If further information is desired, the reader is referred to an article by Mrs. Helen Kinne in the Teachers College Record for May, 1909. This can be secured for thirty cents from Teachers College, Columbia University, New York City.

| | | |
|---|---|---|
| 1 | gasoline stove | $ 7.50 |
| 1 | oven | 3.00 |
| 12 | individual stoves (@ .75) | 9.00 |
| 3 | table tops (2x12) | 4.50 |
| 12 | boxes (5c ea.) | .60 |
| 3 | boxes with hinges | 2.00 |
| 12 | sets of apparatus (each costing, $1.04) | 13.68 |

| | |
|---|---|
| Bread board | $ .10 |
| Sauce pan | .10 |
| Double boiler | .25 |
| Pan | .05 |
| Bowl | .10 |
| Cup (measure) | .08 |
| Baking dish | .05 |
| Cover | .05 |
| Pie tin | .05 |
| 2 teaspoons | .03 1-3 |
| 1 tablespoon | .06 2-3 |
| Knife and fork | .06 2-3 |
| Sharp knife | .05 |
| Egg beater | .01 |
| Frying pan | .08 |
| | $ 1.14 |

| | | |
|---|---|---|
| 6 | thermometers at 30c. | $ 1.80 |
| 1 | balance | 3.00 |
| 100 | test tubes | 1.00 |
| | Beaker | 2.00 |
| | Rolling pins | .30 |
| | Flour sifter | .10 |
| 6 | dish pans | 1.50 |
| 3 | wire egg beaters | .30 |
| | Tea kettle | .75 |

| | |
|---|---|
| Soup kettle | .25 |
| Mixing bowls | .50 |
| Frying kettle | .75 |
| Muffin pan | .50 |
| Cake pan | .60 |
| 6 small tin buckets | .30 |
| Large sauce pan | .25 |
| Scrubbing brush | .15 |
| Carving knife | .25 |
| Biscuit cutter | .15 |
| Tea pot | .25 |
| Coffee pot | .25 |
| Grater | .10 |
| Total cost | $ 55.33 |

When a room can be set apart for this work and gas can be had, the following should be substituted for the first six items in the above list:

| | |
|---|---|
| Coal range | $15.00 to $ 30.00 |
| Gas stove | 18.00 to 30.00 |
| 3 12x2 hard wood tables. (Hard wood is desirable but soft wood is cheaper.) | 60.00 |
| Case for supplies | 25.00 |
| Sink installed with drain board | 30.00 |
| Refrigerator | 28.00 |
| Total cost, including the above substitutions | $231.73 |

## SEWING.

### GENERAL EQUIPMENT.

A small room or corner screened for fitting.

| | |
|---|---|
| 1 mirror | $ 6.00 to $ 25.00 |
| Machines (1 for each three or four pupils) | 22.00 to 30.00 |

Tables (9 sq. ft. for each pupil).

Lockers to hold work (if drawers for this purpose are not provided in tables).

Chairs.

Stools.

INDIVIDUAL EQUIPMENT.

| | |
|---|---|
| 1 short ruler (1 ft.) graded in inches | $ .05 |
| 1 long ruler (metal edge) | .20 |
| Scissors | .75 |
| Tape measure | .05 |
| Pin cushion | .10 |
| Thimble | .10 |
| Box to hold equipment | .05 |
| Total cost | $ 1.30 |

## III.

## SUGGESTIONS FOR THE EQUIPMENT OF LIBRARIES.

### GENERAL INFORMATION.

In accordance with the law approved March 19, 1901, it is made mandatory upon the district boards of directors to set aside, out of the levy for incidental purposes, not less than five nor more than twenty cents per pupil enumerated in the district each year, which shall be spent, under the direction of the board, in purchasing books, the first hundred of which shall be from a list selected by the State Library Board. (R. S. 1909, Sec. 8186.)

In addition to this provision, the qualified voters in each school district (outside of an incorporated city) have the power, at the annual meeting, by a majority of the votes cast, to vote such a sum as they may deem proper, not to exceed two mills on the dollar, for the purchase of books for a district library. (R. S. 1909, Sec. 8196.)

In cities containing 1,000 and less than 100,000 inhabitants, the Board of Education has power "to establish and maintain a library for the use of the public school district therein," and to appropriate the following sums therefor: 20,000 and under 100,000 inhabitants, $2,500; 5,000 and under 20,000, $500; 1,000 and under 5,000, $250. (R. S. 1909, Sec. 10871.)

This is, in brief, the state of the law in Missouri in reference to the school library. The list of books spoken of in the first paragraph, which may be obtained from the State Superintendent, contains largely books suited to the lower grades. It is with the hope of stimulating the growth of the high school libraries throughout the State and directing that growth in the right direction that these suggestions are made.

Books can generally be purchased to the greatest advantage through some large retail book shop. The firm of A. C. McClurg, 215 Wabash Avenue, Chicago, is recommended for domestic books and that of G. E. Stechert, 151 West 25th St., New York, for foreign books. Low discounts may usually be secured from local booksellers. It is seldom of advantage to deal with the publisher direct. If a large order is sent, a discount of about thirty per cent from the price named in the following lists may be expected. The discount will vary on different books and on some no discount can be given. In writing for books, one should be particular to state *exactly* what is wanted, giving author, title, edition, and publisher.

When the books arrive they should be compared with the order and the bill and entered in an accession book. This book, which can be obtained already ruled from the Library Bureau, 156 Wabash Ave., Chicago, is intended to be an exact record of the books in the library and is ruled for author, title, publisher, date, size, binding, house from which purchased and cost. This record is simply intended for business purposes. It is not a catalogue in any sense. One line is given to each volume and each line is numbered consecutively. Each volume, then, has a separate number which should be entered in some stated place on the volume itself, such as the foot of the page following the title.

Before the books are circulated, they should be marked indelibly in several places with the name of the library. A rubber stamp for this purpose can be had for a few cents. For example, the title page, the fifty-first page and the last page should be marked. It is a good idea to have a book plate printed and inserted on the inside cover of each book. The leaves of all uncut books should be cut.

If it is a possible thing, a separate room should be set apart for the library. This room should be made attractive and kept open all day long as a study room. If there is no fund from which to pay a librarian, the library should be placed in charge of one of the teachers, who should be held responsible for it. Good aids for the person in charge of the library are Dana's *Library Primer*, Stearns' *Essentials in Library Administration*, Hitchler's *Cataloging for Small Libraries*, Kroeger's *Aids in Book Selection* and *Binding for Small Libraries* and Brown's *Mending and Repair of Books. The Library Primer*, which costs $1.00, can be obtained of the Library Bureau, Chicago. The other books in the list, which cost 15c each, can be obtained of The American Library Association, 1 Washington St., Chicago.

Every means should be used to encourage pupils to read. They should be referred to definite books frequently and should

be shown the books by the teacher. Supplementary reading in moderate quantities should be assigned. Pupils should be permitted to take the books home. During the vacation when the school house is closed, the books should be removed to the home of some one who will care for them and issue them as desired by the residents of the district.

If library is large enough to warrant the employment of a librarian, some one with a special library training should be employed. It is just as important that the librarian should have a special education as it is for the teacher. If a whole year cannot be given to the study, the librarian should take at least a course at some summer school of library economy.

Every library of over 1,000 volumes should be catalogued on cards. To be effective this work must be done by trained cataloguers. Card cases and other supplies can be had of the Library Bureau. A model catalogue can be secured from the Superintendent of Documents, Washington, D. C., by sending for a copy of the *A. L. A. Catalogue of 8000 Volumes for a Popular Library.* (Price, $1.00.) This is a most carefully selected list and is most useful as an aid in the selection of books. Printed cards of all the books listed can be obtained from the Library of Congress at a cost of two cents for each different card and one-half cent for each duplicate card. The *Handbook of Card Distribution*, which will be sent gratis, should be secured from the Library of Congress.

The Missouri Library Commission, Jefferson City, Missouri, will be glad to correspond with anyone who wishes suggestions regarding the establishment or administration of school libraries.

The following lists of books are suggested:

## GENERAL REFERENCE BOOKS.

*Note.*—The asterisk indicates that the book is especially valuable.

| | |
|---|---|
| *Webster's *New International Dictionary*, (Springfield, Mass.) Merriam | $ 12.00 |
| **New International Encyclopedia*, (22 Vols.), (N. Y.) Dodd, Mead | 92.50 |
| Lippincott's *New Gazetteer*, Philadelphia | 10.00 |
| *Rand-McNally's *Indexed Atlas of the World*, (2 Vols.), | 18.50 |
| Bartlett's *Familiar Quotations*, (Boston) Little | 3.00 |
| Stephen & Lee's *Dictionary of National Biography*, (22 Vols.), Macmillan | 93.50 |

## ENGLISH.

*Note.*—The asterisk indicates that the book is especially valuable.

### FOR REFERENCE.

*Language and Rhetoric*:

Abbott, E. A., *Shakespearian Grammar*, Macmillan .....$ 1.50
Alden, R. M., *Introduction to the Study of Poetry*, Holt.. 1.25
Bradley, H., *The Making of English*, Macmillan ..... 1.00
Bright & Miller, *Elements of English Versification*, Ginn .80
*Genung, J. F., *Working Principles of Rhetoric*, Ginn... 1.40
*Greenough, B., and Kittredge, G. L., *Words and their Ways in English Speech*, Macmillan ..... 1.10
*Hill, A. S., *Principles of Rhetoric*, New Edition, American Book Co. ..... 1.20
Jespersen, O., *Growth and Structure of the English Language*, (N. Y.) Stechert ..... 1.00
Johnson, C. F., *Forms of English Poetry*, American Book Co. ..... 1.00
*Krapp, G. F., *Modern English*, Scribner ..... 1.25
Lounsbury, T. R., *History of the English Language*, Holt 1.12
Nesfield, J. C., *English Grammar Past and Present*, Macmillan ..... 1.10
Skeat, W. W., *An Etymological Dictionary of the English Language*, (1910), Oxford University Press ..... 9.50
*Skeat, W. W., *Principles of English Etymology*, (2 Vols.), Clarendon ..... 5.35
Sweet, H., *New English Grammar*, (2 parts), Clarendon Press ..... 2.65
*Whitney, W. D., *Essentials of English Grammar*, Ginn.. .75

### BOOKS ON LITERATURE.

Adams, O. F., *Dictionary of American Authors*, Houghton ..... 3.00
Alexander, W. J., *Introduction to Browning*, Ginn..... 1.00
Bates, Arlo, *Talks on the Study of Literature*, Houghton 1.50
Bradley, A. C., *Shakespearean Tragedy*, Macmillan..... 3.25
Bronson, W. D., *English Poems*, (4 Vols.), University of of Chicago Press ..... 6.00
Brooke, S. A., *History of Early English Literature*, Macmillan ..... 2.50
Child, C. G., *Early Plays*, (Riv. Ser.), Houghton..... .40
Corson, H., *Introduction to Shakespeare*, Heath..... 1.50

Corson, H., *Introduction to the Study of Robert Browning's Poetry*, Heath ..... $ 1.50
Dixon, W. M., *Tennyson Primer*, Dodd, Mead ..... 1.25
Dowden, E., *Shakspere: His Mind and Art*, Harper..... 1.75
*English Men of Letters*, ed. by J. Morley, (39 Vols.), Harper ..... 29.25
Furnivall and Munro, *Shakespeare: Life and Work*, Cassell ..... .35
Gayley, C. M., *Classic Myths in English Literature*, Ginn ..... 1.50
Gayley, C. M., *Representative English Comedies*, Macmillan ..... 1.50
Gosse, E. W., *History of Eighteenth Century Literature*, Macmillan ..... 1.50
Gummere, F. B., *Old English Ballads*, (Athen. Press), Ginn ..... .80
Gummere, F. B., *The Oldest English Epic*, Macmillan.... 1.10
Maccallum, M. W., *Shakespeare's Roman Plays and their Background*, Macmillan ..... 2.50
Manly, J. M., *English Poetry*, Ginn ..... 1.50
Manly, J. M., *English Prose*, Ginn ..... 1.50
Minto, W., *Manual of English Prose Literature*, Ginn.... 1.50
Newcomer, A. G., *Twelve Centuries of English Prose and Poetry*, Scott, Foresman ..... 1.75
Page, C. H., *Chief American Poets*, Houghton ..... 1.75
Pollard, A. W., *English Miracle Plays*, Clarendon Press.. 1.90
Pound, L., *The Periods of English Literature*, University of Nebraska Press ..... .75
Raleigh, W., *Shakespeare*, Macmillan ..... .50
Raleigh, W., *Wordsworth*, (London) Arnold..... 2.00
Ryland, T., *Chronological Outlines of English Literature*, Macmillan ..... 1.75
Saintsbury, G., *History of Elizabethan Literature*, Macmillan ..... 1.75
Saintsbury, G., *History of Nineteenth Century Literature*, Macmillan ..... 1.50
Stedman, E. C., *American Anthology*, Houghton ..... 3.00
Stedman, E. C., *Victorian Anthology*, Houghton ..... 3.00
Taine, H., *History of English Literature*, Holt ..... 1.75
Thayer, W. R., *Best English Plays*, Ginn ..... 1.40
Tolman, A. H., *Questions on Shakespeare*, University of Chicago Press .....Part I, 75c; Part 2, 1.00
Ward, T. H., *English Poets*, (4 Vols.), Macmillan..... 4.00
Wendell, B., *Literary History of America*, Scribner .... 3.00

## ENGLISH CLASSICS.

Addison, J., *Spectator*, Macmillan ..... $ 1.50
Arnold, M., *Essays in Criticism*, (2 Vols.), Macmillan.... 3.00
Austen, J., *Works*, (5 Vols.), Putnam..... 2.50
Bacon, *Essays*, ed. by West, Putnam ..... 1.00
Blackmore, *Lorna Doone*, Ginn ..... .65
Boswell, *Life of Johnson*, (2 Vols.), (Everyman's Lib.), Dutton ..... .70
Browne, Sir T., *Religio Medici* and *Urn Burial*, (Everyman's Lib.), Dutton ..... .35
Browning, R., *Complete Works*, (Cambridge ed.), Houghton ..... 3.00
Bryant, W. C., *Poetical Works*, (Household ed.), Appleton 1.50
Bunyan, J., *Pilgrim's Progress*, (Everyman's Lib.), Dutton ..... .35
Burns, R., *Poems, Songs and Letters*, (Globe ed.), Macmillan ..... 1.75
Burke, E., *Selected Works*, (3 Vols.), Macmillan ..... 3.60
Byron, Lord, *Poems*, (Cambridge ed.), Houghton ..... 3.00
Carlyle, T., *Heroes and Hero Worship*, (Athen. Press), Ginn ..... .80
Carlyle, T., *Sartor Resartus*, (Athen. Press), Ginn ..... .80
Chaucer G., *The Student's Chaucer*, ed. by Skeat, Macmillan ..... 1.75
Clemens, S. L., (Mark Twain), *Works*, (Complete sets, 18 Vols.), Harper ..... 33.50
Coleridge, S. T., *Poetical Works*, (Globe ed.), Macmillan. 1.75
Cooper, J. F., *The Spy*, *The Pilot*, and the five "*Leatherstocking Tales*," (5 Vols.), (Everyman's Library), Dutton ..... 1.75
Cowper, W., *Poetical Works*, (Globe ed.), Macmillan.... 1.75
Defoe, D., *Robinson Crusoe*, (Everyman's Library), Dutton ..... .35
De Quincey, T., *Confessions of an English Opium Eater* and *Select Essays*, (3 Vols.), Scribner ..... 5.00
Dickens, C., *Works*, (20 Vols.), Macmillan..... 20.00
Dryden, J., *Poetical Works*, (Globe ed.), Macmillan..... 1.75
Evans, Mary A., ("George Eliot"), *Works*, (12 Vols. at .90), Harper ..... 10.80
Emerson, R. W., *Works*, (5 Vols.), (Bohn Lib.), Bell.... 4.35
Goldsmith, O., *Miscellaneous Works*, (Globe ed.), Macmillan ..... 1.75

Gray, T., *Selections*, (Athen. Press), Ginn ..... $ .80
Harte, B., *Complete Poems*, (Cabinet ed.), Houghton.... 1.00
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Hart (editor), *The American Nation: A History from Original Sources*, by Associated Scholars, (28 Vols.), Macmillan ..... 42.00
**Higginson and Macdonald, *History of the United States*, Harper ..... 2.00
**Hill, *Liberty Documents*, Longmans ..... 2.00

Hinsdale, *How to Study and Teach History, with Particular Reference to the History of the United States*, Appleton ..... $ 1.50
Hinsdale, *Old Northwest*, Silver, Burdett ..... 1.75
Hodges, *William Penn*, (Riverside Biog. Series), Houghton, Mifflin ..... .50
*Hosmer, *History of the Louisiana Purchase*, Appleton... 1.25
Hosmer, *Samuel Adams*, (American Statesmen Series), Houghton, Mifflin ..... 1.25
*Hosmer, *Short History of the Mississippi Valley*, Houghton, Mifflin ..... 1.20
Hovey, *Stonewall Jackson*, (Bacon Biog. Series), Small, Maynard ..... .75
*James and Mann, *Readings in American History*, Scribner 1.50
Johnston, *General Washington*, (Great Commanders Series), Appleton ..... 1.50
*Johnston, Alex., editor, *American Orations*, (4 Vols.), Putnam ..... 5.00
*Johnston, *History of American Politics*, Holt ..... .80
*Lecky, *The American Revolution*, ed. by Woodburn, Appleton ..... 1.25
Lee, *General Robert E. Lee*, (Great Commanders Series), Appleton ..... 1.50
Lighton, *Lewis and Clark*, (Riverside Biog. Series), Houghton, Mifflin ..... .50
*Lodge, *Alexander Hamilton*, (American Statesmen Series), Houghton, Mifflin ..... 1.25
*Lodge, *Daniel Webster*, (American Statesmen Series), Houghton, Mifflin ..... 1.25
*Lodge, *George Washington*, (2 Vols.), (American Statesmen Series), Houghton, Mifflin ..... 2.50
*Lodge, *History of English Colonies in America*, Harper.. 3.00
Lodge, *Story of the Revolution*, Scribner ..... 3.00
Macdonald, *Select Documents, etc., Illustrative of the History of the United States*, 1606-1898, (3 Vols.), Macmillan ..... 6.25
Maclay, *History of American Privateers*, Appleton ..... 3.50
*McMaster, *Life of Benjamin Franklin*, Houghton, Mifflin ..... 1.25
McMaster, *History of the People of the United States*, (7 Vols.), (6 pub.), Appleton ..... 17.50
*McMaster, *With the Fathers*, Appleton ..... 1.50
*Macy, *Political Parties in the United States*, 1846-61, Macmillan ..... 1.25

Madison, *Papers*, (3 Vols.), (N. Y.), Langley ..... $ 6.00
Mahan, *Admiral Farragut*, (Great Commanders Series), Appleton ..... 1.50
Mahan, *Gulf and Inland Waters*, (Navy in Civil War Series), Scribner ..... 1.00
*Morse, *Abraham Lincoln*, (2 Vols.), (American Statesmen Series), Houghton, Mifflin ..... 2.50
*Morse, *Thomas Jefferson*, (American Statesmen Series), Houghton, Mifflin ..... 1.25
*New England History Teachers Association, *History Syllabus for Secondary Schools, Part IV, on American History*, Heath ..... .15
*Nicolay, *Outbreak of Rebellion*, Scribner ..... 1.00
*Nicolay, *Abraham Lincoln: A Short Life*, Century Co.... 2.40
*Ogg, *Opening of the Mississippi*, Macmillan ..... 2.00
**Old South Leaflets*, ed. by Mead (about 150 Nos., 6 Vols.), Old South Meeting House (Boston) ..... 9.00
Parkman, *Works*, (12 Vols.), Little, Brown ..... 18.00
*Parkman, *Half Century of Conflict*, (2 Vols.), Little, Brown ..... 5.00
Parkman, *Jesuits in North America*, Little, Brown .... 2.00
**Parkman, *La Salle and the Discovery of the Great West*, Little, Brown ..... 2.00
*Rhodes, *History of the United States from the Compromise of* 1850, (7 Vols.), Macmillan ..... 14.00
Roosevelt, *Naval War of* 1812, Putnam ..... 2.50
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*Schouler, *Alexander Hamilton*, (Beacon Biog. Series, Small, Maynard ..... .75
*Schouler, *History of the United States Under the Constitution*, (6 Vols.), Dodd, Mead ..... 13.50
*Schouler, *Thomas Jefferson*, (Makers of American Series), Dodd, Mead ..... 1.00
Schurz, *Henry Clay*, (American Statesmen Series), Houghton, Mifflin ..... 2.50
*Schudder, *Men and Manners in America One Hundred Years Ago*, Scribner ..... 1.25
*Semple, *American History, and its Geographic Conditions*, Houghton, Mifflin ..... 3.00
Sloane, *The French War and the Revolution*, Scribner.. 1.00

**Sparks, *Expansion of the American People*, Scott, Foresman ..... $ 1.50
**Sparks, *The Men Who Made the Nation*, Macmillan.... 2.00
**Sparks, *The United States of America*, 1775-1897, (2 Vols.), (Nations Series), Putnam ..... 2.70
**Stanwood, *History of the Presidency*, Houghton, Mifflin.. 2.50
Sumner, *Alexander Hamilton*, (Makers of American Series), Dodd, Mead ..... 1.00
Sumner, *Andrew Jackson*, (American Statesmen Series), Houghton, Mifflin ..... 1.25
*Taussig, *Tariff History of the United States*, new ed., Putnams ..... 1.25
*Thwaites, *Daniel Boone*, Appleton ..... 1.00
*Thwaites, *Father Marquette*, Appleton ..... 1.00
*Thwaites, *How George Rogers Clark Won the Northwest, etc*, McClurg ..... 1.20
Trent, *Robert E. Lee*, (Beacon Biog. Series), Small, Maynard ..... .75
**Southern Statesmen of the Old Regime*, Crowell..... 1.75
Tyler, *Patrick Henry*, (American Statesmen Series), Houghton, Mifflin ..... 1.25
*Walker, *Making of the Nation*, Scribner..... 1.00
Warner, *Captain John Smith*, (American Worthies Series), Holt ..... 1.25
*Wilson, Woodrow, *A History of the American People*, (5 Vols.), Harper ..... 17.50
Wilson, *George Washington*, Harper ..... 1.50
*Winsor, *Christopher Columbus*, Houghton, Mifflin ..... 4.00
Winsor, *Mississippi Basin: the Struggle Between England and France*, 1697-1763, Houghton, Mifflin ..... 4.00
*Winsor (ed.), *Narrative and Critical History of America*, (8 Vols.), Houghton, Mifflin ..... 44.00
Winsor, *Reader's Handbook of the Revolution*, Houghton, Mifflin ..... 1.25
*Winsor, *Westward Movement*, 1763-1798. Houghton, Mifflin ..... 4.00
*Woodburn, *American Republic and its Government*, Putnam ..... 2.00
*Wright, *Industrial Evolution of the United States*, Scribner ..... 1.25

MAPS AND CHARTS.

Atkinson-Mentzer, *Charts for American History*, Atkinson, Mentzer & Grover ..... 15.00

Foster, *Historical Maps for American History*, Rand McNally ..... $ 20.00
Hart, *History Aids (Charts for United States History)*, Nystrum & Co. ..... 4.00

## GENERAL REFERENCE WORKS.

As the lists given above are special in character the following general reference works of value might be mentioned as desirable in connection with history courses:

American Year Book, pub. annually, Appleton ..... $ 2.50
Bourne, *The Teaching of History and Civics*, (American Teachers Series), Longmans, Green ..... 1.50
Brewer, *Historic Note Book*, Lippincott ..... 3.50
**Century Dictionary of Proper Names*, Century Co. ..... 10.00
*Day, *History of Commerce*, Longmans ..... 2.00
*George, *Relations of History and Geography*, Clarendon Press ..... 1.10
*Historical Sources in Schools*, Macmillan ..... .50
*History Syllabus for Secondary Schools*, New England History Teachers Association, Heath ..... 1.20
Larned, *History for Ready Reference*, (6 Vols.), (Springfield, Mass.), Nichols ..... 30.00
*New International Encyclopedia*, (20 Vols.), Dodd, Mead (or other good standard encyclopedia such as the new Brittanica). 85.00
Ploetz, *Epitome of Ancient, Mediaeval, and Modern History*, ed. by Tillinghast, Houghton, Mifflin ..... 3.00
Report of the Committee of Seven, *The Study of History in Schools*, Macmillan ..... .50
*Statesman's Year Book*, pub. annually, Macmillan Co..... 3.50

## CIVIL GOVERNMENT.

*Note.*—The most essential books are indicated by the prefix ** and present the minimum library which should be possessed by a secondary school. Books next in importance are indicated by the prefix * and every effort should be made to secure these as well as the remaining volumes in the list.

Historical works have not been included as it is assumed that these will be selected from the list of reference works for American History. Among the books in that list special attention is

called to such collections as *Old South Leaflets*, Hill's *Liberty Documents* and Macdonald's *Select Charters and Other Documents Illustrative of American History*, 1606-1898.

**Ashley, R. L., *The American Federal State*, (1910), Macmillan ..... $ 2.00

Baldwin, Simeon E., *The American Judiciary*, (1905), Century ..... 1.25

**Beard, Charles A., *American Government and Politics*, (1910), Macmillan ..... 2.10

**Beard, *Readings in American Government and Politics*, (1909), Macmillan ..... 1.90

**Bryce, James, *American Commonwealth*, (2 Vols.), (1910), Macmillan ..... 4.00

*Cleveland, Frederick A., *The Growth of Democracy in the United States*, (Chicago, 1898), Quadrangle Press.. 1.50

Dole, Charles F., *The American Citizen*, (1891), Heath.. .80

Ely, Richard T., *Taxation in American States and Cities*, (1888), Crowell ..... 1.75

*Fairlie, John A., *Local Government in Counties, Towns, and Villages*, (1906), Century ..... 1.25

Fairlie, *Municipal Administration*, (1901), Macmillan .. 3.00

*Fairlie, *The National Administration of the United States*, (1905), Macmillan ..... 2.50

Finley, J. H., *The American Executive and Executive Methods*, (1908), Century ..... 1.25

Fiske, John, *Civil Government in the United States Considered with Some Reference to Its Origin*, (1904), Houghton ..... 1.00

*Follett, Mary Parker, *The Speaker of the House of Representatives*, (1902), Longmans ..... 1.75

Ford, Henry Jones, *The Rise and Growth of American Politics*, (1898), Macmillan ..... 1.50

*Goodnow, F. J., *City Government in the United States*, (1904), Century ..... 1.25

*Harrison, Benjamin, *This Country of Ours*, (1903), Scribner ..... 1.50

**Hart, Albert Bushnell, *Actual Government as Applied under American Conditions*, (1904), Longmans .... 2.00

*Hart, *Manual of History, Diplomacy, and Government of the United States*, (Cambridge, Mass., 1908), Harvard University Press ..... 2.00

Hart, *Practical Essays on American Government*, (1893), Longmans ..... 1.50

**Hinsdale, Burke Aaron, *The American Government, National and State*, American Book Co. ..... $ 1.25
**Macy, Jesse, *Our Government*, (1901), Ginn ..... .75
*Macy, *Party Organization and Machinery*, (1904), Century ..... 1.25
***Official Manual of the State of Missouri*, (published biennially by the Secretary of State, Jefferson City). Free .....
*Ostrogorski, M., *Democracy and the Party System in the United States*, (1910), Macmillan ..... 1.75
*Reinsch, Paul S., *American Legislatures and Legislative Methods*, (1907), Century ..... 1.25
*Reinsch, Paul S., *Readings in American Federal Government*, (1909), Ginn ..... 3.30
*Roosevelt, Theodore, *American Ideals and Other Essays*, (1902), Putnam ..... 1.50
Rowe, L. S., *Problems of City Government*, (1908), Appleton ..... 1.50
Smith, J. Allen, *The Spirit of American Government*, (1907), Macmillan ..... 1.25
**Statistical Abstract of the United States*, (published annually by the Bureau of Statistics, Department of Commerce and Labor, Washington). Free.
*Stimson, F. J., *The American Constitution*, (1908), Scribner ..... 1.25
*United States Civil Service Commission*, (Annual Report), (Washington).
*Willoughby, W. F., *Territories and Dependencies of the United States*, (1905), Century ..... 1.25
**Willoughby, W. W., *Rights and Duties of American Citizenship*, (1898), American Book Co. ..... 1.00
*Willoughby, W. W., *The American Constitutional System*, (1904), Century ..... 1.25
*Wilson, Woodrow, *The State*, (1902), Heath ..... 2.00
*Wilson, *Congressional Government*, (1900), Houghton .. 1.25
Woodburn, J. A., *The American Republic and Its Government*, (1903), Putnam ..... 2.00
*Zeublin, Charles, *American Municipal Progress*, (1903), Macmillan ..... 1.25

## GREEK AND LATIN.

### EDITIONS, TRANSLATIONS AND SPECIAL WORK.

#### GREEK.

*Note.*—The asterisk indicates that the book is especially valuable.

Aeschylus, *The Tragedies*, ed. with English Commentary by F. A. Paley, (4th ed., 1879), Macmillan .....$ 2.75
Aeschylus, *The Tragedies*, trans. by E. H. Plumptre, (1890), Heath ..... 1.25
Aeschylus, *The Tragedies*, trans. by Stewart Blackie, (Everyman's), Dutton ..... .35
Autenveith, G., *Homeric Dictionary*, American Book Co.. 1.10
Demosthenes, *Orations*, trans. by C. R. Kennedy, (5 Vols.), (1906), (London) Geo. Bell ..... 5.00
Euripides, *The Tragedies*, trans. by various authors, (2 Vols.), (Everyman's), Dutton ..... .70
Euripides, *The Tragedies*, with English commentary by F. W. Paley, (2nd ed.), (3 Vols.), (London) Whitaker ..... 6.00
Euripides, *The Tragedies*, trans. by A. S. Way, (3 Vols.), Macmillan ..... 6.00
Hessiod, trans. by G. A. Elton, (1894), (London) Geo. Routledge & Sons ..... .50
Homer, *Iliad*, ed. by Walter Leaf, (2nd ed.), (2 Vols.), (1902), Macmillan ..... 6.00
Homer, *Odyssey*, ed. with English notes by Merry and Ridell, (Bks. I-XII), (2nd Ed.), (Oxford) Clarendon ..... 4.00
Homer, *Odyssey*, (Bks. XIII-XXIV), ed. with English notes by D. B. Munro, (1901), (Oxford) Clarendon.. 4.00
Homer, *Die Homerischen Hymnen*, text ed. by Bemoll, (1886), (Leipzig) Teubner ..... 1.25
Homer, *Iliad*, trans. by Lang, Leaf and Myers, (1903), Macmillan ..... .80
Homer, *Odyssey*, trans. by F. H. Palmer, (1895), Houghton ..... 1.50
Homer, *Homeric Hymns*, trans. by Andrew Lang, (1899), Longmans ..... 2.00
Homer, *Odyssey*, trans. by Butcher and Lang, Macmillan .80
Herodotus, with commentary by J. W. Blakesley, (2 Vols.), Macmillan ..... 4.50

Herodotus, translated by G. C. Macauley, (2 Vols.), (1890), Macmillan ..... $ 4.50
Hesiod, ed. with English commentary by F. A. Paley, (2nd Ed.), Macmillan ..... 1.75
Lucian, trans. by H. W. and F. G. Fowler, (4 Vols.), (1905), Oxford ..... 3.50
Monro, D. B., *A Grammar of the Homeric Dialect*, Oxford Univ. Press ..... 3.50
Theocritus, *Idyls*, trans. by J. H. Hallard, (1894), (London) Longmans ..... 1.65
Theophrastus, *Characters*, text and trans. by R. C. Jebb, (1909), (London) Macmillan ..... 1.65
Sophocles, *The Tragedies*, trans. by Sir George Young, (Everyman's), Dutton ..... .35
Sophocles, *The Tragedies*, edited with English notes by L. Campbell, (2 Vols.), (Oxford) Clarendon Press.... 8.00
Sophocles, *The Tragedies*, trans. by E. H. Plumptre, (1882), Heath ..... 1.25
*The New Testament in the Original Greek*, ed. by Westcott and Hort, (2 Vols.), Macmillan ..... 4.00
Thucydides, trans. by B. Jowett, (2 Vols.), (1881), (Oxford) Clarendon ..... 3.75
Xenophon, trans. by H. G. Dakyns, (4 Vols.), (1890-97), Macmillan ..... 8.75

LATIN.

*Caesar.*

Allen, J. H., and Greenough, J. B., *Caesar's Gallic War*, (revised edition), Ginn ..... 1.25
Bennett, C. E., *Caesar's Gallic War*, Allyn and Bacon.... 1.00
*Dodge, Theodore A., *Caesar: A History of the Art of War among the Romans*, Houghton ..... 5.00
Fowler, William Warde, *Julius Caesar and the Foundation of the Roman Imperial System*, Putnam .... 1.50
*Froude, James Anthony, *Caesar: a Sketch*, Appleton.... 1.25
*Hodges, A. T., *Caesar's Gallic War*, Macmillan ..... 1.25
Holmes, R. T., *Caesar's Conquest of Gaul*, Macmillan.... 6.50
Judson, H. P., *Caesar's Army*, Ginn ..... 1.00
Kelsey, F. W., *Caesar's Gallic War*, Allyn and Bacon, Appleton ..... 1.10
Napoleon III, Emperor of France, *History of Julius Caesar*, Harper ..... 5.00
Trollope, A., *Commentaries of Caesar*, Lippincott ..... .50

Walker, A. T., *Caesar's Gallic War*, Scott, Foresman....$ 1.25
Westcott, J. H., *Caesar's Gallic War*, Appleton ..... 1.25

*Cicero.*

Allen, J. H., and Greenough, J. B., *Orations and Letters of Cicero*, (revised edition), Ginn ..... 1.30
Bennett, C. E., *Orations of Cicero*, Allyn and Bacon..... 1.25
Boissier, Gaston, *Cicero and his Friends*, (translation), (London) Ward, Lock ..... 1.25
Collin, W. L., *Cicero*, Lippincott ..... .50
Forbes, Charles H., *Cicero's Orations*, Appleton ..... 1.40
*Forsyth, William, *Life of Marcus Tullius Cicero*, Scribner ..... 2.60
Johnston, A. W., and Kingery, H. M., *Orations of Cicero*, Scott, Foresman ..... 1.25
Kelsey, Francis W., *Orations and Letters of Cicero*, Allyn and Bacon ..... 1.25
Minkwitz, R. A., *Cicero's Oration and Letters*, Macmillan 1.25
*Strachan-Davidson, James Leigh, *Cicero and the Fall of the Roman Republic*, Putnam ..... 1.50
Trollope, Anthony, *The Life of Cicero*, Harper ..... 3.00

*Eutropius.*

Welch, and Duffield, *Eutropius*, Macmillan ..... .40

*Nepos.*

Barss, J. E., *Nepos; Lives*, Macmillan ..... .90
Chase, G. D., *Nepos; Lives*, Appleton ..... 1.00
Roberts, A. W., *Nepos; Lives*, Ginn ..... .75

*Ovid.*

Bain, C. W., *Selections from Ovid*, Macmillan ..... 1.10
Fowler, Harold N., *Selections from Ovid*, Ginn ..... 1.10
Gleason, C. W., *A term of Ovid*, American Book Co. ..... .75
Laing, G. J., *Selections from Ovid*, Appleton ..... 1.40

*Sallust.*

Greenough, J. B., and Daniel, M. S., *Catiline*, Ginn .... .90
Gudeman, A., *Catiline*, Appleton ..... 1.00
Brooke, W. P., *Jugurtha*, Longman ..... .65
Herbermann, Charles G., *Catiline*, Sanborn ..... .90

*Vergil.*

Bennett, C. E., *Aeneid*, Allyn and Bacon ..... 1.20
Carter, J. R., *Aeneid*, Appleton ..... 1.40
Comparetti, *Vergil in the Middle Ages*, Macmillan ..... 2.50
*Church, A. J., *Stories from Vergil*, Dodd, Mead ..... 1.25
Collins, W. L., *Vergil*, Lippincott ..... .50

Comstock, E. Y., *Aeneid*, Allyn and Bacon ..... $ 1.40
*Conington, John, *Complete Works of Vergil*, (3 Vols.), (London) Geo. Bell & Son ..... 7.90
*Conington, *Translation of the Aeneid*, Longman..... .65
Fairclough, H. R., *Aeneid*, Sanborn ..... 1.40
Frieze, H. S., and Dennison, W., *Aeneid*, American Book Co. ..... 1.50
Glover, T. R., *Studies in Vergil*, (London) Edward Arnold ..... 2.65
Greenough, J. B., *Georgics and Aeneid* (Books VII-XII), Ginn ..... 1.12
Greenough, J. B., and Kitridge, G. L., *Aeneid* (Books I-VI), and *Bucolics*, Ginn ..... 1.60
*Howard, J. H., *Quantitative Reading of Latin Verse*, Scott, Foresman ..... .25
*Johnston, H. W., *Metrical Licenses of Vergil*, Scott, Foresman ..... .50
Knapp, Charles W., *Aeneid*, Scott, Foresman ..... 1.40
Lonsdale and Lee, *Translation of the Aeneid*, Macmillan 1.25
Miller, F. J., *Two Dramatizations from Vergil*, University of Chicago Press ..... 1.08
*Morris, William, *Translation of the Aeneid*, Longmans.. 2.00
*Nettlership, Henry, *Ancient Lives of Vergil*, Macmillan.. .50
*Nettlership, Henry, *Lectures and Essays*, Macmillan.... 1.90
*Sellar, W. Y., *Roman Poets of the Augustan Age; Vergil*, (London) Clarendon Press ..... 2.25
Sidgwick, A., *Complete Works of Vergil*, (2 Vols.), Cambridge University Press ..... 1.90

*Viri Romae.*

Churchill, M. E., and Sanford, F. W., *Viri Romae*, Scott, Foresman ..... .75
D'Ooge, B. L., *Viri Romae*, Ginn ..... .75
Rolfe, J. C., *Viri Romae*, Allyn and Bacon ..... .75

## GRAMMARS AND DICTIONARIES.

### GREEK.

Blass, Fr., *Pronunciation of Ancient Greek*, trans. by W. J. Purton, (1893), Macmillan ..... 1.90
Goodwin, W. W., *Syntax of the Moods and Tenses of the Greek Verb*, (1893), (Boston) Ginn ..... 2.00
Hadley and Allen's *Greek Grammar*, American Book Co... 1.50

Liddell and Scott, *Greek-English Lexicon*, (7th ed.), (1886), Harper ..... $ 10.00
Pizo-Rangabe, E., *A Practical Method in the Modern Greek Language*, (1896), Ginn ..... 2.00
Veitch, Wm., *Greek Verbs Irregular and Defective*, (1887), Oxford University ..... 2.50

LATIN.

*Allen, J. H., and Greenough, J. B., *New Latin Grammar*, Ginn ..... 1.20
*Bennett, C. E., *The Latin Language*, Allyn and Bacon.... 1.00
*Bennett, C. E., *Latin Grammar*, Allyn and Bacon ..... .80
*Gildersleeve, B. L., *Latin Grammar*, revised edition, University Publishing Co. ..... 1,20
*Hale, W. G., and Buck, C. D., *Latin Grammar*, Ginn .... 1.00
Hale, W. G., *Syntax of Latin Moods and Tenses*, Ginn .. 1.50
*Harkness, A., *Latin Grammar*, American Book Co. ..... 1.12
*Lane, George, *Latin Grammar*, revised by Morgan, M. H., American Book Co. ..... 1.50
*Lewis, C. T., and Short, C., *Harpers' Latin Dictionary*, American Book Co. ..... 6.50
Lewis, C. T., *Elementary Latin Dictionary*. American Book Co. ..... 2.00
*Lord, F. E., *Roman Pronunciation of Latin*, Ginn ..... .35
Roby, H. J., *Grammar of the Latin Language*, (2 Vols.), Macmillan ..... 4.60
Shumway, E. S., *Handbook of Latin Synonyms*, Ginn .... .30
*Smith, W., and Hall, T. D., *English-Latin Dictionary*, American Book Co. ..... 4.00
*West, A. F., *Latin Grammar*, Appleton ..... .90

## HISTORY, MYTHOLOGY AND RELIGION.

GENERAL.

*Bulfinch, J., *The Age of Fable*, (London) Lee and Shepard ..... 1.25
Collignon, M., *Manual of Mythology*, trans. by J. E. Harrison, (London) Gravel & Co. ..... 1.90
*Gayley, C. M., *Classic Myths*, Ginn ..... 1.50
Guerber, H. A., *Myths of Greece and Rome*, (1893), American Book Co. ..... 1.50
*Harrington and Tolman, *Greek and Roman Mythology*, Sanborn ..... 1.00

*Keightley, Thos., *Mythology of Ancient Greece and Italy*, 4th ed. edited by Leonhard Schmitz, (1880), (London) Geo. Bell ..... $ .75
*Murray, A. S., *Manual of Mythology*, Scribner ..... 1.25

GREEK.

*Botsford, G. W., *History of the Orient and Greece*, Macmillan ..... 1.20
Bury, J. B., *A History of Greece*, Macmillan ..... 1.75
Cox, G. W., *The Athenian Empire*, (5th Ed.), (1887), Scribner ..... 1.00
*Fairbanks, A., *Handbook of Greek Religion*, (1910), American Book Co. ..... 1.50
Fiske, J., *Myths and Mythmakers*, (1900), Houghton.... 2.00
Gardner, P., *New Chapters in Greek History*, (1892), Putnam ..... 5.00
Holm, A., *History of Greece*, (4 Vols.), (1898-1900), Macmillan ..... 10.00
Lang, A., *Myth Ritual and Religion*, (2 Vols.), Longmans 2.50
Mahaffy, J. P., *The Greek World Under Roman Sway*, (1890), Macmillan ..... 3.00
Oman, C. W. C., *History of Greece*, (1892), Longmans.. 1.50

LATIN.

*Botsford, S. W., *History of Rome*, Macmillan ..... 1.10
*Capes, W. W., *The Age of the Antonines*, Longmans..... 1.10
*Capes, W. W., *The Early Empire*, Longmans..... 1.10
Gibbon, Edward, *The Decline and Fall of the Roman Empire*, (6 Vols.), Macmillan ..... 14.00
*Howe, W. W., and Leigh, H. D., *History of Rome to the Death of Caesar*, Longmans ..... 2.00
*Ihne, William, *Early Rome*, Scribner ..... 1.00
*Merivale, Charles, *The Roman Triumvirates*, Longmans. 1.00
*Merivale, Charles, *History of the Romans under the Empire*, (8 Vols.), Longmans ..... 10.00
Mommsen, Th., *The Provinces of the Roman Empire*, (2 Vols.), Scribner ..... 6.00
*Mommsen, Th., *History of Rome*, (5 Vols.), Scribner.... 10.00
Pelham, H. F., *Outlines of Roman History*, Putnam ..... 1.75

## BOOKS OF REFERENCE, HANDBOOKS, ETC.

### GENERAL.

*Baumeister, A., *Bilder aus dem griechischen und römischen Altertum*, (Munich) R. Oldenbourg.....$ 3.00
Coulanges, Fustel de., *The Ancient City*, (London) Lee and Shepard ..... 1.60
*Gow, J. A., *Companion to School Classics*, Macmillan... 1.75
*Guhl, E., and Koner, W., *Life of the Greeks and Romans Described from Antique Monuments*, Appleton ..... 2.50
*Kiepert, H., *Atlas Antiquus*, Sanborn ..... 1.25
Marquand, A., and Frothingham, A. L., *Text Book of the History of Sculpture*, Longmans ..... 1.50
*Mau, A., *Pompeii, its Life and Art*, translated by Kelsey, Macmillan ..... 6.00
*Peck, H. T., *Harper's Dictionary of Classical Literature and Antiquities*, American Book Co. ..... 6.00
*Rich, A., *Dictionary of Roman and Greek Antiquities*, Longmans ..... 2.50
*Schreiber, Th., *Atlas of Classical Antiquities*, Macmillan 6.50
*Seyffert, O., *Dictionary of Classical Antiquities*, Macmillan ..... 3.00
Smith, W., *Dictionary of Greek and Roman Antiquities*, (2 Vols.), Little, Brown & Co. ..... 14.00
Smith, W., *Dictionary of Greek and Roman Geography*, (2 Vols.), Little, Brown & Co. ..... 12.00
Smith, W., *Dictionary of Greek and Roman Biography and Mythology*, (3 Vols.), Little, Brown & Co. ..... 18.00
*Tozer, H. F., *Classical Geography*, American Book Co. ... .35

### GREEK.

Baedeker, K., *Greece*, (1901), (4th revised), (Leipzig) Karl Baedeker ..... 2.50
Becker, W. A., *Charicles, or Illustrations of the Private Life of the Ancient Greeks*, (1899), Longmans..... 2.50
Bluemner, H., *Home Life of the Ancient Greeks*, (1895), Cassell ..... 2.00
Engelmann, R., and Anderson, W. C. F., *Pictorial Atlas to Homer's Iliad and Odyssey*, (1892), (London) ..... 3.00
Gardner, P., and Jevons, F. B., *A Manual of Greek Antiquities*, (1895), Scribner ..... 4.00
Gulick, C. B., *Life of the Ancient Greeks*, (1902), Appletons ..... 1.40

Mahaffy, J. P., *Social Life in Greece*, (1898), (London) Macmillan ..... $ 1.75
Mahaffy, J. P., *Greek Life and Thought*, (1896), Macmillan 3.00
*Tucker, T. G., *Life in Ancient Athens*, (1906), Macmillan 1.25

LATIN.

Abbott, F. F., *Society and Politics in Ancient Rome*, Scribner ..... 1.25
*Becker, W. A., *Gallus*, Longmans ..... 2.50
Church, A. J., *Roman Life in the Days of Cicero*, Macmillan ..... .50
Fowler, W. W., *Social Life at Rome in the Age of Cicero*, Macmillan ..... 2.25
Inge, W. R., *Society in Rome under the Caesars*, Scribner 1.25
Johnston, H. W., *The Private Life of the Romans*, Allyn and Bacon ..... 1.50
Lanciani, R., *Ancient Rome in the Light of Recent Discoveries*, Houghton, Mifflin ..... 6.00
Lanciani, R., *The Ruins and Excavations of Ancient Rome*, Houghton, Mifflin ..... 4.00
*MacKail, J. W., *Latin Literature*, Scribner ..... 1.25
Platner, Samuel B., *Ancient Rome*, Allyn and Bacon..... 3.00
*Preston, H. W., and Dodge, L., *Private Life of the Romans*, Sanborn ..... 1.25
Ramsay, W., *Manual of Roman Antiquities*, Scribner .... 3.00
*Tucker, T. G., *Life in the Ancient World of Nero and St. Paul*, Macmillan ..... 2.50

## GERMAN.

### FOR CLASS-ROOM READING.

SUITABLE FOR THE FIRST AND SECOND UNITS.

Allen, *Herein!* Holt ..... .75
Anderson, *Bilderbuch ohne Bilder*, Holt ..... .30
Anderson, *Die Eisjungfrau*, Holt ..... .30
Anderson, *Märchen*, Heath ..... .70
Auerbach, *Brigitta*, Ginn ..... .50
Bacon, *Im Vaterland*, Allyn & Bacon ..... 1.00
Baker, *German Stories*, Holt ..... .30
Baumbach, *Sommermärchen*, Holt ..... .25
Baumbach, *Waldnovellen*, Heath ..... .30

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| Baumbach, *Nicotiana*, Heath | $ .25 |
| Bernhardt, *Aus Herz und Welt*, Heath | .25 |
| Betz, *Till Eulenspiegel*, Heath | .25 |
| Burkhard, *German Poems for Memorizing*, Holt | .30 |
| Carruth, *A German Reader*, Ginn | .50 |
| Frommel, *Eingeschneit*, Heath | .25 |
| Frommel, *Mit Ränzel und Wanderstab*, Heath | .30 |
| Gerstacker, *Germelshausen*, American Book Co. | .25 |
| Grimm, *Märchen*, American Book Co. | .45 |
| Guerber, *Märchen und Erzählungen*, I & II, Holt | .65 |
| Harris, *German Reader*, Holt | 1.00 |
| Hauff, *Die Karawane*, Holt | .75 |
| Hauff, *Das Kalte Herz*, Heath | .40 |
| Hauff, *Der Zwerg Nase*, Heath | .15 |
| Hewett, *A German Reader*, Macmillan | 1.25 |
| Heyse, *L'Arrabbiata*, Heath | .25 |
| Heyse, *Das Mädchen von Treppi*, Heath | .30 |
| Heyse, *Die Blinden*, Holt | .30 |
| Heyse, *Anfang und Ende*, Holt | .30 |
| Krüger and Smith, *English-German Conversation Book*, Heath | .30 |
| Leander, *Träumereien*, Holt | .30 |
| Nichols, *Easy German Reader*, Holt | .35 |
| Petersen, *Prinzessin Ilse*, Holt | .50 |
| Pope, *German Composition*, Holt | .90 |
| Riehl, *Burg Neideck*, Ginn | .30 |
| Riehl, *Das Spielmannskind*, Heath | .25 |
| Ries, *Easy German Reader*, American Book Co. | .30 |
| Schrakamp, *Ernstes und Heiteres*, American Book Co. | .30 |
| Seeligmann, *Altes und Neues*, Ginn | .35 |
| Seidel, *Aus goldenen Tagen*, Heath | .35 |
| Stern, *Geschichten vom Rhein*, American Book Co. | .85 |
| Stern, *Geschichten von deutschen Städten*, American Book Co. | 1.25 |
| Stifter, *Das Haidedorf*, Heath | .20 |
| Storm, *Geschichten aus der Tonne*, Ginn | .60 |
| Storm, *Auf der Universität*, Holt | .35 |
| Storm, *Der Schimmelreiter*, Ginn | .50 |
| Storm, *Immensee*, Holt | .25 |
| Storm, *Im Sonnenschein*, American Book Co. | .30 |
| Thomas and Harvey, *German Reader*, Holt | 1.00 |
| Wildenbruch, *Das edle Blut*, Holt | .30 |
| Zschokke, *Abenteuer der Neujahrsnacht*, Holt | .25 |

Zschokke, *Das Wirtshaus zu Cransac*, Heath ..... $ .25
Zschokke, *Der verbrochene Krug*, Heath ..... .25

SUITABLE FOR THIRD UNIT.

Benedix, *Der Prozesz*, Heath ..... .20
Benedix, *Die Hochzeitsreise*, Heath ..... .25
Chamisso, *Peter Schlemihl*, Holt ..... .25
Droste-Hülshoff, *Die Judenbuche*, Oxford University Press .65
Eichendorff, *Aus dem Leben eines Taugenichts*, Holt.... .40
Fouqué, *Undine*, American Book Co. ..... .50
Freytag, *Die Journalisten*, Holt ..... .50
Freytag, *Aus dem Jahrhundert des groszen Kreiges*, Heath ..... .50
Freytag, *Doktor Luther*, Ginn ..... .50
Freytag, *Karl der Grosze*, Holt ..... .50
Fulda, *Der Dummkopf*, Holt ..... .30
Fulda, *Der Talisman*, Heath ..... .30
Goethe, *Dichtung und Wahrheit*, Holt ..... .70
Goethe, *Hermann und Dorothea*, Ginn ..... .70
Gutzkow, *Uriel Acosta*, Holt ..... .30
Hauff, *Lichtenstein*, Holt ..... .60
Heine, *Poems*, Ginn ..... .70
Heine, *Harzreise*, Ginn ..... .50
Helbig, *Komödie auf der Hochschule*, Heath ..... .30
Klenze, *Deutsche Gedichte*, Holt ..... .90
Lessing, *Minna von Barnhelm*, Macmillan ..... .50
Manley and Allen, *Four German Comedies*, Ginn ..... .45
Moser, *Köpnickerstrasse*, Heath ..... .30
Moser, *Der Bibliothekar*, Holt ..... .40
Rosegger, *Waldheimat*, Ginn ..... .30
Rosegger, *Die Schriften des Waldschulmeisters*, Holt .... .25
Scheffel, *Der Trompeter von Säkkingen*, Macmillan .... .75
Schiller, *Thirty Years' War*, Holt ..... .60
Schiller, *Ballads*, Heath ..... .60
Schiller, *Die Glocke*, Holt ..... .25
Schoenfeld, *German Historical Prose*, Holt ..... .70
Schuecking, *Die Drei Freier*, Ginn ..... .30
Sudermann, *Frau Sorge*, Heath ..... .40
Sudermann, *Der Katzensteg*, Heath ..... .40
Sybel, *Die Erhebung Europas*, Ginn ..... .40
Tieck, *Die Elfen*, Holt ..... .20
Uhland, *Poems*, Macmillan ..... 1.25
Vos, *Wilhelm Tell*, Ginn ..... .90

*For Reference.*

Vietor, Wilhelm, *German Pronunciation*, (Leipzig) Reisland ..... $ .50
Flügel-Schmidt-Tanger, *Dictionary of the English and German Languages*, (Braunschweig) Westermann.. 4.00
James, *German and English Dictionary*, Macmillan.... 1.50
Kluge, *Deutsches etymologisches Wörterbuch*, (7 Auflage), (Strassburg) Trübner, (in German)..... 3.00

## GENERAL REFERENCE.

Duden, K., *Orthographisches Wörterbuch der deutschen Sprache*, (in German), (last edition), (Leipzig) Bibliographisches Institut ..... ..... .35
Eberhard, Joh. A., *Synonymisches Handwörterbuch der deutschen Sprache*, (in German), (17th Ed.), (Leipzig) Grieben ..... 2.80
Francke, H., *History of German Literature*, (1901), Holt 2.50
Robertson, John A., *A History of German Literature*, (1902), Putnam ..... 3.50
Scherer, W., *History of German Literature*, (1892), Scribner ..... ..... 3.50
Könnecke, G., *Bilderatlas zur Geschichte der deutschen National-Litteratur*, (in German), (3d Ed.), (Marburg) Elwert ..... 6.50
Curme, Geo. O., *A Grammar of the German Language*, Macmillan ..... ..... 4.00
Bagster-Collins, E. W., *The Teaching of German in Secondary Schools*, (1904), The Columbia University Press ..... ..... 1.50
*Report of the Committee of Twelve*, Heath ..... .20

## FRENCH.

Most of the books mentioned as desirable are published in France. They can best be ordered through A. Picard et Fils, Libraires, No. 82, Rue Bonaparte, Paris. This is the best firm at Paris for ordering foreign books. One should always order directly from abroad, since American dealers at New York and elsewhere ask from 20 per cent to 50 per cent more than this and other good foreign firms. Books are sent by mail or freight, and the money is forwarded by postoffice money order.

Edgren-Burnet, *French and English Dictionary*, Holt..$ 1.50
Hatzfield-Darmsteter, *Dictionary*, (2 Vols.), (Paris) Delagrave .....40 francs
*International French-English Dictionary*, Hinds & Noble.$ 3.00
(This dictionary is invaluable because of its having the pronunciation of all words given in phonetic spelling.)
*Le Petit Larousse*, (1 Vol.) ..... 6.50
Skeat's *Etymological Dictionary*, Clarendon Press..... 11.00
(This dictionary is invaluable for showing the relationship between French and English words.)
Fortier, *Hist. de la Littérature Française*, Holt ..... 1.00
Lanson, *Hist. de la Lit. Française*, (Paris) Hachette.. 7 francs
Pellissier, *Précis de l'Histoire de la Lit. Française*.... 4 francs
Brachet-Toynbee, *Historical French Grammar*, Clarendon Press .....$ 2.00
Parton, *French Parnassus*, Houghton, Mifflin..... 1.50
*L'Echo des Deux Mondes*, a monthly journal, (Chicago) A. C. Babize & Co., per year ..... 1.50

A maximum equipment should of course include all or nearly all of the volumes just mentioned. In addition, the following suggestions are made:

Petit de Julleville, *Hist. de la Langue et de la Lit. Française*, (8 Vols.), (Paris) Armand Colin....126 francs
Nyrop, *Grammaire Historique de la Langue Française*, (2 Vols.), (1904), (Paris) ..... 15 francs
*Le Maître Phonétique*, the best journal for the study of accurate speech, not only in French but in all the more important modern languages. (Address: Rue de la Madeleine, Bourg-la-Reine, Seine, France), per year ..... 5 francs
*Revue des Deux Mondes*, Paris, bi-monthly, per year 62 francs
Matzke, *French Pronunciation*, 2d edition, is very useful, Holt .....$ .25
Michaelis-Passy, *Dict. Phonétique Française*, (Paris) Le Soudier ..... 5 francs
Passy, P., *Le Français Parlé*, (Leipzig) Reisland....2.50 francs
Passy, *Les Sons du Français*, (Paris) Didot.....1.50 francs
Rambeau-Passy, *Chrestomathie Phonétique*, (Paris) Le Soudier ..... 6 francs

One of the most desirable aids to a correct pronunciation is the phonograph. A teacher can not possibly give all the time necessary to secure good pronunciation in an average class, but this

machine proves an admirable substitute, when conscientiously and continuously used. The best company that sells or leases phonographs and the necessary disks for the study of a modern language is the United States School of Languages, 1127-29 Walnut St., Philadelphia, Pa. A machine with a set of elementary disks and the corresponding text can be bought for about $45. The set of advanced records costs $10, and a third set of difficult French words costs $5. The same school also has sets of records for Spanish.

A library should of course contain a considerable number of the standard works of French literature. It would be too great a task to attempt to name any special authors or books.

## SPANISH.

In addition to a collection of the standard authors and a phonograph with disks, the following brief list of desirable volumes may be given:

*Diccionario de la Real Academia*, (Madrid) Hernando 25 pesetas
(Double the price here given if not paid in advance; postage extra.)

Velásquez de la Cadena, *Diccionario Esp. Inglés*, (2 Vols.), Appleton .....$ 6.00

Of smaller and cheaper dictionaries, Appleton's *New Spanish Dictionary* will be found usable ..... 2.00

Fitzmaurice-Kelly, *History of Spanish Lit.* (For beginners, the English edition; for advanced classes, the more complete edition; translated by Bonilla y San Martin), (Madrid) Espana Moderna ..... 10 pesetas

Hume, *Modern Spain*, (Nations Series), (London) Unwins .....$ 1.25

## PHYSICS.

Ames, J. S., *Text-book of General Physics*, (1904), American Book Co. .....$ 1.60

Aryton, W. E., *Practical Electricity*, (1900), Cassell..... 2.00

Boys, C. V., *Soap Bubbles*, (1900), (London) S. P. C. K. .50

Cajori, F. F., *History of Physics*, (1899), Macmillan.... 1.60

Derr, *Photography for Students of Physics and Chemistry*, Macmillan ..... 1.40

Duff, A. W., *Text-book of Physics*, (1909), Blakiston.... 2.75

Edser, E., *Light for Students*, (1903), Macmillan..... 1.50

Edser, E., *Heat for Advanced Students*, (1901), Macmillan $ 1.00
Everett, J. D., *C. G. S. System of Units*, (1891), Macmillan 1.25
Forbes, G., *Course of Lectures on Electricity*, (1888), (London) Longmans ..... 1.00
Ganot, A., *Elementary Treatise on Physics*, 17th ed., (1906), Longmans ..... 2.50
Glazebrook, R. T., *Mechanics and Hydrostatics*, Macmillan 2.50
Glazebrook, R. T., and Shaw, W. N., *Practical Physics*, (4th ed.), (1893), (London) Longmans ..... 2.50
Hastings, *Light*, Scribner ..... 2.50
Houston and Kennelly, *Elementary Electrical Series*, (10 Vols.), *Magnetism, The Electric Motor, The Electric Telegraph, The Electric Telephone, Electric Street Railways*, etc., (New York) McGraw and Hill, per volume ..... 1.00
Larden, W., *Electricity*, Longmans ..... 1.75
Maxwell, J. C., *Theory of Heat*, (1897), (London) Longmans ..... 1.50
Michelson, *Light Waves and their Uses*, University of Chicago Press ..... 2.00
Miller, D. C., *Laboratory Physics*, (1903), Ginn ..... 2.00
Nichols, E. L., *Laboratory Manual of Physics*, (Vol. 1), Macmillan ..... 3.00
Perry, J., *Spinning Tops*, (1901), (London) S. P. C. K. .50
Poyser, A. W., *Magnetism and Electricity*, Longmans.... 1.50
Stewart, B., and Gee, W. W., *Lessons in Elementary Practical Physics*, (1 Vol.), (1898), Macmillan..... 1.50
Taylor, Sedley, *Sound and Music*, (London) Macmillan 2.25
Thomas, J. J., *Electricity and Matter*, (1904), Scribner 1.25
Thompson, S. P., *Elementary Lessons in Electricity and Magnetism*, (1892), Macmillan ..... 1.40
Thompson, S. P., *Light, Visible and Invisible*, (1897), Macmillan ..... 1.50
Tyndall, J., *Heat as a Mode of Motion*, (1895), Appleton 2.50
Tyndall, J., *Sound*, (1895), Longmans ..... 2.00
Watson, W., *Text-book on Physics*, Longmans ..... 3.50
Wood, R. W., *Physical Optics*, (1905), Macmillan ..... 3.50
Wright, L., *Optical Projection*, Longmans ..... 2.25
Zahm, J. A., *Sound and Music*, (1892), McClurg ..... 3.00

## CHEMISTRY.

Armitage, F. A., *History of Chemistry*, (1906), Longmans 1.60
Bailey, E. H. S., *Sanitary and Applied Chemistry*, (1906), Macmillan ..... 1.40
Dobbin, L., and Walker, J., *Chemical Theory for Beginners*, Macmillan ..... .70
Duncan, R. K., *The Chemistry of Commerce*, (1907), Harper ..... 2.00
Faraday, M., *Chemical History of a Candle*, Harper.... .85
Holleman, A., *Organic Chemistry*, Wiley ..... 2.50
Lassar-Cohn, *Chemistry in Daily Life*, Lippincott..... 1.50
Meyer, E. von, *History of Chemistry*, (1898), Macmillan 4.50
Newth, G. S., *Text-book of Inorganic Chemistry*, (1894), Longmans ..... 1.75
Olsen, *Quantitative Analysis*, Van Ostrand ..... 4.00
Ostwald, W., *Conversations in Chemistry*, (1905), (N. Y.) Wiley ..... 1.50
Picton, H. W., *Story of Chemistry*, (1892), (London) Isbister ..... .85
Ramsay, W., *Gases of the Atmosphere*, (1896), Macmillan 1.50
Reychler, A., *Outlines of Physical* Chemistry, Macmillan ..... 1.00
Roscoe, H. E., *Life and Experiences*, (1906), Macmillan 4.00
Smith, A., *General Inorganic Chemistry*, (1906), Century 2.25
Snyder, H., *Chemistry of Plant and Animal Life*, (1903), Macmillan ..... 1.40
Snyder, H., *Chemistry of Soils and Fertilizers*, (1899), (Easton) Chemical Pub. ..... 1.50
Sutton, *Volumetric Analysis*, Blakiston's Son. (In press.)
Thompson, S. P., *Michael Faraday: Life and Work*, (1898), Macmillan ..... 1.25
Thorp, F. H., *Industrial Chemistry*, Macmillan ..... 3.75
Thorpe, T. E., *Essays in Historical Chemistry*, Macmillan 4.00
Treadwell-Hall, (Vol. I), *Qualitative Analysis*, Wiley.. 3.00
Treadwell-Hall, (Vol. II), *Quantitative Analysis*, Wiley.. 4.00

## GENERAL BIOLOGY, BOTANY AND ZOOLOGY.

### GENERAL BIOLOGICAL REFERENCES.

Bateson, W., *Mendel's Principles of Heredity*, Putnam.. 3.50
Bower, F. O., *The Origin of a Land Flora*, (1908), Macmillan ..... 5.50
Darwin, C., *Origin of Species*, (1892), Appleton ..... 2.00

Davenport, E., *Principles of Breeding*, (1908), Ginn....$ 2.50
Hertwig, R., *General Principles of Zoology*, (1897), Holt 1.60
Hodge, C. F., *Nature Study and Life*, (1902), Ginn..... 1.50
Jordan and Kellogg, *Evolution and Animal Life*, Appleton ..... 2.50
Kerner, A., von M., *Natural History of Plants*, tr. by F. W. Oliver, (2 Vols.), (1895), Holt ..... 15.00
Metcalf, M. M., *Outline of the Theory of Organic Evolution*, (1904), Macmillan ..... 2.50
Punnett, R. C., *Mendelism*, (1909), (N. Y.) Wiltshire Book Co. ..... .50
Romanes, G. J., *Darwin and After Darwin*, (2 Vols.), Vol. I—*The Darwinian Theory*, (1892), (Chicago) Open Court ..... 2.00
Sedgwick, W. T. & Wilson, E. B., *General Biology*, (2d ed.), (1895), Holt ..... 1.75
Thomson, J. A., *Heredity*, (1908), Putnam ..... 3.50
Wallace, A. R., *Darwinism*, (1890), Macmillan ..... 1.75
The teacher should have access to the following:
Lloyd, F. E., and Biglow, M. A., *The Teaching of Biology in the Secondary School*, (1904), Longmans ..... 1.50
*Nature-study Review: A Journal Devoted to all Phases of Nature-study in Elementary Schools*, 41 North Queen St., Lancaster, Pa. Per Vol. (6 nos.) ..... 1.00

## BOTANY.

### ELEMENTARY TEXTS AND REFERENCE BOOKS.

Atkinson, G. F., *Elementary Botany*, rev. ed., (1905), Holt 1.50
Atkinson, G. F., *Botany for High Schools*, (1910), Holt. 1.25
Bailey, L. H., *Lessons with Plants*, (1898), Holt ..... 1.10
Bailey, L. H., *Garden Making*, Macmillan ..... 1.00
Barnes, C. R., *Outlines of Plant Life*, (1900), Holt ..... 1.10
Bergen, J. Y., *Elements of Botany*, rev. ed., (1904), Ginn 1.30
Bergen, J. Y., and Davis, B. M., *Principles of Botany*, (1906), Ginn ..... 1.50
Caldwell, O. W., *Handbook of Plant Morphology*, (1904), Holt ..... 1.00
Coulter, J. M., *A text-book of Botany*, (1906), Appleton.. 1.25
Coulter, J. M., *Plants—A Text-book of Botany*, (1901), Appleton ..... 1.25
Coulter, J. M., Barnes, C. R., and Cowles, H. C., *A Text-book of Botany*, (1910), American Book Co. ..... 3.50

Duggar, B. M., *Fungous Diseases of Plants*, (1909), Ginn. $ 2.00
Leavitt, R. G., *Outlines of Botany*, (1901), American Book Co. ..... 1.00
Lipman, J. G., *Bacteria in Relation to Country Life*, 2nd ed., (1909), Macmillan ..... 1.50
MacDougal, D. T., *Experimental Plant Physiology*, (1898), Holt ..... 1.00
Peirce, G. J., *A Text-book of Plant Physiology*, (1903), Holt ..... 2.00
Pinchot, G., *A Primer of Forestry*, Bul. 24, Bureau of Forestry, (Washington) .....
Robinson, B. L., and Fernald, *Gray's New Manual of Botany*, (7th edition), (1908), American Book Co... 2.50
Schimper, A. F. W., *Plant Geography*, tr. by Fischer, (1903), Oxford Press ..... 12.75
Strasburger, E., Noll, F., Schenck, H., and Karston, G., *A Text-book of Botany*, 3rd Eng. edition, translated by W. H. Lang, (1908), Macmillan ..... 5.00

The following should be added to the above list if possible:

ADDITIONAL TEXTS, FLORAS, AND APPLIED WORKS.

Andrews, E. F., *Botany All the Year Round*, (1903), American Book Co. .....$ 1.00
Arthur, J. C., and MacDougal, D. T., *Living Plants and Their Properties*, (1898), Holt ..... 1.25
Atkinson, G. F., *College Botany*, (1905), Holt..... 2.00
Atkinson, G. F., *Studies of American Fungi: Mushrooms—Edible, Poisonous, etc.*, (1900), (Ithaca) Andrus & Church ..... 3.00
Bailey, L. H., *Survival of the Unlike*, (1896), Holt .... 2.00
Bailey, L. H., *Plant Breeding*, (1906), Macmillan ..... 1.00
Bergen, J. Y., *Foundations of Botany*, Ginn ..... 1.50
Britton, N. L., *N. A. Trees*, (1908), Holt ..... 7.00
Campbell, D. H., *Mosses and Ferns*, (1905), Macmillan .. 4.00
de Candolle, *Origin of Cultivated Plants*, (1906), Appleton .... ..... 2.00
Chamberlain, C. J., *Methods in Plant Histology*, (2nd ed.), (1905), Chicago University Press ..... 2.25
Conn, H. W., *Agricultural Bacteriology*, (2nd ed.), (1910), (Philadelphia) Blakiston ..... 2.50
Darwin, C., *Insectivorous Plants*, (1892), Appleton .... 2.00
Darwin, C., *Power of Movement in Plants*, (1892), Appleton ..... 2.00
Darwin, C., *Cross and Self Fertilization in the Vegetable Kingdom*, (1895), Appleton ..... 2.00

Detmer, W., *Practical Plant Physiology*, tr. by S. A. Moore, (1898), Macmillan ..... $ 3.00
Farmers' Bulletins, U. S. Dept. of Agr., Washington, D. C., (free).
Freeman, E. M., *Minnesota Plant Diseases*, Minnesota Botanical Survey, (1905), (St. Paul).
Frost, W. D., and M. C., Campbell, E. F., *A Text-book of General Bacteriology*, (1910), Macmillan ..... 1.50
Gifford, J., *Practical Forestry*, (1902), Appleton ..... 1.20
Goebel, K., *Outlines of Classification and Special Morphology*, (Oxford) Clarendon Press ..... 5.25
Hard, M. A., *Mushrooms*, (1908), (Kirkwood, Mo.) Author ..... 4.75
Jordan, E. O., *A Text-book of General Bacteriology*, (1909), Saunders ..... 3.00
Lubbock, J., *Flowers, Fruits and Leaves*, (1886), Macmillan ..... 1.25
Stevens, W. C., *Introduction to Botany*, (1906), Heath.. 1.50
Stevens, W. C., *Plant Anatomy*, (2nd ed. rev.), (1910), Blakiston ..... 2.00
Stevens, F. L., and Hall, J. G., *Diseases of Economic Plants*, (1910), Macmillan ..... 1.50
Tubeuf and Smith, W. G., *Diseases of Plants Induced by Cryptogamic Parasites*, (1897), Longmans ..... 5.50
Underwood, L. M., *Our Native Ferns and Their Allies*, (1900), Holt ..... 1.00
Underwood, L. M., *Moulds, Mildews and Mushrooms*, (1899), Holt ..... 1.50
Vines, H. S., *Students' Text-book of Botany*, (1895), Macmillan ..... 3.75

Many bulletins of the Bureau of Plant Industry, U. S. Dept. of Agriculture, Washington, D. C., are extremely valuable in high school work and should be obtained when possible.

## ZOOLOGY.

### ELEMENTARY TEXTS AND REFERENCE BOOKS.

Davenport, C. B., and G. C., *Introduction to Zoology*, (1900), Macmillan ..... $ 1.10
French, N. S., *Animal Activities*, (1902), Longmans.... 1.20
Holmes, S. J., *The Biology of the Frog*, (1906), Macmillan 1.60
Hunter, G. W., *Elements of Biology*, (1907), American Book Co. ..... 1.25

Jordan, D. S., and Kellogg, V. L., *Animal Life: A First Book of Zoology*, (1900), Appleton ..... $ 1.20
Jordan, D. S., and Heath, H., *Animal Forms: A Second Book of Zoology*, (1902), Appleton ..... 1.10
Jordan, D. S., Kellogg, V. L., and Heath, H., *Animals* (consisting of *Animal Life* and *Animal Forms* bound in one volume), (1903), Appleton ..... 1.80
Jordan, D. S., Kellogg, V. L., and Heath, H., *Animal Studies: A Text-book of Elementary Zoology*, (1903), Appleton ..... 1.25
Jordan, D. S., and Price, G. C., *Animal Structures: A Laboratory Guide Designed to Accompany Animal Studies*, (1903), Appleton ..... .50
Linville, H. R., and Kelly, H. A., *A Text-book in General Zoology*, (1906), Ginn ..... 1.50
Parker, T. J., and W. N., *Practical Zoology*, (1908), Macmillan ..... 2.60
Pratt, H. S., *A Course in Invertebrate Zoology*, (1902), Ginn ..... 1.25
Pratt, H. S., *A Course in Vertebrate Zoology*, (1905), Ginn 1.50
Sedgwick, W. T., and Wilson, E. B., *General Biology*, (1895), Macmillan ..... 1.75
Thomson, J. A., *The Story of Animal Life*, Scribner .... 1.50
Thomson, J. A., *The Science of Life*, (1899), (N. Y.) Stone 1.25

The following books should be added, if possible, to the above list:

ADDITIONAL TEXTS AND REFERENCE BOOKS.

Davison, A., *Mammalian Anatomy, with Special Reference to the Cat*, (1903), (Phila.) Blakiston ..... 1.50
Hertwig, R., ed. by J. S. Kingsley, *A Manual of Zoology*, (1902), Holt ..... 3.00
Hornaday, W. T., *Taxidermy and Zoological Collecting*, (1891), Scribner ..... 2.50
Howes, G. B., *Atlas of Practical Elementary Biology*, (1885), (London) Macmillan ..... 4.00
Jennings, H. S., *Behavior of the Lower Organisms*, (1906), Macmillan ..... 3.00
Kingsley, J. S., *Vertebrate Zoology*, (1899), Holt ..... 3.00
Lubbock, J., *On the Senses, Instinct and Intelligence of Animals, with Special Reference to Insects*, (Internat. Sci. Ser.), (1888), Appleton ..... 1.75
Parker, T. J., and Haswell, W. A., *A Text-book of Zoology*, (2 Vols.), (1910), Macmillan ..... 9.00

*Riverside (formerly Standard) Natural History, ed. by* J. S. Kingsley, (6 Vols.), Houghton .....$ 30.00
Thomson, J. A., *Outlines of Zoology*, (1899), Appleton.. 3.50

BOOKS ON SPECIAL SUBJECTS.

*Insects and Spiders.*

Benton, F., *Honey Bee*, U. S. Dep't of Agriculture, Division of Entomology, New Ser., Bulletin No. 1..... .15
Emerton, J. H., *Spiders, Their Structure and Habits*, (1890), (Boston) Whidden ..... 1.50
Folsom, J. W., *Entomology, with Special Reference to its Biological and Economic Aspects*, (1906), (Phila.) Blakiston ..... 3.00
Holland, W. J., *The Butterfly Book*, (1899), (N. Y.) Doubleday, Page ..... 3.00
Holland, W. J., *The Moth Book*, (1903), Doubleday ..... 4.00
Howard, L. O., *The Insect Book*, (1902), Doubleday ..... 3.00
Howard, L. O., *Mosquitoes*, (1901), N. Y. McClure ..... 1.50
Kellogg, V. L., *American Insects*, (1905), Holt ..... 5.00
Lubbock, J., *Ants, Bees and Wasps*, (International Science Ser.), (1882), Appleton ..... 2.00
Miall, L. C., *Natural History of Aquatic Insects*, (1895), Macmillan ..... 1.75
Packard, A. S., *Entomology for Beginners*, (1888), Holt 1.40
Peckham, G. W., and E. G., *Wasps, Social and Solitary*, (1905), Houghton ..... 1.50
Riley, C. V., *Directions for Collecting and Preserving Insects*, (1892), (Wash.) Smithsonian Institute .... .25
Scudder, S. H., *Butterflies: Their Structure, Changes and Life Histories*, (1889), Holt ..... 1.50

*Crustacea, Worms, Mollusks, Echinoderms and Coelentrates.*

Brooks, W. K., *The Oyster*, (1905), (Balto.) John Hopkins Press ..... 1.00
Darwin, C., *Formation of Vegetable Mould through the Action of Worms, with Observations on Their Habits*, (1892), Appleton ..... 1.50
Huxley, T. H., *Crayfish: An Introduction to the Study of Zoology*, (International Science Ser.), (1895), Appleton ..... 1.75
Hyatt, A., *Commercial and Other Sponges*, (Guides for Science Teaching), (1893), Heath ..... .20

*Vertebrates.*

Bailey, F. M., *Handbook of Birds of the Western United States*, (1902), Houghton ..... $ 3.50
Blanchan, N., *Birds that Hunt and Are Hunted*, (1898), (N. Y.) Doubleday ..... 2.00
Chapman, F. M., *Color Key to North American Birds*, (1903), Doubleday ..... 2.50
Chapman, F. M., *Bird Life: A Guide to the Study of our Common Birds*, (1897), Appleton. Without colored plates ..... 1.75
With colored plates ..... 5.00
Dugmore, A. R., *Bird Homes*, (1900), Doubleday ..... 2.00
Jordan, D. S., *A Guide to the Study of Fishes*, (1905), Holt ..... 12.00
Jordan, D. S., *Manual of the Vertebrates of the Northern United States*, (9th ed.), (1900), McClurg ..... 2.50
Jordan, D. S., and Evermann, B. W., *American Food and Game Fishes*, (1902), Doubleday, Page ..... 4.00
Lankester, E. R., *Extinct Animals*, (1905), Holt ..... 1.75
Marshall, A. M., *The Frog*, (1900), Macmillan ..... 1.10
Reed, C. A., *North American Birds' Eggs*, (1904), Doubleday ..... 2.50
Stone, W., and Cram, W. E., *American Animals*, (1902), Doubleday ..... 3.00

## PHYSIOLOGY.

### ELEMENTARY TEXT AND REFERENCE BOOKS.

Budgett, *Essentials of Physiology*, Saunders ..... 1.00
Colton, *Physiology, Experimental and Descriptive*, Heath 1.15
Eddy, *General Physiology and Anatomy*, Am. Book Co. .. 1.20
Fitz, *Physiology and Hygiene*, Holt ..... 1.12
*Gulick Hygiene Series*, Ginn
I. Gulick, *Good Health* ..... .40
II. Gulick, *Emergencies* ..... .40
III. Jewett, *Town and City* ..... .50
IV. Jewett, *The Body at Work* ..... .50
V. Jewett, *Control of Body and Mind* ..... .50
Hewes, *High School Physiology*, Am. Book Co..... 1.00
Hough and Sedgwick, *The Human Mechanism*, Ginn.... 2.00
Huxley, *Lessons in Elementary Physiology*, edited by Lee, Macmillan ..... 1.40

Jones and Stephens, *Outlines of Physiology*, (Phila.) Blakistons ..... $ 1.50
Krohn, *Graded Lessons in Hygiene*. Appleton ..... .60
Martin, *The Human Body*, (Advanced course), Holt.... 2.50
Ritchie, *Human Physiology*, (Yonkers, N. Y.) World Book Co. ..... .80
Schenk and Güber, *Human Physiology*, tr. by Zoethout, Holt ..... 1.75
Walters, *Physiology and Hygiene*, *Heath* ..... 1.20

## LABORATORY GUIDES.

Beddard, Edkins, Flack, Hill, MacLeod, and Pembrey, *Practical Physiology*, Longmans, Green ..... 4.00
Busch, *Laboratory Physiology*, (N. Y.) Wm. Wood..... 1.25
Gorham and Tower, *Dissection of the Cat*, Scribner..... .90
Hall, *Manual of Experimental Physiology*, (Phila.) Lea & Febigers ..... 2.75
Howell, *Dissection of the Dog*, Holt ..... 1.00
Lombard, *Laboratory Work in Physiology*, (Ann Arbor, Mich.) Geo. Wahr ..... 1.50
Stirling, *Outlines of Practical Physiology*, (Phila.) Blakistons ..... 2.00

## ADVANCED TEXTS AND REFERENCE BOOKS.

Gerrish, *Text-book of Anatomy*, (Phila.) Lea Bros..... 6.50
Greene, *Kirke's Handbook of Physiology* (With Laboratory Outlines), (N. Y.) Wm. Wood ..... 3.00
Hall, *Text-book of Physiology*, (Phila.) Lee Bros. .... 4.00
Howell, *American Text-book of Physiology*, (2 Vols.), Saunders ..... 6.00
Howell, *Text-book of Physiology*, Saunders ..... 4.00
Hutchison, *Food and Dietetics*, Wm. Wood ..... 3.00
Schaefer, *Text-book of Physiology*, (2 Vols.), Macmillan.. 15.00
Simon, *Physiological Chemistry*, Lee Bros. ..... 3.25
Sollman, *Text-book of Pharmacology*, Saunders..... 4.00
Stewart, *Manual of Physiology* (With Laboratory Outlines), Wm. Woods ..... 4.00

## PHYSICAL GEOGRAPHY.

### TEXT BOOKS.

| | |
|---|---|
| Davis, *Physical Geography*, Ginn | $ 1.40 |
| Dryer, *Physical Geography*, American Book Co. | 1.20 |
| Emerson, *Manual of Physical Geography*, Macmillan | 1.40 |
| Fairbanks, *Practical Physiography*, Allyn | 1.60 |
| Gilbert and Brigham, *Physical Geography*, Appleton | 1.25 |
| Salisbury, *Physiography*, Holt | 3.50 |
| Tarr, *Physical Geography*, Macmillan | 1.00 |

### GENERAL REFERENCE BOOKS.

| | |
|---|---|
| Brigham, *Elementary Geology*, Appleton | 1.40 |
| Chamberlain and Salisbury, *Geology*, (Vol. I), Holt | 4.00 |
| Davis, *Meteorology*, Ginn | 2.50 |
| Le Conte, *Geology*, Appleton | 4.00 |
| *Physiography of the U. S.*, American Book Co. | 1.50 |
| Russell, *Glaciers of N. A.*, Ginn | 1.75 |
| Russell, *Lakes of N. A.*, Ginn | 1.50 |
| Russell, *Rivers of N. A.*, Putnam | 2.00 |
| Shaler, *Aspects of the Earth*, Scribner | 2.50 |
| Shaler, *Sea and Land*, Scribner | 2.50 |
| *Interpretation of Topographic Maps*, U. S. Geological Survey, Professional paper No. 60, (free). | |
| Waldo, *Elementary Meteorology*, American Book Co. | 1.50 |

## AGRICULTURE.

*Note.*—Where no price is given, the book is free.

#### BOOKS THAT ARE ESSENTIAL.

| | |
|---|---|
| Bailey, *Nursery Book*, Macmillan | 1.50 |
| Brigham, *Progressive Poultry Culture*, (Cedar Rapids, Iowa) Torch Press | 1.30 |
| King, *Physics of Agriculture*, (Madison, Wis.) pub. by author | 1.75 |
| King, *The Soil*, Macmillan | 1.50 |
| Lyon and Fippin, *Soils*, Macmillan | 1.75 |
| Osterhaut, *Experiments with Plants*, Macmillan | 1.25 |
| Plumb, *Types and Breeds of Farm Animals*, Ginn | 2.00 |

*From the Secretary of Agriculture, Washington:*

1 complete set Farmers' Bulletins, and extra copies, one for each member of the class, of Nos. 44, 123, 143, 154, 157, 187, 203, 218, 229, 255 and 260.

1 copy of list of bulletins for free distribution.

1 copy of list of publications for sale. (Some of these may be obtained through the congressman of the district.)

Year Books, U. S. Dept. of Agriculture.

1 set Missouri Agricultural College Bulletins.

1 set Missouri Board of Agricultural Annual Reports.

1 set Missouri Board of Agricultural Bulletins.

1 copy *A Unit in Agriculture*, Missouri University Circular of Information.

U. S. Bureau of Entomology, Circular No. 59.

U. S. Office of Experiment Station, Circular No. 34.

U. S. Bureau of Soil Study, Circulars Nos. 13, 195.

U. S. Bureau of Plant Industry, Circular No. 30.

U. S. Bureau of Animal Husbandry, Bulletins Nos. 37, 113.

Bureau of Education Bulletins No. 2 (1907).

## BOOKS THAT ARE VERY DESIRABLE, BUT NOT ABSOLUTELY ESSENTIAL.

Bailey, *Cyclopedia of American Agriculture*, (4 Vols.), Macmillan ..... $ 20.00

(This is the very best work of the kind, and will be of much value to patrons as well as to students.)

| | |
|---|---|
| Bailey, *Plant Breeding*, Macmillan | 1.25 |
| Bailey, *Principles of Fruit Growing*, Macmillan | 1.50 |
| Bailey, *Vegetable Gardening*, Macmillan | 1.50 |
| Bowman & Crossley, *Corn*, (Ames, Iowa) pub. by the authors | 2.50 |
| Burkett, *Soils*, Orange Judd | 1.00 |
| *Farm Buildings*, (Chicago) Sanders | 2.00 |
| *Farm Science*, International Harvester Co. (free). | |
| Roberts, *The Horse*, Macmillan | 1.25 |
| Vivian, *First Principles of Soil Fertility*, Orange Judd | 1.00 |
| Voorhees, *Fertilizers*, Macmillan | 1.25 |

## DRAWING.

Batchelder, E. A., *Principles of Design*, (1904), (Chicago) Inland Printer ..... $ 3.00
Batchelder, E. A., *Design in Theory and Practice*, Macmillan ..... 1.75
Brown, G. Baldwin, *The Fine Arts*, Scribner ..... 1.25
De Garmo, *Art Appreciation*, (Syracuse, N. Y.) C. W. Bardeen ..... .40
Dow, A. W., *Composition*, (N. Y.) Baker and Taylor .. 1.50
Duval, M., *Artistic Anatomy*, (N. Y.) Cassell ..... 2.50
Edminster, C. F., *Architectural Drawing*, (N. Y.) Williams ..... 2.00
Froehlich, H. B., and Snow, B. E., *Art Education for High Schools*, (1908), (N. Y.) Prang ..... 1.25
Holme, C., ed., *Modern Pen Drawing*, (N. Y.) Lane.... 4.00
Jackson, T. G., *Lessons in Decorative Design*, (Lond.) Chapman ..... 2.00
La Farge, John, *Great Masters*, McClure, Phillips ..... 2.50
Lilley, A. E. V., and Midgley, W., *Book of Studies in Plant Form*, Scribner ..... 2.00
Longfellow, W. P. P., *Applied Perspective*, Houghton .... 3.00
Maginnis, C. D., *Pen Drawing*, (Bost.) Bates and Guild 1.00
Miller, L. W., *Essentials of Perspective*, Scribner ..... 1.50
Morris, I. H., *Geometrical Drawing for Art Students*, (Lond.) Longmans ..... .60
Mumford, J. K., *Oriental Rugs*, Scribner ..... 7.50
Patridge, W. O., *Technique of Sculpture*, Ginn ..... 1.00
Poore, Henry, *Pictorial Composition*, Baker, Taylor.... 1.50
Reinhardt, C. W., *Lettering for Draftsmen*, (N Y.) Van Nostrand ..... 1.00
Reinach, Solomon, *Apollo or the Story of Art Throughout the Ages*, Scribner ..... 1.50
Rimmer, C. H., *Animal Drawing*, Houghton ..... 5.00
Robinson, *Principles of Architectural Composition*, Arch. Record Co. ..... 2.50
Ross, D. W., *Theory of Pure Design*, Houghton ..... 2.50
Ross, D. W., and others, *Illustrations of Balance and Rhythm*, (Bost.) Clarke ..... 3.00
*School Art Book*, (Bound volumes), (Worcester, Mass.) Davis press ..... 1.00
Spanton, J. H., *Complete Geometrical Course*, Macmillan.. 1.25
Spanton, J. H., *Complete Perspective Course*, Macmillan 1.25

Townsend, W. G. P., *Plant and Floral Studies for Designers*, (N. Y.) Lane ..... $ 2.00
Tracy, J. C., *Introductory Course in Mechanical Drawing*, American Book Co. ..... 1.80
Western Drawing Teachers' Association, *Annual Reports*, (624 So. Grove Ave., Oak Park, Ill.) Ira Griffith.. 1.00
Woodbury, C. H., *Pencil Studies*, (Boston) Prang.... 1.50
*Year Book of the Council of Supervisors*, (Park Ave. and 59th Street, Brooklyn, N. Y.) Dr. J. P. Henry 3.00
The following periodicals are also recommended:
*School Arts Book* (monthly), (Boston) National Art Pub. Co., per year ..... 1.00
*Art and Progress*, (Washington, D. C.) American Federation of Arts ..... 1.50
*The International Studio* (monthly), (N. Y.) John Lane, Per year ..... 3.50

## MANUAL TRAINING.

### WOODWORKING.

Crawshaw, F. D., *Problems in Furniture Making*, (Peoria, Ill.) Manual Arts Press ..... 1.00
Goss, W. F. M., *Bench Work in Wood*, (Chicago) Ginn.. .70
Griffith, Ira S., *Essentials of Woodworking*, (Peoria, Ill.) Manual Arts Press ..... 1.00
Murray, M. W., *Problems in Woodworking*, (Peoria, Ill.) Manual Arts Press ..... .75
Noyes, William, *Handwork in Wood*, (Peoria, Ill.) Manual Arts Press ..... 2.00
Park, J. C., *Educational Woodworking*, Macmillan ..... 1.00
Ritchey, S. E., *Woodwork*, American Book Co. ..... 1.00

### MECHANICAL DRAWING.

Bennett, Charles A., *Problems in Mechanical Drawing*, (Peoria, Ill.) Manual Arts Press ..... 1.00
Mathewson, Frank E., *Notes for Mechanical Drawing*, (Springfield, Mass.) Taylor-Holden Co. ..... 1.25

### PERIODICALS.

Manual Training Magazine, Peoria, Ill. ..... $ 1.50
*School Arts Book*, Worcester, Mass. ..... 1.50
*Craftsman*, New York City ..... 3.00
*Wood Craft*, Cleveland, Ohio..... .50
*American Blacksmith*, Buffalo, N. Y. ..... 1.00

## DOMESTIC SCIENCE AND ART.

### HYGIENE, SANITATION, ETC.

Chittenden, R. H., *Nutrition of Man*, Stokes..... 3.00
Conn, H. W., *Bacteria, Yeasts and Molds in the Home*, Ginn ..... 1.00
Fletcher, Horace, *A. B-Z of Our Own Nutrition*, Stokes.. 1.00
Hutchison, Robt., M. D., *Food and the Principles of Dietetics*, Wm. Wood ..... 3.00
Ravenhill, Alice, *Practical Hygiene*, Whitcomb and Barrows ..... 1.50
Richards and Talbot, *Home Sanitation*, Whitcomb ..... .25
Snyder, Harry, *Chemistry of Plant and Animal Life*, Macmillan ..... 1.25
Snyder, *Human Foods*, Macmillan ..... 1.25

### THE HOUSE AND ITS MANAGEMENT.

Clark, F. M., *Care of a House*, Macmillan ..... 1.50
Daniels, Fred H., *Furnishing a Modest Home*, (Worcester, Mass.) Davis Piers ..... 1.00

### SOCIOLOGY AND ECONOMICS.

Mason, O. T., *Woman's Share in Primitive Culture*, Appleton ..... 1.75
Richards, Ellen H., *Cost of Cleanness*, Wiley..... 1.00
Richards, *Cost of Food*, Wiley..... 1.00
Richards, *Cost of Living*, Wiley..... 1.00
Richards, *Cost of Shelter*, Wiley..... 1.00
Talbot, Marion, *The Education of Women*, University of Chicago Press ..... 1.25

## COOKING AND SEWING.

Barrows, Anna, and Lincoln, Mary J., *Home Science Cook Book*, Whitcomb & Barrows ..... $ 1.00
Farmer, Fannie Merritt, *Boston Cooking School Cook Book*, Whitcomb ..... 2.00
Hill, Janet M., *Up to Date Waitress*, Whitcomb..... 1.50
Williams and Fisher, *Elements of the Theory and Practice of Cookery*, Macmillan ..... 1.00
*Encyclopaedia of Textile Work*, (7 Vols.), (Chicago) American School of Correspondence.

## GENERAL.

The following collection of books, issued by the American School of Home Economis, Chicago, is valuable:

*The House.*
*Household Bacteriology.*
*Household Hygiene.*
*Chemistry of the Household.*
*Principles of Cookery.*
*Food and Dietetics.*
*Household Management.*
*Personal Hygiene.*
*Home Care of the Sick.*
*Textiles and Clothing.*
*Study of Child Life.*
*Care of Children.*

## ECONOMICS.

For references in General Economics, see page 44. To that might be added:

Bullock, *Select Readings in Economics*, Ginn.....$ 2.25
Fetters, *Principles of Economics*, Century Co. ..... 2.00
Seligman, *Principles of Economics*, Longmans..... 2.50

## COMMERCIAL GEOGRAPHY.

Adams, *Commercial Geography*, Appleton ..... 1.10
Davis, *Physical Geography*, Ginn ..... 1.25
Gregory, Kellar & Bishop, *Physical and Commercial Geography*, Ginn ..... 3.00
Trotter, *Geography of Commerce*, Macmillan ..... 1.10