BIOLOGY CODE

by the

CHEMICAL-BIOLOGICAL

COORDINATION CENTER

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of the

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A system for coding results, procedures, and conditions of tests for biological responses to chemicals

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PREFACE

This book describes a system for coding biological responses to chemicals. It is published in two volumes, a Biology Code and its attendant Key. Both were developed by the Chemical-Biological Coordination Center of the National Academy of Sciences--National Research Council in the course of its work of organizing a large mass of chemical-biological data as described hereafter in the Introduction to the Code.

Established in 1946, the Chemical-Biological Coordination Center set out to develop methods for coding information on chemical structures and biological responses. Its ultimate aim was to provide both a repository for such information and means for machine searching of the stored data. Its founders were emboldened by the expectation that if information of this kind could be coded on a large scale, machine methods would provide an important research tool for discovering and exploring correlations between chemical structure and biological activity.

The concept of the Center had its roots in a widely felt need for ways to deal effectively with the growing mass of chemical-biological data, both published and unpublished.

Pertinent experience had been gained during World War II by the testing program of the Insect Control Committee of the Office of Scientific Research and Development. The late Dr. Milton C. Winternitz, in particular, recognized the potential of that program and its possible extension with machine aids to the general field of chemical-biological relationships. With his characteristic dynamic enthusiasm he developed the idea of the Center and guided its establishment as a broad experimental undertaking in the service of science.

The first essential step was the design of coding systems, one for chemical structures and one for biological responses. Newly developed accounting machines were available, and it was decided that punched card, machine sorting techniques should be used.

To devise a coding system for chemical structures was the easier of the two tasks. C. Chester Stock directed the development of the Chemical Code, which was based on an existing scheme, the Frear chemical coding system, selected as a pattern because it was designed for punched cards and was therefore adaptable to machine sorting. As developed by the Center the chemical code was ultimately used to record the structures of approximately 63,000 compounds. It was published by the Academy-Research Council in 1950 under the title, "A Method of Coding Chemicals for Correlation and Classification." Except for a few extensions it was not subsequently modified.

Construction of a coding system for biological responses proved to be more difficult. In 1946 the Center took over, as its Biological Codification Panel, the Biological Codification Committee which had been established under the chairmanship of McKeen Cattell by the OSRD Insect Control Committee. Given the task of devising a satisfactory biological coding system, this Panel carefully reviewed the suggestions of various CBCC subcommittees and in 1950, through the devoted efforts of Raimon Beard, who agreed to assume the immediate direction of the undertaking, a functioning code was established.

Comprehensive studies showed that workable coding procedures had been evolved, and the program of storing chemical and biological data went ahead. The Center collected and coded published data from the periodical literature and unpublished data from screening programs of various agencies, including those participating in the Center's own screening program. A total of some 220,000 punched cards were eventually put into the Center's files, each representing one "unit of information", that is, one biological response to one chemical. These cards were coded from more than 75,000 "code sheets", each containing data from one source of information on the biological responses of one chemical.

Those who used the Biology Code soon realized that the complexities of coding biological responses were such that an explanatory guide would be necessary if the coding and interpretation were to be uniform enough to insure efficient retrieval. Thus the Key to the Biology Code was progressively developed as coding experience grew. Also, the Code itself went through a number of revisions as corrections, additions, deletions, and annotations accumulated steadily.

Despite the loyalty to the Center of agencies inside and outside the Federal Government, which provided financial support through its formative stages and the beginnings of larger-scale operations, funds could not be found to permit its growth to proportions that were considered necessary for its effectiveness, and the Center was regretfully terminated by the Academy-Research Council in 1957.

Many scientists contributed to this experiment in scientific documentation and correlation research. To all of them the gratitude of the Academy-Research Council is due. Chemists and biologists were widely consulted in the establishment of criteria for the coding systems; the names of these individuals are listed in the present book, together with the names of committee and staff members who took part. Also, besides the few to whom reference by name has already been made, special mention should be made of the devoted services to the Center of Walter R. Kirner, its first Director (1946-1952), Karl F. Heumann, its second Director (1952-1956), and George A. Livingston, who was Acting Director during the final year (1956-1957).

After the Center was closed, George A. Livingston, Philip G. Seitner, and Ann S. Williams, all of whom had served in its staff, undertook to prepare the Biology Code and Key for publication. They critically reviewed the accumulated additions, corrections, and suggestions in the files and reconsidered comprehensively the entire biological coding system. To Dr. Seitner fell the task of preparing drafts of the several parts of the Code and Key for the many conferences among the three editors, and of putting the manuscript in its final form.

For their ready acceptance and faithful performance of an exacting assignment, the National Academy of Sciences--National Research Council here records its appreciation to Dr. Livingston, Dr. Seitner, and Mrs. Williams. They have preserved a vital portion of the experience of the Center and have insured that it will be available to scientists and documentalists who can benefit by it.

S. D. CORNELL
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INTRODUCTION

The following descriptions of the Chemical-Biological Coordination Center, its mechanical equipment, and the Biology Code will introduce the reader to the objectives of the Center and the Code. However, reference should also be made to the Appendix. The sections of this Introduction and the Appendix form a unit which explains how the Center attempted to meet its objectives, some of the inherent problems, and its accomplishments.

The Chemical-Biological Coordination Center

The Chemical-Biological Coordination Center (CBCC) was established on the premise that correlations exist between molecular structures of chemicals and biological responses to those chemicals and that studies of structures of chemicals causing known biological responses and of responses caused by chemicals of known structure could be of increasing orientative significance in research. Such studies should be a guide in (1) selection, synthesis, or search for chemicals to be tested for a given biological response and in (2) selecting appropriate responses for which a given chemical should be tested. The basis for such studies was conceived as a collection of data demonstrating the known biological actions of chemicals whose structures are known. The CBCC strived especially to collect the diverse but often meager existing information about biological responses to thousands of tested compounds, rather than to attempt an analysis of the detailed data on the biological responses to only the more well-known and exhaustively tested compounds. The latter information is normally available from monographs, reviews, and textbooks, while the former is frequently difficult to find in the literature or is unpublished. To make practical the study of such a large collection of data, mechanical means must be used for sorting and arranging the information, procedures which involve enormous and impractical expenditures of time when done manually. Thus, the CBCC required a means of converting chemical and biological information to a language of symbols which could be inscribed on a mechanical system. At the time the CBCC was established, no scheme was known to exist which could satisfy the specific and broad needs of the CBCC, either for chemical structures or for biological information.

It is not the purpose here to present a detailed history of the CBCC and describe all its activities; it is hoped that this may eventually be possible. However, certain observations on its evolution and activities which bear particularly on the Biology Code and the CBCC collection of biological data are appropriate. (The sponsors of the Center and the names of committee members and staff members are listed following this Introduction.)

Although the CBCC had collected and organized considerable information from chemical-biological tests prior to the adoption of the present Biology Code, the collecting during that earlier period had to play a subordinate and supportive role to the major objective of developing methods for coding and handling the information. That picture was altered with the adoption of the Code in essentially the form presented here. In 1951, having developed the methods to do so, the Center decided to concentrate on assembling information from every available source to create a file of data of the broadest nature which would permit any conceivable correlation in all fields of biology and with all types of chemicals. This decision was made only by resolving to abandon sponsorship of symposia and preparation of reviews, several of which had been organized prior to 1951; with the funds available, it was not possible to meet both objectives adequately. It seemed reasonable that the path for the Center should be in original directions, not in sponsoring symposia and reviews which, for the immediate future, might be accomplished by other agencies.

Thus, the CBCC organized during 1951 procedures for collecting information and coding it by the previously developed coding scheme. This involved finding coding personnel with adequate biological training, designing a means of training personnel for coding, and establishing a pattern for handling the selection of data to be coded, assigning it to appropriate coders, checking the coding, recording, filing, and IBM punching. A description of each of these procedures is included in the Appendix.

It should again be emphasized that the Center's activities from 1951 were concentrated on building its collection of information and improving its coding (indexing) of the information. Therefore, the evaluation of the Center should be in terms of the contemporary needs for a collection of such special information and for effective methods of handling and indexing it. Correlative studies of structures

of chemicals and biological responses to those chemicals, which has been described as an initial inspiration for this collection, might have been a valuable result of the collection, but the Center was by no means committed to limiting its objectives to complex or theoretical correlative studies.

To a degree, the collection has represented a source of information unavailable anywhere else, partly because some of its sources are not conveniently available to other agencies. This has been a natural result of the CBCC's deliberate efforts to search for more obscure sources of data from chemical-biological tests and the inclusion of test results from the CBCC's own unique and extensive Screening Program. (The Screening Program has been described in the general booklet describing the CBCC, the last edition of which was prepared in 1954.) For this reason, and because the information has been indexed in ways exceeding any other existing index of the information, the CBCC files are regarded as a valuable reference source of information. As the Center's collection became more widely known, the number of information requests coming to the Center increased; most of these requested that the Center report whatever information its files might have on a subject for which the requester gave specifications. The requests were seldom for the Center's performing actual correlation studies, partly because it has been generally understood that such interpretive projects by the Center were impossible in view of the limitation of the Center's staff size and time and partly because generally the actual correlation can only be accomplished, to the ultimate satisfaction of the requester, by the requester himself. The Center has always had the attitude, however, that the files could be made available, by special request, to any visitor for any broad project of data correlation; none of the information included in the file bears a security classification and no material has been included which is restricted for proprietary reasons.

Thus, the Center should be regarded as having been in its first years a source of both information and reference to information, supplementary to all other sources. That this has been appreciated is attested to by the use made of the CBCC files by an impressive number of agencies and individuals. The Center has rightly been regarded, also, as pioneering in the general field of documentation of scientific information, in developing its program for converting chemical and biological data to a form that can be handled practically by mechanical equipment. The CBCC was consulted frequently for advice for establishing other specialized programs of a similar nature and the Chemistry and Biology Codes have been studied and adapted for a number of such programs. Although it has not been possible to conduct broad correlative studies as originally intended (described in the first paragraph as a primary objective), leading to publications and chemical or biological research based on such studies, the Center's files have the important potential of correlative studies. Finally, by a program of collecting chemicals to be distributed to selected testing programs screening chemicals for specific effects, the CBCC Screening Program provided a service to this particular field of research that is probably unique and unprecedented. It made possible the testing of chemicals in many ways for which the agencies isolating or synthesizing the chemicals had no equivalent facilities, provided a rich source of chemicals for testing programs whose sources of untested chemicals were limited, and engendered thereby much information on chemicals' capacities for affecting biological systems, which is made available in the CBCC files and by the CBCC bi-monthly publication, Summary Tables of Biological Tests sponsored by the Chemical-Biological Coordination Center. A summation of the Center's aspirations related to coding of chemical-biological information will be found at the close of the final Appendix.

The announcement of the CBCC's termination was made in December 1956. Therefore, essentially all activities for collection of information and coding into the CBCC files stopped as of that date. Although the files at the date of this publication have not been discarded, they are not generally available in that no staff exists to retrieve information from them. The Screening Program was likewise discontinued. Only one vestige of the CBCC remains active, though it is no longer identified with the Center. This is a specialized project which began as a CBCC responsibility, the Cardiovascular Literature Project of the National Research Council, sponsored by the National Heart Institute, National Institutes of Health. This, however, is not a program for extensive coding and indexing cardiovascular data by CBCC methods nor can it entertain requests for information about references to the literature except through sponsoring agencies. Its objective is to build and publish a comprehensive index to the literature on cardiovascular responses to chemicals, cross-indexed by author, title, and subject, to the extent possible as a publication. The original intent was for the CBCC to incorporate into its coded files all the cardiovascular information, as the project collected it.

The final gesture in closing the Center is this publication of the Biology Code and Key and a description of the Center's procedures for coding information from tests for biological responses to chemicals. While it is possible that no center will ever again be established with precisely the objectives of the CBCC nor would the new staff of such a center be inclined to find entirely suitable the present CBCC Biology Code and procedures for coding, the complete record of the CBCC experience in collecting

and coding this particular information must be a useful guide. Further, individual sections of the Biology Code can be used for coding information other than that from chemical-biological tests; the details would require being reduced or expanded, according to the special needs of the project, but they are presented here as a basis for a beginning.

A Brief History of the Development of the Biology Code

While the Biology Code and coding procedures must be considered to be the products of the Center's early experiments in coding, much important assistance came initially from the several sub-committees whose members were appointed by the Chairman of the National Research Council to serve in an advisory capacity to the Center. The members and chairmen of these committees are listed in another place. One of these committees in particular, the Biological Codification Panel, the Chairman of which was Dr. McKeen Cattell (later, Dr. Raimon L. Beard), guided the first experimental coding efforts.

A detailed comparative review of the coding schemes tried prior to 1951 can not be made here. It is hoped that this can be recorded eventually in a history of the CBCC. However, the following paragraphs record an outline of the events and preliminary codes leading to the present.

In 1949, a code was organized whose symbols were designed for use in recording biological information on IBM punched cards, subsequent to recording the information in code written on "work sheets". This code was entitled the General Biological Code of the Biological Codification Panel, Chemical-Biological Coordination Center. As its name suggests, the items of the code represented generalizations of information from chemical-biological tests; the items of the present Code's Field T-3 illustrate the character of the items of the earlier General Biological Code. A few examples here will assist in understanding this quality of generality: "Information is available relative to viruses"; "The test compound is a plant growth stimulant"; "The test compound affects the blood and circulation"; "The test compound is an insecticide"; "The test compound is a carcinoclastic agent".

The total General Biological Code consisted of approximately 225 of these items, each of which had a different code symbol. With that Code, a single IBM punched card was used for each chemical for which the CBCC had chemical-biological information; on the card, Columns 1 through 54 were designated to be used for information about the chemical, leaving only 22 columns for punching symbols for biological information. (A description of the general IBM punched card will be found in the Appendix.) The symbols for the items of the Code each consisted of three numerical units; the first two indicated a specific IBM punched card column and the third indicated the specific code item. Thus, by using the three IBM zone punches, each column afforded space for 12 code symbols and, in the 22 columns, a total of 264 symbols were available for 264 code items of such general nature as illustrated above. On this single IBM card, all information collected about the given compound's biological effects was punched; in other words, if any additional biological information were obtained, the card was retrieved from the file and the additional information punched on it, rather than placing each piece of information on a separate IBM punched card.

This General Biological Code represented the product of the meetings of the Biological Codification Panel from early 1946 to the end of 1948. That Code was used for approximately a year, resulting in a large file of work sheets. It became apparent, however, from the experimental use of the files built on the Code, that the pattern was inadequate and it was recommended, therefore, that a complete revision be made of the pattern.

The original procedure described above, which used only a single IBM card for each chemical, with the card containing all biological information collected relating to the chemical, was very quickly altered because of difficulties encountered in information retrieval. A new system was established whereby a separate IBM card was punched for each piece of biological information (each card having the information about the chemical used punched in Columns 1 through 54). The CBCC refers to these two systems, historically, as its "single card system" and "multiple card system". In using a separate card for each piece of biological information, it meant that on each card only one symbol would be punched for biological information in the entire 22 IBM punched card columns.

The next development was the preparation of a special experimental code resembling more the detailed character of the present Code. This intermediate code was designed specifically for

information from insecticide tests and included features of the General Biological Code as well as symbols for details of insecticide tests, utilizing the entire space allotted to biology information on the IBM punched card (Columns 55 through 76). At this point, it was resolved to test the three systems, the single card system, the multiple card system, and the code designed especially for entomological data which was a modification of the multiple card system. This test was accomplished by coding the same data by all three systems and attempting retrieval of information from each of the three sets of IBM punched cards. The results of this test led to the decision that the CBCC Biology Code should be a detailed code using multiple cards and that the coding of biological details should be expanded.

Consequently, in the spring of 1950, Dr. Beard visited the CBCC for two weeks at the invitation of the National Research Council and, with the cooperation of the 1950 staff members, guided the revision to provide the coding detail needed. Most of the present coding "fields" were established and, within each field, lists of items were compiled to which code symbols were assigned. A further modification was the separation of the specific information about the test compound and the information about the biological test onto separate IBM punched cards so that the card on which was punched the biological information had only a serial number reference to the chemical used, the information about the chemical being on a special IBM punched card filed separately by that reference number. Thus, many more columns were made available for punching biological information on the special biology card. This code revision was duplicated and distributed internally as the second edition of the CBCC Biology Code.

The Biology Code underwent two revisions within the same year and the fifth edition appeared in 1951. The revisions consisted mostly of changing the sequence of the coding fields as they appeared on the IBM card, adding new fields and new items in each field. It was during 1951 that the intricate procedure was established for the actual selection, coding, punching on IBM cards, and filing of chemical-biological information.

By the end of 1951, a number of coders had been trained and information was being processed into the files. It had become apparent by 1952, from the innumerable problems encountered by the coders, that the Code itself, merely as a list of items and their symbols, was insufficient and that a manual for the use of the symbols under specific situations was essential.

Early in 1952, the Code was revised again and, accompanying this revision, a manual for its use was prepared. The Code was distributed as the sixth edition and the manual, entitled The Key to the Detailed Biology Code, was distributed shortly thereafter. The same edition of the Code was used until the Center was closed in 1957, though a new edition of the Key was issued in 1953. During the years following 1952, a number of supplements to both the Code and Key were prepared notifying coders of changes and additions and by 1957 a revision was actually long overdue.

Mechanical Equipment Used by the CBCC

Before describing and commenting on the Code itself, it is necessary to explain briefly the equipment used for handling the coded information, since only by understanding this background will the design of the Code be appreciated. It is suggested also that the reader refer to the section of the Appendix describing the special procedures used by the CBCC, including description of the special IBM punched cards, the Code Sheets, and the Center's files.

In recent years, research and development of machines for storage and retrieval of information has progressed at a remarkable rate. However, it can safely be said that development of new equipment and methods for greater speed and capacity does not necessarily mean total obsolescence for earlier equipment of lower capacity, since documentation programs differ widely in their needs.

In the case of the CBCC, it was long recognized that the mechanical equipment at its disposal was inadequate for its purposes. It must be pointed out, however, that when the Center's program began, the equipment its information collection eventually demanded did not exist and commissioning the special design and construction of equipment was beyond the Center's resources.

Nevertheless, while the equipment used bears no special design, it does represent an electronic mechanization for handling information which is far superior in speed to any comparable manual method. The CBCC Biology Code and coding methods have been patterned for this mechanized handling, but they are by no means dependent on the machines used and the coding done by use of the Code could be placed

on other types of storage equipment. These observations are made to avoid any possible impression that the Biology Code is designed only for the equipment hereafter described. On the other hand, it should be made clear that this equipment is not being described as obsolete nor is it being necessarily described as inadequate for use with the Biology Code, except under the situation of storing and handling an enormous quantity of data such as that of the CBCC.

Although the scope of the Center's information collection surpasses the capacity of the equipment it used, the fact that its early development has been with this equipment must be considered as a distinct advantage. It means that the procedures developed and described here are applicable to standard business machines which are widely available. It is therefore reasonable to suggest that the special designs for Code Sheets, IBM punched cards for biology coding, and the organization of the Code can be adopted directly for coding projects of more limited scope for which the machines will be fully adequate.

The electronic machines used for handling the information consisted of standard International Business Machine equipment, including IBM punches, sorters, an interpreter, a reproducing punch, and a collator. Detailed descriptions of these machines and their uses are readily available elsewhere.

Sorting has two general applications. The first and more obvious is that of arranging a file of punched cards in a given sequence (for example, in ascending Chemical Serial Number order). The second is in selecting (searching for) a card with a given symbol, or a group of cards related by having a given symbol in common, from a stack of cards or a file that is not in any order or not in such an order that would allow a rapid hand selection of the desired cards to be made. Both IBM sorters, Types 075 and 082, were available for the Center's use.

Collation refers essentially to a process of merging or matching two sets of cards, but the IBM collator is used to perform additional functions; the most important uses to the Center were: (1) checking the filing sequence in files; (2) merging two or more separate groups of cards into one combined file; (3) selection of some desired combination of information on certain cards without disturbing the original order of the remaining card file; and (4) matching two or more groups of cards for coincidence of a given characteristic. The matching operation is probably the most useful in answering questions. An answer that would justify the use of the collator in matching would be composed of at least two "components", ordinarily a chemical component vs. one or more biological components. Each of these may be selected by hand from one of the files and the matching operation then determines which of the cards, having the essential biology information punched on them, match the cards having the essential chemical punching. The matching occurs through any identical punching of the Chemical Serial Numbers between chemistry cards and biology cards.

Automatic reproduction of all or any part of the card may be accomplished on the reproducing punch. This permits establishing at will new or specialized files from existing cards. The same machine was used by the CBCC for the purpose of checking accuracy of punching as follows. The process of punching the information on either biology cards or chemistry cards was performed in duplicate. In other words, the card for the test organism file and the card for the biology serial file were each punched independently by different operators using the same coded information source. The two cards then were matched by the reproducer for identity and accuracy of punching; if a discrepancy between the supposedly identically punched cards occurred, the machine stopped and pointed out the exact discrepancy.

The interpreter is designed to read the card perforations and print the code symbols they represent; it can not interpret the code symbols into the biological information they represent.

In addition, there is an electronic statistical machine (referred to as Type 101) which supplements the sorter. The latter is limited in function by being able to sort only in a single column of the punched card. For certain large tasks, the 101 is preferred because of its capacity to sort not only in a single column, but to sort selectively in many columns simultaneously.

The Biology Code

The General Character of the Biology Code:

While the observations of this division and the next may be regarded as obvious by those readers

accustomed to thinking in terms of coding procedures, indexing, and mechanical storage of information, they are made because it is certain that they are not always immediately or clearly appreciated by new coders.

In gaining initial understanding of the Biology Code, it might be helpful to approach it, perhaps unconventionally, by regarding it as a specially devised language. Indeed, any language is a code for transmission of thought, words being symbols used in an organized fashion. The Biology Code is composed of special symbols which provide at least three advantages, (1) condensation of ideas and ordinary words, (2) facility, resulting from condensation, to be handled by mechanical methods, and (3) a common medium of expression in a multilingual scientific society.

The first of these may be appreciated by having examined the IBM punched card (illustrated and described in the Appendix) and items of the Biology Code. Any word, such as "emulsion" (a physical state of the test compound, Field A of the Code) could be recorded literally by perforations of the IBM card, using eight IBM punched card columns for the eight letters of the word. The purpose of the Biology Code is to reduce this idea to occupy the least possible space and it does so by substituting one symbol (the number 5 in Column 9 on the IBM punched card) for the other symbol (i. e., for the word "emulsion"). Regardless of whether information is to be placed on punched cards or merely written, the brevity represents an advantage in recording.

The abbreviation usually accomplished by devising code symbols, described above as the first of the advantages, provides mechanical advantage. Mechanical selection of a given word or idea is far more simple and rapid when only one mechanical motion or electric contact (or the minimum possible number of mechanical motions or electric contacts) needs to be made to accomplish the selection.

The third advantage presumes that the Biology Code and the manual for its use (i. e., the Key) can be translated into any contemporary language. The Biology Code symbols for the ideas conveyed remain the same and, to the extent that coding itself is successful in expressing information about a test, coded biological information on IBM punched cards (or on any other medium, such as electronic tape) can be universally exchanged.

The Biology Code, then, is first a collection of terms and ideas which represent pieces of information that are typical of experimental application of chemicals to biological systems; these terms and ideas of the Code are expressed in a specially devised language of symbols, each of which is defined by its equivalent in the language by which tests are described. Therefore, the Biology Code might be regarded as a foreign language dictionary in which the words of one language are defined in terms of words of the other.

The original list of terms and ideas ("items") of the Biology Code were those which were recommended by the biologists of the several CBCC subcommittees and biologists of the CBCC staff to meet the objectives of the Center. Since the second edition (refer to the description of the historical development of the Code), many additional items have been added by the staff of the Center, to accommodate coding of all types of biological information.

The Code's organization into fields and the influence exerted by the particular mechanical equipment used on the number and character of the fields are discussed in the following paragraphs.

Fields of the Code Considered as Independent Codes and Indexes:

The information about chemical-biological tests will be seen to lend itself to being organized into categories or types, such as the identity of the organism used, the anatomical part affected, the dosage used, etc.

As explained in the next paragraph, organization of the Code is such that each of these categories of information about chemical-biological tests is treated independently. By virtue of this, any symbol used for an item of one category can be used for another item in another category, just as, in any language, one word symbol may have different meanings according to how it is applied (e. g., "left", "train", "press", "bream", "crab"). Symbol A, therefore, can be used as a symbol for one state of test compounds (adsorbed gas) and can be used also as a symbol for one phylum of test organisms (Chordata), as a symbol for an anatomical organ system (skin), etc., according to the position in which it is placed on the mechanical system.

To be able to treat these categories independently, it is necessary to establish each category's identity in the mechanical system used. Using standard business machines as its basic mechanical

equipment, the CBCC has organized the columns of the IBM punched card into significant categories. (Refer to the illustration of the IBM punched card in the Appendix.) Thus, to cite an example, of the total 80 IBM punched card columns available, the CBCC established that one column (Column 11) was to be reserved for only one category of information, the solvent of the test compound. Since nothing else might be recorded at that position on the card, any symbol being punched in that column must refer to a solvent and can not represent a taxonomy phylum or organ system, nor have any other meaning.

Each of these categories is referred to as a coding "field", being restricted to a single designated ("fixed") area or field of the IBM punched card. Each field bears a strict definition of the category of information that can be coded in it. (In a few fields, the CBCC codes two categories of information when one or both categories has so few items that no coding interference occurs. Examples are Fields A, B, F, K, O, P, and W.) The division of the total Biology Code into fields is discussed in the following section. The alphabetical designations of the fields has no significance except as a convenient reference. These designations were made after the various categories had been arranged in what seemed a convenient sequence for reading the information. Whether the sequence seems equally convenient to everyone is perhaps no more important than whether the position of keys on a typewriter suits everyone's fancy; the significant fact is that they are fixed and the coder and interpreter soon learn their positions. Throughout the Code and Key, the fields are referred to by their alphabetical designations except when it has seemed clearer to refer to them by naming the information category.

It may be understood, then, that the total Biology Code is really a composite of many independent codes. Field A represents a code for physical states of chemicals, Field H is a code for gross anatomical structures, Field T-2 is a code for biological states, qualities, or processes which can be caused or affected by chemicals, etc.

Many of these codes (i. e., independent fields of the CBCC Biology Code) could be used independently and for purposes other than indexing chemical-biological test information. The Taxonomy Code (Field E) might be used for terms of a card index of organisms or information on organisms; the Tumor Code (also Field E), the code for organs (Field H), the code for tissues (Field I), etc., each might be used independently. On the other hand, certain of the Biology Code fields would be of dubious value extracted from the Code; for example, the code for the action of the test compound (Field T-1) has little meaning except when used with an item of Field T-2 indicating the biological state, quality, or process acted on.

The purpose of the CBCC Biology Code (to refer to the several codes or "fields" collectively again) is not cryptogrammic, but documentary; its objective is the indexing of information from chemical-biological tests, using the specially adapted language of symbols. Therefore, each of the coding fields should be regarded as an indexing criterion for storage of information ("documentation"). For example, all chemical-biological tests must involve a biological system, either an organism or a tumor or pathology of an organism; by the use of symbols of Field E, all information recorded by the CBCC is indexed according to the organism, the tumor, or the pathology.

If all information related to a specified organism were wanted and if the arrangement of the file had no relationship to organisms, the only means of sorting out the information desired without disrupting the established order of the file (arranged according to chemicals, e. g.) would be by examining each card for the organism name. To do this manually becomes impractical, if the file is of any size and if such a search is to be made repeatedly. Two alternatives exist, (1) duplicating the cards of the initial file and establishing a second file in which the cards are arranged according to a test organism classification or (2) marking the cards in the original file so that organisms' identities are "recognized" by a mechanical apparatus such as an IBM sorter. The second of these alternatives, made practical by speed of machines, is actually equivalent to the first alternative; in other words, both represent a file of information indexed by organisms. An advantage of the latter is that the two indexes ([1] the index according to which the cards are arranged in the file and [2] the organism index) are contained in a single set of cards, representing conservation of storage space. In addition, information might be wanted related to specified anatomical parts, biological responses, routes of administration, dose size, etc., as well as organism and chemical identities. In the case of each of these, the information could be efficiently sorted from the information collection only by a special file indexed by that criterion (anatomical part, biological response, etc.) and, as in the case of the organism index described above, each can be established within a single file of cards by marking the anatomical part, the biological response, etc. on each card so that it can be recognized and sorted by a mechanical apparatus.

Thus, the basic advantage offered by coding chemical-biological information and placing the coded information on a medium that can recognize and sort the coded information mechanically, such as IBM punched cards or electronic tape or wire, is that many indexes can be composited in a single file, representing an economy of space in information storage. The Appendix will disclose that, in spite of using mechanical equipment and punching all information (i. e., all the indexing criteria) in a single file, the CBCC established several separate punched card files for separate indexes (test organism, host, anatomical part, etc.). While this might seem to contradict the claims just made for conservation of storage space and advantage of machines, it is actually only evidence of a complication arising from the size of the information collection and the limitation of machines used. The Appendix should be consulted for an explanation of this. Under the general section describing the CBCC files, see "Biology IBM Punched Card Files".

A number of the fields of the Code are not expected to be used frequently, if ever, as indexes for retrieval of coded information. Fields T-1, V, and R are fields (i. e., indexing criteria) which should probably be regarded as essentially useless as retrieval criteria (the action of the test compound [increasing, decreasing, initiating, antagonizing, etc.], the time to evaluation of the effect, and the time of treatment with the test compound relative to the time of inoculation, respectively). Fields A, B, C, F, G, K, L, O, P, Q, S, and U (refer to the Code for their descriptions) are of more probable use as indexes, yet are of minor importance compared to the remaining fields, in terms of frequency of use.

Since a number of the coding fields can be regarded as of little importance as general retrieval criteria, they must be considered from other standpoints. First, it should be pointed out that an index which may have a low incidence of use for general retrieval of information in the CBCC coded files may be of critical importance when studying and correlating a mass of chemical-biological information of a circumscribed nature, such as all anti-malarial chemotherapy tests, all rodent repellency tests, all tumor inhibiting tests, etc., since the ability for separation of information according to this detail might be expected to become more important as the study of information becomes more specialized. Secondly, an advantage may be assumed for having available from the mechanized file of information as many details of a test as possible, in a code language, making the coded information as self-sufficient as possible; this would be especially true in the case of a system by which it was not intended that reference would be made to the original data or to a written abstract. The CBCC has regarded coding in the light of both of these aspects and while perhaps none of the coding fields should be considered to be totally valueless as an index, some of them may be regarded as having more significance as a means of expressing in code language all aspects of chemical-biological tests.

The Organization of the Biology Code as Related to the Machines Used for Handling Coded Information:

To return to the matter of determining the number of information categories (coding "fields") to be included in the CBCC Biology Code and the limits of each, it must be recognized that the CBCC was committed to using standard business machines. The limitations of this equipment, as well as the equipment's advantages, were impressed on the structure of the Biology Code. This can be said of every mechanical system and when coded chemical-biological information is placed on other media, such as electronic tape, the limitations and advantages of that system will likewise be impressed on the code used, influencing such decisions as that for the number of information categories.

After studying the IBM equipment and methods, the CBCC decided that the IBM punched card handling of masses of coded information concerning individual chemical-biological tests was practical only by restricting the information about any given test to a single IBM punched card. Having made this decision, coding of information about the test was limited to less than 80 IBM punched card columns. Eight columns are needed for the eight units of the CBCC Chemical Serial Number identifying the chemical used in the test; nine more columns are needed for the six units of the Code Sheet Number, the two units of the Code Line Number, and the single unit of the IBM Punched Card File Number. Thus, actually only 63 columns are available for information coded by the Biology Code. The 63 available columns can not be utilized independently to permit coding of 63 types of information, since a few of the types of information require more than one IBM column. Thus, the CBCC apportioned the available IBM columns to the various categories of information it considered most essential in order to have converted into code language as completely as possible the record of the test and, by the same token, to index the information to provide the greatest possible retrieval and correlative facility.

The Key description of each of the code fields generally explains why a given type of information can be adequately coded using only a single IBM punched card column or why more columns must be

used. Therefore, as the Key is studied, an understanding will be gained of the apportioning of the total available punched card columns to each category of information.

For example, eight IBM punched card columns have been committed to coding the biological system (a test organism or a tumor or pathology of an organism) and this group of eight columns is regarded as a single coding field, representing a major category of biology information. Considering coding of test organisms only, it will be seen that test organisms might be given simple serial numbers, so that the Norway rat might have been assigned Symbol 1, a species of mosquito Symbol 2, a species of bacteria Symbol 3, the tobacco plant Symbol 4, etc. Had this been done, the few hundred (or perhaps, few thousand) organisms that may reasonably be expected to be used in chemical-biological tests might have been accommodated by considerably fewer than eight columns. Instead, the CBCC recognized not only the desirability but the necessity of indicating by code the taxonomic affinities of each organism used. Thus, the total field of eight columns was sub-divided into what might be thought of as sub-fields. As a result, only a single IBM punched card column was assigned to coding of the phyla to which organisms belong; a single column was assigned to coding of classes; a single column to coding of orders; two columns to coding of families; two columns to coding of genera; and one column to coding of species (or strains). As an illustration of the apportioning of IBM punched card columns, this particular example has been chosen with the secondary objective of preventing any initial impression that certain coding fields, such as Field E, have been assigned a number of IBM columns providing a number of code symbols far beyond the needs of the CBCC coding. This misapprehension will be avoided by recognizing that, within the fields representing major categories of information, the IBM columns may be committed to special sub-categories of information such as phyla, classes, or orders of test organisms, the coding of each of which is satisfied by one or two columns.

The question as to whether the 63 available IBM punched card columns are sufficient or are more than sufficient is not to be answered positively one way or the other, except in terms relative to the character of the particular coding project. This is discussed in the Appendix, in terms of the particular needs of the CBCC and of the Code's adaptability.

The Detailed Nature of the Code; Its Limitations and Aspirations:

While the CBCC functioned, there was always the reasonable assumption that any special information collection elsewhere might be advantageously indexed (coded) to be collatable with the Center's coded files. Even with the Center discontinued, it has not been unreasonable to hope that the Biology Code might be accepted as, or serve as the basis for, a standard, so that information might be freely exchanged between open collections and so that information of one collection might be collated with that of another.

Many of the specialized information collections now being initiated are private and some are even confidential for proprietary purposes. Thus, coding of chemical-biological information in these collections may be frankly as much cryptogrammic as it is documentary. Beyond this, most projects of information collection are severely subject to justifications of time and expense in coding; the additional effort of coding to a standard and more complex scheme is, at least under the present situation, not apt to be viewed in many cases as offering foreseeable practical advantage.

When an information collection is limited in scope, the variety of indexing criteria and items is correspondingly less than that needed by the CBCC to index (code) information of all types. For example, if the information collection were never to involve more than twenty or twenty-five organisms, simple sequential code symbols of a single unit might be entirely adequate for organism code identification. The same would be true of categories of information other than test organisms. Because of its broad character, the CBCC Biology Code has frequently been regarded critically as too detailed for practical considerations in indexing information collections of a limited nature.

If it develops that all future collections of information about chemical-biological data are to be collections of specialized nature and that the coding of each is to be referable to none of the others or to no central and standard coding scheme, much of the effort spent on the CBCC Biology Code may prove unfortunately to have been wasted.

This Code is presented with the conviction that it will prove something more than a key to the information collected and coded by the CBCC during its active period. It may be hoped that eventually this Code or a derivative will be found universally acceptable and will serve as the basis for better

exchange, documentation, and correlation of information about biological responses to chemicals than is evident at the present time.

The Manual to the Use of the Biology Code: The Key to the Biology Code

The Origin and Description of the Key:

It has already been noted, in describing the development of the Code, that a manual for its use was discovered very quickly to be essential and that this was first prepared in 1952. The term, "Key", applied to this manual may not have been entirely appropriate in view of the fact that a key to a code is most commonly regarded as the definitions for its symbols while the code is thought of as merely the symbols (i.e., the code language). The term has persisted, however, and the Key to the Biology Code will be understood to refer to the manual for explaining items of the Code, the Code symbols, the procedure for their use, and retrieval of coded information.

A new edition of the Key in 1953 incorporated certain changes, but no major revision was made. In preparing the Key for this published edition, every section has been re-written, attempting to clarify the organization, purpose, and use of each field (i.e., of each "subsidiary code" of the total Biology Code). In this revision, every effort was made to use the many residual notes from coders outlining problems encountered in coding certain information and suggesting additions. It is not inappropriate to point out that many details concerning early decisions about coding procedures and arrangement and use of code items and symbols had never been recorded in an organized fashion or at all, some of the staff members making the provisions have since resigned, and memory of the complex of factors considered in making decisions has been imperfect. As a result, the task of preparing the Key has been difficult and consumed time far beyond expectations. The incentive in making it as thorough as possible has been the conviction of its value, from the standpoints of explaining each field, its future use with the Biology Code per se, and of conveying to the prospective coder or agency considering coding biology information some better idea of the nature of the task which coding represents.

For each field, the Key explains first any special organization of the items in the field and the structure of the symbols for the items. This is followed by a section describing the purpose of the field and its general relationship to the other fields of the Code in coding information about a given chemical-biological test as a "code line". The final section is devoted to details of use of the symbols for specific types of information and it attempts in most cases to explain the reasons for the particular procedure rather than to present the coder or general reader with a stark set of rules and rule exceptions.

The Complexity of the Key and the Complexity of Coding:

Each of the CBCC resident staff members and, doubtless, each of the CBCC coders has the memory of his first reaction to the Key, the manual describing coding of chemical-biological tests using the Biology Code. An introduction to the CBCC Biology Code and Key could hardly omit, therefore, a few words preparing the new coder, or anyone reviewing the Code, for the Key.

The Key, as it is presented here, is an expansion of the 1953 edition. The expansion has been made with the view of explaining, in turn, each coding field more thoroughly than did the earlier editions of the Key.

The detailed character of the Key has met with some criticism. Paradoxically, the criticism is a wind that blows both ways. By persons who have had little experience in reducing chemical-biological test information to code, the suggestion has been made that the present Key for coding biological data is far too detailed and that its intelligibility is reduced by the sheer volume of minutiae. However, when the Key has been criticized by coders, it is to the effect that coding provisions have not always been adequately explained so that, when a special coding problem is encountered, the coder has no recourse but to correspond with the Center, when he might otherwise have been able to understand himself how to accomplish the solution.

The initial impact of such a volume of details might understandably alarm the uninitiated, making the Code seem more intricate than it actually is. This is possibly because coding is so frequently expected to be easy, mechanical, and requiring a minimum of cerebral exertion; to discover it might be otherwise can be a rude awakening. It is of course ironical that the CBCC, which had as

one of its objectives facilitating the handling of information, may be subject to having its own Code's description (i. e., the Key) criticized as being abstruse because of its concern with detail. A more careful examination will reveal that the bulk of the Key is made of basic explanations, to which the coder need seldom return once the general coding pattern is well in mind, and explanations for special and sometimes rare coding problems, to which the coder will turn when a problem is encountered.

One observation which may prove a common one has been made, that too little has been assumed in the text of the Key and that much explanation has been made that is unnecessary and even unflattering to the chemical or biological specialist. The CBCC conviction that this assumption is a serious error is based on experience with persons who have proved talented as coders and who have considerable erudition in one or another special field of biology and chemistry. They do not all know, nor do any pretend familiarity with, all biology and chemistry met with in chemical-biological tests. Furthermore, none of them had, prior to their CBCC association, experience in transforming these facts to a coded state. It is unrealistic to make the assumptions that all biologists are necessarily trained in all fields of biology and chemistry or that they remember all aspects of the field in which they have concentrated their study. A professional taxonomist should not assume the taxonomy of insects, for example, to be well known by each pharmacologist. The pharmacologist should not expect antagonism and its measurement to be well known to the taxonomist.

Neither is it realistic to assume that these scientifically trained persons will all find easy the translation of biological data into code, even if the data are completely understood. It can not even be assumed that everyone assigned as a coder to a coding project is necessarily to be trained in the biological sciences. Thus, the persons for whom the Key is intended to be a reference are highly varied in their training.

However, the Key is not actually written nor intended for the biologically untrained person. It is intended as a coding manual for persons untrained in coding, whether they are biologists, chemists, or otherwise. There must be some middle ground in presenting the explanation for coding and the present approach is to assume that principally biologists are being addressed, but emphatically biologists of all descriptions: pathologists, plant physiologists, horticulturists, animal taxonomists, bacteriologists, anatomists, pharmacologists, biology librarians, etc.

Coding can be reduced to a simple procedure in some cases, but even the most simple coding demands establishing conventions which must be adhered to and the conventions must be logical. Furthermore, if the coder is trained as a scientist, it is probable that he has the curiosity to want to understand the reasoning behind the coding procedures. The reasons for a given procedure must be understood not only for establishing other procedures the character of which must depend on already existing procedures, but for intelligent retrieval of information coded by those procedures.

It is difficult for persons who have not contended with coding problems to appreciate what these facts mean and how invaluable are the details explaining coding conventions that must be adhered to. To entertain the opinion that the explanatory details are superfluous can only mean a lack of appreciation of the enormous amount of time and patience (and money) wasted under circumstances in which there exists no single reference to those details that are so easily forgotten or become confused.

The composition of this Key has as its objective the provision of a reference for coding procedures. If a more brief Key is more practical for ordinary use in coding chemical-biological information, by all means it should be devised by the adapter, and this can be done from the information in the present Key.

Considerations in Publishing the Details of the Biology Code and Key

Certain questions were posed by the circumstances of the Biology Code and Key being published only after the disruption of all activities of the Center. No serious doubts have been held about the basic matter, that the Center's experience in biology coding should be made available by publication of the Biology Code, including a record of the procedures used by the Center for handling of biological information. However, at the time the task was begun for preparing the publication, two indeterminate factors made difficult certain decisions about the form in which the Code should be published.

First, the disposition of the CBCC collection of coded information was uncertain. Therefore, there was no assurance that the files, as static files, would ever again be consulted on a regular basis, a factor that was irrespective of the undetermined intrinsic worth of the finite collection. However, the assumption was made that the files might possibly be used and that the unaltered Biology Code might be needed for its interpretation.

The second factor was the question of the extent of usefulness of a Biology Code whose design and detail had been based on the special objectives and mechanical equipment of the CBCC. The Code was recognized as being too detailed and broad in scope for use in coding and indexing information collections of very limited nature, and not sufficiently detailed in certain of its coding fields for certain other uses. It was disturbing also to recognize that the act of closing the Center had the unfortunate but unavoidable effect of creating an atmosphere of failure which the Center's Code and methods would bear with them. For these reasons, an alternative to publishing the Biology Code in its entirety had to be considered, that of publishing only an outline of the Code with examples and a very brief resume of the use of the Code.

It was finally agreed that the greatest value of the CBCC experience in coding biological information actually resided in those details which would be omitted in publishing only an outline.

The Code and Key, therefore, are presented here in essentially the form used by the Center.

The question as to whether to make revisions for the published form was finally settled by resolving to incorporate all the suggestions made by coders and resident staff members, since it seemed senseless to present, as a publication, a code in which there were recognized deficiencies that could be corrected. This decision was made in the face of the impossibility of altering the files to bring them to conformity with any alterations in the Code and Key. Thus, there was the prospect of defeating one purpose in publication, that of preserving the Code as an interpretive tool for the CBCC files of information. The decision to incorporate changes had to be made, then, by accepting the philosophy that the balance of the argument was for a corrected version for publication, leaving the files to be interpreted by the last unpublished edition of the code lists, assisted by information in the published Key and Code.

It must be made clear that most of the alterations are minor. In most fields, no changes have been made except to enlarge and, it is hoped, to clarify the definition and use of symbols. In certain of the fields, some of the items have been only slightly rearranged or redefined to make a more logical pattern and this has involved making a few changes in symbols. On the other hand, the lists of the Taxonomy Code (Field E) were all reviewed and the classification and code symbols were revised where it seemed appropriate. The published symbols for test organisms must therefore no longer be depended on for retrieval from the CBCC files, even though certain of the organism groups are essentially as they were when the information in the files was coded. It might be said that, had there been promise of resumption of coding information into the CBCC files, revisions of the Taxonomy lists might have been more conservative in view of the task it might involve to retrieve all the coded information and recode it according to the new lists.

The Tumor Code and Pathology Code were both analyzed and the organization and symbols entirely replaced; neither had been used to any extent by the CBCC, because so few tumor and pathology identities had actually been needed for coding the type of information selected by the CBCC. Unfortunately, no explanation was prepared or survived for the original Pathology Code symbols and very little was recorded for the Tumor Code. The analysis of these sections of the Biology Code, in terms of time and effort, was an expensive lesson which strengthened the conviction that the detailed explanation of the Biology Code and its parts are more valuable than the bare lists of code items and symbols which conceivably might be compiled by anyone.

In preparing this edition of the Code (as a list of symbols with their definitions), there has been some deviation from the principle of restricting the definitions of symbols to the briefest possible form. The merits of brevity are not underestimated, especially when speed is important in scanning a list to select the most appropriate item; to provide this quality to the Code, essentially all instructions and explanations are omitted from it and compiled separately as the Key. Nevertheless, there are limits to which abbreviation can be carried beyond which the definitions and efficiency in use are impaired. It has seemed certain that confusion of the coders and many errors in coding have been directly due to inadequacies of explanation and definition in the Code (regardless of the adequacy of explanations in the Key). This is also indicated from the experience of the resident staff members in using the Code.

Weighing the factors involved, the definitions have been expanded in some fields, including more specific directions than was typical of the mimeographed editions used previously by the CBCC coders.

When a coder uses certain symbols constantly, he eventually becomes so familiar with their use and limitations that he needs no longer to refer to the Key nor even consult the definition in the Code. While this may lead to overconfidence which may in turn lead to coding errors, it is reasonable that the coder who has developed familiarity with the symbols would prefer having those symbols listed with definitions of one word or the fewest possible words. A given coder, however, never uses all of the Code's symbols with consistent frequency; some symbols are rarely used. Further, although coding has been generally assigned in accordance to coders' special biological fields of interest, this is not always possible and coders constantly must use symbols with whose definitions and use they are less familiar. It is certain that a beginning coder finds helpful having a relatively complete and distinguishing definition for each symbol, including basic specifications for its use, with the symbol in the Code; anyone examining the Code lists, in considering their appropriateness for other coding projects, should also find advantageous more complete definitions of the symbols.

Whether a proper balance has been struck between the completeness of definitions in the Code and the explanations of the Key, can not be certain. It is probable that, from the present Code, each coder or coding project might want to extract the items used most frequently and list them with definitions of the desired brevity.

Appendix B further discusses the published Code's character and adaptability, as well as CBCC problems and ambitions related to the Biology Code and its coding procedures.

ACKNOWLEDGMENTS

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It is appropriate in this publication to express special gratitude to the two last named agencies, since without the continued interest and support of NSF and NIH, the present edition of the Code could not have been completed as the editors wanted it.

The general responsibility for all terminating activities of the CBCC was placed on the NAS-NRC Division of Chemistry and Chemical Technology of which Dr. Clem O. Miller is Executive Secretary. Completion of the review and amendment of the Biology Code, which have been made under irregular and often trying circumstances, has frequently depended on Dr. Miller's administrative efforts and his faith in the judgments of the editors. For bearing with this undertaking and its problems over the many months, the editors wish to express their gratitude to Dr. Miller.

On the following pages are listed members of those CBCC committees and subcommittees which contributed particularly to the early development of CBCC methods for handling biological data, including the initial codes. The Biology Code also owes much to various members of the CBCC staff, including the coding staff. Consequently, in recognition of their varied contributions to the Code, the members of the resident staff, including biologists, chemists, and supervisors of the Screening Program, are listed, as well as the non-resident coders of the final years.

CBCC COMMITTEE MEMBERS
(Dates are approximate only)

Adams, Roger: Advisory Committee 1947 through 1952; Chairman of the Organic Chemistry Subcommittee 1947 through 1952.

Ball, Eric G.: Member of the Biochemistry Subcommittee 1947 through 1952.

Barron, E. S. G.: Member of the Biochemistry Subcommittee 1947 to 1949.

Bauer, Walter: Member of the Medicine Subcommittee 1947 through 1949.

Beard, Raimon L.: Member of the Biological Codification Panel 1947 through 1952. Chairman of the Biological Codification Panel 1951 and 1952. Member of the Executive Committee 1949 through 1950. Member of the Entomology Subcommittee from 1949 through 1952; chairman of the Entomology Subcommittee from 1950 through 1952. Member of the 1952 Steering Committee.

Bernheim, Frederick: Member of the Physiology-Pharmacology Subcommittee 1947 to 1949.

Bishopp, Fred C.: Member of the Entomology Subcommittee 1947 through 1952.

Blanchard, Kenneth C.: Member of the Chemotherapy Subcommittee 1947 through 1952.

Bodenstein, Dietrich: Member of the Entomology Subcommittee 1947 through 1952.

Boell, E. J.: Member of the Biological Codification Panel 1947 through 1952.

Bovarnick, Max: Member of the Microbiology Subcommittee 1947 to 1949.

Boyce, A. M.: Member of the Entomology Subcommittee 1947 to 1949.

Brown, Thomas M.: Member of the Medicine Subcommittee 1950 through 1952; vice-chairman of the Medicine Subcommittee 1951 through 1952.

Cannan, R. Keith: Alternate member of the Executive Committee (alternate for Dr. Winternitz) 1952 through 1953. Member of the Executive Committee 1953 to 1957.

Cattell, McKeen: Member of the Advisory Committee 1947 through 1952; vice-chairman of the Advisory Committee 1948 to 1949; chairman of the Advisory Committee 1949 to 1952 when Advisory Committee was discontinued. Chairman of the Physiology-Pharmacology Subcommittee 1947 through 1952. Chairman of the Biological Codification Panel 1947 through 1950; member of the Biological Codification Panel through 1952. Member of the Executive Committee 1948 through 1952. Member of the 1952 Steering Committee.

Chambers, William H.: Member of the Physiology-Pharmacology Subcommittee 1947 through 1952.

Cleland, Ralph E.: Member of the Executive Committee 1950.

Comroe, Julius H., Jr.: Member of the Physiology-Pharmacology Subcommittee 1947 through 1952.

Cope, Arthur C.: Member of the Organic Chemistry Subcommittee 1947 through 1952.

Cottam, Clarence: Member of the Mammology Subcommittee 1947 through 1952.

Davis, Bernard D.: Member of the Microbiology Subcommittee 1949 through 1952.

De Beer, Edwin J.: Member of the Committee on Industrial Liaison 1954.

Drake, Nathan L.: Member of the Organic Chemistry Subcommittee 1947 through 1952; vice-chairman of the Organic Chemistry Subcommittee late 1947 through 1952.

Dubos, René J.: Member of the Microbiology Subcommittee 1947 to 1948.

Dunham, Lucia J.: Member of the Malignancy Subcommittee 1952.

Eagle, Harry: Member of the Advisory Committee 1947 through 1952. Chairman of the Chemotherapy Subcommittee 1947 through 1952.

Elderfield, Robert C.: Member of the Organic Chemistry Subcommittee 1947 through 1952.

Fothergill, Leroy D.: Member of the Microbiology Subcommittee 1947 through 1949.

Friend, Roger B.: Member of the Advisory Committee 1947 through 1950. Member of the Entomology Subcommittee 1947 through 1952; chairman of the Entomology Subcommittee 1947 through 1950.

Fruton, Joseph S.: Member of the Advisory Committee 1947 through 1950. Member of the Biochemistry Subcommittee 1947 through 1952; chairman of the Biochemistry Subcommittee 1947 through 1950.

Gellhorn, Alfred: Member of the Malignancy Subcommittee 1950 through 1952.

Gersh, Isadore: Member of the Malignancy Subcommittee 1950 through 1952.

Gilman, Alfred: Member of the Physiology-Pharmacology Subcommittee 1947 through 1952. Member of the Biological Codification Panel 1947 through 1952.

Goddard, David R.: Member of the Advisory Committee 1947 through 1952. Chairman of the Plant Sciences Subcommittee (originally the Plant Physiology Subcommittee) 1947 through 1952. Member of the Biological Codification Panel 1948 through 1952. Member of the 1952 Steering Committee.

Griggs, Robert F.: Member of the Advisory Committee in 1947. Chairman of the Plant Ecology Subcommittee which was discontinued in 1947.

Hagan, William A.: Member of the Veterinary Medicine Subcommittee 1947 through 1952.

Hall, Stanley A.: Member of the Committee on Coding of Chemical Reactivities 1953 to 1957.

Hanson, Harry G.: Member of the Sanitary Engineering Subcommittee 1947 through 1952.

Harris, Stanton A.: Member of the Committee on Industrial Liaison 1954.

Harvey, A. McGehee: Member of the Advisory Committee 1948 through 1952. Member of the Executive Committee 1948 through 1950. Member of the 1952 Steering Committee. Member of the Medicine Subcommittee 1947 through 1952; Chairman of the Medicine Subcommittee 1948 through 1952.

Henderson, John M.: Member of the Sanitary Engineering Subcommittee 1947 through 1952.

Herriott, Roger M.: Member of the Biochemistry Subcommittee 1947 through 1952.

Hilbert, G. E.: Chairman of the Committee on Coding of Chemical Reactivities 1953 to 1957. Alternate member of the Executive Committee 1953 (alternate to Dr. W. A. Noyes).

Hodge, Harold C.: Member of the Executive Committee 1953. Chairman of the Committee on Industrial Liaison 1954.

Horsfall, James G.: Member of the Plant Sciences Subcommittee (originally called the Plant Physiology Subcommittee) 1947 through 1952. Chairman of the Executive Committee 1953 to 1957.

Hotchkiss, Rollin D.: Member of the Microbiology Subcommittee 1949 through 1952.

Hueper, Wilhelm C.: Member of the Malignancy Subcommittee 1952.

Irish, Don D.: Member of the Committee on Industrial Liaison 1954.

Jellison, William L.: Member of the Subcommittee on Mammology 1947 through 1952.

Johns, Iral B.: Member of the Committee on Industrial Liaison 1954.

Kearns, Clyde: Member of the Committee on Coding of Chemical Reactivities 1953 to 1957.

Kellog, Remington: Member of the Advisory Committee 1947 through 1952. Chairman of the Mammalogy Subcommittee 1947 through 1952.

Kelser, Raymond A.: Member of the Advisory Committee 1947 through 1952. Chairman of the Veterinary Medicine Subcommittee 1947 through 1952.

Kirner, Walter R.: Member of the Executive Committee 1951; Secretary of the Executive Committee and Director of the Center to 1952.

Kruse, C. W.: Member of the Sanitary Engineering Subcommittee 1947 through 1952.

Larkey, Sanford V.: Member of the Executive Committee 1954 to 1957.

Lee, Milton O.: Alternate member of the Executive Committee (alternate for Dr. P. Weiss) 1953.

Longcope, Warfield T.: Member of the Advisory Committee 1947; replaced by Dr. Harvey in 1948. Chairman of the Medicine Subcommittee 1947.

MacLeod, Colin M.: Member of the Chemotherapy Subcommittee 1947 through 1950. Vice-chairman of the Chemotherapy Subcommittee late 1947 through 1950.

Marsh, David Fielding: Member of the Physiology-Pharmacology Subcommittee 1950 through 1952.

Martin, Harry M.: Member of the Veterinary Medicine Subcommittee 1947 through 1952.

Maynard, L. A.: Member of the Executive Committee 1956.

Metcalf, Robert L.: Member of the Entomology Subcommittee 1949 through 1952.

Meyer, K. F.: Member of the Medicine Subcommittee 1947 through 1950.

Meyer, Samuel L.: Member of the Committee on Coding of Chemical Reactivities 1953 to 1957.

Mitchell, John W.: Member of the Plant Sciences Subcommittee 1949 through 1952.

Mosettig, Erich: Member of the Chemotherapy Subcommittee 1947 through 1952.

Mueller, John H.: Member of the Advisory Committee 1947; replaced by Dr. Tatum in 1948. Chairman of the Microbiology Subcommittee 1947.

Niemann, Carl: Member of the Biochemistry Subcommittee 1947 to 1949.

Noyes, W. Albert, Jr.: Member of the Advisory Committee 1947 through 1952. Member of the Executive Committee 1948 through 1953. Chairman of the Physical Chemistry Subcommittee 1947 through 1952.

Ormsbee, Richard A.: Member of the Biological Codification Panel 1947 through 1948.

Patton, Robert L.: Member of the Entomology Subcommittee 1947 through 1952.

Perry, Isabella: Member of the Malignancy Subcommittee, 1951 through 1952.

Philips, Frederick S.: Member of the Malignancy Subcommittee 1951 through 1952.

Pincus, Sol: Member of the Sanitary Engineering Subcommittee 1947 through 1949.

Renn, Charles E.: Member of the Sanitary Engineering Subcommittee 1947 through 1952.

Rhoads, C. P.: Member of the Advisory Committee 1947 to 1949. Chairman of the Malignancy Subcommittee 1947 to 1949.

Roeder, Kenneth D.: Member of the Biological Codification Panel 1947 through 1952.

Rossini, Frederick D.: Member of the Executive Committee 1956 to 1957.

Schoening, Harry W.: Member of the Veterinary Medicine Subcommittee 1947 through 1952.

Schwartz, Benjamin W.: Member of the Veterinary Medicine Subcommittee 1948 through 1952.

Seevers, M. H.: Member of the 1952 Steering Committee.

Shepard, Harold H.: Member of the Biological Codification Panel 1947 through 1952. Member of the Entomology Subcommittee 1952.

Skipper, Howard E.: Member of the Malignancy Subcommittee 1951 through 1952.

Smith, Paul K.: Member of the Physiology-Pharmacology Subcommittee 1948 through 1952.

Snyder, John C.: Member of the Microbiology Subcommittee 1949 through 1952.

Sparks, William J.: Member of the Executive Committee 1954 through 1955.

Stein, William H.: Member of the Biochemistry Subcommittee 1949 through 1952: chairman of the Biochemistry Subcommittee 1950 through 1952.

Sterner, James H.: Member of the Committee on Industrial Liaison 1954.

Stock, C. Chester: Member of the Executive Committee 1949 and 1950. Chairman of the Malignancy Subcommittee 1951 through 1952. Member of the Biological Codification Panel 1947 through 1952.

Tatum, E. L.: Member of the Microbiology Subcommittee 1949 through 1952. Chairman of the Microbiology Subcommittee 1948 through 1950. Member of the Advisory Committee 1948 through 1950.

Taylor, John F.: Member of the Biochemistry Subcommittee 1949 through 1952.

Treffers, Henry P.: Vice chairman of the Microbiology Subcommittee 1948 through 1950; chairman of the Microbiology Subcommittee 1950 through 1952.

Tukey, H. B.: Member of the Plant Sciences Subcommittee (originally the Plant Physiology Subcommittee) 1947 through 1952.

Weiss, Paul A.: Member of the Executive Committee 1951 through 1955.

Welch, A. D.: Chairman of the Malignancy Subcommittee 1948.

Weston, Arthur W.: Member of the Committee on Coding Chemical Reactivities 1953 to 1957.

Whitaker, Douglas: Member of the Executive Committee 1950 and 1951.

Whitman, Bradley: Member of the Committee on Coding Chemical Reactivity 1953 to 1957.

Willaman, J. J.: Member of the Committee on Coding Chemical Reactivity 1953 to 1957.

Winternitz, M. C.: Chairman of the Executive Committee 1948 through 1950. Member of the Executive Committee 1948 through 1952. Chairman of the Advisory Committee 1947 through 1950. Chairman of the Pathology Subcommittee 1947.

Wiselogle, Fred Y.: Member of the Committee on Coding Chemical Reactivities 1953 to 1957.

Wolman, Abel: Member of the Advisory Committee 1947 through 1952. Chairman of the Sanitary Engineering Subcommittee 1947 through 1952.

Woodard, Geoffrey: Member of the Mammalogy Subcommittee 1947 through 1952.

Woods, Lauren A.: Member of the Committee on Coding of Chemical Reactivities 1953 to 1957.

Yeager, J. Franklin: Member of the Entomology Subcommittee 1947 through 1952.

Zapp, John A.: Member of the Committee on Industrial Liaison.

CBCC Technical Staff

Ballard, Delbert L.: May 1947 to 1954

Beard, Raimon L.: July 1946 to March 1947

Billingsley, Alice M.: Jan. 1955 to Jan. 1957

Brown, Rosamond: Sept. 1956 to Jan. 1957

Chambers, Richard: Nov. 1954 to Jan. 1957

Cicala, Lorraine: June 1951 to Jan. 1957

Dale, Estaleta: Oct. 1947 to Nov. 1956

Davison, Margaret C.: Dec. 1949 to May 1954

Defandorf, James H.: July 1956 (Contd. in CVLP*)

Filippi, Michael J.: July 1946 to May 1952

Geer, Harriett A.: July 1946 to Oct. 1954

Heumann, Karl F.: Sept. 1946 to Sept. 1947; Sept. 1952 to Sept. 1955

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Kirner, Walter R.: 1946 to April 1952

Kraybill, Herman F.: Feb. 1948 to March 1949

Krop, Stephen: March 1951 to July 1952

Lee, Lucy C.: July 1946 to March 1957

Livingston, George A.: June 1953 to June 1957

MacMillan, Judith T.: June 1955 (Contd. in CVLP)

Maskaleris, Chris H: July 1946 to Oct. 1954

Moser, Jean: July 1946 to Nov. 1947

Patterson, Helen: June 1955 (Contd. in CVLP)

Rich, Edgar C.: July 1955 (Contd. in CVLP)

Schuyler, Patricia: Feb. 1947 to Dec. 1947

Seitner, Philip G.: June 1953 to April 1957

Smith, Paul K.: April 1947 to March 1950

Smyrniotis, Pauline: March 1947 to March 1949

Thurlow, John F.: Nov. 1950 to Nov. 1952

Thurlow, Marian P.: July 1946 to Nov. 1952

Welt, Isaac D.: July 1953 (Contd. in CVLP)

White, Florence: Sept. 1956 to Jan. 1957

Williams, Ann S.: July 1947 to 1957

Wood, G. Congdon: Nov. 1952 to March 1957

Non-resident CBCC coders, 1954 through 1956

Ackerman, Lloyd

Beard, Frances C.

Berueffy, Robert

Chambers, Jacqueline

Gauch, Martha

Hill, Charles

Kaplan, Leo

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Leonard, Clifford S.

Love, Lois

Parton, Jacqueline

Simons, H. C. R.

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*CVLP: Cardiovascular Literature Project, National Academy of Sciences - National Research Council

FOREWORD

Each division of this volume represents one of the major categories of information which may be about, or derived from, a test for biological responses to chemicals. Examples are (1) state of the chemical, (2) organism, (3) dose size, (4) path of administration, and (5) response. Information of any one category is recorded (both as a written abstract and in written code) in only one specified location (i.e., a fixed position) on Biology Code Sheets; subsequently, it is punched (in code) in an analogous fixed position on Biology IBM Punched Cards. The fixed area of the Code Sheet or punched card used for one category may be larger or smaller, according to the nature of the category (e.g., the area for the organism is larger than the area for the state of the chemical); the area is referred to as a coding "field" on both the punched card and Code Sheet. In CBCC parlance, the categories have come to be referred to simply as "fields"--for example, the "dosage fields", "taxonomy field", and "anatomy field". For more convenient reference, however, these fixed coding fields have been assigned alphabetical designations. For example, Field A is concerned with states of the chemicals tested, Field E with the name of organisms, pathologies, or tumors treated, Field H with the anatomical parts affected, etc. Under each information category ("field") of this Code are classified the many specific items belonging to that category, each item being accompanied by its assigned code symbol.

In the Introduction and Appendixes, the role of the Code for indexing, machine handling, and storage of chemical-biological information is discussed.

Within each field, the organization is according to the numerical and alphabetical sequence of the items' code symbols. Since the symbols reflect the classification within a field, the items themselves are listed according to their natural relationships.

To find an item of a given field, it is necessary to scan the field. No index is furnished for any of the fields, since, in using the Code, positions of the items are quickly learned, after which an index to a field becomes more an impediment than an assistance.

Special directions and distinctions for use of code symbols are included with the items of the Code in cases where it has seemed appropriate for expediting coding. However, these are as brief as possible and are included in the Code only when needed to delineate the idea which the code symbol is to convey.

Directions for coding information about any chemical-biological test by use of the symbols, as well as explanations for the construction and arrangement of symbols, are in a separate volume designated as the Key to the CBCC Biology Code. The Code and Key have been published in separate volumes, because it has been found the most practical arrangement for use of the Code.

In the Code's symbols, the capital letter O and the numerical zero are distinguished by using the special symbol "Ø" for the letter O. (For persons using the CBCC IBM Punched Cards, it should be observed that the IBM Interpreter distinguished these two symbols in the reverse way, the zero being typed by the Interpreter as "Ø" and the letter O as "O".)

FIELD A
Column 9

(1) PHYSICAL STATE OF THE TEST COMPOUND

(2) INDICATION OF DIRECT, MASS APPLICATION VS. REMOTE, PARTICULATE APPLICATION (I. E., DISPERSION VS. APPLICATION OF THE UNDISPERSED COMPOUND)[1]

(3) INDICATION THAT INFORMATION ON CORRELATION OF ACTIVITY AND CHEMICAL STRUCTURES OCCURS IN THE DATA SOURCE

Note: With only one or two exceptions, coding in Field A is restricted to a description of the state and method AT THE TIME OF APPLICATION to the host or the test organism. See the Key for specific directions and explanation of exceptions.

1	Gas; vapor (a compound applied in a normal environment such as air, water, or soil; either undiluted or a per cent composition of a mixture with air, components of air, or other innocuous gas)	
A	Adsorbed gas	
2	Liquid (undiluted compound, not dispersed)	
B	Liquid (undiluted compound) applied as a spray	
K	Liquid (undiluted compound) applied as a mist or aerosol	
3	Solid (undiluted compound, not dispersed)	
C	Solid (undiluted compound) applied as a dust	
4	Solution (not dispersed)	(The solvent, if specified, should be expressed in Field C.)
D	Solution applied as a spray	
M	Solution applied as a mist or aerosol	
5	Emulsion (not dispersed)	(The vehicle, if specified, should be expressed in Field C.)
E	Emulsion applied as a spray	
N	Emulsion applied as a mist or aerosol	
6	Suspension (not dispersed)	(The conditioning agent, if specified, should be expressed in Field B; the vehicle, if specified, would be in Field C.)
F	Suspension applied as a spray	
Ø	Suspension applied as a mist or aerosol	
7	Suspension in a solid (not dispersed) (salve or powder)	
G	Suspension in a solid, applied as a dust (dust = dispersed powder)	
O	The article contains information on the correlation of activity and structure of chemical compounds.	

[1] "Dispersion" is used here to mean scattering the test material by use of a sprayer, atomizer, duster, aerosol; "dispersion" is NOT used in Field A definitions of the Code to describe mechanical spreading or smearing of the test material over the surface of--or diffusing through the substance of--a test organism or host. An examination of the Code terms will clarify this.

(1) CONDITIONING AGENT

(2) MISCELLANEOUS INFORMATION ABOUT THE TEST COMPOUND ADMINISTRATION

(3) INDICATION THAT IN THE DATA SOURCE THERE IS INFORMATION ON THE EFFECT OF pH ON THE CHEMICAL ACTION

1 Presence of conditioning agents such as spreading agents, wetting agents, detergents, emulsifiers, etc. (Use this symbol when other more specific symbols cannot be used.) Examples: Tween-80 and Tergitol.

2 Gelatin

3 Gums (gum arabic, gum acacia, etc.)

4 Synthetic colloids (polyvinyl alcohol, carboxymethylcellulose, etc.)

5 Agar; alginate

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6 Test compound is not pure; it is applied as a formulation. (A formulation is defined as a product containing a given proportion of the test compound, the remaining ingredients being disregarded and presumably inert.) Use Symbol 0 for indicating that the test compound is administered as a mixture.

7 Test compound is administered as a precursor (from which the test compound is biologically synthesized or degraded); the action is demonstrated to be of the test compound and not of its precursor. Include the NAME AND INFORMATION ABOUT THE PRECURSOR in the written abstract portion of Field B on the Code Sheet. (Consult the Key.)

0 Test compound is one ingredient of a mixture of compounds administered in a test for the action in Field T-2; the remaining compounds are written on the Code Sheet in this coding field and the evaluation, dose, etc., are based on the response to the mixture. (Consult the Key.)

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9 Data source contains information on the effect of pH on the action coded in Field T-2.

FIELD C
Column 11

SOLVENT OR VEHICLE

S	Acetone
T	Alcohol, ethyl (ethanol), and aqueous ethyl alcohol
7	Benzene; xylene
2	Butyl succinate
Q	Caprylic acid
M	Cetane
5	Chloroform; carbon tetrachloride
N	Cholesterol (other than in lanolin, Symbol H)
A	Co-solvent; mixtures of solvents or vehicles (other than aqueous ethyl alcohol, Symbol T)
4	Ether, ethyl
U	Gasoline; kerosene
3	Glycerol; ethylene glycol; propylene glycol
Ø	Glycols, polyethylene
H	Lanolin
9	Lard and other animal fat or grease; wax (except lanolin, Symbol H, or petroleum wax, Symbol G); fatty acids
I	Mineral oil; paraffin oil
W	Miscellaneous - solvent or vehicle used and specified by the author but not assigned elsewhere to this field's symbols
6	Petroleum ether; petroleum naphtha
1	Saline solutions (e.g., Locke's, Tyrode's, acidic, basic solutions)
P	Turpentine and other terpenes
K	Tricaprylin
B	Vegetable oil or wax (e.g., sesame, peanut, cotton seed, corn, coconut, olive, soya bean, castor bean)
R	Water
G	Wax (petroleum)

SECONDARY COMPOUND

The IBM punched card columns of this field (12 through 17) are used for coding a compound other than the "test compound", i. e., a "secondary compound".

(The test compound is always expressed in Columns 1 through 8 on each IBM biology punched card. On the Biology Code Sheet, the test compound's name and its Serial Number are written only on the chemistry side, regardless of the number of lines of data coded on the sheet; this provision eliminates the necessity of entering the name and Serial Number of the test compound for each line of biological data when several lines are coded on a single Code Sheet.)

Examples of secondary compounds that are coded in Field D are (1) compounds whose actions are antagonized or synergized by the test compound or (2) compounds whose metabolic fate (e. g., excretion), coded in Field T-2, is affected in some way by the test compound.

The secondary compound can be coded only by a person having access to a reference file of chemical names and Serial Numbers. In any case, the coder must always include in the written abstract for this field the full name and all other information given about the secondary compound.

A more thorough discussion of all the uses of Field D and specific directions are given in the Key, including the uses of the following special symbols.

* RADIOACTIVITY: To designate that the secondary compound is radioactive, place an asterisk in Column 16.

* STANDARD OF COMPARISON: To designate that a compound is used as a standard of comparison for evaluation, place an asterisk in Column 17.

\# MORE THAN ONE SECONDARY COMPOUND PRESENT AND ESSENTIAL: To designate that more than one secondary compound is present and is essential to the action, place the Symbol # in Column 16.

FIELD E
Columns 18, 19, 20, 21,
22, 23, 24, and 25

ORGANISM OR PATHOLOGICAL CONDITION ACTED ON BY THE TEST COMPOUND

Field E is for the entry of one of the following:

I (1) TEST ORGANISM ACTED ON BY THE TEST COMPOUND
(2) TUMOR ACTED ON BY THE TEST COMPOUND
(3) PATHOLOGICAL CONDITION OTHER THAN TUMOR ACTED ON BY THE TEST COMPOUND

II (4) TUMOR PRODUCED BY THE TEST COMPOUND

The section of the Code designated as Field E is divided into three major parts. The first is the Taxonomy Code, listing all the phyla, classes, orders, families, genera, and species for which the CBCC has already assigned code symbols.

Following the Taxonomy Code lists, the second part of Field E is the Tumor Code, listing all types of tumors and specific tumors for which the CBCC has already assigned code symbols. Appended at the end of this Tumor Code section is a special list of anatomical items to be used only for interpreting the second and third units of the tumor symbols (Columns 19 and 20); the list is used by the Center for constructing unique symbols for tumors added to the existing list.

Finally, the third part of Field E is the Pathology Code, listing the pathologies for which the CBCC has assigned code symbols and designated specific coding involving Fields H and T as well as Field E. Appended at the end of this list of pathologies are lists of etiologies classified and assigned code symbols to be used in interpreting the 5th and 6th units of the pathology symbol (Columns 22 and 23) and used by the Center in constructing unique symbols for pathologies added to the existing list.

It will be understood that the CBCC coding procedure permits Field E to be coded with only a single entry in any one code line, an organism, a tumor of an organism, or a pathology of an organism, whichever the chemical was tested to affect. Therefore, for any one code line, only one of the three separate Field E codes will be consulted.

The general use of the field is discussed in the Key, prior to the three special sections explaining the organization of each of the Taxonomy, Tumor, and Pathology Codes.

TAXONOMY CODE

1	Protozoa
1	Plasmodroma, subphylum of Protozoa
11	Sarcodina (syn. Rhizopoda), class of subphylum Plasmodroma
11	Rhizopoda (syn. Sarcodina), class of subphylum Plasmodroma
11	Rhizopoda, subclass of Sarcodina
111	Amoebozoa (syn. Lobosa), order of Sarcodina
111	Lobosa (syn. Amoebozoa)
111	Amoebina (syn. Amoebozoa)
11101	Amoebidae
11101011	Amoeba proteus
11101011	Chaos diffluens (syn. Amoeba proteus)
11101011	Amiba diffluens (syn. Amoeba proteus)
11102	Endamoebidae
1110201	Endamoeba
1110201	Entamoeba (syn. Endamoeba)
11102011	Endamoeba histolytica
11102012	Endamoeba coli
11102021	Endolimax nana
11102031	Dientamoeba fragilis
111	Proteomyxa, order of subclass Rhizopoda
11103	Vampyrellidae, family of order Amoebozoa or family of order Proteomyxa
111	Testacea, suborder of Amoebozoa or order of subclass Rhizopoda
111	Thecamoebaea (syn. Testacea), suborder of Amoebozoa
11104	Arcellidae, family of suborder Testacea
11105	Difflugidae, family of suborder Testacea
112	Foraminifera
113	Heliozoa
114	Radiolaria
115	Mycetozoa
1	Ciliophora, subphylum of Protozoa
12	Ciliata, class of subphylum Ciliophora
12	Infusoria (syn. Ciliata)
12	Euciliata, subclass of Ciliata
121	Holotricha, order of subclass Euciliata
121	Trichostomata, suborder of Holotricha
12101	Parameciidae, family of suborder Trichostomata
12101011	Paramecium caudatum
121	Gymnostomata, suborder of Holotricha
121	Pleurostomata, tribe of suborder Gymnostomata
12102	Amphileptidae, family of tribe Pleurostomata
12103	Isotrichidae, family of suborder Trichostomata
12104	Colpodidae, family of suborder Trichostomata
121	Astomata, suborder of Holotricha
12105	Anoplophryidae, family of suborder Astomata
121	Hymenostomata, suborder of Holotricha
12106	Frontoniidae, family of suborder Hymenostomata
12106011	Tetrahymena geleii
12107	Tracheliidae, family of tribe Pleurostomata
121	Prosostomata, tribe of suborder Gymnostomata
12108	Holophryidae, family of tribe Prosostomata
12108011	Parachaenia myae
12108021	Ichthyophthirius multifiliis
122	Spirotricha, order of subclass Euciliata
122	Heterotricha, suborder of Spirotricha
12201	Bursariidae, family of suborder Heterotricha
12201011	Balantidium coli
123	Peritricha, order of subclass Euciliata
123	Mobilia, suborder of Peritricha
12301	Urceolariidae, family of suborder Mobilia
12302	Vorticellidae
124	Chonotricha, order of subclass Euciliata
12401	Spirochonidae, family of Chonotricha
13	Sporozoa, class of subphylum Plasmodroma
13	Telosporidia, subclass of Sporozoa
131	Haemosporidia, order of subclass Telosporidia
13101	Plasmodiidae
13101011	Plasmodium malariae
13101012	Plasmodium vivax
13101013	Plasmodium falciparum
13101014	Plasmodium gallinaceum
13101015	Plasmodium lophurae
13101016	Plasmodium knowlesi

13101017	Plasmodium cathemerium
13101018	Plasmodium relictum
13101019	Plasmodium circumflexum
1310101A	Plasmodium cynomolgi
1310101B	Plasmodium berghei
1310101C	Plasmodium praecox
1310101D	Plasmodium hexamerium
13102	Babesiidae
13102011	Babesia bigemina
13102021	Toxoplasma gondii
132	Gregarinida, order of subclass Telosporidia
133	Coccidia, order of subclass Telosporidia
133	Eimeridia, suborder of Coccidia
13301	Eimeriidae, family of suborder Eimeridia
13301011	Eimeria stiedae
13301012	Eimeria tenella
133	Adeleidea, suborder of Coccidia
13	Cnidosporidia, subclass of Sporozoa
134	Microsporidia, order of subclass Cnidosporidia
134	Monocnidea, suborder of Microsporidia
13401	Nosematidae, family of suborder Monocnidea
13401011	Nosema apis
135	Myxosporidia, order of subclass Cnidosporidia
135	Platysporea, suborder of Myxosporidia
136	Actinomyxidia, order of subclass Cnidosporidia
13	Acnidosporidia, subclass of Sporozoa
137	Sarcosporidia, order of subclass Acnidosporidia
14	Mastigophora, class of subphylum Plasmodroma
14	Flagellata (syn. Mastigophora)
14	Zoomastigina, subclass of Mastigophora
141	Protomonadina, order of subclass Zoomastigina
14101	Trypanosomatidae
14101	Herpetomonadidae (syn. Trypanosomatidae)
14101011	Leishmania braziliensis
14101012	Leishmania donovani
14101013	Leishmania tropica
14101021	Trypanosoma brucei
14101022	Trypanosoma cruzi
14101023	Trypanosoma evansi
14101024	Trypanosoma gambiense
14101025	Trypanosoma rhodesiense
14101026	Trypanosoma equiperdum
14101027	Trypanosoma hippicum
14101028	Trypanosoma lewisi
14101029	Trypanosoma theileri
1410102A	Trypanosoma venezuelense
1410102B	Trypanosoma congolense
1410102C	Trypanosoma vivax
1410102D	Trypanosoma duttoni
1410102E	Trypanosoma equinum
1410103	Phytomonas sp.
142	Polymastigina, order of subclass Zoomastigina
142	Monomonadina, suborder of Polymastigina
142	Monozoa (syn. Monomonadina)
14201	Trichomonadidae, family of suborder Monomonadina
1420101	Pentatrichomonas sp.
14201021	Trichomonas foetus
14201021	Tritrichomonas foetus (syn. Trichomonas foetus)
14201022	Trichomonas hominis
14201023	Trichomonas elongata
14201024	Trichomonas vaginalis
14201025	Trichomonas suis
14201026	Trichomonas canistomae
14201027	Trichomonas ruminantium
14201028	Trichomonas felistomae
14201029	Trichomonas eberthi
1420102A	Trichomonas anseri
1420102B	Trichomonas gallinae
14202	Chilomastigidae, family of suborder Monomonadina
14202011	Chilomastix mesneli
14	Phytomastigina, subclass of Mastigophora
143	Euglenoidina, order of subclass Phytomastigina
143	Euglenida (syn. Euglenoidina)
14301	Euglenidae
14301011	Euglena viridis
14301012	Euglena gracilis
144	Dinoflagellata, order of subclass Phytomastigina
144	Peridiniinae, suborder of Dinoflagellata
144	Peridinoidae, tribe of suborder Peridiniinae
14401	Peridiniidae, family of tribe Peridinioidae
144	Gymnodinioidae, tribe of suborder Peridiniinae
14402	Blastodiniidae, family of tribe Gymnodinioidae
14403	Noctilucidae, family of tribe Gymnodinioidae
14403011	Noctiluca scintillans
145	Hypermastigina, order of subclass Zoomastigina
146	Rhizomastigina, order of subclass Zoomastigina

146	Pantastomatida (syn. Rhizomastigina)
147	Phytomonadina, order of subclass Phytomastigina
14701	Chlamydomonadidae, family of Phytomonadina
14701011	Chlorogonium teragamum
14701021	Chlamydomonas eugametos
15	Suctoria, class of subphylum Ciliophora
15	Acineta (syn. Suctoria)
150	(Familial organization into orders unknown for Suctoria)
2	Porifera
2	Sponges
21	Calcispongiae
21	Calcarea (syn. Calcispongiae)
211	Homocoela
211	Asconosa (syn. Homocoela)
21101	Leucosolenidae
2110101	Leucosolenia sp.
212	Heterocoela
212	Scyconosa (syn. Heterocoela)
21201	Grantildae
2120101	Grantia sp.
21202	Sciphidae
21202011	Sycon raphanus
22	Demospongiae
22	Monaxonida, subclass of Demospongiae
221	Hadromerina, order of subclass Monaxonida
22101	Clionidae
22101011	Cliona celata
222	Haplosclerina, order of subclass Monaxonida
22201	Spongillidae
2220101	Spongilla sp.
22	Keratosa, subclass of Demospongiae
3	Cnidaria
3	Coelenterata (syn. Cnidaria)
31	Hydrozoa
311	Hydroida
311	Gymnoblastea, suborder of Hydroida
311	Anthomedusae (syn. Gymnoblastea), suborder of Hydroida
311	Athecata (syn. Gymnoblastea), suborder of Hydroida
31101	Hydridae, family of suborder Gymnoblastea
3110101	Hydra sp.
31101021	Pelmatohydra oligactis
311	Calyptoblastea, suborder of Hydroida
311	Leptomedusae (syn. Calyptoblastea), suborder of Hydroida
311	Thecaphora (syn. Calyptoblastea), suborder of Hydroida
312	Trachylina
312	Trachymedusae, suborder of Trachylina
313	Milleporina
313 and 314	Hydrocorallina (order, includes Milleporina plus Stylasterina)
314	Stylasterina
315	Siphonophora
315	Physophorida, suborder of Siphonophora
32	Scyphozoa
32	Jellyfishes
321	Semaeostomeae
322	Rhizostomeae
33	Anthozoa
33	Alcyonaria, subclass of Anthozoa
33	Octocorallia (syn. Alcyonaria)
33	Soft corals (Alcyonaria)
331	Pennatulacea
331	Sea pens (Pennatulacea)
33	Zoantheria, subclass of Anthozoa
33	Hexacorallia (Syn. Zoantheria), subclass of Anthozoa
332	Actiniaria
332	Sea anemones

4	Platyhelminthes
4	Flat worms
41	Cestoda, class of Platyhelminthes
41	Cestoidea, class of Platyhelminthes (equiv. of Cestoda)
41	Cestodaria, subclass of Cestoda or of Cestoidea
41	Eucestoda, subclass of class Cestoda
41	Cestoda (equiv. of Eucestoda), subclass of Cestoidea
41	Tapeworms
411	Pseudophyllidea, order of subclass Eucestoda of class Cestoda
411	Bothriocephaloidea, superfamily of order Pseudophyllidea
41101	Diphyllobothriidae, family of order Pseudophyllidea (or of superfamily Bothriocephaloidea)
41101	Dibothriocephalidae (syn. Diphyllobothriidae)
41101011	Diphyllobothrium latum
41101011	Dibothriocephalus latus (syn. Diphyllobothrium latum)
41102	Ptychobothriidae, family of order Pseudophyllidea (or of superfamily Bothriocephaloidea)
412	Tetraphyllidea, order of subclass Eucestoda of class Cestoda (or order of subclass Cestoda)
41201	Phyllobothriidae
413	Cyclophyllidea, order of subclass Eucestoda of class Cestoda (or order of subclass Cestoda)
413	Taenioidea (syn. of order Cyclophyllidea)
413	Taenioidea, superfamily of order Cyclophyllidea (equiv. of Taenioidea, order of Eucestoda)
41301	Taeniidae, family of order Cyclophyllidea (or of superfamily Taenioidea)
41301011	Taenia saginata
41301011	Cysticercus bovis (larva of Taenia saginata)
41302	Davaineidae, family of order Cyclophyllidea (or of superfamily Taenioidea)
41302011	Raillietina cesticillus
41303	Dilepididae, family of order Cyclophyllidea (or of superfamily Taenioidea)
41304	Hymenolepididae, family of order Cyclophyllidea (or of superfamily Taenioidea)
41305	Anoplocephalidae, family of order Cyclophyllidea (or of superfamily Taenioidea)
414	Trypanorhyncha, order of subclass Eucestoda of class Cestoda (or order of subclass Cestoda)
414	Tetrarhynchoidea (syn. Trypanorhyncha)
415	Diphyllidea, order of subclass Eucestoda of class Cestoda (or order of subclass Cestoda)
41501	Echinobothriidae

The following code symbols for Trematoda are based on a single scheme, marked by (1). Included, however, are certain other commonly encountered names of groups in which the Trematoda have been classified by other schemes, marked by (0) and (X).

42		Trematoda, class of Platyhelminthes
42	(1) (0)	Digenea, subclass of class Trematoda
42	(X)	Digenea, order of class Trematoda. (When Digenea is treated by the author as an order, it is equivalent to the combination of the five orders as listed here, Symbols 421, 422, 423, 424, and 425 and equivalent to Digenea as a subclass, Symbol 42.)
42	(1)	Anepitheliocystidia, superorder of subclass Digenea
42	(X)	Prosostomata, a suborder of order Digenea. (The suborder was conceived to include all digenetic families except Bucephalidae. Since in this list, the Bucephalidae are not separated into a distinct suborder, but are included with the order Strigeatoidea, Prosostomata here is essentially equivalent to Digenea, Symbol 42.)
42	(0)	Prosostomata, an order of subclass Digenea. (Equivalent to Prosostomata as a suborder of order Digenea and equivalent to Digenea minus Bucephalidae.)

42 (0) Distomata*, a suborder of order Prosostomata. Not recognized in the scheme used here in which "distome" Digenea are in each of the five orders recognized by Symbols 421, 422, 423, 424, and 425, except that the Strigeata, Symbol 422, have ordinarily been considered separate from "Distomata". A reference to a "distome trematode" can be coded only as Symbol 42.

421 (0) Monostomata*, a suborder of order Prosostomata. Not recognized in the scheme used for code symbols here. Examples of "monostome" Digenea are in the superfamily Notocotyloidea, Symbol 421.

421 (0) Amphistomata*, a suborder of order Prosostomata. Not recognized in this scheme in which "amphistome" families are included under superfamily Paramphistomatoidea, Symbol 421.

421 (0) Fascioloidea, superfamily of suborder Distomata. The superfamily Fascioloidea is not recognized in this scheme in which its families are included in the superfamily Echinostomatoidea, Symbol 421.

421 (1) Echinostomida, order of superorder Anepitheliocystidia

421 (1) Echinostomata, suborder of superorder Echinostomida

421 (1) Echinostomatoidea, superfamily of suborder Echinostomata

42101 (1) Echinostomatidae, family of superfamily Echinostomatoidea

42102 (1) (0) Fasciolidae, family of superfamily Echinostomatoidea (or of superfamily Fascioloidea)

42102011 Fasciola hepatica

42102011 Liver fluke

421 (1) Paramphistomata, suborder of order Echinostomida

421 (1) Paramphistomatoidea, superfamily of suborder Paramphistomata

421 (1) Notocotyloidea, superfamily of suborder Paramphistomata

422 (1) Strigeatoidea, order of superorder Anepitheliocystidia

422 (1) Strigeata, a suborder of order Strigeatoidea

422 (0) Strigeata, a suborder of order Prosostomata. (Equivalent to Strigeata as a suborder of order Strigeatoidea, Symbol 422.)

422 (1) Schistosomatoidea, superfamily of suborder Strigeata

42201 (1) Schistosomatidae, family of superfamily Schistosomatoidea

42201011 Schistosoma mansoni

42201012 Schistosoma japonicum

42201013 Schistosoma haematobium

42201021 Schistosomatium douthitti

422 (1) Brachylaimata, suborder of order Strigeatoidea

422 (1) Bucephaloidea, superfamily of suborder Brachylaimata

422 (X) Gasterostomata, suborder of order Digenea. The suborder accommodated the single family Bucephalidae which is considered in this scheme as a member of order Strigeatoidea, Symbol 422.

422 (0) Gasterostomata, order of subclass Digenea. (Equivalent to Gasterostomata as a suborder of order Digenea.)

423 (1) Renicolida, order of superorder Anepitheliocystidia

42 (1) Epitheliocystidia, superorder of subclass Digenea

424 (1) Opisthorchiida, order of superorder Epitheliocystidia

424 (1) Opisthorchiata, suborder of order Opisthorchiida

424 (1) Opisthorchioidea, superfamily of suborder Opisthorchiata

424 (0) Opisthorchioidea, superfamily of suborder Distomata. (Distomata is not recognized in this scheme.) (Equivalent to Opisthorchioidea, Symbol 424, superfamily of suborder Opisthorchiata.)

42401 (1) Opisthorchiidae, family of superfamily Opisthorchioidea

42401011 Clonorchis sinensis

42401021 Heterophyes heterophyes

425 (1) Plagiorchiida, order of superorder Epitheliocystidia

* The terms, monostome, amphistome, distome, holostome, echinostome, etc., are commonly used as convenient designations of the distinctive forms of adult digenetic trematodes. However, this characteristic of the adult has long been abandoned as a major or strict taxonomic criterion and the groups designated as Monostomata, Amphistomata, and Distomata are therefore no longer generally accepted as valid. Any of these designations must be coded by the symbol for its nearest equivalent, as indicated in the list above.

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Columns 18, 19, 20, 21,
22, 23, 24, and 25

425	(1)	Plagiorchiata, suborder of order Plagiorchiida
425	(1)	Troglotrematoidea, superfamily of suborder Plagiorchiata
425	(0)	Troglotrematoidea, superfamily of suborder Distomata. (Distomata is not recognized in this scheme.) (Equivalent to Troglotrematoidea, Symbol 425, superfamily of suborder Plagiorchiata.)
42501	(1)	Troglotrematidae, family of superfamily Troglotrematoidea. (In the present scheme, provisionally placed in superfamily Allocreadioidea.)
42501011		Paragonimus westermanii
42501012		Paragonimus kellicotti
425	(1)	Plagiorchioidea, superfamily of suborder Plagiorchiata
425	(1)	Plagiorchioidea, superfamily of suborder Distomata. (Distomata is not recognized in this scheme.) (Equivalent to Plagiorchioidea, Symbol 425, superfamily of suborder Plagiorchiata.)
42502	(1)	Dicrocoeliidae, family of superfamily Plagiorchioidea
42502011		Dicrocoelium dendriticum
42502011		Lancet fluke
42	(1)	Monogenea, subclass of class Trematoda
42	(X)	Monogenea, order of class Trematoda (equivalent to Monogenea as a subclass of Trematoda, Symbol 42)
426	(1)	Monopisthocotylea, order of subclass Monogenea
426	(X)	Monopisthocotylea, suborder of order Monogenea (equivalent to Monopisthocotylea, order of subclass Monogenea)
426	(1)	Capsaloidea, superfamily of order Monopisthocotylea
426	(X)	Capsaloidea, superfamily of suborder Monopisthocotylea (equivalent to Capsaloidea, superfamily of order Monopisthocotylea)
42601		Capsalidae, family of superfamily Capsaloidea
426	(1)	Gyrodactyloidea, superfamily of order Monopisthocotylea
426	(X)	Gyrodactyloidea, superfamily of suborder Monopisthocotylea (equivalent to Gyrodactyloidea, superfamily of order Monopisthocotylea)
42602		Gyrodactylidae, family of superfamily Gyrodactyloidea
427	(1)	Polyopisthocotylea, order of subclass Monogenea
427	(X)	Polyopisthocotylea, suborder of order Monogenea (equivalent to Polyopisthocotylea, order of subclass Monogenea)
427	(1)	Polystomatoidea, superfamily of order Polyopisthocotylea
427	(X)	Polystomatoidea, superfamily of suborder Polyopisthocotylea (equivalent to Polystomatoidea, superfamily of order Polyopisthocotylea)
42701		Polystomatidae, family of superfamily Polystomatoidea
42701		Polystomatinae, subfamily of Polystomatidae
42701		Sphyranurinae, subfamily of Polystomatidae
428*	(1)	Aspidobothria*, subclass of class Trematoda (equivalent of Aspidobothria, order of class Trematoda)
428	(X)	Aspidobothria, order of class Trematoda (equivalent to Aspidobothria, subclass of class Trematoda)
428		Aspidogastrea, subclass (or order) of class Trematoda (synonym for Aspidobothria)
42801		Aspidogastridae, family of subclass (or order) Aspidobothria
4280101		Aspidogaster sp.
42802		Stichocotylidae, family of subclass (or order) Aspidobothria
43		Turbellaria, class of Platyhelminthes
43		Flatworms, free living
431		Tricladida, order of Turbellaria
431		Paludicola, suborder of Tricladida
431		Probursalia (syn. Paludicola)
43101		Planariidae

* Although code symbols follow the scheme marked by (1), the scheme would omit the division of this subclass into orders, but would divide it into families. By adhering strictly to rules for forming CBCC taxonomy symbols, the third digit would need to be 0, indicating that there were no orders, merely because the division of the class was into subclasses rather than orders. Under these circumstances, the code symbol reflects the category between the class and the family, regardless of whether it is designated as subclass or order.

4310101	Planaria sp.
4310102	Dugesia sp.
4310102	Euplanaria sp. (syn. Dugesia)
43101021	Dugesia dorotocephala
43101021	Planaria dorotocephala (syn. Dugesia dorotocephala)
432	Polycladida
432	Acotylea, suborder of Polycladida
432	Schematommata, section of Acotylea
43201	Leptoplanidae, family of section Schematommata
5	Nematoda (excludes Rotifera, Gastrotricha, Kinorhyncha, and Nematomorpha)
5	Nemathelminthes (to include Rotifera, Gastrotricha, Kinorhyncha, Nematoda, and Nematomorpha)
5	Aschelminthes (syn. Nemathelminthes)
5	Round worms
51	Secernentea, class of phylum Nematoda
51	Phasmidia (syn. Secernentea)
511	Rhabditida, order of class Secernentea
511	Rhabditina, suborder of order Rhabditida
511	Anguillulata (syn. Rhabditina)
511	Rhabditoidea, superfamily of suborder Rhabditina
511	Anguillulinoidea (equiv. of Rhabditida)
51101	Diplogasteridae, family of superfamily Rhabditoidea
51102	Rhabditidae, family of superfamily Rhabditoidea
51103	Cephalobidae, family of superfamily Rhabditoidea
51103011	Panagrolaimus subelongatus
51103021	Panagrellus redivivus
51103031	Turbatrix aceti
51103031	Anguillula aceti (syn. Turbatrix aceti)
51103031	Vinegar eel
51104	Strongyloididae, family of superfamily Rhabditoidea
51104011	Strongyloides stercoralis
51104012	Strongyloides papillosus
51104013	Strongyloides ratti
511	Tylenchoidea, superfamily of suborder Rhabditina
51105	Tylenchidae, family of superfamily Tylenchoidea
51105011	Meloidogyne marioni
51105011	Heterodera radicicola (syn. Meloidogyne marioni)
51105012	Meloidogyne incognita
51105021	Heterodera schachtii
51105022	Heterodera rostochiensis
51105031	Pathoaphelenchoides ritzemabosi
51105031	Aphelenchoides ritzemabosi (syn. Pathoaphelenchoides ritzemabosi)
51105041	Pratylenchus pratensis
5110505	Ditylenchus sp.
51105061	Paraphelenchus pseudoparietinus
51106	Steinernematidae, family of superfamily Rhabditoidea
51106011	Neoaplectana glaseri
511	Strongylina, suborder of order Rhabditida
511	Strongyloidea, superfamily of suborder Strongylina
51107	Strongylidae, family of superfamily Strongyloidea
51107011	Ternidens deminutus
51107011	Tridontophorus deminutus (syn. Ternidens deminutus)
51107021	Oesophagostomum radiatum
51107021	Bosicola radiatum (syn. Oesophagostomum radiatum)
51107031	Chabertia ovina
51107041	Strongylus equinus
51108	Ancylostomatidae, family of superfamily Strongyloidea
51108011	Necator americanus
51108011	Hookworm, human
51108021	Ancylostoma duodenale
51108021	Hookworm, human
51108022	Ancylostoma caninum
51108022	Hookworm, dog
51108021	Bunostomum phlebotomum
51109	Syngamidae, family of superfamily Strongyloidea
51109011	Syngamus laryngeus
511	Trichostrongyloidea, superfamily of suborder Strongylina
51110	Trichostrongylidae, family of superfamily Trichostrongyloidea
51110011	Haemonchus contortus
511	Metastrongyloidea, superfamily of suborder Strongylina
51111	Metastrongylidae, family of superfamily Metastrongyloidea
51111011	Metastrongylus elongatus
511	Oxyurina, suborder of order Rhabditida
511	Oxyuroidea, superfamily of suborder Oxyurina
51112	Oxyuridae, family of superfamily Oxyuroidea
51112011	Oxyuris equi
51112021	Enterobius vermicularis
51112021	Oxyuris vermicularis (syn. Enterobius vermicularis)
51112031	Syphacia obvelata
51112041	Aspiculuris tetraptera

51112041	Pinworm, mouse
511	Ascaridina, suborder of order Rhabditida
511	Ascaridoidea, superfamily of suborder Ascaridina
51113	Kathlaniidae, family of superfamily Ascaridoidea
51114	Heterakidae, family of superfamily Ascaridoidea
51114011	Heterakis gallinarum
51114011	Heterakis gallinae (syn. Heterakis gallinarum)
51115	Ascarididae, family of superfamily Ascaridoidea
51115011	Ascaris lumbricoides
51115021	Parascaris equorum
51115021	Ascaris megalocephala (syn. Parascaris equorum)
512	Spirurida
512	Spirurina, suborder of order Spirurida
512	Filarioidea, superfamily of suborder Spirurina
51201	Filariidae, family of superfamily Filarioidea
51202	Acanthocheilonematidae, family of superfamily Filarioidea
51202011	Wuchereria bancrofti
51202011	Filaria bancrofti (syn. Wuchereria bancrofti)
51202021	Dirofilaria immitis
51202022	Dirofilaria repens
51202031	Litomosoides carinii
51202041	Loa loa
51202041	Eye worm
51202051	Onchocerca volvulus
512	Spiruroidea, superfamily of suborder Spirurina
51203	Spiruridae, family of superfamily Spiruroidea
51204	Gnathostomatidae, family of superfamily Spiruroidea
512	Camallanina, suborder of order Spirurida
512	Dracunculoidea, superfamily of suborder Camallanina
51205	Dracunculidae, family of superfamily Dracunculoidea
51205011	Dracunculus medinensis
51205011	Guinea worm
52	Adenophorea, class of phylum Nematoda
52	Aphasmidia (syn. Adenophorea)
521	Enoplida, order of class Adenophorea
521	Dorylaimina, suborder of order Enoplida
521	Trichinelloidea, superfamily of suborder Dorylaimina
521	Trichuroidea (syn. Trichinelloidea)
52101	Trichinellidae, family of superfamily Trichinelloidea
52101011	Trichinella spiralis
52101011	Trichina spiralis (syn. Trichinella spiralis)
52102	Trichuridae, family of superfamily Trichuroidea
52102	Trichocephalidae (syn. Trichuridae)
52102011	Trichuris trichiura
52102011	Trichocephalus trichiurus (syn. Trichuris trichiura)
52102011	Whipworm
52102021	Trichuris suis
52102021	Trichocephalus suis (syn. Trichuris suis)
521	Dioctophymatina, suborder of order Enoplida
521	Dioctophymatoidea, superfamily of suborder Dioctophymatina
52103	Dioctophymatidae, family of superfamily Dioctophymatoidea
52103011	Dioctophyma renale
B	Acanthocephala
B1	Metacanthocephala
B11	Archiacanthocephala
B1100011	Echinorhynchus trutta
C	Rotatoria
C	Rotifera (syn. Rotatoria)
C1	Monogononta
C11	Ploima
C1101	Notommatidae
C1102	Brachionidae
C1102011	Brachionus calyciflorus
C2	Bdelloidea
C3	Seisonidea
D	Entoprocta
E	Bryozoa, phylum excluding Entoprocta
E	Ectoprocta (equiv. to Bryozoa, phylum excluding Entoprocta)
D and E	Bryozoa, phylum including Entoprocta (obs.)
6	Echinodermata
6	Eleutherozoa, subphylum of Echinodermata
61	Asteroidea, class of subphylum Eleutherozoa
61	Starfishes
611	Phanerozonia
611	Cribellosa, suborder of order Phanerozonia
61101	Porcellanasteridae, family of suborder Cribellosa

612	Spinulosa
61201	Asterinidae
61202	Echinasteridae
61202011	Henricia sanguinolenta
613	Forcipulata
61301	Asteriidae
61301	Asteriinae
61301011	Asterias forbesi
62	Ophiuroidea
621	Ophiurae
62101	Ophiolepididae
62101011	Ophiura robusta
63	Echinoidea
631	Camarodonta
63101	Toxopneustidae
63101011	Lytechinus variegatus
63101011	Toxopneustes variegatus (syn. Lytechinus variegatus)
63101012	Lytechinus pictus
63102	Echinometridae
63102011	Echinometra lacunter
63103	Strongylocentrotidae
63103	Sea urchins
63103011	Strongylocentrotus pulcherrimus
63103012	Strongylocentrotus drobachiensis
63104	Echinidae
632	Clypeastroida
63201	Scutellidae
63201011	Echinarachnius parma
633	Stirodonta
63301	Arbaciidae
63301011	Arbacia punctulata
634	Spatangoida
64	Holothuroidea
641	Dendrochirota
64101	Cucumariidae
64101	Sea cucumber
642	Apoda
6	Pelmatozoa, subphylum of Echinodermata
65	Crinoidea
7	Mollusca
71	Amphineura
71	Aplacophora, subclass of class Amphineura
711	Caudofoveata, order of subclass Aplacophora
711	Chaetodermatina (syn. Caudofoveata, order of subclass Aplacophora)
712	Ventroplicida, order of subclass Aplacophora
712	Neomeniina (syn. Ventroplicida, order of subclass Aplacophora)
71	Polyplacophora, subclass of class Amphineura
713	Lepidopleurina, order of subclass Polyplacophora
714	Chitonina, order of subclass Polyplacophora
71401	Ischnochitonidae
71401011	Chaetopleura opiculata
71402	Chitonidae
71402011	Chiton tuberculatus
72	Gastropoda
72	Prosobranchia, subclass of class Gastropoda
721	Archaeogastropoda, order of subclass Prosobranchia
722	Mesogastropoda, order of subclass Prosobranchia
72201	Calyptraeidae
72201011	Crepidula plana
72202	Littorinidae
72202011	Littorina litorea
72203	Hydrobiidae
72203011	Oncomelania quadrasi
723	Neogastropoda, order of subclass Prosobranchia
723	Stenoglossa (syn. Neogastropoda, order of subclass Prosobranchia)
72301	Buccinidae
72301011	Busycon canaliculatum
72301011	Fulgar canaliculatum (syn. Busycon canaliculatum)
72	Opisthobranchia, subclass of Gastropoda
724	Tectibranchia, order of subclass Opisthobranchia
725	Pteropoda, order of subclass Opisthobranchia
726	Sacoglossa, order of subclass Opisthobranchia
727	Acoela, order of subclass Opisthobranchia
728	Ditremata, order of subclass Opisthobranchia
72	Pulmonata, subclass of class Gastropoda
729	Basommatophora, order of subclass Pulmonata
72901	Planorbidae
7290101	Planorbis sp.
72901021	Australorbis glabratus
72901031	Bulinus sp.
72901041	Biomphalaria boissyi
72902	Lymnaeidae
72902011	Lymnaea stagnalis
72902021	Stagnicola bulimoides
72902021	Lymnaea bulimoides (syn. Stagnicola bulimoides)
72902022	Stagnicola cubensis
72902022	Fossaria cubensis (syn. Stagnicola cubensis)
7290203	Galba sp.
72902041	Fossaria ollula
72902051	Pseudosuccinea columella

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72903	Physidae
7290301	Physa sp.
72A	Stylommatophora, order of subclass Pulmonata
72A01	Helicidae
72A01011	Helix aspersa
72A01012	Helix pomatia
72A01021	Cepea nemoralis
72A01021	Helix nemoralis (syn. Cepea nemoralis)
72A02	Limacidae
72A02011	Limax maximus
72A02021	Deroceras reticulatum
72A02031	Milax gagates
72A03	Testacellidae
72A03011	Testacella haliotidea
73	Pelecypoda
731	Protobranchia, order of class Pelecypoda
732	Filibranchia, order of class Pelecypoda
732	Taxodonta, suborder of order Filibranchia
732	Anisomyaria, suborder of order Filibranchia
73201	Ostreidae, family of suborder Anisomyaria
73201011	Crassostrea virginica
73201011	Ostrea virginica (syn. Crassostrea virginica)
73201021	Ostrea lurida
73202	Mytilidae, family of suborder Anisomyaria
73202011	Mytilus edulis
73203	Pectinidae, family of suborder Anisomyaria
7320301	Pecten sp.
733	Eulamellibranchia, order of class Pelecypoda
733	Schizodonta, suborder of order Eulamellibranchia
733	Heterodonta, suborder of order Eulamellibranchia
733	Adapedonta, suborder of order Eulamellibranchia
733	Anomalodesmacea, suborder of order Eulamellibranchia
73301	Veneridae, family of suborder Heterodonta
73301011	Mercenaria mercenaria
73301011	Venus mercenaria (syn. Mercenaria mercenaria)
73302	Myidae, family of suborder Adapedonta
73302011	Mya arenaria
73303	Teredinidae, family of suborder Adapedonta
7330301	Teredo sp.
7330302	Bankia sp.
73304	Unionidae, family of suborder Schizodonta
73304011	Lamellidens marginalis
73304021	Anodonta cataracta
73304022	Anodonta fluvialis
73305	Solenidae, family of suborder Adapedonta
73305011	Ensis directus
74	Cephalopoda
74	Tetrabranchiata, subclass of Cephalopoda
741	Nautiloidea, order of subclass Tetrabranchiata
741	Nautilida, suborder of order Nautiloidea
74101	Nautilidae, family of suborder Nautilida
74101011	Nautilus pompilius
74	Dibranchiata, subclass of Cephalopoda
743	Teuthoidea, order of subclass Dibranchiata
743	Myopsida, suborder of order Teuthoidea
743	Oegopsida, suborder of order Teuthoidea
74301	Loliginidae, family of suborder Myopsida
74301011	Loligo pealii
74301012	Loligo opalescens
74301013	Loligo vulgaris
744	Octopoda, order of subclass Dibranchiata
744	Cirromorpha, suborder of order Octopoda
744	Incirrata, suborder of order Octopoda
74401	Octopodidae, family of suborder Incirrata
7440101	Octopus sp.
742	Sepioidea, order of subclass Dibranchiata
74201	Sepiidae
74201011	Sepia officinalis
74201012	Sepia cultrata
8	Annelida
8	Annulata (syn. Annelida)
81, 83, and 84	Chaetopoda, class of Annelida (equals Archiannelida plus Oligochaeta and Polychaeta, classes of Annelida)
81 and 82	Clitellata, class of Annelida (equals classes Oligochaeta and Hirudinea)
81	Oligochaeta, class of Annelida
81	Oligochaeta, subclass of class Clitellata

811, 812, and 813	Oligochaeta, order of Chaetopoda (equals orders Opisthopora, Plesiopara, and Prosopora)
811	Opisthopora, order of class Oligochaeta
811	Opisthopora, suborder of order Oligochaeta
81101	Lumbricidae, family of order Opisthopora
81101	Earthworms
81101011	Lumbricus terrestris
812	Plesiopora, order of class Oligochaeta or suborder of order Oligochaeta
81201	Tubificidae
81201011	Tubifex tubifex
813	Prosopora, order of class Oligochaeta or suborder of order Oligochaeta
82	Hirudinea, class of phylum Annelida or subclass of class Chaetopoda
82	Leeches
821	Arhynchobdellida (syn. Gnathobdellida)
821	Gnathobdellida (syn. Arhynchobdellida)
82101	Hirudidae
82101	Gnathobdellidae (syn. Hirudidae)
82101011	Hirudo medicinalis
822	Rhynchobdellida, order of class Hirudinea
83	Polychaeta, class of Annelida
83	Errantia, subclass of class Polychaeta
831 to 836	Polychaeta, order of Chaetopoda (equals all other orders listed of class Polychaeta)
831	Amphinomorpha, order of subclass Errantia
83101	Amphinomidae
832	Nereimorpha (syn. Nereidiformia), order of subclass Errantia
832	Nereidiformia (syn. Nereimorpha), order of subclass Errantia
832	Nereidiformia, suborder of order Polychaeta
83201	Aphroditidae, family of order Nereimorpha
83	Sedentaria, subclass of class Polychaeta
833	Spiomorpha (syn. Spioniformia), order of subclass Sedentaria
833	Spioniformia (syn. Spiomorpha), order of subclass Sedentaria
833	Spioniformia, suborder of order Polychaeta
83301	Ariciidae, family of order Spioniformia
834	Drilomorpha (syn. Capitelliformia), order of subclass Sedentaria
834	Capitelliformia (syn. Drilomorpha), order of subclass Sedentaria
834	Capitelliformia, suborder of order Polychaeta
83401	Cirratulidae, family of order Drilomorpha
835	Terebellomorpha (syn. Terebelliformia), order of subclass Sedentaria
835	Terebelliformia (syn. Terebellomorpha), order of subclass Sedentaria
835	Terebelliformia, suborder of order Polychaeta
836	Serpulimorpha (syn. Sabelliformia), order of subclass Sedentaria
836	Sabelliformia (syn. Serpulimorpha), order of Sedentaria
836	Sabelliformia, suborder of order Polychaeta
83601	Sabellariidae, family of order Serpulimorpha
84	Archiannelida, class of Annelida
840	Archiannelida (no acceptable organization into orders in 1957)
84001	Polygordiidae
F	Echiuroidea
F1	Echiurida
F11	Echiuroinea
F1101	Echiuridae
F1101011	Echiurus pallasii
F1101021	Urechis caupo
F1102	Bonelliidae
G	Sipunculidoidea
H	Priapulidoidea
9	Arthropoda
91	Crustacea
91	Branchiopoda, subclass of class Crustacea
91	Eubranchiopoda, superorder of subclass Branchiopoda
911	Anostraca, order of subclass Branchiopoda (or order of Eubranchiopoda)
91	Oligobranchiopoda, superorder of subclass Branchiopoda
912	Cladocera, order of subclass Branchiopoda (or order of Oligobranchiopoda)
91201	Daphnidae
91201011	Daphnia pulex

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91	Phyllopoda (syn. Branchiopoda or syn. Eubranchiopoda)
91	Cirripedia, subclass of class Crustacea
913	Thoracica, order of subclass Cirripedia
91301	Balanidae
91301011	Balanus tintinnabulum
91	Malacostraca, subclass of class Crustacea
91	Eumalacostraca, series of subclass Malacostraca
91	Eucarida, superorder of subclass Malacostraca (and superorder of series Eumalacostraca)
914	Decapoda, order of subclass Malacostraca (and order of superorder Eucarida)
91401	Homaridae
91402	Hippidae
91403	Cancridae
91404	Portunidae
91405	Ocypodidae
91406	Majidae
91407	Palaemonidae
91408	Palinuridae
91409	Astacidae
9140901	Cambarus sp.
91	Peracarida, superorder of subclass Malacostraca (and superorder of series Eumalacostraca)
915	Isopoda, order of subclass Malacostraca (and order of superorder Peracarida of series Eumalacostraca)
915	Asellota, suborder of order Isopoda
91501	Asellidae, family of suborder Asellota of order Isopoda
916	Amphipoda, order of subclass Malacostraca (and order of superorder Peracarida of series Eumalacostraca)
916	Gammaridea, suborder of order Amphipoda
91601	Gammaridae, family of suborder Gammaridea of order Amphipoda
9160101	Gammarus sp.
92	Arachnida
92	Arachnoidea (syn. Arachnida)
921	Xiphosura, order of class Arachnida
922	Araneida, order of class Arachnida
922	Araneae (syn. Araneida)
92201	Theridiidae
92201011	Latrodectus mactans
923	Acarina, order of class Arachnida
923	Ixodoidea, superfamily of order Acarina
92301	Ixodidae, family of superfamily Ixodoidea
92301011	Dermacentor variabilis
92301021	Rhipicephalus sanguineus
92301031	Amblyomma americanum
92301041	Boöphilus annalatus
92301042	Boöphilus australis
92301043	Boöphilus decoloratus
92302	Tetranychidae
92302011	Tetranychus telarius
92302011	Tetranychus althaeae (syn. of T. telarius)
92302012	Tetranychus pacificus
92302013	Tetranychus bimaculatus
(92302014)	(Available for Tetranychus sp.)
(92302015)	(Available for Tetranychus sp.)
92302016	Tetranychus cinnabarinus
92302016	Tetranychus multisetis (syn. Tetranychus cinnabarinus)
92302017	Tetranychus atlanticus
92302021	Metatetranychus pilosus
92302021	Paratetranychus pilosus (syn. Metatetranychus pilosus)
92302022	Metatetranychus citri
92302022	Paratetranychus citri (syn. Metatetranychus citri)
92302031	Eotetranychus sexmaculatus
923	Trombidioidea, superfamily of order Acarina
92303	Trombidiidae, family of superfamily Trombidioidea
92303011	Eutrombicula alfreddugesi
9230302	Hannemania sp.
92303031	Trombicula acuscutellaris
92303041	Acariscus masoni
92304	Argasidae, family of superfamily Ixodoidea
92304011	Argas persicus
923	Sarcoptoidea, superfamily of order Acarina
92305	Sarcoptidae, family of superfamily Sarcoptoidea
9230501	Knemidokoptes sp.
923	Parasitoidea, superfamily of order Acarina
92306	Dermanyssidae, family of superfamily Parasitoidea
92306011	Dermanyssus gallinae
92306021	Ornithonyssus bacoti
923	Acaroidea, superfamily of order Acarina
92307	Acaridae, family of superfamily Acaroidea
923	Tarsonemoidea, superfamily of order Acarina
92308	Tarsonemidae, family of superfamily Tarsonemoidea

923	Laelaptoidea, superfamily of order Acarina
92309	Laelaptidae, family of superfamily Laelaptoidea
92309011	Echinolaelaps echidninus
923	Analgesoidea, superfamily of order Acarina
92310	Analgesidae, family of superfamily Analgesoidea
923	Hydrachnae, superfamily of order Acarina
92311	Hydrachnidae, family of superfamily Hydrachnae
923	Eriophyoidea, superfamily of order Acarina
92312	Eriophyidae, family of superfamily Eriophyoidea
9231201	Eriophyes sp.
9231202	Phyllocoptes sp.
92312031	Aceria sheldoni
93	Insecta
931	Protura
932	Thysanura
933	Collembola
934	Orthoptera
93401	Blattidae
93401011	Periplaneta americana
93401021	Blattella germanica
93402	Locustidae (not in current valid use)
93402	Acrididae (syn. Locustidae)
93402	Cyrtacanthacridinae, subfamily of Acrididae
9340201	Melanoplus, genus of subfamily Cyrtacanthacridinae
93402011	Melanoplus femur-rubrum
93402012	Melanoplus bivittatus
93402013	Melanoplus mexicanus
93402014	Melanoplus differentialis
9340202	Locusta, genus of subfamily Oedipodinae
93402021	Locusta migratoria
93402	Oedipodinae, subfamily of Locustidae
9340203	Camnula, genus of subfamily Oedipodinae
93402031	Camnula pellucida
935	Zoraptera
936	Isoptera
93601	Mastotermitidae
93602	Kalotermitidae
93603	Hodotermitidae
93603011	Zootermopsis nevadensis
93604	Rhinotermitidae
9360402	Reticulitermes sp.
937	Neuroptera
938	Ephemeroptera
939	Odonata
93A	Plecoptera
93B	Psocoptera
93C	Mallophaga
93D	Embioptera
93E	Thysanoptera
93E	Terebrantia, suborder of order Thysanoptera
93E01	Thripidae, family of suborder Terebrantia
93E01011	Heliothrips haemorrhoidalis
93E01021	Thrips tabaci
93E01031	Anaphothrips obscurus
93E01041	Frankliniella fusca
93F	Anoplura
93F01	Pediculidae
93F01011	Pediculus humanus humanus
93G	Homoptera
93G01	Cicadellidae
93G01	Jassidae (syn. Cicadellidae)
93G01011	Empoasca fabae
93G01011	Potato leaf hopper, Apple leaf hopper
93G01012	Empoasca abrupta
93G01021	Erythroneura elegantula
93G01031	Circulifer tenellus
93G01041	Macrosteles divisus
93G01051	Idiocerus pistacioe
93G02	Aphidae
93G02011	Aphis gossypii
93G02012	Aphis spiraecola
93G02021	Macrosiphum solanifolii
93G02022	Macrosiphum pisi
93G02023	Macrosiphum gei
93G02024	Macrosiphum onobrychidis
93G02025	Macrosiphum rosae
93G02026	Macrosiphum ambrosiae
93G02031	Brevicoryne brassicae
93G03	Coccidae
93G03011	Pseudococcus citri
93G03012	Pseudococcus maritimus
93G03013	Pseudococcus comstocki
93G03014	Pseudococcus njalensis
93G0302	Myzodes sp.
93G03031	Lecanium corni
93G03041	Aonidiella aurantii
93G04	Cercopidae
93G04011	Aphrophora saratogensis
93G04021	Philaenus leucophthalmus
93G04031	Clastoptera achatina
93G05	Membracidae
93G06	Aleyrodidae
93G07	Cicadidae
93G08	Psyllidae
93G08011	Psylla pyricola
93G08021	Paratrioza cockerelli
93H	Hemiptera
93H01	Miridae
93H02	Cimicidae
93H02011	Cimex lectularius
93H03	Reduviidae
93H04	Coreidae
93H04011	Anasa tristis

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93H05	Tingidae
93H06	Lygaeidae
93H06011	Blissus leucopterus
93H06021	Nysius ericae
93H06031	Oncopeltus fasciatus
93H07	Nabidae
93H07011	Nabis alternatus
93H07012	Nabis ferus
93H0702	Pagasa
93H0703	Prostemma
93H07041	Geocoris punctipes
93H08	Pentatomidae
93H09	Pyrrhocoridae
93H10	Anthocoridae
93H10011	Orius insidiosus
93J	Coleoptera
93J01	Chrysomelidae
93J01011	Chrysomela lapponica
93J01021	Diabrotica vittata
93J01031	Leptinotarsa decemlineata
93J01041	Galerucella xanthomelaena
93J01051	Altica chalybea
93J01052	Altica ambiens
93J01061	Crioceris asparagi
93J01071	Lema melanopa
93J01081	Phyllotreta vittata
93J01091	Epitrix cucumeris
93J01092	Epitrix fuscula
93J01093	Epitrix hirtipennis
93J01094	Epitrix parvula
93J01095	Epitrix subcrinita
93J01096	Epitrix tuberis
93J01101	Paria canella
93J01111	Phaedon cochleariae
93J01121	Gastrophysa cyanea
93J02	Tenebrionidae
93J02011	Tribolium madens
93J02012	Tribolium castaneum (syn. Tribolium ferrugineum)
93J02013	Tribolium confusum
93J02021	Tenebrio molitor
93J03	Coccinellidae
93J03011	Epilachna varivestis
93J03021	Adalia bipunctata
93J03031	Hippodamia convergens
93J03041	Ceratomegilla fuscilabris
93J0305	Scymnus sp.
93J04	Curculionidae
93J04011	Anthonomus grandis
93J04021	Rhynchites bicolor
93J04031	Cylas formicarius elegantulus
93J04041	Hypera postica
93J04051	Conotrachelus nenuphar
93J04061	Sitona cylindricollis
93J04071	Sitophilus granarius
93J04071	Calandra granaria (syn. Sitophilus granarius)
93J04072	Sitophilus oryza
93J04081	Brachyrhinus ovatus
93J04091	Pissodes strobi
93J0410	Calendra sp.
93J04111	Ceutorhynchus assimilis
93J04121	Sciobius granosus
93J04131	Listroderes costirostris obliquus
93J04141	Graphognathus leucoloma
93J04141	Pantomorus leucoloma (syn. Graphognathus leucoloma)
93J05	Bruchidae
93J05011	Acanthoscelides obtectus
93J05021	Bruchus brachialis
93J05031	Callosobruchus maculatus
93J06	Anobiidae
93J06011	Anobium punctatum
93J06021	Stegobium peniceum
93J06031	Lasioderma serricorne
93J07	Scarabaeidae
93J07011	Anomala orientalis
93J0702	Phyllophaga sp.
93J07031	Macrodactylus subspinosus
93J07041	Popillia japonica
93J08	Dermestidae
93J09	Byturidae
93J10	Scolytidae
93J11	Meloidae
93J11011	Epicauta lemniscata
93J12	Cucujidae
93J13	Elateridae
93J14	Lyctidae
93J15011	Rhizopertha dominica
93J15021	Dinoderus minutus
93K	Strepsipera
93L	Mecoptera
93M	Trichoptera
93N	Lepidoptera
93N01	Olethreutidae
93N01011	Carpocapsa pomonella
93N01021	Evetria comstockiana
93N01031	Lobesia viteana
93N01031	Polychrosis viteana (syn. Lobesia viteana)
93N01041	Spilonota ocellana
93N01051	Cydia pomonella
93N01051	Carpocapsa pomonella (syn. Cydia pomonella)
93N01061	Grapholitha molesta
93N01061	Laspeyresia molesta (syn. Grapholitha molesta)
93N01062	Grapholitha packardi
93N02	Pieridae
93N03	Arctiidae
93N03011	Hyphantria cunea
93N03021	Estigmene acrea
93N04	Pyralidae
93N05	Noctuidae
93N05	Phalaenidae (syn. Noctuidae)
93N05011	Pseudaletia unipuncta
93N05011	Cirphis unipuncta (syn. Pseudaletia unipuncta)
93N05021	Heliothis armigera
93N05022	Heliothis zea

93N05031	Alabama argillacea
93N05041	Feltia subterranea
93N05051	Prodenia litura
93N05052	Prodenia eridania
93N05053	Prodenia ornithogalli
93N05061	Ceramica picta
93N0507	Caenurgina erechtea
93N05081	Laphygma exigua
93N05082	Laphygma frugiperda
93N05091	Mamestra brassicae
93N05101	Peridroma margaritosa
93N05111	Trichoplusia ni
93N05121	Agrotis orthogonia
93N05131	Anticarsia gemmatalis
93N05141	Crymodes devastator
93N0515	Aramisa sp.
93N05161	Euxoa messoria
93N05171	Hypena humuli
93N05181	Pseudoplusia rogationis
93N05181	Pseudoplusia includens (syn. Pseudoplusia rogationis)
93N06	Bombycidae
93N07	Tineidae
93N08	Plutellidae
93N08011	Plutella maculipennis
93N09	Gelechiidae
93N10	Tortricidae
93N11	Citheroniidae
93N12	Notodontidae
93N13	Gracilariidae
93N14	Lymantriidae
93N14	Liparidae (syn. Lymantriidae)
93N15	Hyponemeutidae
93N16	Lasiocampidae
93N17	Aegeriidae
93N18	Sphingidae
93N19	Psychidae
93N20	Geometridae
93N21	Hesperiidae
93N21011	Urbenus proteus
93N22	Saturniidae
93N23	Dioptidae
93N23011	Phryganidia californica
93N24	Pyraustidae
93N24011	Pyrausta nubilalis
93N24021	Hymenia recurvalis
93N24031	Pachyzancla bipunctalis
93N24041	Udea rubigalis
93N24041	Phlyctaenia rubigalis (syn. Udea rubigalis)
93N24051	Hellula undalis
93N24061	Loxostege similalis
93N24071	Diaphania hyalinata
93N24072	Diaphania nitidalis
93N24081	Evergestis rimosalis
93Ø	Diptera
93Ø01	Calliphoridae
93Ø01011	Phormia regina
93Ø01021	Calliphora augur
93Ø01031	Chrysomyia macellaria
93Ø0104	Rhinia sp.
93Ø01051	Lucilia caesar
93Ø01061	Callitroga americana
93Ø02	Culicidae
93Ø02011	Aedes aegypti
93Ø02012	Aedes sollicitans
93Ø02013	Aedes taeniorhynchus
93Ø02014	Aedes communis
93Ø02015	Aedes excrucians
93Ø02016	Aedes pionips
93Ø02017	Aedes trivittatus
93Ø02021	Mansonia fasciolata
93Ø02031	Anopheles quadrimaculatus
93Ø02032	Anopheles gambiae
93Ø02033	Anopheles pseudopunctipennis
93Ø02034	Anopheles albimanus
93Ø02035	Anopheles aztecus
93Ø02036	Anopheles claviger
93Ø02037	Anopheles farauti
93Ø02041	Culex pipiens
93Ø02042	Culex quinquefasciatus
93Ø02042	Culex fatigans (syn. Culex quinquefasciatus)
93Ø02043	Culex apicalis
93Ø02044	Culex bitaeniorhynchus
93Ø02045	Culex erraticus
93Ø03	Muscidae
93Ø03011	Stomoxys calcitrans
93Ø03021	Musca domestica
93Ø0303	Anthomya sp.
93Ø03041	Chrysomyia megacephala
93Ø0305	Haematobia irritans
93Ø0305	Siphona irritans (syn. Haematobia irritans)
93Ø0306	Muscina stabulans
93Ø03071	Glossina morsitans
93Ø03072	Glossina palpalis
93Ø04	Tephritidae
93Ø04	Trypetidae (syn. Tephritidae)
93Ø04011	Rhagoletis pomonella
93Ø04021	Dacus oleae
93Ø04022	Dacus ferrugineus
93Ø04023	Dacus dorsalis
93Ø05	Drosophilidae
93Ø05011	Drosophila melanogaster
93Ø06	Tabanidae
93Ø07	Agromyzidae
93Ø08	Acroceridae
93Ø09	Asilidae
93Ø10	Hippoboscidae
93Ø11	Itonididae
93Ø11	Cecidomyiidae (syn. Itonididae)
93Ø12	Tendipedidae
93Ø12	Chironomidae (syn. Tendipedidae)
93Ø1201	Tendipes sp.
93Ø1201	Chironomus (syn. Tendipes)
93Ø12021	Hydrobaenus stercorarius
93Ø12021	Smittia stercorarius (syn. Hydrobaenus stercorarius)

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93Ø12021	Camptocladius byssinus (syn. Hydrobaenus stercorarius)
93Ø1203	Cricotopus trifasciatus
93Ø12041	Procladius pusillus
93Ø12042	Procladius culiciformis
93Ø12042	Protenthes culiciformis (syn. Procladius culiciformis)
93Ø12051	Pentaneura carnea
93Ø12051	Tanypus carneus (syn. Pentaneura carnea)
93Ø12061	Tanytarsus obediens
93Ø13	Chaoboridae
93Ø14	Heleidae
93Ø14	Ceratogonidae (syn. Heleidae)
93Ø14	Ceratopogonidae (syn. Heleidae)
93Ø1401	Dasyhelea
93Ø14021	Bezzia setulosa
93Ø14022	Bezzia glabra
93Ø14022	Probezzia glaber (syn. Bezzia glabra)
93Ø1403	Atrichopogon
93Ø1404	Palpomyia
93Ø14051	Forcipomyia cilipes
93Ø14061	Dicrohelea argentata
93Ø14061	Johannesenomyia argentata (syn. Dicrohelea argentata)
93Ø14071	Sphaeromias longipennis
93Ø14071	Palpomyia longipennis (syn. Sphaeromias longipennis)
93Ø1408	Leptoconops sp.
93Ø1409	Lasiohelea sp.
93Ø1410	Stilobezzia
93Ø1411	Macropeza
93Ø1412	Monohelea
93Ø14131	Culicoides nubeculosus
93Ø14132	Culicoides tristriatulus
93Ø15	Chloropidae
93Ø16	Gasterophilidae
93Ø17	Fungivoridae
93Ø17	Mycetophilidae (syn. Fungivoridae)
93Ø18	Oestridae
93Ø19	Piophilidae
93Ø20	Psilidae
93Ø21	Psychodidae
93Ø22	Sarcophagidae
93Ø23	Simuliidae
93Ø23011	Austrosimulium bancrofti
93Ø23021	Cnephia dacotensis
93Ø23021	Eusimulium lascivum (syn. Cnephia dacotensis)
93Ø2303	Prosimulium hirtipes
93Ø23041	Simulium damnosum
93Ø23042	Simulium metallicum
93Ø23043	Simulium ochraceum
93Ø23044	Simulium ornatum
93Ø23045	Simulium venustum
93Ø23046	Simulium vittatum
93Ø23047	Simulium downsi
93P	Siphonaptera
93P01	Pulicidae
93P01011	Ctenocephalides canis
93P01012	Ctenocephalides felis
93P01021	Xenopsylla cheopis
93Q	Hymenoptera
93Q01	Apidae
93Q01011	Apis mellifera
93Q02	Tenthredinidae
93Q03	Braconidae
93Q0303	Habrobracon sp.
93Q04	Formicidae
93Q05	Vespidae
93Q06	Ichneumonidae
93Q07	Cephidae
93Q08	Chalcididae
93Q08011	Eurytoma pistaciae
94	Symphyla
95	Chilopoda
96	Diplopoda

PROTOCHORDATA AND VERTEBRATA THROUGH PISCES

The list of lower Chordata has presented a particular difficulty. It has been decided finally to arrange a selected number of group and intergroup names, each accompanied with a note of its taxonomic status relative to the superior group of which it is a member. The thread of more than one taxonomic scheme can be traced through the list, therefore, by examination of the definitions of the items. Regardless of the multiplicity of schemes that are represented by the many taxonomic names, the basic scheme that has been followed in assigning code symbols (for fishes) is that of Berg. [1] The others are more or less "obsolete" schemes, yet they include names and organizations encountered frequently enough to justify their inclusion.

A supplemental guide to the taxonomic relationships is provided by the parenthetical numbers and letters immediately preceding the name: all those items designated by the same parenthetical figure represent a single classification scheme. (In general, the scheme according to Berg is marked by [2].)

In the following list, any group name which does not represent a category assigned it in the taxonomic scheme of Berg has been assigned a symbol--as far as possible--on the basis of that group's equivalent in Berg's scheme: for example, Hyperoartia, which has been described as an order of a class, Marsipobranchii, (in a scheme now probably considered "obsolete", designated as the "X" series), has been assigned Code Symbol A1 on the basis of the fact that its equivalent (as recognized in this list) is a class, Petromyzones.

A	(1, 0, T, X)	Chordata, phylum (equals phylum Vertebrata plus Hemichordata and Tunicata)
A	(1)	Protochordata (syn. Prochordata), division of phylum Chordata (equals Tunicata plus Leptocardii and Hemichordata)
A	(1)	Prochordata (syn. Protochordata), division of phylum Chordata (equals Tunicata plus Leptocardii and Hemichordata)
A	(1)	Tunicata, sub-division of division Protochordata
A	(1)	Leptocardii, sub-division of division Protochordata
A	(1)	Hemichordata, sub-division of division Protochordata
A	(1)	Enteropneusta (syn. Hemichordata)
A	(1)	Adelochorda (syn. Hemichordata)
A	(0)	Tunicata, subphylum of phylum Chordata
A	(1 or 0)	Urochordata (syn. Tunicata, subdivision or subphylum)
A	(0)	Leptocardii, subphylum of phylum Chordata (equals division Acrania)
A	(T)	Acrania (syn. Cephalochordata), (excluding Hemichordata and Tunicata) division of phylum Chordata
A	(T)	Cephalochordata (syn. division Acrania excluding Hemichordata and Tunicata), division of phylum Chordata
A	(1 and T)	Vertebrata (syn. division Craniata), division of phylum Chordata
A	(1 and T)	Craniata (syn. division Vertebrata), division of phylum Chordata
A	(0)	Vertebrata (syn. subphylum Craniata), subphylum of phylum Chordata
A	(0)	Craniata (syn. subphylum Vertebrata), subphylum of phylum Chordata
A	(2)	Vertebrata, phylum
A	(2)	Acrania, subphylum of phylum Vertebrata
A	(2)	Cephalochordata (syn. Acrania, subphylum of phylum Vertebrata)
A	(2)	Leptocardii (syn. Acrania, subphylum of phylum Vertebrata)
A	(X)	Leptocardii, class of phylum Chordata (equals Leptocardii, subphylum of phylum Vertebrata)

[1] Classification of Fishes Both Recent and Fossil; Leo S. Berg; 1940: English and Russian Edition, 1947, J. W. Edwards, Ann Arbor, Michigan.

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A	(X)	Myelozoa (syn. Leptocardii, class of phylum Chordata) (equals Leptocardii, subphylum of phylum Vertebrata)
A	(2)	Craniata, subphylum of phylum Vertebrata
A	(2)	Anamnia, sub-subphylum of subphylum Craniata
A	(1)	Anamnia, subdivision of division Craniata (equals Anamnia, sub-subphylum of subphylum Craniata)
A	(1)	Pisces, superclass of subdivision Anamnia
A	(2)	Agnatha, superclass of sub-subphylum Anamnia
A	(1)	Agnatha, class of superclass Pisces (equals Agnatha, superclass of sub-subphylum Anamnia)
A1 and A2	(1)	Cephalaspidomorphi, subclass of superclass Pisces
A1 and A2	(1)	Cyclostomata, order of subclass Cephalaspidomorphi (equals Cyclostomata, class of superclass Agnatha)
A1 and A2	(2)	Cyclostomata (syn. Marsipobranchii), class of superclass Agnatha
A1 and A2	(2)	Marsipobranchii (syn. Cyclostomata, class of superclass Agnatha)
A1 and A2	(X)	Marsipobranchii, class of phylum Chordata (equals Marsipobranchii, class of superclass Agnatha) (equals Petromyzones plus Myxini, classes of superclass Agnatha)
A1 and A2	(X)	Cyclostomi (syn. Marsipobranchii, class of Chordata) (equals Marsipobranchii, class of superclass Agnatha) (equals Petromyzones plus Myxini, classes of superclass Agnatha)
A1	(2)	Petromyzones, class of superclass Agnatha
A1	(2)	Hyperoartii (syn. Petromyzones, class of superclass Agnatha)
A1	(X)	Hyperoartia, order of Marsipobranchii, class of Chordata (equals Petromyzones, class of superclass Agnatha)
A12	(2)	Petromyzoniformes, order of class Petromyzones
A12	(1)	Petromyzontia, suborder of order Cyclostomata (equals Petromyzoniformes, order of class Petromyzones)
A1201	(2)	Petromyzonidae, family of Petromyzoniformes, order of Petromyzones
A1201	(X)	Petromyzonidae, family of Hyperoartia, order of Marsipobranchii (equals family Petromyzonidae, family of Petromyzoniformes)
A1201011		Petromyzon marinus
A2	(2)	Myxini, class of superclass Agnatha
A2	(2)	Hyperotreti (syn. Myxini, class of superclass Agnatha)
A21	(2)	Myxiniformes, order of class Myxini
A2	(X)	Hyperotreta, order of Marsipobranchii, class of Chordata (equals Myxini, class of superclass Agnatha)
A21	(1)	Myxinoidea, suborder of order Cyclostomata (equals Myxiniformes, order of class Myxini)
A21	(1)	Hyperotreti (syn. Myxinoidea, suborder of order Cyclostomata) (equals Myxiniformes, order of class Myxini)
A	(2)	Gnathostomata, superclass of sub-subphylum Anamnia
A	(1)	Chondrichthyes, class of superclass Pisces (is included in Gnathostomata, superclass of sub-subphylum Anamnia)
A	(1)	Gnathostomata, class of superclass Pisces (equals class Chondrichthyes plus class Osteichthyes of superclass Pisces) (equals Gnathostomata, superclass of sub-subphylum Anamnia)
A	(2)	Pisces, series of Gnathostomata
AA	(2)	Elasmobranchii, class of series Pisces
AA	(1)	Elasmobranchii, subclass of class Chondrichthyes (equals Elasmobranchii, class of series Pisces)
AA	(X)	Elasmobranchii, class of phylum Chordata (equals Elasmobranchii, class of series Pisces)
AA	(2 or X)	Selachii, subclass of class Elasmobranchii
AA	(1)	Selachii, order of subclass Elasmobranchii (equals Selachii, subclass of class Elasmobranchii)
AA	(2)	Euselachii (syn. Selachii, subclass of class Elasmobranchii)
AA	(2)	Plagiostomi (syn. Selachii, subclass of class Elasmobranchii)
AA	(2)	Selachoidei, superorder of subclass Selachii
AA	(2)	Pleurotremata (syn. Selachoidei, superorder of subclass Selachii)

AA1	(2)	Heterodontiformes, order of superorder Selachoidei
AA1	(X)	Cestraciontes, order of subclass Selachii
AA1	(1)	Heterodontoidea, suborder of order Selachii (equals Heterodontiformes, order of superorder Selachoidei)
AA1	(2)	Heterodontoidei, suborder of order Heterodontiformes
AA1	(X)	Prosarthri, suborder of order Cestraciontes
AA101	(2 or 1)	Heterodontidae, family of suborder Heterodontoidei or of suborder Heterodontoidea
AA101	(X)	Heterodontidae, family of suborder Prosarthri (equals Heterodontidae, family of suborder Heterodontoidei)
AA2	(2)	Hexanchiformes, order of superorder Selachoidei
AA201	(2)	Hexanchidae, family of order Hexanchiformes
AA2	(2)	Notidanoidei (syn. Hexanchiformes, order of superorder Selachoidei)
AA2	(1)	Notidantoidea, suborder of order Selachii (equals Hexanchiformes, order of superorder Selachoidei)
AA2	(X)	Notidani, order of subclass Selachii
AA2	(X)	Opistharthri, suborder of order Notidani
AA201	(X)	Hexanchidae, family of suborder Opistharthri (equals Hexanchidae, family of order Hexanchiformes)
AA3	(2)	Lamniformes, order of superorder Selachoidei
AA3	(2)	Galeoidei (syn. Lamniformes, order of superorder Selacnoidei)
AA3	(2)	Lamnoidei, suborder of order Lamniformes
AA301	(2)	Lamnidae, family of suborder Lamnoidei
AA3	(1)	Galeoidea, suborder of order Selachii (equals Lamniformes, order of superorder Selachoidei)
AA3	(X)	Euselachii, order of subclass Selachii
AA3	(X)	Galei, suborder of order Euselachii
AA3	(X)	Lamnoidei, series of suborder Galei
AA301	(X)	Lamnidae, family of series Lamnoidei (equals family Lamnidae of suborder Lamnoidei)
AA4	(2)	Squaliformes, order of superorder Selachoidei
AA4	(1)	Squaloidea, suborder of order Selachii (equals Squaliformes, order of superorder Selachoidei)
AA4	(X)	Tectospondyli, order of subclass Selachii (syn. Squaliformes, order of superorder Selachoidei)
AA4	(2)	Squaloidei, suborder of order Squaliformes
AA4	(X)	Squaloidei, suborder of order Tectospondyli (equals Squaloidei, suborder of order Squaliformes)
AA4	(2)	Squatinoidei, suborder of order Squaliformes
AA4	(X)	Squatinoidei, suborder of order Tectospondyli (equals Squatinoidei, suborder of order Squaliformes)
AA	(2)	Batoidei, superorder of subclass Selachii
AA	(2)	Hypotremata (syn. Batoidei, superorder of subclass Selachii)
AA	(X)	Batoidei, order of subclass Selachii (equals Batoidei, superorder of subclass Selachii)
AA	(X)	Hypotremata (syn. Batoidea, order of subclass Selachii) (equals Batoidei, superorder of subclass Selachii)
AA	(1)	Batoidea, order of subclass Elasmobranchii (equals superorder of subclass Selachii)
AA5	(2)	Rajiformes, order of superorder Batoidei
AA501	(2)	Pristidae, family of order Rajiformes
AA5	(X)	Sarcura, suborder of order Batoidea (plus suborder Masticura equals order Rajiformes)
AA501	(X)	Pristidae, family of suborder Sarcura (equals Pristidae, family of order Rajiformes)
AA5	(X)	Masticura, suborder of order Batoidea (plus suborder Sarcura equals order Rajiformes)
AA502	(X)	Dasyatidae, family of suborder Masticura (equals Trygonidae, family of order Rajiformes)
AA6	(2)	Torpediniformes, order of superorder Batoidei
AA601	(2)	Torpedinidae, family of order Torpediniformes
AA6	(1)	Narcaciontes, suborder of order Batoidea (equals order Torpediniformes)

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AA601	(1)	Torpedinidae, family of suborder Narcaciontes (equals Torpedinidae, family of order Torpediniformes)
AB	(2)	Holocephali, class of series Pisces
AB	(1)	Holocephali, subclass of class Chondrichthyes (equals Holocephali, class of series Pisces)
AB	(X)	Holocephali, subclass of class Elasmobranchii (equals Holocephali, class of series Pisces)
AB	(2)	Chimaerae, subclass of class Holocephali
AB1	(2)	Chimaeriformes, order of subclass Chimaerae
AB	(1)	Chimaerae, order of subclass Holocephali (equals Chimaerae, subclass of class Holocephali)
AB1	(X)	Chimaeroidei, order of subclass Holocephali (equals Chimaeriformes, order of subclass Chimaerae)
A	(X)	Pisces, class of phylum Chordata (equals Pisces, series of superclass Gnathostomata)
AC	(2)	Dipnoni, class of series Pisces
AC	(2)	Dipneusta (syn. Dipnoi, class of series Pisces)
A	(1)	Osteichthyes, class of superclass Pisces (is included in superclass Gnathostomata, of sub-subphylum Anamnia)
A	(1)	Amphibioidei, subclass of class Osteichthyes (see Osteichthyes)
AC	(1)	Dipnoi, order of subclass Amphibioidei (equals Dipnoi, class of series Pisces)
AC	(2)	Dipneusta, subclass of class Pisces (equals Dipnoi, class of series Pisces)
AC	(2)	Ceratodi, superorder of class Dipnoi
AC1	(2)	Ceratodiformes, order of superorder Ceratodi
	(X)	Crossopterygii, subclass of class Pisces (Symbol A3)
AC1	(X)	Sirenoidei, order of subclass Crossopterygii (equals Ceratodiformes, order of superorder Ceratodi)
A3	(2)	Teleostomi, class of series Pisces
A3	(2)	Crossopterygii, subclass of class Teleostomi
A3	(X)	Crossopterygii, subclass of class Pisces (equals Crossopterygii, subclass of class Teleostomi)
A3	(1)	Crossopterygii, order of subclass Amphibioidei (equals Crossopterygii, subclass of class Teleostomi)
A3	(2)	Coelancanthi, superorder of subclass Crossopterygii
A31	(2)	Coelacanthiformes, order of superorder Coelacanthi
A31	(2)	Actinistia (syn. Coelacanthiformes, order of superorder Coelacanthi)
A31	(X)	Actinistia, order of subclass Crossopterygii (equals Coelacanthiformes, order of superorder Coelacanthi)
A31	(X)	Coelacanthini (syn. Actinistia, order of subclass Crossopterygii) (equals Coelacanthiformes, order of superorder Coelacanthi)
A31	(2)	Coelacanthoidei, suborder of order Coelacanthiformes
A3	(1)	Coelacanthini, suborder of order Crossopterygii (equals Coelacanthi, superorder of subclass Crossopterygii)
A3	(2)	Actinopterygii, subclass of class Teleostomi
A3	(1)	Actinopterygii, subclass of class Osteichthyes (equals Actinoperygii, subclass of class Teleostomi)
A3	(1)	Chondrostei, superorder of subclass Actinopterygii
A3	(X)	Actinopteri, subclass of class Pisces (plus Cladistia equals Teleostomi, class of series Pisces)
A32	(2)	Polypteriformes, order of subclass Actinopterygii
A32	(2)	Cladistia (syn. Polypteriformes, order of subclass Actinopterygii)
A32	(2)	Brachiopterygii (syn. Polypteriformes, order of subclass Actinopterygii)
A32	(X)	Cladistia, order of subclass Crossopterygii (equals Polypteriformes, order of subclass Actinopterygii)
A3201	(X)	Polypteridae, family of order Cladistia (equals Polypteridae, family of order Polypteriformes)
A32	(1)	Polypterini, order of superorder Chondrostei (equals Polypteriformes order of subclass Actinopterygii)
A33	(2)	Acipenseriformes, order of subclass Actinopterygii (equals order Glaniostomi plus order Selachostomi)

A33	(1)	Acipenseroidei, order of superorder Chondrostei (equals Acipenseriformes, order of subclass Actinopterygii)
A33, A34, and A35	(X)	Ganoidei, superorder of subclass Actinopteri
A3301	(2)	Acipenseridae, family of order Acipenseriformes
A33	(X)	Glaniostomi, order of superorder Ganoidei (plus order Selachostomi equals order Acipenseriformes)
A3301	(X)	Acipenseridae, family of order Glaniostomi (equals Acipenseridae, family of order Acipenseriformes)
A3302	(2)	Polyodontidae, family of order Acipenseriformes
A33	(X)	Selachostomi, order of superorder Ganoidei (plus order Glaniostomi equals order Acipenseriformes)
A3302	(X)	Polyodontidae, family of order Selachostomi (equals Polyodontidae, family or order Acipenseriformes)
A3	(1)	Holostei, superorder of subclass Actinopterygii
A3B	(2)	Amiiformes, order of subclass Actinopterygii
A3B	(1)	Amioidea, order of superorder Holostei (equals Amiiformes, order of subclass Actinopterygii)
A3B	(X)	Halecomorphi, order of superorder Ganoidei (equals Amiiformes, order of subclass Actinopterygii)
A3B	(X)	Amioidei (syn. Halecomorphi, order of superorder Ganoidei) (equals Amiiformes, order of subclass Actinopterygii)
A3B01	(X)	Amiidae, family of order Halecomorphi (equals Amiidae, family of order Amiiformes)
A3C	(2)	Lepidosteiformes, order of subclass Actinopterygii
A3C01	(2)	Lepidosteidae, family of order Lepidosteiformes
A3	(1 and X)	Teleostei, superorder of subclass Actinopterygii
A34	(2)	Clupeiformes, order of subclass Actinopterygii
A34	(2)	Isospondyli (syn. Clupeiformes, order of subclass Actinopterygii)
A34	(2)	Thrissomorphi (syn. Clupeiformes, order of subclass Actinopterygii)
A34	(1 and X)	Isospondyli, order of superorder Teleostei (equals Clupeiformes, order of subclass Actinopterygii)
A34	(2)	Clupeoidei, suborder of order Clupeiformes
A34	(X)	Clupeoidei, suborder of order Isospondyli
A34	(1)	Clupeoidea, suborder of order Isospondyli (equals Clupeoidei, suborder of order Clupeiformes)
A34	(2)	Clupeoidae, superfamily of suborder Clupeoidei
A3401	(2)	Clupeidae, family of superfamily Clupeoidae
A3401	(X)	Clupeidae, family of suborder Clupeoidei (equals Clupeidae, family of superfamily Clupeoidae)
A34	(2)	Salmonoidei, suborder of order Clupeiformes
A34	(X)	Salmonoidei, suborder of order Isospondyli (equals Salmonoidei, suborder of order Clupeiformes)
A34	(1)	Salmonoidea, suborder of order Isospondyli (equals Salmonoidei, suborder of order Clupeiformes)
A3402	(2)	Salmonidae, family of suborder Salmonoidei
A3402011		Salmo salar
A3402011		Atlantic salmon
A3402012		Salmo irideus
A3402012		Rainbow trout
A3402013		Salmo trutta
A3402013		Brown trout
A3402021		Oncorhynchus nerka
A3402021		Blue-back salmon
A35	(2)	Anguilliformes, order of subclass Actinopterygii
A35	(X)	Apodes, order of superorder Teleostei (equals Anguilliformes, order of subclass Actinopterygii)
A36	(2)	Mormyriformes, order of subclass Actinopterygii
A36	(2)	Scyphophori (syn. Mormyriformes, order of subclass Actinopterygii)
A36	(X)	Scyphophori, suborder of order Isospondyli
A37	(2)	Cyprinodontiformes, order of subclass Actinopterygii

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A37 (2) Cyprinodontes (syn. Cyprinodontiformes, order of subclass Actinopterygii)
A37 (X) Cyprinodontes, order of superorder Teleostei
A3701 (2) Cyprinodontidae, family of order Cyprinodontiformes
A3701 (X) Cyprinodontidae, family of order Cyprinodontes
A3702 (2) Poeciliidae, family of order Cyprinodontiformes
A3702 (X) Poeciliidae, family of order Cyprinodontes
A3702011 Gambusia affinis
A38 (2) Gasterosteiformes, order of subclass Actinopterygii
A39 (2) Syngnathiformes, order of subclass Actinopterygii
A3A (2) Perciformes, order of subclass Actinopterygii
A3A (2) Acanthopterygii (syn. Perciformes, order of subclass Actinopterygii)
A3A (2) Percomorphi (syn. Perciformes, order of subclass Actinopterygii)
A3 (X) Acanthopterygii, superorder of subclass Actinopterygii
A3A (X) Percomorphi, order of superorder Acanthopterygii
A3A (2) Percoidei, suborder of order Perciformes
A3A (1) Percoidea, suborder of order Acanthopterygii
A3A01 (2 or 1) Centrarchidae, family of suborder Percoidei or of suborder Percoidea
A3A01 (X) Centrarchidae, family of order Percomorphi
A3A01011 Chaenobryttus gulosus
A3A01021 Lepomis macrochirus
A3A01021 Helioperca incisor (syn. Lepomis macrochirus)
A3A01021 Bluegill sunfish
A3A01022 Lepomis cyanellus
A3A02 (2 or 1) Percidae, family of suborder Percoidei or of suborder Percoidea
A3A02 Percidae, family of order Percoidei
A3A02011 Perca flavescens
A3A02011 Yellow perch
A3A03 (2 or 1) Cichlidae, family of suborder Percoidei or of suborder Percoidea
A3A (X) Chromides, order of superorder Teleostei (included in the suborder Percoidei of the order Perciformes)
A3A03 (X) Cichlidae, family of order Chromides (equals Cichlidae, family of suborder Percoidei)
A3A03011 Tilapia kafuensis
A3D (2) Ophiocephaliformes, order of subclass Actinopterygii
A3E (2) Symbranchiformes, order of subclass Actinopterygii
A3F (2) Pleuronectiformes, order of subclass Actinopterygii
A3G (2) Mastacembeliformes, order of subclass Actinopterygii
A3H (2) Cypriniformes, order of subclass Actinopterygii
A3H (2) Cyprinoidei, suborder of order Cypriniformes
A3H (2) Eventognathi, suborder of order Cypriniformes (syn. Cyprinoidei, suborder of order Cypriniformes)
A3H (X) Eventognathi, order of superorder Teleostei (equals Eventognathi, suborder of order Cypriniformes)
(1) Ostariophysi, order of superorder Teleostei (included in order Cypriniformes) (Symbol A3H)
A3H (1) Cyprinoidea, suborder of order Ostariophysi (equals Cyprinoidei, suborder of order Cypriniformes)
A3H01 (2) Cyprinidae, family of suborder Cyprinoidei
A3H01 (X) Cyprinidae, family of order Eventognathi (equals Cyprinidae, family of suborder Cyprinoidei)
A3H01 Cyprinidae, family of suborder Cyprinoidea
A3H01011 Carassius auratus
A3H01011 Goldfish
A3H (1) Ostariophysi, order of superorder Teleostei (included in order Cypriniformes)
A3H (1) Siluroidea, suborder of order Ostariophysi
A3H (2) Siluroidei, suborder of order Cypriniformes
A3H (2) Nematognathi, suborder of order Cypriniformes (syn. Siluroidei, suborder of order Cypriniformes)
A3H (X) Nematognathi, order of superorder Teleostei (equals Nematognathi, suborder of order Cypriniformes)

A3H02	(2)	Ameiuridae, family of suborder Siluroidei
A3H02	(X)	Ameiuridae, family of order Nematognathii
A3H02	(1)	Ameiuridae, family of suborder Siluroidea
A3H02011		Ameiurus nebulosus
A3H02021		Ictalurus punctatus
A3H	(2)	Gymnotoidei, suborder of order Cypriniformes
A3H	(X)	Gymnonoti, order of superorder Teleostei (equals Gynotoidei, suborder of order Cypriniformes)
A3H03	(2)	Electrophoridae, family of suborder Gymnotoidei
A3H03	(X)	Electrophoridae, family of order Gymnonoti (equals Electrophoridae, family of suborder Gymnotoidei)
A3H03011		Electrophorus electricus
A3H03011		Electric eel
A4		Amphibia, class of division Craniata
A4		Amphibia, class of phylum Chordata
A41		Caudata, order of class Amphibia
A41		Urodela (syn. Caudata)
A41		Proteidea, suborder of order Caudata
A4101		Proteidae, family of suborder Proteidea
A4101011		Necturus maculosus
A4101021		Proteus anguinus
A41		Cryptobranchoidea, suborder of order Caudata
A4102		Cryptobranchidae, family of suborder Cryptobranchoidea
A410201		Cryptobranchus sp.
A41		Ambystomoidea, suborder of order Caudata
A4103		Ambystomidae, family of suborder Ambystomoidea
A4103011		Ambystoma tigrinum
A41		Salamandroidea, suborder of order Caudata
A4104		Salamandridae, family of suborder Salamandroidea
A4104011		Salamandra salamandra
A4104021		Triton cristatus
A4104022		Triton taeniatus (syn. Triturus taeniatus)
A4104022		Triturus taeniatus (syn. Triton taeniatus)
A4104022		European salamander
A42		Salientia
A42		Anura (syn. Salientia)
A42		Amphicoela, suborder of order Anura
A4201		Liopelmidae, family of order Anura or of suborder Amphicoela
A42		Opisthocoela, suborder of order Anura
A4202		Discoglossidae, family of order Anura or of suborder Opisthocoela
A4202011		Alytes obstetricans
A4203		Pipidae, family of order Anura or of suborder Opisthocoela
A4203011		Xenopus laevis
A42		Anomocoela, suborder of order Anura
A4204		Pelobatidae, family of order Anura or of suborder Anomocoela
A42		Procoela, suborder of order Anura
A4205		Bufonidae, family of order Anura or of suborder Procoela
A4205011		Bufo americanus
A4205012		Bufo fowleri
A4205013		Bufo cognatus
A4205014		Bufo marinus
A4205015		Bufo bufo
A4206		Hylidae, family of order Anura or of suborder Procoela
A4206011		Hyla crucifer
A4206011		Hyla pickeringii (syn. Hyla crucifer)
A4206012		Hyla versicolor
A4206013		Hyla aborea
A42		Diplasiocoela, suborder of order Anura
A4207		Ranidae, family of order Anura or of suborder Diplasiocoela
A4207011		Rana pipiens
A4207012		Rana esculenta
A4207013		Rana aurora
A4207014		Rana catesbeiana
A4207015		Rana clamitans
A4207016		Rana temporaria
A4207017		Rana sylvatica
A4208		Brevicipitidae, family of order Anura or of suborder Diplasiocoela
A4209		Leptodactylidae, family of order Anura or of suborder Procoela
A4209011		Leptodactylus ocellatus
A5		Reptilia, class of division Craniata
A5		Reptilia, class of phylum Chordata
A5		Archosauria, subclass
A51		Crocodilia, order of subclass Archosauria
A51		Loricata (syn. Crocodilia)
A51		Eusuchia, suborder of order Crocodilia
A5101		Crocodilidae, family of suborder Eusuchia
A5101011		Crocodylus acutus
A5101021		Alligator mississipiensis
A5		Subclass Lepidosauria

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A52	Squamata, order of subclass Lepidosauria
A52	Lacertilia, suborder of order Squamata
A52	Sauria (syn. Lacertilia), suborder of order Squamata
A5201	Helodermatidae, family of suborder Lacertilia
A5201011	Heloderma suspectum
A5201011	Gila monster
A5202	Chamaeleontidae, family of suborder Lacertilia
A520201	Chamaeleon sp.
A5203	Iguanidae, family of suborder Lacertilia
A5203011	Anolis carolinensis
A5203021	Sceloporus undulatus
A520303	Phrynosoma sp.
A520304	Iguana sp.
A5204	Gekkonidae, family of suborder Lacertilia
A5204011	Tarentola mauritanica
A520402	Phyllodactylus sp.
A520403	Hemidactylus sp.
A5204041	Coleonyx variegatus
A5205	Scincidae, family of suborder Lacertilia
A5206	Lacertidae, family of suborder Lacertilia
A5207	Teiidae, family of suborder Lacertilia
A5207011	Cnemidophorus tessellatus
A5208	Varanidae, family of suborder Lacertilia
A5209	Agamidae, family of suborder Lacertilia
A5210	Xantusidae, family of suborder Lacertilia
A5211	Amphisbaenidae, family of suborder Lacertilia
A5212	Anguidae, family of suborder Lacertilia
A52	Serpentes, suborder of order Squamata
A5213	Viperidae, family of suborder Serpentes (no division into subfamilies)
A521301	Vipera sp.
A521302	Cerastes sp.
A521303	Bitis sp.
A5214	Crotalidae, family of suborder Serpentes
A5214011	Bothrops jararaca
A5214021	Crotalus horridus
A5214022	Crotalus viridis
A5214023	Crotalus atrox
A5214024	Crotalus cerastes
A5214031	Agkistrodon mokeson
A5215	Elapidae, family of suborder Serpentes
A5215011	Naja tripudians
A5215011	Cobra
A5216	Boidae, family of suborder Serpentes
A5216	Pythoninae, subfamily of family Boidae
A5216011	Python reticulatus
A5216021	Eunectes murinus
A5217	Colubridae, family of suborder Serpentes
A5217011	Natrix sipedon
A521702	Thamnophis sp.
A5217031	Coluber constrictor
A5217041	Pituophis catenifer
A5217051	Lampropeltis zonata
A53	Chelonia, order of class Reptilia
A53	Testudinata (syn. Chelonia) (obsolete)
A53	Turtles
A53	Thecophora, suborder of order Chelonia
A5301	Testudinidae, family of order Chelonia (or of suborder Thecophora)
A530101	Testudo sp.
A530102	Terrapene sp.
A530103	Graptemys sp.
A530104	Gopherus sp.
A5302	Chelydridae, family of order Chelonia (or of suborder Thecophora)
A5302011	Chelydra serpentina
A5303	Emydidae, family of order Chelonia (or of suborder Thecophora)
A530301	Emys sp.
A5303021	Chrysemys picta
A5303022	Chrysemys picta marginata
A5303023	Chrysemys picta picta
A5303023	Eastern painted turtle
A5303031	Pseudemys elegans
A5304	Chelonidae, family of order Chelonia (or of suborder Thecophora)
A530401	Chelonia sp.
A5305	Trionychidae, family of order Chelonia (or of suborder Thecophora)
A5305011	Trionyx ferox
A5306	Kinosternidae, family of order Chelonia (or of suborder Thecophora)
A530601	Kinosternon sp.
A530602	Sternotherus sp.
A54	Rhynchocephalia, order of class Reptilia
A5401	Sphenodontidae
A5401011	Sphenodon punctatum
A6	Aves, class of Phylum Chordata
A6	Aves, class of division Craniata

A6	Neornithes, subclass of class Aves
A6	Neognathae, superorder of subclass Neornithes
A61	Galliformes, order of superorder Neognathae
A6101	Meleagrididae
A6101011	Meleagris gallopavo
A6101011	Wild turkey
A6102	Phasianidae
A6102011	Gallus domesticus
A6102021	Phasianus torquatus
A6103	Tetraonidae
A610301	Tympanuchus sp.
A6104	Perdicidae
A6104011	Lophortyx gambelii
A6	Palaeognathae, superorder of subclass Neornithes
A62	Struthioniformes, order of superorder Palaeognathae
A6201	Struthionidae
A6201	Ostriches
A6201011	Struthio camelus
A63	Anseriformes, order of superorder Neognathae
A6301	Anatidae
A6301	Ducks
A6301011	Anas platyrhynchos
A6301011	Anas boschas
A6301011	Domestic duck
A6301011	Mallard duck
A64	Columbiformes, order of superorder Neognathae
A6401	Columbidae
A6401011	Columba livia
A6401011	Pigeon
A6401012	Columba fasciata
A6401012	Pigeon
A6401021	Zenaidura macroura
A6401021	Mourning dove
A65	Passeriformes, order of superorder Neognathae
A65	Oscines, suborder of order Passeriformes
A6501	Fringillidae, family of suborder Oscines
A6501011	Serinus canarius
A6501011	Canary
A6502	Ploceidae, family of suborder Oscines
A6502011	Passer domesticus
A6502011	House sparrow
A6502011	English sparrow
A6503	Corvidae, family of suborder Oscines
A6504	Sturnidae, family of suborder Oscines
A6505	Icteridae, family of suborder Oscines
A66	Falconiformes, order of superorder Neognathae
A6601	Cathartidae
A6601011	Cathartes aura
A6601011	Turkey vulture
A6601012	Cathartes urubu
A6601012	Vulture
A6602	Accipitridae
A6602011	Buteo regalis
A67	Strigiformes, order of superorder Neognathae
A6701	Strigidae
A6701011	Bubo virginianus pallescens
A68	Charadriiformes, order of superorder Neognathae
A6801	Laridae
A6801011	Larus argentatus
A7	Mammalia, class of phylum Chordata
A7	Mammalia, class of division Craniata
A7	Theria, subclass of class Mammalia
A7	Eutheria, infraclass of subclass Theria
A7	Ferungulata, cohort of infraclass Eutheria
A7	Paraxonia, superorder of cohort Ferungulata
A71	Artiodactyla, order of superorder Paraxonia
A71	Ruminantia, suborder of order Artiodactyla
A71	Pecora, infraorder of suborder Ruminantia
A71	Bovoidea, superfamily of infraorder Pecora
A7101	Bovidae, family of superfamily Bovoidea
A7101	Bovinae, subfamily of family Bovidae
A7101	Bovini, tribe of subfamily Bovinae
A7101011	Bos taurus (subfamily Bovinae)
A7101011	Domestic cow
A7101012	Bos sondaicus (subfamily Bovinae)
A7101013	Bos indicus (subfamily Bovinae)
A7101	Caprinae, subfamily of family Bovidae
A7101	Caprini, tribe of subfamily Caprinae
A7101021	Ovis musimon (tribe Caprini)
A7101022	Ovis aries (tribe Caprini)
A7101031	Capra hircus (tribe Caprini)
A71	Suiformes, suborder of order Artiodactyla
A71	Suina, infraorder of suborder Suiformes

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A71	Suoidea, superfamily of infraorder Suina
A7102	Suidae, family of superfamily Suoidea
A7102	Suinae, subfamily of family Suidae
A7102011	Sus scrofa (subfamily Suinae)
A7102011	Pigs
A7	Ferae, superorder of cohort Ferungulata
A72	Carnivora, order of superorder Ferae
A72	Fissipedia, suborder of order Carnivora
A72	Canoidea, superfamily of suborder Fissipedia
A7201	Canidae, family of superfamily Canoidea
A7201	Caninae, subfamily of family Canidae
A7201011	Canis familiaris (subfamily Caninae)
A7201011	Domestic dog
A7201012	Canis latrans (subfamily Caninae)
A7201013	Canis nubilis (subfamily Caninae)
A7201021	Urocyon cinereoargenteus (subfamily Caninae)
A7201021	Urocyon cinereoargenteus scotti (subfamily Caninae)
A7201021	Gray fox
A720103	Alopex sp.
A7201041	Vulpes fulva (subfamily Caninae)
A7202	Felidae, family of superfamily Canoidea
A7202	Felinae, subfamily of family Felidae
A7202011	Felis catus (subfamily Felinae)
A7202021	Lynx rufus baileyi (subfamily Felinae)
A7202022	Lynx canadensis (subfamily Felinae)
A7203	Mustelidae, family of superfamily Canoidea
A7203	Mustelinae, subfamily of family Mustelidae
A7203011	Mustela vison (subfamily Mustelinae)
A7203011	Mink
A7203	Mephitinae, subfamily of family Mustelidae
A720302	Mephitis sp.
A7203	Melinae, subfamily of family Mustelidae
A7203031	Taxidea taxus berlandieri (subfamily Melinae)
A7204	Ursidae, family of superfamily Canoidea
A7204	Bears
A7204011	Ursus horribilis
A7204011	Grizzly bear
A72	Pinnipedia, suborder of order Carnivora
A7201	Phocidae, family of suborder Pinnipedia
A7201	Phocinae, subfamily of family Phocidae
A7201011	Phoca vitulina (subfamily Phocinae)
A7	Glires, cohort of infraclass Eutheria
A73	Rodentia, order of cohort Glires
A73 plus A77	Rodentia, order of cohort Glires (inc. suborder Duplicidentata) (obs.)
A73	Sciuromorpha, suborder of order Rodentia A73
A73	Simplicidentata, suborder of Rodentia A73 plus A77 (obs.) (equals Rodentia A73)
A73	Geomyoidea, superfamily of suborder Sciuromorpha
A7301	Heteromyidae, family of superfamily Geomyoidea
A7301	Perognathinae, subfamily of family Heteromyidae
A7301011	Perognathus inornatus (subfamily Perognathinae)
A7301	Dipodomyinae, subfamily of family Heteromyidae
A7301021	Dipodomys spectabilis (subfamily Dipodomyinae)
A7301022	Dipodomys merriami (subfamily Dipodominae)
A73	Myomorpha, suborder of order Rodentia A73
A73	Muroidea, superfamily of suborder Myomorpha
A7302	Muridae, family of superfamily Muroidea
A7302	Murinae, subfamily of family Muridae
A7302011	Mus musculus (subfamily Murinae)
A7302012	Micromys minutus (subfamily Murinae)
A7302021	Rattus rattus (subfamily Murinae)
A7302022	Rattus norvegicus (subfamily Murinae)
A7302022	Norway rat
A73	Sciuroidea, superfamily of suborder Sciuromorpha
A7303	Sciuridae, family of superfamily Sciuroidea
A7303	Sciurinae, subfamily of family Sciuridae
A7303	Marmotini, tribe of subfamily Sciurinae
A730301	Citellus richardsoni (tribe Marmotini)

A73	Hystricomorpha, suborder of order Rodentia A73
A73	Cavioidea, superfamily of suborder Histricomorpha
A7304	Caviidae, family of superfamily Cavioidea
A7304	Caviinae, subfamily of family Caviidae
A7304011	Cavia porcellus (subfamily Caviinae)
A7304011	Guinea pig
A73	Geomyoidea, superfamily of suborder Sciuromorpha
A7305	Geomyidae, family of superfamily Geomyoidea
A7306	Cricetidae, family of superfamily Muroidea
A7306	Cricetinae, subfamily of family Cricetidae
A7306	Cricetini, tribe of subfamily Cricetinae
A7306011	Cricetus cricetus (tribe Cricetini)
A7306011	Hamster (large European)
A7306	Hesperomyini, tribe of subfamily Cricetinae
A7306021	Neotoma lepida intermedia (tribe Hesperomyini)
A7306	Microtinae, subfamily of family Cricetidae
A7306	Microtini, tribe of subfamily Microtinae
A7306031	Microtus ochrogaster haydeni (tribe Microtini)
A630604	Peromyscus sp. (tribe Hesperomyini)
A7306051	Sigmodon hispidus (tribe Hesperomyini)
A7306051	Cotton rat
A7306061	Mesocricetus auratus (tribe Cricetini)
A7306061	Golden hamster
A73	Erethizontoidea, superfamily of suborder Hystricomorpha
A7307	Erethizontidae, family of superfamily Erethizontoidea
A73	Chinchilloidea, superfamily of suborder Hystricomorpha
A7308	Chinchillidae, family of superfamily Chinchilloidea
A730801	Chinchilla sp.
A7	Unguiculata, cohort of infraclass Eutheria
A74	Primates, order of cohort Unguiculata
A74	Anthropoidea, suborder of order Primates
A74	Hominoidea, superfamily of suborder Anthropoidea
A7401	Hominidae, family of superfamily Hominoidea
A7401011	Homo sapiens
A7401011	Man
A74	Ceboidea (syn. Platyrhini), superfamily of suborder Anthropoidea
A7402	Callithricidae, family of superfamily Ceboidea
A7402	Hapalidae (syn. Callithricidae)
A740201	Callithrix sp.
A740201	Hapale sp. (syn. Callithrix sp.)
A7403	Cebidae, family of superfamily Ceboidea
A7403	Cebinae, subfamily of family Cebidae
A740301	Cebus sp. (subfamily Cebinae)
A7403	Atelinae, subfamily of family Cebidae
A7403021	Ateles ater (subfamily Atelinae)
A74	Cercopithecoidea (syn. Catarrhini), superfamily of suborder Anthropoidea
A74	Catarrhini (equ. Cercopithecoidea plus Hominoidea), superfamily of suborder Anthropoidea
A7404	Cercopithecidae, family of superfamily Cercopithecoidea
A7404	Cercopithecinae, subfamily of family Cercopithecidae
A7404012	Macaca mulatta (syn. Macaca rhesus) (subfamily Cercopithecinae)
A7404013	Macaca philippinensis (subfamily Cercopithecinae)
A7405	Pongidae, family of superfamily Hominoidea
A7405	Ponginae, subfamily of family Pongidae
A7405011	Pan troglodytes (subfamily Ponginae)
A7405011	Anthropopithecus troglodytes (syn. Pan troglodytes)
A7	Mesaxonia, superorder of cohort Ferungulata
A75	Perissodactyla, order of superorder Mesaxonia
A75	Hippomorpha, suborder of order Perissodactyla
A75	Ceratomorpha, suborder of order Perissodactyla
A75	Equoidea, superfamily of suborder Hippomorpha
A7501	Equidae, family of superfamily Equidae
A7501011	Equus caballus
A7501011	Horse
A7	Metatheria, infraclass of subclass Theria
A76	Marsupialia, order of infraclass Metatheria

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A76	Didelphoidea, superfamily of order Marsupialia
A7601	Didelphidae, family of superfamily Didelphoidea
A7601	Didelphinae, subfamily of family Didelphidae
A7601011	Didelphis virginianus (subfamily Didelphinae)
A7601011	Opossum
A77	Lagomorpha, order of cohort Glires
A77	Duplicidentata, suborder of order Rodentia A73 plus A77 (obs.) (equals order Lagomorpha A77)
A7701	Leporidae, family of order Lagomorpha
A7701	Leporinae, subfamily of family Leporidae
A7701011	Lepus americanus (subfamily Leporinae)
A7701011	Snowshoe hare
A7701012	Lepus campestris (subfamily Leporinae)
A7701012	Jack rabbit, white-tailed
A7701021	Oryctolagus cuniculus (subfamily Leporinae)
A7701021	Domestic rabbit
A7701031	Sylvilagus auduboni (subfamily Leporinae)
A78	Insectivora, order of cohort Unguiculata
A78	Soricoidea, superfamily of order Insectivora
A7801	Talpidae, family of superfamily Soricoidea
A7801	Talpinae, subfamily of family Talpidae
A7801011	Talpa europaea (subfamily Talpinae)
A7801011	Mole, European
B	Acanthocephala
B1	Metacanthocephala
B11	Archiacanthocephala
B1100011	Echinorhynchus trutta
C	Rotatoria
C	Rotifera (syn. Rotatoria)
C1	Monogononta
C11	Ploima
C1101	Notommatidae
C1102	Brachionidae
C1102011	Brachionus calyciflorus
C2	Bdelloidea
C3	Seisonidea
D	Entoprocta
E	Bryozoa, phylum excluding Entoprocta
E	Ectoprocta (equiv. to Bryozoa, phylum excluding Entoprocta)
D and E	Bryozoa, phylum including Entoprocta (obsolete)
F	Echiuroidea
F1	Echiurida
F11	Echiuroinea
F1101	Echiuridae
F1101011	Echiurus pallasii
F1101021	Urechis caupo
F1102	Bonelliidae
G	Sipunculidoidea
H	Priapulidoidea
J	Thallophyta (Fungi, Algae and Bacteria)
J9	Fungi (otherwise unspecified)
J1	Myxothallophyta
J11	Acrasiales
J1101	Dictyosteliaceae
J110101	Dictyostelium
J1101011	Dictyostelium discoideum
J12	Labyrinthulales
J13	Hydromyxales
J14	Myxomycetes
J3	Phycomycetes
J31	Hyphochytriales
J32	Chytridiales
J33	Blastocladiales
J34	Monoblepharidales
J35	Saprolegniales
J3501	Saprolegniaceae
J350101	Aphanomyces
J3501011	Aphanomyces cochlioides
J36	Leptomitales
J37	Lagenidiales
J38	Peronosporales
J3801	Peronosporaceae
J380101	Pythium
J3801011	Pythium ultimum
J3801012	Pythium debaryanum
J3801013	Pythium aphanidermatum
J380102	Phytophthora
J3801021	Phytophthora infestans
J3801022	Phytophthora cinnamomi
J39	Mucorales
J3901	Endogonaceae
J3902	Mucoraceae
J390201	Rhizopus
J3902011	Rhizopus nigricans
J390202	Phycomyces
J3902021	Phycomyces blakesleeanus
J390203	Mucor
J3902031	Mucor mucedo
J3902032	Mucor piriformis
J390204	Absidia
J3902041	Absidia glauca
J3903	Choanephoraceae

J390301	Cunninghamella
J3903011	Cunninghamella elegans
J3904	Thamnidiaceae
J390401	Thamnidium
J3904011	Thamnidium elegans
J3A	Entomophthorales
J3B	Phycomycetes Incertae Sedis
J4	Ascomycetes
J41	Endomycetales
J4101	Endomycetaceae
J410101	Piedraia
J4101011	Piedraia sarmontoi
J410102	Endomyces
J4101021	Endomyces magnusii
J410103	Eremothecium
J4101031	Eremothecium ashbyii
J4102	Coccidioideaceae
J410201	Coccidioides
J4102011	Coccidioides immitis
J4103	Saccharomycetaceae
J410301	Debaryomyces
J4103011	Debaryomyces matruchoti
J4103012	Debaryomyces neoformans
J410302	Hansenula
J4103021	Hansenula anomala
J4103022	Hansenula saturnus
J410303	Nematospora
J4103031	Nematospora phaseoli
J410304	Pichia
J4103041	Pichia membranaefaciens
J410305	Saccharomyces
J4103051	Saccharomyces chodati
J4103052	Saccharomyces carlsbergensis
J4103053	Saccharomyces cerevisiae
J4103054	Saccharomyces ellipsoideus
J4103055	Saccharomyces fragilis
J4103056	Saccharomyces lactis
J4103057	Saccharomyces pastorianus
J410306	Schizosaccharomyces
J4103061	Schizosaccharomyces pombe
J410307	Torulaspora
J4103071	Torulaspora rosei
J410308	Zygosaccharomyces
J4103081	Zygosaccharomyces marxianus
J4103082	Zygosaccharomyces mandshuricus
J4103083	Zygosaccharomyces lactis
J4103084	Zygosaccharomyces barkeri
J410309	Saccharomycodes
J4103091	Saccharomycodes ludwigii
J410310	Endomycopsis
J4103101	Endomycopsis javanensis
J42	Taphrinales
J43	Eurotiales
J4301	Eurotiaceae
J430101	Thielavia
J44	Myriangiales
J45	Dothideales
J46	Microthyriales (syn. Hemisphaeriales)
J47	Meliolales
J48	Erysiphales
J4801	Erysiphaceae
J480101	Erysiphe
J4801011	Erysiphe polygoni
J49	Hypocreales
J4901	Nectriaceae
J490101	Nectria
J4901011	Nectria galligena
J4902	Hypocreaceae
J490201	Claviceps
J4902011	Claviceps purpurea
J4A	Laboulbeniales
J4B	Sphaeriales
J4B01	Chaetomiaceae
J4B0101	Chaetomium
J4B01011	Chaetomium globosum
J4B01012	Chaetomium convolutum
J4B02	Xylariaceae
J4B0201	Xylaria
J4B02011	Xylaria hypoxylon
J4B03	Sphaeriaceae
J4B0301	Neurospora
J4B03011	Neurospora crassa
J4B03012	Neurospora sitophila
J4B03013	Neurospora tetrasperma
J4B04	Ceratostomataceae
J4B0401	Ceratocystis (syn. Ceratostomella)
J4B04011	Ceratocystis ulmi (syn. Ceratostomella ulmi)
J4B04012	Ceratocystis fimbriata (syn. Ceratostomella fimbriata)
J4B04013	Ceratocystis multiannulata (syn. Ophiostoma multiannulatum)
J4B05	Mycosphaerellaceae
J4B0501	Venturia
J4B05011	Venturia inaequalis
J4B0502	Mycosphaerella
J4B05021	Mycosphaerella tulasni
J4C	Hysteriales
J4D	Phacidiales
J4E	Helotiales
J4E01	Sclerotiniaceae
J4E0101	Monilinia
J4E01011	Monilinia fructicola (syn. Sclerotinia fructicola)
J4E01012	Monilinia fructigena (syn. Sclerotinia fructigena)
J4E01013	Monilinia laxa (syn. Sclerotinia laxa)
J4E0102	Sclerotinia
J4E01021	Sclerotinia sclerotiorum
J4E01022	Sclerotinia homeocarpa
J4F	Pezizales
J4G	Tuberales
J4H	Ascomycetes Incertae Sedis
J5	Basidiomycetes
J51	Tremellales
J52	Uredinales
J5201	Pucciniaceae

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J520101	Gymnosporangium
J5201011	Gymnosporangium clavipes
J520102	Puccinia
J5201021	Puccinia coronata
J5201022	Puccinia graminis
J53	Ustilaginales
J54	Exobasidiales
J55	Agaricales
J5501	Polyporaceae
J550101	Poria
J5501011	Poria monticola
J5501012	Poria microspora
J550102	Fomes
J5501021	Fomes pini
J5501022	Fomes pomaceus
J550103	Polyporus
J5501031	Polyporus squamosus
J5501032	Polyporus circinatus
J5501033	Polyporus croceus
J5501034	Polyporus obtusus
J5501035	Polyporus schweinitzii
J5501036	Polyporus alboluteus
J5501037	Polyporus tulipiferus
J5502	Agaricaceae
J550201	Agaricus
J5502011	Agaricus campestris
J550202	Coprinus
J5502021	Coprinus fimetarius
J550203	Schizophyllum
J5502031	Schizophyllum commune
J5503	Thelephoraceae
J550301	Stereum
J5503011	Stereum murrayi
J550302	Pellicularis
J5503021	Pellicularis filamentosa (imperfect stage known as: Rhizoctonia solani or obs. Corticium solani)
J56	Hymenogastrales
J57	Phallales
J58	Lycoperdales
J59	Sclerodermatales
J5A	Nidulariales
J6	Fungi Imperfecti
J61	Sphaeropsidales
J6101	Sphaerioidaceae
J610101	Ascochyta
J6101011	Ascochyta chrysanthemi
J610102	Diplodia
J6101021	Diplodia natalensis
J610103	Phomopsis
J6101031	Phomopsis citri
J62	Melanconiales
J63	Moniliales
J6301	Cryptococcaceae (syn. Pseudosaccharomycetaceae)
J630101	Candida
J6301011	Candida albicans
J6301012	Candida crusei
J6301013	Candida pulcherrima
J6301014	Candida lipolytica
J6301015	Candida tropicalis
J6301016	Candida guilliermondii
J6301017	Candida flareri
J6301018	Candida monosa
J6301019	Candida pseudotropicalis
J630102	Kloeckeria
J6301021	Kloeckeria brevis
J630103	Rhodotorula
J6301031	Rhodotorula aurantiaca
J6301032	Rhodotorula mucilaginosa
J6301033	Rhodotorula sanniei
J630104	Torulopsis
J6301041	Torulopsis neoformans
J6301042	Torulopsis hominis
J6301043	Torulopsis utilis
J630105	Pullularia
J6301051	Pullularia pullulans
J630106	Mycoderma
J6301061	Mycoderma cerevisiae
J6301062	Mycoderma vini
J630107	Brettanomyces
J6301071	Brettanomyces anomolus
J6302	Sporobolomycetaceae
J630201	Sporobolomyces
J6302011	Sporobolomyces salmonicolor
J6303	Moniliaceae
J630301	Aspergillus
J6303011	Aspergillus candidus
J6303012	Aspergillus niger
J6303013	Aspergillus tamarii
J6303014	Aspergillus terreus
J6303015	Aspergillus wentii
J630302	Monosporium
J6303021	Monosporium apiospermum
J630303	Sporotrichum
J6303031	Sporotrichum schenckii
J6303032	Sporotrichum floccosum
J630304	Botrytis
J6303041	Botrytis cinerea
J6303042	Botrytis allii
J630305	Paecilomyces
J630306	Scopulariopsis
J630307	Gliocladium
J630308	Trichoderma
J6303081	Trichoderma lignorum
J6303082	Trichoderma viride
J6303083	Trichoderma koeningi
J630309	Trichothecium
J630310	Oidium
J6303101	Oidium lactis
J630311	Monilia
J6303111	Monilia albicans
J630312	Penicillium
J6303121	Penicillium digitatum
J6303122	Penicillium chrysogenum
J6303123	Penicillium citrinum
J6303124	Penicillium patulum
J6303125	Penicillium brevicompactum
J6303126	Penicillium expansum

J6303127	Penicillium notatum
J6303128	Penicillium gladioli
J6303129	Penicillium cyclopium
J630312A	Penicillium italicum
J6304	Dematiaceae
J630401	Hormodendron
J6304011	Hormodendron compactum
J6304012	Hormodendron pedrosoi
J6304013	Hormodendron cladosporoides
J630402	Phialophora
J6304021	Phialophora verrucosa
J6304022	Phialophora braziliensis
J630403	Memnoniella
J630404	Alternaria
J6304041	Alternaria oleracea
J6304042	Alternaria solani
J6304043	Alternaria tenuis
J6304044	Alternaria brassicae
J630405	Cercospora
J6304051	Cercospora nicotianae
J630406	Cladosporium
J6304061	Cladosporium herbarum
J630407	Margarinomyces
J6304071	Margarinomyces atrovirens
J630408	Helminthosporium
J6304081	Helminthosporium sativum
J6304082	Helminthosporium avenae
J630409	Torula
J6304091	Torula utilis
J6304092	Torula lactosa
J6304093	Torula cremoris
J630410	Stemphylium
J6304101	Stemphylium sarcinaeforme
J630411	Curvularia
J6305	Tuberculariaceae
J630501	Fusarium
J6305011	Fusarium coeruleum
J6305012	Fusarium oxysporum
J6305013	Fusarium nivale
J6305014	Fusarium culmorum
J6305015	Fusarium lycopersici
J6305016	Fusarium graminearum
J6305017	Fusarium avenaceum
J6305018	Fusarium dianthi
J6305019	Fusarium lini
J630502	Myrothecium
J6305021	Myrothecium verrucaria
J6306	Dermatophytes (not a true family designation but is term listed in Ainsworth and Bisby.)
J630601	Blastomyces
J6306011	Blastomyces dermatitidis
J6306012	Blastomyces brasiliensis
J630602	Microsporum
J6306021	Microsporum audouini
J6306022	Microsporum canis
J6306023	Microsporum lanosum
J6306024	Microsporum gypseum
J630603	Trichophyton
J6306031	Trichophyton floccosum
J6306032	Trichophyton gypseum
J6306033	Trichophyton interdigitale
J6306034	Trichophyton mentagrophytes
J6306035	Trichophyton purpureum
J6306036	Trichophyton rubrum
J6306037	Trichophyton schoenleine
J6306038	Trichophyton rosaceum
J6306039	Trichophyton crateriforme
J630604	Histoplasma
J6306041	Histoplasma capsulatum
J64	Mycelia Sterilia
J9	Fungi otherwise unspecified
JF	Algae (otherwise unspecified)
JA	Phaeophyceae (Brown Algae)
JA1	Fucales
JA101	Fucaceae
JA10101	Fucus
JA101011	Fucus evanescens
JA10102	Ascophyllum
JA101021	Ascophyllum nodosum
JA2	Chordariales
JA3	Sporochnales
JA4	Desmaristiales
JA5	Punctariales
JA6	Dictyosiphonales
JA7	Laminariales
JA8	Dictyotales
JA9	Tilopteridales
JAA	Cutleriales
JAB	Sphacelariales
JAC	Ectocarpales
JB	Cyanophyceae (Blue-Green Algae)
JB1	Coccogonales
JB2	Hormogonales
JC	Rhodophyceae (Red Algae)
JC1	Ceramiales
JC2	Rhodymeniales
JC3	Gigartinales
JC4	Cryptonemiales
JC5	Gelidiales
JC6	Nemalionales
JC7	Bangiales
JD	Chrysophyceae (Yellow-Green Algae)
JD1	Tribonemeae (subclass)
JD2	Diatomeae (subclass)
JD3	Chrysomonadineae (subclass)
JD4	Peridineae (subclass)
JD5	Cryptomonadineae (subclass)
JD6	Chloromonadineae (subclass)
JD7	Euglenineae (subclass)
JE	Chlorophyceae (Green Algae)
JE1	Chlorococcales
JE101	Scenedesmaceae
JE10101	Scenedesmus
JE101011	Scenedesmus quadricauda
JE102	Oocystaceae
JE10201	Chlorella
JE102011	Chlorella pyrenoidosa
JE2	Ulotrichales

FIELD E; Taxonomy Code
Columns 18, 19, 20, 21,
22, 23, 24, and 25

JE201	Ulotrichaceae
JE20101	Stichococcus
JE201011	Stichococcus subtilis
JE3	Ulvales
JE4	Conjugales
JE5	Chaetophorales
JE6	Siphonales
JE7	Charales
JE8	Siphonocladales
JF	Algae, not otherwise specified
JS	Schizophyceae, class of division Protophyta (Thallophyta)
JS	Schizomycetes, class of division Protophyta (Thallophyta)
JS	Microtatobiotes, (addendum to class Schizomycetes)
JS1	Pseudomonadales, order of class Schizomycetes
JS1	Rhodobacteriineae, suborder of order Pseudomonadales
JS1	Pseudomonadineae, suborder of order Pseudomonadales
JS101	Thiorhodaceae, family of suborder Rhodobacteriineae
JS102	Athiorhodaceae, family of suborder Rhodobacteriineae
JS103	Chlorobacteriaceae, family of suborder Rhodobacteriineae
JS104	Nitrobacteraceae, family of suborder Pseudomonadineae
JS10401	Nitrosomonas
JS10402	Nitrosococcus
JS10403	Nitrobacter
JS105	Methanomonadaceae, family of suborder Pseudomonadineae
JS106	Thiobacteriaceae, family of suborder Pseudomonadineae
JS107	Pseudomonadaceae, family of suborder Pseudomonadineae
JS10701	Pseudomonas
JS107011	Pseudomonas aeruginosa
JS107011	Pseudomonas pyocyaneus
JS107012	Pseudomonas fluorescens
JS107013	Pseudomonas putida
JS10702	Xanthomonas
JS107021	Xanthomonas vitians
JS107022	Xanthomonas phaseoli
JS10703	Acetobacter
JS107031	Acetobacter suboxydans
JS10704	Photobacterium
JS107041	Photobacterium fischeri
JS10705	Azotomonas
JS108	Caulobacteraceae, family of suborder Pseudomonadineae
JS10801	Caulobacter
JS10802	Gallionella
JS10803	Nevskia
JS109	Siderocapsaceae, family of suborder Pseudomonadineae
JS110	Spirillaceae, family of suborder Pseudomonadineae
JS11001	Vibrio
JS110011	Vibrio comma
JS110012	Vibrio metschnikovii
JS11002	Methanobacterium
JS11003	Spirillum
JS2	Chlamydobacteriales, order of class Schizomycetes
JS201	Chlamydobacteriaceae, family of order Chlamydobacteriales
JS202	Peloplocaceae, family of order Chlamydobacteriales
JS203	Crenotrichaceae, family of order Chlamydobacteriales
JS3	Hyphomicrobiales, order of class Schizomycetes
JS301	Hyphomicrobiaceae, family of order Hyphomicrobiales
JS302	Pasteuriaceae, family of order Hyphomicrobiales
JS4	Eubacteriales, order of class Schizomycetes
JS401	Azotobacteraceae, family of order Eubacteriales
JS40101	Azotobacter
JS401011	Azotobacter chroococcum
JS402	Rhizobiaceae, family of order Eubacteriales
JS40201	Rhizobium
JS402011	Rhizobium leguminosarum
JS402012	Rhizobium meliloti
JS40202	Agrobacterium
JS402021	Agrobacterium tumefaciens
JS40203	Chromobacterium
JS402031	Chromobacterium amethystinum
JS403	Achromobacteraceae, family of order Eubacteriales
JS40301	Alcaligenes
JS403011	Alcaligenes faecalis
JS403012	Alcaligenes metalcaligenes
JS40302	Achromobacter
JS404	Enterobacteriaceae, family of order Eubacteriales
JS404	Escherichieae, tribe of family Enterobacteriaceae
JS404	Erwinieae, tribe of family Enterobacteriaceae
JS404	Serratieae, tribe of family Enterobacteriaceae
JS404	Proteae, tribe of family Enterobacteriaceae
JS404	Salmonelleae, tribe of family Enterobacteriaceae
JS40401	Escherichia
JS404011	Escherichia coli
JS40402	Aerobacter
JS404021	Aerobacter aerogenes

JS40403	Klebsiella
JS404031	Klebsiella pneumoniae
JS40404	Paracolobactrum
JS404041	Paracolobactrum coliforme
JS40405	Erwinia
JS40406	Serratia
JS404061	Serratia marcescens
JS40407	Proteus
JS404071	Proteus vulgaris
JS404072	Proteus morganii
JS404073	Proteus mirabilis

The distinct species of Salmonella have not been given separate code numbers as decided by the NRC-CBCC Microbiology Subcommittee, since the serological types do not always refer to separate species and the rules of binomial nomenclature have not always been followed. The code numbers refer to the various serological groups themselves but may be altered without difficulty to provide a uniform pattern throughout the code.

JS40408	Salmonella
JS404081	Salmonella: A group
	S. paratyphi
JS404082	Salmonella: B group
	S. schottmuelleri
	S. typhimurium
	S. abortivoequina
	S. abortusovis
JS404083	Salmonella: C group
	S. hirschfeldii
	S. choleraesuis
	S. typhisuis
	S. tennessee
	S. bovismorbificans
JS404084	Salmonella: D group
	S. typhosa
	S. enteritidis
	S. gallinarum
	S. pullorum
JS404085	Salmonella: E group
JS404086	Salmonella: F group
JS40409	Shigella
JS404091	Shigella dysenteriae
JS404092	Shigella flexneri
JS404092	Shigella paradysenteriae
JS404093	Shigella boydii
JS404094	Shigella sonnei
JS405	Brucellaceae, family of order Eubacteriales
JS40501	Pasteurella
JS405011	Pasteurella pestis
JS405012	Pasteurella multocida
JS405013	Pasteurella pseudotuberculosis
JS405014	Pasteurella tularensis
JS40502	Bordetella
JS405021	Bordetella pertussis
JS405022	Bordetella bronchiseptica
JS40503	Brucella
JS405031	Brucella abortus
JS405032	Brucella melitensis
JS405033	Brucella suis
JS40504	Haemophilus
JS405041	Haemophilus influenzae
JS405042	Haemophilus ducreyi
JS40505	Actinobacillus
JS40506	Calymmatobacterium
JS405061	Calymmatobacterium granulomatis
JS40507	Moraxella
JS406	Bacteroidaceae, family of order Eubacteriales
JS40601	Bacteroides
JS40602	Fusobacterium
JS407	Micrococcaceae, family of order Eubacteriales
JS40701	Micrococcus
JS407011	Micrococcus flavus
JS40702	Staphylococcus
JS407021	Staphylococcus aureus
JS407022	Staphylococcus aureus var. aureus
JS407023	Staphylococcus aureus var. albus
JS407024	Staphylococcus aureus var. citreus
JS40703	Gaffkya
JS407031	Gaffkya tetragena
JS40704	Sarcina
JS40704	Zymosarcina, subgenus of genus Sarcina
JS40704	Methanosarcina, subgenus of genus Sarcina
JS40704	Sarcinococcus, subgenus of genus Sarcina
JS40704	Urosarcina, subgenus of genus Sarcina
JS407041	Sarcina lutea
JS408	Neisseriaceae, family of order Eubacteriales
JS40801	Neisseria
JS408011	Neisseria catarrhalis
JS408012	Neisseria gonorrhoeae
JS408013	Neisseria meningitidis
JS409	Brevibacteriaceae, family of order Eubacteriales
JS410	Lactobacillaceae, family of order Eubacteriales

JS410	Streptococceae, tribe of family Lactobacillaceae
JS410	Lactobacilleae, tribe of family Lactobacillaceae
JS41001	Diplococcus
JS410011	Diplococcus pneumoniae

The distinct species of Streptococcus have not been assigned individual code numbers but rather separated into the groups listed in Bergey's Manual of Determinative Bacteriology, 7th edition. This decision was made by the NRC-CBCC Microbiology Subcommittee on the basic assumption that any questioner interested in a specific Streptococcus would also want the data on other species in a given group. Since the numbering system may be expanded there is no hindrance to disregarding this grouping and giving each species an individual code designation.

JS41002	Streptococcus
JS410021	Streptococcus: pyogenic group
	S. pyogenes
	S. zooepidemicus
	S. equi
	S. equisimilis
	S. agalactiae
JS410022	Streptococcus: viridans group
	S. salivarius
	S. mitis
	S. bovis
	S. thermophilus
	S. equinus
JS410023	Streptococcus: lactic group
	S. lactis
	S. cremoris
JS410024	Streptococcus: enterococcus group
	S. faecalis
	S. durans
JS41003	Leuconostoc
JS410031	Leuconostoc mesenteroides
JS410032	Leuconostoc dextranicum
JS410033	Leuconostoc citrovorum
JS41004	Lactobacillus
JS41004	Lactobacillus, subgenus of genus Lactobacillus
JS41004	Saccharobacillus, subgenus of genus Lactobacillus
JS410041	Lactobacillus acidophilus
JS410042	Lactobacillus casei
JS410043	Lactobacillus fermenti
JS410044	Lactobacillus plantarum
JS410044	Lactobacillus pentosus
JS410045	Lactobacillus lactis
JS410046	Lactobacillus delbrueckii
JS410047	Lactobacillus brevis
JS410048	Lactobacillus leichmannii
JS410049	Lactobacillus helveticus
JS41004A	Lactobacillus bulgaricus
JS41004B	Lactobacillus bifidus
JS411	Propionibacteriaceae, family of order Eubacteriales
JS41101	Propionibacterium
JS41102	Butyribacterium
JS412	Corynebacteriaceae, family of order Eubacteriales
JS41201	Corynebacterium
JS412011	Corynebacterium diphtheriae
JS412012	Corynebacterium michiganense
JS412013	Corynebacterium pyogenes
JS412014	Corynebacterium xerose
JS41202	Listeria
JS412021	Listeria monocytogenes
JS41203	Erysipelothrix
JS412031	Erysipelothrix insidiosa
JS41204	Microbacterium
JS413	Bacillaceae, family of order Eubacteriales
JS41301	Bacillus
JS413011	Bacillus anthracis
JS413012	Bacillus brevis
JS413013	Bacillus cereus
JS413014	Bacillus pumilus
JS413015	Bacillus polymyxa
JS413016	Bacillus subtilis
JS413017	Bacillus subtilis var. niger
JS413018	Bacillus coagulans
JS413019	Bacillus megaterium
JS41301A	Bacillus alvei
JS41301B	Bacillus circulans
JS41302	Clostridium
JS413021	Clostridium botulinum
JS413022	Clostridium butyricum
JS413023	Clostridium perfringens
JS413024	Clostridium tetani
JS413025	Clostridium novyi
JS413026	Clostridium histolyticum
JS413027	Clostridium septicum
JS413028	Clostridium acetobutylicum
JS5	Actinomycetales, order of class Schizomycetes
JS501	Mycobacteriaceae, family of order Actinomycetales
JS50101	Mycobacterium
JS501011	Mycobacterium avium
JS501012	Mycobacterium leprae
JS501013	Mycobacterium phlei
JS501014	Mycobacterium tuberculosis
JS501015	Mycobacterium smegmatis
JS501015	Mycobacterium lacticola
JS502	Actinomycetaceae, family of order Actinomycetales

JS50201	Nocardia
JS502011	Nocardia farcinica
JS502012	Nocardia globerula
JS502013	Nocardia asteroides
JS50202	Actinomyces
JS502021	Actinomyces bovis
JS503	Streptomycetaceae, family of order Actinomycetales
JS50301	Streptomyces
JS503011	Streptomyces griseus
JS503012	Streptomyces fradiae
JS503013	Streptomyces aureofaciens
JS50302	Micromonospora
JS504	Actinoplanaceae, family of order Actinomycetales
JS6	Caryophanales, order of class Schizomycetes
JS601	Caryophanaceae, family of order Caryophanales
JS602	Oscillospiraceae, family of order Caryophanales
JS603	Arthromitaceae, family of order Oscillospiraceae
JS7	Beggiatoales, order of class Schizomycetes
JS701	Beggiatoaceae, family of order Beggiatoales
JS702	Vitreoscillaceae, family of order Beggiatoales
JS703	Leucotrichaceae, family of order Beggiatoales
JS704	Achromatiaceae, family of order Beggiatoales
JS8	Myxobacterales, order of class Schizomycetes
JS801	Cytophagaceae, family of order Myxobacterales
JS802	Archangiaceae, family of order Myxobacterales
JS803	Sorangiaceae, family of order Myxobacterales
JS804	Polyangiaceae, family of order Myxobacterales
JS805	Myxococcaceae, family of order Myxobacterales
JS80501	Myxococcus
JS80502	Chondrococcus
JS805021	Chondrococcus columnaris
JS9	Spirochaetales, order of class Schizomycetes
JS901	Spirochaetaceae, family of order Spirochaetales
JS902	Treponemataceae, family of order Spirochaetales
JS90201	Borrelia
JS902011	Borrelia novyi
JS90202	Treponema
JS902021	Treponema pallidum
JS90203	Leptospira
JSA	Mycoplasmatales, order of class Schizomycetes
JSA01	Mycoplasmataceae, family of order Mycoplasmatales
JSB	Rickettsiales, order of class Microtatabiotes
JSB01	Rickettsiaceae, family of order Rickettsiales
JSB01	Rickettsieae, tribe of family Rickettsiaceae
JSB01	Ehrlichieae, tribe of family Rickettsiaceae
JSB0101	Rickettsia
JSB0101	Rickettsia, subgenus of genus Rickettsia
JSB0101	Zinssera, subgenus of genus Rickettsia
JSB0101	Dermacentroxenus, subgenus of genus Rickettsia
JSB0101	Rochalimaea, subgenus of genus Rickettsia
JSB01011	Rickettsia prowazekii
JSB01012	Rickettsia typhi
JSB01012	Rickettsia mooseri
JSB01013	Rickettsia akari
JSB01014	Rickettsia rickettsii
JSB0102	Coxiella
JSB01021	Coxiella burnetii
JSB0103	Cowdria
JSB02	Chlamydiaceae, family of order Rickettsiales
JSB0201	Chlamydia
JSB0202	Miyagawanella
JSB02021	Miyagawanella lymphogranulomatosis
JSB02022	Miyagawanella ornithosis
JSB02023	Miyagawanella psittaci
JSB02024	Miyagawanella felis
JSB02025	Miyagawanella bronchopneumoniae
JSB02026	Miyagawanella pneumoniae
JSB03	Bartonellaceae, family of order Rickettsiales
JSB0301	Haemobartonella
JSB03011	Haemobartonella muris
JSB04	Anaplasmataceae, family of order Rickettsiales
JSC	Virales, order of class Microtatabiotes
JSC	Phagineae, suborder of order Virales
JSC	Phytophagineae, suborder of order Virales
JSC	Zoophagineae, suborder of order Virales
JSC01	Phagaceae, family of suborder Phagineae

Note: All phages of the genus Phagus, Holmes, Bergey's

Manual, 6th edition, are coded under the family designation Phagaceae. The specific phages are further identified by using the last three places of Field E to designate a single phage strain. Thus, number space is provided for all genera known to be bacterial hosts of phages and code symbols are assigned to each bacterial genus according to the number of phage species within a given bacterial genus; for example, Pseudomonas is assigned 01, 02, 03 and 04 in the 6th and 7th places of Field E since this genus has about 150 recognized species. A specific symbol in the 8th place identifies the specific phage strain; the associated host is designated in Field J.

JSC0101 thru JSC0104	Pseudomonas phage strains
JSC01011	Pseudomonas aeruginosa, phage strain Pa
JSC01012	Pseudomonas aeruginosa, phage strain Pb
JSC01013	Pseudomonas aeruginosa, phage strain Pc
JSC0105 thru JSC0106	Xanthomonas phage strains
JSC0107	Vibrio phage strains
JSC0108	Azotobacter, Rhizobium and Agrobacterium phage strains
JSC0109 thru JSC0110	Escherichia phage strains
JSC01091	Escherichia coli, phage strain T1
JSC01092	Escherichia coli, phage strain T2
JSC01093	Escherichia coli, phage strain T3
JSC01094	Escherichia coli, phage strain T4
JSC01095	Escherichia coli, phage strain T5
JSC01096	Escherichia coli, phage strain 2
JSC01097	Escherichia coli, phage strain 4
JSC01098	Escherichia coli, phage strain 5
JSC0111	Erwinia phage strains
JSC0112	Serratia phage strains
JSC01121	Serratia marcescens, phage strain IV
JSC0113 thru JSC0116	Salmonella phage strains
JSC01131	Salmonella Type Poona, phage strain 1
JSC01132	Salmonella Type Poona, phage strain 2
JSC0117	Shigella phage strains
JSC01171	Shigella dysenteriae, phage strain P2
JSC0118	Pasteurella phage strains
JSC0119 thru JSC0121	Staphylococcus phage strains
JSC01191	Staphylococcus aureus, phage strain P1
JSC01192	Staphylococcus aureus, phage strain P14
JSC01193	Staphylococcus sp., phage strain 6
JSC01194	Staphylococcus sp., phage strain 13
JSC01195	Staphylococcus sp., phage strain 9
JSC0122 thru JSC0124	Streptococcus phage strains
JSC01221	Streptococcus cremoris, phage strain hp
JSC01222	Streptococcus cremoris, phage strain w
JSC01223	Streptococcus pyogenes, phage strain A-25
JSC01224	Streptococcus pyogenes, phage strain A-27
JSC01225	Streptococcus sp., phage strain 2A
JSC01226	Streptococcus sp., phage strain 2B
JSC0125 thru JSC0126	Corynebacterium phage strains
JSC01251	Corynebacterium sp., phage strain DLC, 2921/49
JSC0127 thru JSC0128	Bacillus phage strains
JSC0129	Mycobacterium phage strains
JSC0130	Streptomyces phage strains
JSC02	Chlorogenaceae, family of suborder Phytophagineae
JSC02	Viruses inducing yellow-type diseases
JSC0201	Chlorogenus
JSC0202	Carpophthora
JSC0203	Morsus
JSC0204	Aureogenus
JSC0205	Galla
JSC0206	Fractilinea
JSC03	Marmoraceae, family of suborder Phytophagineae
JSC03	Viruses inducing mosaic diseases
JSC0301	Marmor
JSC03011	Marmor tabaci
JSC03012	Marmor cucumeris
JSC03013	Marmor solani
JSC0302	Acrogenus

JSC0303	Corium
JSC0304	Nanus
JSC03041	Nanus mirabilis
JSC0305	Rimocortius
JSC0306	Adelonosus
JSC04	Annulaceae, family of suborder Phytophagineae
JSC04	Viruses inducing ringspot diseases
JSC0401	Annulus
JSC05	Rugaceae, family of suborder Phytophagineae
JSC05	Viruses inducing leaf curl diseases
JSC0501	Ruga
JSC06	Savoiaceae, family of suborder Phytophagineae
JSC06	Viruses inducing leaf-savoying diseases
JSC0601	Savoia
JSC07	Lethaceae, family of suborder Phytophagineae
JSC07	Viruses inducing spotted wilt disease
JSC0701	Lethum
JSC08	Borellinaceae, family of suborder Zoophagineae
JSC08	Viruses inducing diseases of insects as exclusive hosts
JSC0801	Borrelina
JSC0802	Morator
JSC09	Borreliotaceae, family of suborder Zoophagineae
JSC09	Viruses inducing diseases of the pox group
JSC0901	Borreliota
JSC09011	Borreliota avium
JSC09012	Borreliota variolae var. bovis
JSC0902	Briareus
JSC0903	Scelus
JSC09031	Scelus recurrens
JSC0904	Hostis
JSC0905	Molitor
JSC10	Erronaceae, family of suborder Zoophagineae
JSC10	Viruses inducing diseases of the encephalitis group
JSC1001	Erro
JSC10011	Erro nili
JSC10012	Erro equinus
JSC1002	Legio
JSC10021	Legio debilitans
JSC1003	Formido
JSC10031	Formido inexorabilis
JSC11	Charonaceae, family of suborder Zoophagineae
JSC11	Viruses inducing diseases of the yellow-fever group
JSC1101	Charon
JSC11011	Charon vallis
JSC1102	Tarpeia
JSC11021	Tarpeia alpha
JSC11022	Tarpeia premens
JSC1103	Tortor
JSC12	Trifuraceae, family of suborder Zoophagineae
JSC12	Viruses inducing diseases of the infectious anemia group
JSC1201	Trifur
JSC12011	Trifur gallinarum
JSC13	Rabulaceae, family of suborder Zoophagineae
JSC13	Viruses inducing diseases of the mumps group
JSC1301	Rabula
JSC13011	Rabula inflans
JSC14	Borrelomycetaceae
JSC14	Pleuropneumonia and Pleuropneumonia-like organisms
JSC1401	Asterococcus
K	Bryophyta
K1	Hepaticae
K11	Marchantiales
K12	Sphaerocarpales
K13	Jungermanniales
K14	Calobryales
K2	Anthocerotae
K21	Anthocerotales
K3	Musci
K31	Sphagnales
K32	Andreaeales
K33	Fissidentales
K34	Dicranales
K35	Pottiales
K36	Grimmiales
K37	Funariales
K38	Schizostegiales
K39	Tetraphidales
K3A	Eubryales
K3B	Isobryales
K3C	Hookeriales
K3D	Buxbaumiales
K3E	Polytrichinales
K3F	Dawsoniales
L	Pteridophyta
L1	Psilophytinae
L11	Psilotales
L2	Lycopodinae
L21	Lycopodiales
L22	Selaginellales
L23	Isoetales
L3	Equisetinae
L31	Equisetales
L4	Filicinae
L41	Ophioglossales
L42	Marattiales
L43	Filicales

FIELD E; Taxonomy Code
Columns 18, 19, 20, 21,
22, 23, 24, and 25

M	Spermatophyta
MA	Monocotyledoneae
MA1	Pandanales
MA2	Helobiae
MA201	Potamogetonaceae
MA202	Najadaceae
MA203	Aponogetonaceae
MA204	Juncaginaceae
MA205	Alismaceae
MA206	Butomaceae
MA207	Hydrocharitaceae
MA20701	Elodea
MA207011	Elodea canadensis
MA3	Triuridales
MA4	Glumiflorae
MA401	Gramineae
MA40101	Agropyron
MA40102	Agrostis
MA401021	Agrostis tenuis
MA40103	Andropogon
MA40104	Avena
MA401041	Avena sativa
MA40105	Bouteloua
MA40106	Bromus
MA40107	Buchloe
MA40108	Cynodon
MA401081	Cynodon dactylon
MA40109	Dactylis
MA40110	Digitaria
MA40111	Echinochloa
MA40112	Festuca
MA401121	Festuca rubra var. commutata
MA40113	Holcus
MA40114	Hordeum
MA401141	Hordeum vulgare
MA40115	Lolium
MA401151	Lolium multiflorum
MA40116	Oryza
MA401161	Oryza sativa
MA40117	Panicum
MA40118	Pennisetum
MA40119	Phalaris
MA40120	Phleum
MA40121	Poa
MA401211	Poa pratensis
MA40122	Saccharum
MA40123	Secale
MA401231	Secale cereale
MA40124	Setaria
MA40125	Sorghum
MA40126	Triticum
MA401261	Triticum aestivum
MA401262	Triticum dicoccum
MA40127	Zea
MA401271	Zea mays
MA40128	Bambusa
MA401281	Bambusa vulgaris
MA40129	Agropyron-Triticum hybrid
MA402	Cyperaceae
MA40201	Cyperus
MA402011	Cyperus rotundus
MA5	Principes
MA6	Synanthae
MA7	Spathiflorae
MA701	Araceae
MA702	Lemnaceae
MA8	Farinosae
MA801	Flagellariaceae
MA802	Restionaceae
MA803	Centrolepidaceae
MA804	Mayacaceae
MA805	Xyridaceae
MA806	Eriocaulaceae
MA807	Rapateaceae
MA808	Bromeliaceae
MA80801	Ananas
MA809	Commelinaceae
MA80901	Rhoeo
MA809011	Rhoeo discolor
MA810	Pontederiaceae
MA9	Liliflorae
MA901	Juncaceae
MA902	Stemonaceae
MA903	Liliaceae
MA90301	Allium
MA903011	Allium cepa
MA90302	Asparagus
MA90303	Lilium
MA903031	Lilium regale
MA903032	Lilium longiflorum
MA90304	Sansevieria
MA90305	Smilax
MA90306	Tulipa
MA90307	Yucca
MA90308	Scilla
MA903081	Scilla sibirica
MA90309	Aloe
MA903091	Aloe vulgaris
MA904	Haemodoraceae
MA905	Amaryllidaceae
MA90501	Agave
MA905011	Agave toumeyana
MAA	Scitamineae
MAB	Microspermae
MB	Dicotyledoneae
MB1	Verticillatae
MB2	Piperales
MB201	Saururaceae
MB202	Piperaceae
MB3	Salicales
MB301	Salicaceae
MB30101	Salix
MB4	Myricales
MB5	Balanopsidales
MB6	Leitneriales
MB7	Juglandales
MB8	Fagales
MB801	Betulaceae
MB802	Fagaceae
MB80201	Castanea

MB80202	Fagus
MB80203	Quercus
MB9	Urticales
MB901	Ulmaceae
MB902	Moraceae
MB90201	Artocarpus
MB90202	Cannabis
MB90203	Ficus
MB903	Urticaceae
MBA	Proteales
MBB	Santalales
MBC	Aristolochiales
MBD	Polygonales
MBD01	Polygonaceae
MBD0101	Fagopyrum
MBD01011	Fagopyrum esculentum
MBD0102	Polygonum
MBD0103	Rheum
MBD0104	Rumex
MBD01041	Rumex acetosa
MBE	Centrospermae
MBE01	Chenopodiaceae
MBE0101	Beta
MBE01011	Beta vulgaris
MBE02	Amarantaceae
MBE0201	Amarantus
MBE02011	Amarantus retroflexus
MBE03	Nyctaginaceae
MBE04	Batidaceae
MBE05	Cynocrambaceae
MBE06	Phytolaccaceae
MBE07	Aizoaceae
MBE08	Portulacaceae
MBE09	Basellaceae
MBE10	Carophyllaceae
MBE1001	Dianthus
MBE10011	Dianthus caryophyllus
MBE1002	Saponaria
MBE1003	Stellaria
MBE10031	Stellaria media
MBF	Ranales
MBF01	Nymphaeaceae
MBF0101	Cabomba
MBG	Rhoeadales
MBG01	Papaveraceae
MBG02	Cruciferae
MBG0201	Brassica
MBG02011	Brassica kaber
MBG02012	Brassica nigra
MBG02013	Brassica rapa
MBG02014	Brassica campestris
MBG02015	Brassica napus
MBG02016	Brassica oleracea var gemmifera
MBG02017	Brassica oleracea var. capitata
MBG02018	Brassica oleracea var. botrytis
MBG02019	Brassica oleracea var. italica
MBG0201A	Brassica napobrassica
MBG0202	Armoracia
MBG0203	Raphanus
MBG02031	Raphanus sativus
MBG0204	Lepidium
MBG02041	Lepidium sativum
MBG03	Tovariaceae
MBG04	Capparidaceae
MBH	Sarraceniales
MBI	Rosales
MBI01	Podostemonaceae
MBI02	Hydrostachyaceae
MBI03	Crassulaceae
MBI04	Cephalotaceae
MBI05	Saxifragaceae
MBI0501	Ribes
MBI06	Pittosporaceae
MBI07	Brunelliaceae
MBI08	Cunoniaceae
MBI09	Myrothamnaceae
MBI10	Bruniaceae
MBI11	Hamamelidaceae
MBI12	Platanaceae
MBI13	Crossosomataceae
MBI14	Rosaceae
MBI1401	Amelanchier
MBI1402	Crataegus
MBI1403	Cydonia
MBI1404	Eriobotrya
MBI1405	Fragaria
MBI1406	Potentilla
MBI1407	Prunus
MBI14071	Prunus amygdalus
MBI14072	Prunus armeniaca
MBI14073	Prunus avium
MBI14074	Prunus cerasus
MBI14075	Prunus domestica
MBI14076	Prunus salicina
MBI14077	Prunus persica
MBI1408	Pyrus
MBI1409	Rosa
MBI1410	Rubus
MBI1411	Sorbus
MBI1412	Spiraea
MBI1413	Malus
MBI14131	Malus sylvestris
MBI15	Connaraceae
MBI16	Leguminosae
MBI1601	Acacia
MBI1602	Arachis
MBI1603	Astragalus
MBI1604	Ceratonia
MBI1605	Crotalaria
MBI1606	Gleditschia
MBI1607	Glycine
MBI16071	Glycine max
MBI1608	Lathyrus
MBI1609	Lens
MBI1610	Lespedeza
MBI1611	Lupinus
MBI16111	Lupinus albus
MBI1612	Medicago
MBI1613	Melilotus

FIELD E; Taxonomy Code
Columns 18, 19, 20, 21,
22, 23, 24, and 25

MBI1614	Phaseolus
MBI16141	Phaseolus vulgaris
MBI16142	Phaseolus limensis
MBI16143	Phaseolus coccineus
MBI1615	Pisum
MBI16151	Pisum sativum
MBI1616	Trifolium
MBI16161	Trifolium incarnatum
MBI16162	Trifolium repens
MBI16163	Trifolium pratense
MBI1617	Vicia
MBI16171	Vicia faba
MBI1618	Vigna
MBI16181	Vigna sinensis
MBI1619	Canavalia
MBI16191	Canavalia ensiformis
MBJ	Geraniales
MBJ01	Geraniaceae
MBJ02	Oxalidaceae
MBJ03	Tropaeolaceae
MBJ04	Linaceae
MBJ0401	Linum
MBJ04011	Linum usitatissimum
MBJ05	Humiriaceae
MBJ06	Erythroxylaceae
MBJ07	Zygophyllaceae
MBJ08	Cneoraceae
MBJ09	Rutaceae
MBJ0901	Citrus
MBJ09011	Citrus aurantifolia
MBJ09012	Citrus aurantium
MBJ09013	Citrus paradisi
MBJ09014	Citrus limon
MBJ09015	Citrus medica
MBJ09016	Citrus sinensis
MBJ10	Simarubaceae
MBJ11	Burseraceae
MBJ12	Meliaceae
MBJ13	Malpighiaceae
MBJ14	Trigoniaceae
MBJ15	Vochysiaceae
MBJ16	Tremandraceae
MBJ17	Polygalaceae
MBJ18	Dichapetalaceae
MBJ19	Euphorbiaceae
MBJ1901	Aleurites
MBJ1902	Croton
MBJ1903	Euphorbia
MBJ19031	Euphorbia pulcherrima
MBJ1904	Hevea
MBJ1905	Codiaeum
MBJ1906	Ricinus
MBK	Sapindales
MBK01	Buxaceae
MBK02	Coriariaceae
MBK03	Empetraceae
MBK04	Limnanthaceae
MBK05	Anacardiaceae
MBK06	Cyrillaceae
MBK07	Pentaphylacaceae
MBK08	Corynocarpaceae
MBK09	Aquifoliaceae
MBK10	Celastraceae
MBK11	Hippocrateaceae
MBK12	Stackhousiaceae
MBK13	Staphyleaceae
MBK14	Icacinaceae
MBK15	Aceraceae
MBK1501	Acer
MBK15011	Acer saccharum
MBL	Rhamnales
MBL01	Rhamnaceae
MBL02	Vitaceae
MBL0201	Vitis
MBL02011	Vitis vinifera
MBM	Malvales
MBM01	Elaeocarpaceae
MBM02	Chlaenaceae
MBM03	Gonystylaceae
MBM04	Tiliaceae
MBM05	Malvaceae
MBM0501	Abutilon
MBM0502	Althae
MBM0503	Gossypium
MBM06	Triplochitonaceae
MBM07	Bombacaceae
MBM08	Sterculiaceae
MBM0801	Theobroma
MBM08011	Theobroma cacao
MBN	Parietales
MBØ	Opuntiales
MBP	Myrtiflorae
MBP01	Geissolomaceae
MBP02	Penaeaceae
MBP03	Oliniaceae
MBP04	Thymelaeaceae
MBP05	Elaeagnaceae
MBP06	Lythraceae
MBP07	Sonneratiaceae
MBP08	Crypteroniaceae
MBP09	Punicaceae
MBP10	Lecythidaceae
MBP11	Rhizophoraceae
MBP12	Combretaceae
MBP13	Myrtaceae
MBP14	Melastomataceae
MBP15	Onagraceae
MBQ	Umbelliflorae
MBQ01	Araliaceae
MBQ02	Umbelliferae
MBQ0201	Apium
MBQ0202	Conium
MBQ0203	Daucus
MBQ02031	Daucus carota var. sativa
MBQ03	Cornaceae
MBQ0301	Cornus
MBR	Ericales
MBR01	Clethraceae
MBR02	Pirolaceae
MBR03	Lennoaceae

MBR04	Ericaceae
MBR0401	Calluna
MBR0402	Erica
MBR0403	Kalmia
MBR0404	Rhododendron
MBR0405	Vaccinium
MBS	Primulales
MBT	Ebenales
MBU	Contortae
MBU01	Oleaceae
MBU0101	Fraxinus
MBU0102	Jasminum
MBU0103	Ligustrum
MBU01031	Ligustrum ovalifolium
MBU02	Salvadoraceae
MBU03	Loganiaceae
MBU04	Gentianaceae
MBU05	Apocynaceae
MBU0501	Apocynum
MBU0502	Carissa
MBU0503	Nerium
MBU0504	Vinca
MBV	Tubiflorae
MBV01	Convolvulaceae
MBV0101	Convolvulus
MBV0102	Cuscuta
MBV0103	Ipomoea
MBV01031	Ipomoea tricolor
MBV01032	Ipomoea batatas
MBV02	Polemoniaceae
MBV03	Hydrophyllaceae
MBV04	Borraginaceae
MBV05	Verbenaceae
MBV06	Labiatae
MBV0601	Mentha
MBV0602	Nepeta
MBV0603	Salvia
MBV0604	Thymus
MBV0605	Coleus
MBV06051	Coleus blumei
MBV07	Nolanaceae
MBV08	Solanaceae
MBV0801	Atropa
MBV0802	Capsicum
MBV0803	Datura
MBV08031	Datura stramonium
MBV0804	Hyoscyamus
MBV0805	Lycopersicon
MBV08051	Lycopersicon esculentum
MBV0806	Nicotiana
MBV08061	Nicotiana tabacum
MBV08062	Nicotiana glutinosa
MBV0807	Petunia
MBV0808	Solanum
MBV08081	Solanum tuberosum
MBV09	Scrophulariaceae
MBV10	Bignoniaceae
MBV11	Pedaliaceae
MBW	Plantaginales
MBW01	Plantaginaceae
MBW0101	Plantago
MBX	Rubiales
MBY	Campanulatae
MBY01	Cucurbitaceae
MBY0101	Citrullus
MBY01011	Citrullus vulgaris
MBY0102	Cucumis
MBY01021	Cucumis sativus
MBY01022	Cucumis melo
MBY0103	Cucurbita
MBY01031	Cucurbita maxima
MBY01032	Cucurbita pepo var. torticollis
MBY02	Campanulaceae
MBY03	Goodeniaceae
MBY04	Stylidiaceae
MBY05	Calyceraceae
MBY06	Compositae
MBY0601	Achillea
MBY0602	Ambrosia
MBY0603	Artemisia
MBY0604	Aster
MBY0605	Carduus
MBY0606	Chrysanthemum
MBY0607	Cichorium
MBY0608	Cirsium
MBY0609	Cosmos
MBY0610	Dahlia
MBY0611	Helianthus
MBY06111	Helianthus annuus
MBY0612	Lactuca
MBY06121	Lactuca sativa
MBY0613	Parthenium
MBY0614	Solidago
MBY0615	Sonchus
MBY0616	Taraxacum
MBY0617	Tragopogon
MBY0618	Xanthium
MBY06181	Xanthium canadense
MBY06182	Xanthium echinatum
MBY0619	Crepis
MBY0620	Piqueria
MBY06201	Piqueria trinervia
MBY0621	Carthamus
MBY06211	Carthamus tinctarius
MN	Gymnospermae
MN1	Coniferales
MN101	Pinaceae
MN10101	Pinus
MN101011	Pinus taeda
MN2	Gnetales
MN201	Gnetaceae
MN20101	Ephedra
MN3	Cycadales
MN4	Ginkgoales
Z	Organism, general
Z1	Plant (including bacteria, virus, rickettsia), not otherwise specified
Z2	Animal, not otherwise specified

FIELD E; Tumor Code
Columns 18, 19, 20, 21,
22, 23, 24, and 25

TUMOR CODE

This catalogue of tumors and tumor types is arranged in an order corresponding to tumor classification based on the tissues from which they originated. Therefore, to recognize the continuity and to follow the sequence of this particular list of tissue types of tumors, the eye must learn to inspect the 4th, 5th, and 6th units of the symbols (Columns 21, 22, and 23), ignoring the other units. The spaces left between units 3 and 4 and between units 6 and 7 have no other significance than to make the part of the symbol designating tissue origins more easily distinguishable. The meaning of the 2nd and 3rd units (Columns 19 and 20) will be found by reference to the special list of anatomical items immediately following this list of tumors. The 7th and 8th units (Columns 24 and 25) are explained in the Key.

S	Tumor, unspecified
S00 1	Tumor of epithelial tissue, unspecified
SB1	Tumor of skin, unspecified
SB1 1	Carcinoma (tumor of epithelium) of skin, unspecified as to whether the origin is of glandular or non-glandular epithelium
SB1 100 01	Carcinoma DC5
SB1 100 02	Carcinoma Krebs 2
SB1 100 03	Carcinoma 1025 Furth (of cutaneous or subcutaneous tissue)
S00 100 1	Carcinoma, otherwise unspecified (no organ origin known and epithelial type unknown)
S00 100 2	Papilloma, unspecified as to squamous (non-glandular) or mucous (glandular) epithelium
S00 11	Tumors of glandular epithelium, unspecified
S00 110 1	Adenocarcinoma of unspecified glandular origin, unspecified
S92 11	Pancreatic tumor, glandular, unspecified
S92 110 01	Pancreatic tumor SB4
S00 110 11	Adenocarcinoma JS2
S00 110 2	Adenoma, otherwise unspecified (no organ origin known)
S00 110 3	Papilloma of mucous epithelium, unspecified
S00 111	Endocrine tumor, unspecified
S51	Testicular tumor, unspecified
S51 111	Tumor of testicular interstitial (endocrine) cells, unspecified
S51 111 01	Testicular interstitial cell tumor $3AC_1SS$
S51 111 02	Testicular interstitial cell tumor $20AB_2T$
S51 111 03	Testicular interstitial cell tumor Bonser
S51 111 04	Leydig cell tumor Furth
S5A	Ovarian tumor, unspecified
S5A 111	Ovarian glandular epithelium tumor, unspecified
S5A 111 01	Ovarian carcinoma XIX
S5A 111 1	Granulosa cell tumor, unspecified
S5A 111 11	Granulosa cell tumor, 18C57
S5A 111 12	Granulosa cell tumor, OL
S5A 111 13	Granulosa cell tumor E4478
S5A 111 14	Granulosa cell tumor Eschenbrenner
S5A 111 15	Granulosa cell tumor V
S5A 111 16	Granulosa cell tumor XIV
S5A 111 17	Granulosa cell tumor C57b110
S5A 111 18	Granulosa cell tumor NIH
S5A 111 2	Luteoma, unspecified
S5A 111 21	Luteoma IX
S5A 111 3	Theca cell tumor, unspecified

S5A 111 4	Ovarian pseudomucinous cystadenoma; mucinous adenocarcinoma; mucinous papillary cystadenoma; etc., unspecified
S5A 111 41	Ovarian tumor Symeonidis
SA5 111 01	Adrenal cortical tumor Illinois
SA5 111 02	Adrenal cortical carcinoma W35
SA5 111 03	Adrenal cortical carcinoma W92
SA4 111 01	Adrenal tumor Lorenz
SA7 111 01	Thyroid tumor #180 (colloid adenoma)
SA1 111 01	Chromophobe pituitary tumor Furth dependent on absence of thyroid
SA1 111 02	Chromophobe pituitary tumor Furth independent of absence of thyroid
S92 111	Pancreatic endocrine tumor (Islets of Langerhans tumor), unspecified
S00 112	Exocrine gland tumor, unspecified
S1A	Tumor of fundic stomach, unspecified; rodent glandular stomach tumor, unspecified
S1A 112 01	Carcinoma 303
S1A 112 02	Carcinoma 328
S1A 112 03	Carcinoma 342
S21 112	Glandular epithelial tumors of the lung, unspecified[1]
S21 112 1	Pulmonary adenomatosis, unspecified[1]
S21 112 11	Jaagsiekte[1]
S21 112 2	Pulmonary adenocarcinoma[1]
S21 112 21	Pulmonary adenocarcinoma C4461[1]
S21 112 3	Pulmonary carcinoma[1]
S21 112 31	Pulmonary carcinoma MT8[1]
S21 112 4	Pulmonary adenoma, unspecified[1]
S21 112 41	Pulmonary adenoma, Cohen[1]
S31 112	Kidney carcinoma, unspecified
S31 112 01	Kidney carcinoma Lucke
S41 112	Liver tumor, unspecified (assuming glandular origin), hepatoma
S41 112 01	Hepatoma #10 Andervont
S41 112 02	Hepatoma 112/B
S41 112 03	Hepatoma 98/15
S41 112 04	Hepatoma C954
S41 112 05	Hepatoma 3683
S41 112 06	Hepatoma 3924A
S41 112 07	Hepatoma 3930
S41 112 08	Hepatoma N (Hepatoma NK Novikoff)
S41 112 09	Hepatoma LC18
S43	Carcinoma of the bile duct (= cholangioma)
S43	Tumors of the bile duct, unspecified
S43 112	Cholangioma, unspecified (typically adenocarcinoma)
S43 112 01	Hepatoma 3924C (cholangioma)
S91 112 1	Adenocarcinoma of the mammary gland, unspecified
S91 112 11	Adenocarcinoma C3HBA (= C3Hba)
S91 112 12	Adenocarcinoma C3H-HC
S91 112 13	Adenocarcinoma C3HB
S91 112 14	Adenocarcinoma H2712
S91 112 15	Adenocarcinoma, Indiana University Tumor I
S91 112 16	Adenocarcinoma L1221
S91 112 17	Adenocarcinoma MT-8
S91 112 18	Adenocarcinoma S (L.E.O.)
S91 112 19	Adenocarcinoma S663
S91 112 1A	Adenocarcinoma Ca-Z
S91 112 1B	Adenocarcinoma Ca149

[1] These pulmonary epithelial tumors have been placed with glandular epithelial tissue tumors only because it seemed reasonable. The tissue-designating part of the pulmonary section can be altered, if the glandular association does not prove congenial to the concepts of any coding project adopting the coding scheme.

S91 112 1C	Adenocarcinoma Ca-15
S91 112 1D	Adenocarcinoma SPC3H
S91 112 1E	Adenocarcinoma DC4
S91 112 1F	Adenocarcinoma E0771 (=Eo771)
S91 112 1G	Adenocarcinoma 755 Bagg, Jacksen
S91 112 1H	Adenocarcinoma B1
S91 112 1I	Adenocarcinoma BW1898
S91 112 1J	Adenocarcinoma 7-SBT
S91 112 1K	Adenocarcinoma 41-SBT
S91 112 1L	Adenocarcinoma 21-SBT
S91 112 1M	Adenocarcinoma 49-SBT
S91 112 1N	Adenocarcinoma 71-SBT
S91 112 1Ø	Adenocarcinoma C57X
S91 112 1P	Adenocarcinoma dbaH
S91 112 1Q	Adenocarcinoma Cal69
S91 112 1R	Adenocarcinoma Mijono
S91 112 1S	Adenocarcinoma Ca1
S91 112 1T	Adenocarcinoma IT_1
S91 112 1U	Adenocarcinoma dbrB (=dBrB)
S91 112 1V	Adenocarcinoma RC
S91 112 1W	Adenocarcinoma DC2
S91 112 1X	Adenocarcinoma DC3
S91 112 1Y	Adenocarcinoma SPAH
S91 112 1Z	Adenocarcinoma TA3
S91 112 A1	Adenocarcinoma R2426
S91 112 A2	Adenocarcinoma R2857
S91 112 A3	Adenocarcinoma IRC741
S91 112 A4	Adenocarcinoma Webster
S91 112 A5	Adenocarcinoma Shay ("Duct cell type")
S91 112 2	Mammary carcinoma, unspecified
S91 112 21	Carcinoma TC3H (mixed cell)
S91 112 22	Carcinoma, Tumor #1 Youngner
S91 112 23	Carcinoma, Tumor #2 Youngner
S91 112 24	Carcinoma D1905 Heston
S91 112 25	Carcinoma 63 Bashford (English)
S91 112 26	Carcinoma 15091a
S91 112 27	Carcinoma 10 Lewis
S91 112 28	Carcinoma, Ehrlich tumor (ascitic form)
S91 112 29	Carcinoma S674
S92 112	Pancreatic tumor, exocrine, unspecified
S93 112	Tumors of sebaceous glands, unspecified
S93 112 01	Hamartoma-malignum BS_1 (sebaceous gland origin?), gluteal region of rat
S94 112	Tumors of harderian glands, unspecified
S94 112 01	Harderian gland carcinoma 2226
S97 112	Tumor of glandular tissue of submaxillary gland, unspecified
S9A 112	Tumor of glandular epithelium of seminal vesicles, unspecified
S9A 112 01	Carcinoma Flexner-Jobling
S98 112 3	Pleomorphic cell parotid gland tumor, unspecified
S00 12	Tumors of non-glandular epithelium, unspecified
S00 121	Tumors of columnar, non-glandular epithelium, unspecified
S00 122	Tumors of stratified, non-glandular epithelium, unspecified
S00 123	Tumors of transitional, non-glandular epithelium, unspecified
S34	Tumors of urinary bladder, unspecified
S34 123 01	Bladder tumor C3H
S34 123 02	Bladder tumor A
S00 124	Tumors of squamous, non-glandular epithelium, unspecified
S00 124 1	Papilloma of squamous, non-glandular epithelium, unspecified
S00 125	Tumors of squamous stratified, non-glandular epithelium, unspecified
S18 125 01	Gastric carcinoma line A (squamous-cell type)

S18 125 02	Carcinoma G8755 (squamous-cell type)
S1A 125 01	Carcinoma #338 (squamous-cell type)
S52 125 01	Carcinoma Brown-Pearce (Epithelioma Brown-Pearce)
S5D 125 01	Cervical carcinoma T145
SB1 125 01	Tumor 1 Cowdry (Tumor I)
SB1 125 02	Tumor D Cowdry
SB1 125 1	Tumor of basal cells of squamous stratified epithelium (basal-cell carcinoma [variety of squamous-cell carcinoma]), unspecified
S77 125 11	Carcinoma HC1 (basal-cell type)
S00 125 2	Papilloma tumor of squamous stratified non-glandular epithelium, unspecified
SB1 125 21	Papilloma Shope (squamous-cell type)
S00 126	Tumors of myoepithelial (non-glandular) epithelium, unspecified
S96 126 11	Myoepithelial salivary gland tumors of dogs and mice, general
S96 126 12	Myoepithelioma 243C
S96 126 13	Pleomorphic carcinoma BW 1081
S97 126 11	Submaxillary tumor C-CBA
S00 120 1	Cystadenoma (assumed to be of non-glandular epithelial origin), unspecified
S00 13	Tumors of mixed glandular and non-glandular epithelia, unspecified
S00 131	Tumors of mixed endocrine and unspecified non-glandular epithelia, unspecified
S00 13A	Tumors of mixed exocrine and unspecified non-glandular epithelia, unspecified
S00 13B	Tumors of mixed exocrine glandular tissue and myoepithelial tissue, unspecified
S9C 13 B 1	Myoepithelial sweat gland tumor, unspecified
S00 2	Tumors of blood and lymph and blood- and lymph-forming tissues
S00 21	Tumors of the specific leukoblastic tissues of the lymphatic organ system; leukemia. (This symbol is not used to code tumors of the lymph organs, lymphomas [S0022].)
S00 211	Lymphocytic leukemia (leukemia in which the involved leukocytes are lymphocytes and lymphoblasts). (Synonyms: lymphoid leukemia, lymphatic leukemia, lymphoblastic leukemia, lymphogenous leukemia, lymphocythemic leukemia, leukocytic leukemia)
S00 211 1	Lymphocytic leukemia, leukemic, unspecified
S8B 211 1	Leukemic lymphocytic leukemia with origin in the spleen, unspecified
S8B 211 11	Lymphoid leukemia AK4
S8B 211 12	Lymphoid leukemia 100
S8B 211 13	Lymphoid leukemia 868
S8B 211 14	Lymphoid leukemia 876
S8B 211 15	Lymphoid leukemia 926R
S8B 211 16	Lymphatic leukemia 926F
S8B 211 17	Lymphatic leukemia Shay
S8B 211 18	Leukemia Line 1 MacDowell (lymphocytic)
S8D 211 1	Leukemic lymphatic leukemia with origin in the spleen and lymph nodes, unspecified
S8D 211 11	Lymphoid leukemia HE8186
S8D 211 12	Lymphoid leukemia L1210
S8D 211 13	Lymphatic leukemia L4616
S8D 211 14	Lymphatic leukemia L3054
S8D 211 15	Leukemia L3660 (lymphocytic)
S8D 211 16	Lymphatic leukemia Ak
S8D 211 17	Lymphoid leukemia Furth
SA8 211 1	Leukemic lymphatic leukemia with origin in the thymus, unspecified
SA8 211 11	Lymphatic leukemia 1016F
SA8 211 12	Lymphatic leukemia P1534
SA8 211 13	Lymphatic leukemia Leu 3
SA8 211 14	Lymphoid leukemia VII
S00 211 2	Lymphatic leukemia, aleukemic, unspecified
S00 212	Granulocytic leukemia (leukemia in which the involved leukocytes are myelocytic and polymorphonuclear; i.e., granulocytes). (This symbol's definition includes chloroma [= chlorosarcoma], since it is a type of myelogenous leukemia.)

S00 212 1	Myelogenous leukemia, leukemic, unspecified
S8B 212 1	Leukemic myelogenous leukemia with origin in the spleen, unspecified
S8B 212 11	Myeloid leukemia 15F
S8B 212 12	Myeloid leukemia A
S8B 212 13	Myeloid leukemia 274
S8B 212 14	Myeloid leukemia 686
S8B 212 15	Myeloid leukemia 765
S8B 212 16	Myeloid leukemia 15A
S8B 212 17	Myeloid leukemia C1498
S8A 212 1	Leukemic myelogenous leukemia with origin described as being "blood", unspecified
S8A 212 11	Myelogenous leukemia Shay (chloroma type)
S00 212 2	Myelogenous leukemia, aleukemic, unspecified
S00 213	Monocytic leukemia (leukemias in which the involved leukocytes are mostly monocytes). (Synonym: aleukemic reticulosis.) (This is possibly an atypical myelogenous leukemia.)
S00 213 1	Monocytic leukemia, leukemic, unspecified
S00 213 2	Monocytic leukemia, aleukemic, unspecified
S00 22	Tumor of lymphoid tissue, as distinct from tissues of the strictly leukoblastic tissues of the lymphatic organ system. Tumors of the lymph nodes, spleen, thymus, tonsils, lymphoid tissue elements of bone marrow, and diffuse lymphatic tissue of the respiratory organs, the gastro-intestinal tract, liver, etc.; lymphoma, unspecified. Includes the common experimental lymphoid tumors of chickens, distinguished by Symbol 1 as the seventh digit in a symbol for a specified chicken lymphoid tumor. Note: In constructing symbols for tumors of lymphoid tissue (S0022---), when these tumors arise in lymph nodes or diffuse lymphatic tissues associated with only a body area or cavity, the structural (anatomical) origin will be indicated merely as lymph node or lymph tissue (Symbol 8I) rather than to attempt to code the body region or organ in or near which was the lymph node or tissue in which the tumor originated. (It is recognized that this makes the anatomical and tissue units of the tumor symbol somewhat redundant, but this occurs because of the situation of the organs involved being of almost a single tissue type so that having identified the organs, the tissue is also identified.) If the lymphatic tissue tumor arises in the spleen, thymus, tonsil, liver, intestine, lungs, or in any other definite organ (rather than in a lymph node or "near" or "in the region" of an organ or at a general body area), that organ is specified in the anatomical unit of the symbol.
S00 220 1	Lymphoid tumor of fowls (a group of experimental transplantable tumors), unspecified
S21 220 1	Lymphoid tumor of fowls with origin in the lung, unspecified
S21 220 11	Lymphoid tumor RPL14
S41 220 1	Lymphoid tumor of fowls with origin in the liver, unspecified
S41 220 11	Lymphoid tumor RPL12 (Olson lymphoid tumor)
S41 220 12	Lymphoid tumor RPL16
S41 220 13	Lymphoid tumor RPL17
S41 220 14	Lymphoid tumor RPL21
S5A 220 1	Lymphoid tumor of fowls with origin in the ovary, unspecified
S5A 220 11	Lymphoid tumor RPL18
S8B 220 1	Lymphoid tumor of fowls with origin in the spleen, unspecified
S8B 220 11	Lymphoid tumor RPL15
S8B 220 12	Lymphoid tumor RPL20
S00 221	Lymphosarcoma, unspecified
S8B 221	Lymphosarcoma with origin in the spleen, unspecified
S8B 221 01	Lymphosarcoma 1527
S8C 221	Lymphosarcoma with origin in a lymph node (any body region), unspecified
S8C 221 01	Lymphosarcoma Patterson
S8C 221 02	Lymphosarcoma Mecca
S8C 221 03	Lymphosarcoma DS9

S8C 221 04	Lymphosarcoma TT15
S8C 221 05	Lymphosarcoma TT8
S8C 221 06	Lymphosarcoma TT10
S8C 221 07	Lymphosarcoma Krebs, Rask-Nielsen, Wagner
S8C 221 08	Lymphosarcoma Murphy-Sturm
S8C 221 09	Lymphoid Sarcoma 15BL
S8C 221 0A	Lymphoma #1 (L-1) (L#1)
SA8 221	Lymphosarcoma with origin in the thymus
SA8 221 01	Lymphosarcoma 6C3HED Gardner, solid form
SA8 221 02	Lymphosarcoma 6C3HED Gardner, ascitic form
SA8 221 03	Thymoma Dalton (Lymphosarcoma)(Thymoma dba)
SA8 221 04	Lymphosarcoma C43 Kaplan
S00 222	Lymphocytic lymphoma, unspecified
S8C 222	Lymphocytic lymphoma with origin in a lymph node (any body region), unspecified
S8C 222 01	Lymphoma #2 (L#2) (lymphocytic)
S8C 222 02	Lymphoma A40 (lymphocytic)
S00 223	Reticulum cell sarcoma; reticulum-cell-like tumor
S41 223	Reticulum cell sarcoma with origin in the liver, unspecified
S41 223 01	Reticulum cell sarcoma 48814
S5A 223	Reticulum cell sarcoma with origin in the ovary, unspecified
S5A 223 01	Reticulum cell sarcoma F8469
S8C 223	Reticulum cell type sarcoma with origin in lymph node
S8C 223 01	Sarcoma R39, reticulum-cell type
S8C 223 02	Lymphosarcoma R2788, reticulum-cell type
S8C 223 03	Lymphosarcoma Bagg, reticulum-cell type
S8C 223 04	Reticuloendothelioma #9
S8C 223 05	Reticuloendothelioma #19
S8C 223 06	Reticulum-cell-like sarcoma, Yoshida
S91 223	Reticulum cell sarcoma or reticulum-cell-like tumor with origin in the mammary gland, unspecified
S91 223 01	Reticulum-cell-like tumor Copeland
SA8 223	Reticulum cell sarcoma or reticulum-cell-like tumor with origin in the thymus gland, unspecified
SA8 223 01	B-leukemia Bichel; reticulum-cell type
S00 224	Plasma cell tumor, unspecified
S41 224	Plasma cell tumor with origin in the liver, unspecified
S41 224 01	Plasmoma IRS 6820
S8C 224	Plasma cell tumor with origin in a lymph node, unspecified
S8C 224 01	Plasma cell leukemia Bichel
S00 23	Erythremia and related erythrocytic tumors
S00 24	Tumors of combined erythroblastic and leukoblastic elements. Also, tumors described as "hemocytoblastic" and not otherwise defined.
S00 240 1	Tumors as defined by S0024 (--of fowls, unspecified)
S5A 240 11	Lymphoid tumor RPL19
S8A 240 11	Erythrogranuloblastosis RPL3
S8A 240 12	Erythrogranuloblastosis RPL4
S00 3	Tumors of connective tissue, unspecified. (Excluded from the definition of this symbol are tumors of the connective tissues making up sheaths and membranes enclosing peripheral and central parts of the nervous system: endoneurium [sheath of Henle], perineurium, epineurium, and meninges. Also excluded are tumors of the interstitial tissues of the nervous system: neurilemma [sheath of Schwann], satellite cells, astroglia, oligodendroglia, mesoglia, and ependyma. Tumors of these tissues are coded with tumors of nerve tissue, regardless of differences in embryonic origin and function, by Symbol S007----.)
S00 300 1	Benign or innocent connective tissue tumor, unspecified
S00 300 2	Sarcoma, unspecified
S00 31	Tumors of fibroblastic origin, unspecified; fibroma or fibrosarcoma
S00 310 1	Fibroma, unspecified
S00 310 2	Fibrosarcoma, unspecified

S91 310 1	Fibroma with origin in the mammary gland, unspecified
S91 310 11	Fibroma Emge
SB0 310 1	Fibroma with origin in skin, unspecified
SB0 310 11	Infectious fibroma Shope
S00 310 2	Fibrosarcoma, unspecified
S91 310 2	Fibrosarcoma with origin in the mammary gland, unspecified
S91 310 21	Sarcoma dba G (fibrosarcoma)
S91 310 22	Fibrosarcoma R 2572
S91 310 23	Fibrosarcoma Noble
SC3 310 2	Fibrosarcoma with origin in subcutaneous tissue, unspecified
SC3 310 21	Fibrosarcoma S 620
SC3 310 22	Fibrosarcoma S 621
SC3 310 23	Fibrosarcoma S 629
SC3 310 24	Fibrosarcoma Sa89
SC3 310 25	Fibrosarcoma S 636
SC3 310 26	Fibrosarcoma HE 8971
SC3 310 27	Sarcoma Earle L (L Sarcoma), fibrosarcoma
SC3 310 28	Fibrosarcoma Sa 87
SC3 310 29	Fibrosarcoma DS7
SC3 310 2A	Sarcoma DS 8 (fibrosarcoma)
SC3 310 2B	Fibrosarcoma BP 839
SC3 310 2C	Fibrosarcoma ACMCA 2
SC3 310 2D	Fibrosarcoma King A #231
SC3 310 2E	Fibrosarcoma #7
SC3 310 2F	Fibrosarcoma #8
SC3 310 2G	Fibrosarcoma JS 1
SC3 310 2H	Fibrosarcoma Friedewald
SD3 310 2	Fibrosarcoma of the thoracic region, unspecified
SD3 310 21	Tumor C, fibrosarcoma of chicken
SD5 310 2	Fibrosarcoma of the forelimb, unspecified
SD5 310 21	Fibrosarcoma Sa 27
SC1 300 2	Sarcoma with origin in bone region, but not of osteoblastic origin, unspecified
SC1 300 21	Sarcoma R 92
SCA 300 2	Sarcoma with origin in muscle region, but not of muscle tissue origin, unspecified
SCA 300 21	Sarcoma MCIM
S00 300 3	Myxoma, unspecified
S00 300 31	Infectious myxoma
S00 300 4	Myxosarcoma, unspecified
S00 300 41	Sarcoma HS 5 (No. 5), myxosarcoma
S00 300 5	Myxoma mixed with a benign connective tissue tumor, unspecified
S00 300 6	Myxoma mixed with a malignant connective tissue tumor, unspecified
S00 310 6	Fibrosarcoma mixed with a myxoma
SC3 310 6	Fibrosarcoma mixed with a myxoma with origin in subcutaneous tissue, unspecified
SC3 310 61	Chicken tumor I (Rous Sarcoma), fibrosarcoma and myxoma
S00 300 7	Myxosarcoma mixed with a benign connective tissue tumor, unspecified
S00 300 8	Myxosarcoma mixed with a malignant connective tissue tumor, unspecified
S00 310 8	Fibrosarcoma mixed with a myxosarcoma
SC3 310 8	Fibrosarcoma mixed with a myxosarcoma with origin in subcutaneous tissue, unspecified
SC3 310 81	Myxosarcoma 14(d) 7, fibrosarcoma
S00 300 9	Rhabdosarcoma (a sarcoma mixed with striated muscle fibers), unspecified
S00 32	Tumors of osteoblastic origin; osteoma or osteosarcoma, unspecified
SD6 32	Osteoblastic tumor (unspecified as to being osteoma or osteosarcoma) with origin in a bone of the hind limb, non-specific
SD6 320 01	Bone tumor #4 NCI
S00 320 1	Osteoma, unspecified
S00 320 2	Osteosarcoma, unspecified
S18 320 2	Osteosarcoma with origin in the stomach, unspecified
S18 320 21	Osteogenic Sarcoma #344

SC1 320 2	Osteosarcoma with origin in an unspecified bone, non-specific
SC1 320 21	Sarcoma #4 Argonne
SD3 320 2	Osteosarcoma with origin in (an unspecified bone of) the thoracic region, non-specific
SD3 320 21	Osteogenic Sarcoma Wagner (WA Sarcoma)
SD3 320 22	Osteogenic Sarcoma T 491
SD8 320 2	Osteosarcoma with origin in (an unspecified bone of) the inguinal region, unspecified
SD8 320 21	Osteogenic Sarcoma Ridgway
S00 33	Tumors of cartilaginous origin; chondroblastoma, unspecified
S00 330 1	Chondroma, unspecified
S00 330 2	Chondrosarcoma, unspecified
S00 34	Tumors of lipoid origin; lipoblastoma, unspecified
S00 340 1	Lipoma, unspecified
S00 340 2	Liposarcoma, unspecified
SC3 340 2	Liposarcoma with origin in subcutaneous tissue, unspecified
SC3 340 21	Liposarcoma D4888
S00 4	Tumors designated only as "round cell sarcoma", "spindle cell sarcoma", "mixed cell sarcoma", "pleomorphic cell sarcoma", "anaplastic cell sarcoma", or "sarcoma undifferentiated"
S00 400 01	Sarcoma M 4
SC3 4	Sarcoma presumably of connective tissue origin, but the cell types not designated; with origin in subcutaneous tissue
SC3 400 01	Sarcoma E 2730
SC3 400 02	Sarcoma #3 Lewis
SD4 4	Sarcoma presumably of connective tissue origin, but the cell types not designated; with origin in the perineal region
SD4 400 01	Sarcoma 319 Walker
S00 41	"Round cell sarcoma", unspecified
S91 41	Round cell sarcoma with origin in the mammary gland, unspecified
S91 410 01	Sarcoma C 3H (#2), round cell
S00 42	"Spindle cell sarcoma", unspecified
S41 42	Spindle cell sarcoma with origin in the liver, unspecified
S41 420 01	Sarcoma IRS 4337, spindle cell
S91 42	Spindle cell sarcoma with origin in the mammary gland, unspecified
S91 420 01	Sarcoma RIII (#4), spindle cell
S91 420 02	Sarcoma Emge, spindle cell
SC3 42	Spindle cell sarcoma with origin in subcutaneous tissue, unspecified
SC3 420 01	Sarcoma B 12 (L. E. O.), spindle cell
SC3 420 02	Sarcoma 1 (SI), spindle cell
SC3 420 03	Sarcoma DS 2, spindle cell
SC3 420 04	Sarcoma DS 3, spindle cell
SC3 420 05	Sarcoma DS 5, spindle cell
SD4 42	Spindle cell sarcoma with origin in the abdominal region, unspecified
SD4 420 01	Sarcoma Jensen, spindle cell
S00 43	"Mixed cell sarcoma", unspecified
S00 44	"Fusiform cell sarcoma", unspecified
S21 44	Fusiform cell sarcoma with origin in the lung, unspecified
S21 440 01	Sarcoma Ma 387, fusiform cell
SD4 44	Fusiform sarcoma with origin in the abdominal region, unspecified
SD4 440 01	Sarcoma 1643, fusiform
S00 45	"Pleomorphic cell sarcoma", unspecified
S91 45	Pleomorphic cell sarcoma with origin in the mammary gland, unspecified
S91 450 01	Sarcoma A19E, pleomorphic cell
S91 450 02	Sarcoma 37, pleomorphic cell
SC3 45	Pleomorphic cell sarcoma with origin in subcutaneous tissue, unspecified
SC3 450 01	Sarcoma T 241 Lewis, pleomorphic cell
SC3 450 02	Sarcoma DS 4, pleomorphic cell
SC3 450 03	Sarcoma IRS 1548, pleomorphic cell

SC3 450 04	Sarcoma HS 6, pleomorphic cell
SD3 45	Pleomorphic cell sarcoma with origin in the thoracic region, unspecified
SD3 450 01	Sarcoma 180 Crocker, pleomorphic cell
S00 46	"Anaplastic cell sarcoma", unspecified
SC3 46	Anaplastic cell sarcoma with origin in subcutaneous tissue, unspecified
SC3 460 01	Sarcoma S 637, anaplastic cell
S00 47	"Undifferentiated cell sarcoma", unspecified
S00 470 01	Sarcoma A 274, undifferentiated
SC3 47	Undifferentiated cell sarcoma with origin in subcutaneous tissue, unspecified
SC3 470 01	Sarcoma MCI, undifferentiated
S00 5	Tumors of muscle tissue, unspecified
S00 51	Tumors of striated muscle, unspecified
S00 510 1	Rhabdomyoma; benign tumor of striated muscle; unspecified
S00 510 2	Rhabdomyosarcoma; a sarcoma mixed with a rhabdomyoma; unspecified
SC3 510 2	Rhabdomyosarcoma with origin in subcutaneous tissue, unspecified
SC3 510 21	Rhabdomyosarcoma S 653
SC3 510 22	Rhabdomyosarcoma HS 4
SCA 510 2	Rhabdomyosarcoma with origin in an unspecified muscle, non-specific
SCA 510 21	Rhabdomyosarcoma H 6668
SCA 510 22	Rhabdomyosarcoma MCIA
(S00 300 9)	Rhabdosarcoma (a sarcoma mixed with striated muscle fibers), unspecified
S00 52	Tumors of smooth muscle, unspecified
S00 520 1	Leiomyoma, innocent or benign tumor of smooth muscle, unspecified
S00 520 2	Leiomyosarcoma; malignant tumor of smooth muscle, unspecified
S00 6	Tumors of vascular tissue; endothelial tumors; angiomas; unspecified
S00 61	Capillary angioma
S00 611	Hemangioendothelioma, unspecified
S54 611	Hemangioendothelioma with origin in the epididymis, unspecified
S54 611 01	Hemangioendothelioma H 6221
S00 62	Cavernous angioma, unspecified
S00 7	Tumor of nervous tissue or of tissues of the nerve sheath, the meninges, and the mesoglia; unspecified
S00 71	Tumors of nerve cells and fibers or derivatives, unspecified
S00 711	Tumors of the adrenal medulla and sympathetic nerves (including neuroblastoma), unspecified
S00 711 1	Neuroblastoma, unspecified
S6A 711 1	Neuroblastoma with origin in the region of the spinal cord, unspecified
S6A 711 11	Neuroblastoma C 1300
S00 712	Tumors of nerve cells of the ganglia, unspecified
S00 712 1	Ganglioneuroma, unspecified
S00 713	Tumors of sensory receptor nerve cells or their modifications and derivatives, unspecified
S72 713 1	Retinoblastoma, unspecified
S00 72	Tumors of neuroglia, nerve sheaths, or other nerve interstitial tissue, unspecified
S00 721	Tumors of tissues of the nerve sheath and the meninges, unspecified
S00 721 1	Neurofibroma, unspecified. This tumor type has an obscure or controversial tissue origin; it is from either the perineurium or neurilemma. (Synonyms: neurinoma, perineurial fibroma, fibroblastoma, Schwannoma)
S00 721 2	Neurofibromatosis (Recklinghausen's disease, neuromatosis, multiple neuroma), unspecified
S00 721 3	Neurogenic sarcoma; neurosarcoma (origin in the nerve sheath and usually located in the subcutaneous tissue or in a muscle of the arm or leg); unspecified as to organ
S00 721 4	Meningioma, unspecified
S00 722	Tumors of the interstitial tissues of the brain; glioma; unspecified
S00 722 1	Tumors of spongioblasts; glioblastoma; glioblastoma multiforme; spongioblastoma multiforme; gliosarcoma; unspecified
S61 722 11	Glioblastoma 8100 Moore

S00 722 2	Tumors of astrocytes; astrocytoma; unspecified
S61 722 21	Astrocytoma C3H (18)
S00 722 3	Tumor of undifferentiated preneurogliar cells, unspecified
S67 722 3	Medulloblastoma of the cerebellum
S00 722 4	Tumor of ependymal cells, unspecified
S00 722 4	Ependymoma, unspecified
S67 722 4	Ependymoma of the cerebellum, unspecified
S61 722 4	Ependymoma of the brain, unspecified
S61 722 41	Ependymoma A(22)
S00 8	Tumors of melanin-forming tissues, unspecified
S00 800 1	Benign or innocent melanoma; naevus; mole; unspecified
S00 800 2	Malignant melanoma; melanotic sarcoma; unspecified
S7A 800 2	Malignant melanoma with origin in the ear, unspecified
S7A 800 21	Melanoma Harding Passey
SD7 800 2	Malignant melanoma with origin in the tail, unspecified
SD7 800 21	Melanoma S91 Cloudman (dba melanoma)
SD7 800 22	Amelanotic melanoma S91A (C91AA)
SB2 800 2	Malignant melanoma with origin in the corium, unspecified
SB2 800 21	Melanotic tumor Brunst (Chromatophoroma malignum)
S00 9	Tumors of mixed tissues (epithelial and connective tissues)
S00 91	Tumors of connective tissue containing glandular structures (adenofibroma), unspecified
S91 91	Mammary adenofibroma, unspecified
S91 910 01	Adenofibroma Emge
S00 92	Tumors of glandular epithelial tissue with fibrous connective tissue; fibroadenoma
S91 92	Mammary gland fibroadenoma, unspecified
S91 920 01	Fibroadenoma R2737
S91 920 02	Fibroadenoma Tumor #6
S00 93	Tumors of epithelial and connective tissue origin; carcinosarcoma; unspecified
S91 930 01	Carcinosarcoma 256 Walker (Walker rat tumor)
S00 94	Teratomas
S5A 940 01	Embryoma Brues-Jackson
S5A 940 02	Teratoma E6496
S00 A	Tumors of embryonal tissues, unspecified

FIELD E; Tumor Code
Columns 18, 19, 20, 21,
22, 23, 24, and 25

SYMBOLS FOR ANATOMICAL ITEMS, INCORPORATED AS THE SECOND AND THIRD UNITS OF TUMOR SYMBOLS

These items (for the second and third units of the tumor symbols, Columns 19 and 20) represent gross structures only. (Tissue types are indicated by the fourth, fifth, and sixth units and are not a part of this list.) For example, smooth muscle, striated muscle, bone marrow, etc., are not included here, since they are types of tissue; however, organs containing smooth muscle, organs and body areas containing striated muscle (or specific skeletal muscles [organs], such as the gastrocnemius, trapezius, etc.), and specific bones (organs) are in the list. The list may be expanded as necessary for specific organs.

1	Alimentary tract
11	Lip and inner cheek
12	Mandible
13	Palate
14	Gums
15	Tongue
16	Throat
17	Esophagus
18	Stomach; fetal stomach
19	Cardiac region of stomach; rodent forestomach or cardiac sac
1A	Fundic region of stomach; rodent glandular stomach
1B	Pyloric region of stomach
1C	Duodenum
1D	Small intestine
1E	Large intestine
1F	Rectum
1G	Appendix and caecum
1H	Anus
1I	Mesentery
2	Respiratory system
21	Lung
3	Excretory system
31	Kidney
32	Kidney pelvic region
33	Urethra
34	Urinary bladder
35	Ureter
4	Liver and associated structures
41	Liver
42	Gall bladder
43	Bile duct
5	Reproductive system
51	Testicle
52	Scrotum
53	Seminiferous tubule
54	Epididymis
55	Vas deferens
56	Penis
5A	Ovary
5B	Oviduct
5C	Uterus, in toto, or not otherwise specified
5D	Cervix
5E	Body of uterus
5F	Vagina
6	Nervous system, exclusive of sensory organs
61	Brain
62	Cerebrum
63	Mid-brain
64	Thalamus
65	Hypothalamus
66	Pons
67	Cerebellum
68	Medulla
69	Meninges
6A	Spinal cord
7	Sensory organs
71	Eye
72	Retina
73	Iris, choroid coat, intrinsic muscles
74	Lens
75	Cornea
76	Sclera
77	Eyelid, conjunctiva
78	Nictitating membrane
7A	Ear
8	Circulatory system; heart, vessels, and fluids
81	Heart
8A	Blood and lymph
8B	Spleen
8C	Lymph node
8D	Spleen and lymph nodes (combination)
9	Exocrine glands (exclusive of the liver)
91	Mammary gland
92	Pancreas
93	Sebaceous gland
94	Harderian gland
95	Gastric gland
96	Salivary gland, unspecified
97	Sub-maxillary gland
98	Parotid gland
99	Sub-lingual gland
9A	Seminal vesicle
9B	Prostate
9C	Sudoriparous (sudoriferous) gland
A	Endocrine glands

A1	Pituitary gland
A2	Anterior pituitary
A3	Posterior pituitary
A4	Adrenal gland
A5	Adrenal cortex
A6	Adrenal medulla
A7	Thyroid
A8	Thymus
B	Skin; integument; including specialized structures producing hair, nails, feathers, etc.
B1	Epidermis
B2	Dermis
B3	Hair follicle
C	Supportive or skeletal system and muscles
C1	Specific bone (e. g. , the femur)
C2	Cartilagenous organ
C3	Subcutaneous connective tissue layer considered as an organ; subpannicular region
CA	Specific muscle of striated muscle tissue (e. g. , gastrocnemius)
--	Smooth muscle organs. (Code specific organs containing smooth muscle)
D	External body regions
D1	Head
D2	Neck
D3	Thorax; supraclavicular region, pectoral region, axillary region, etc.
D4	Abdomen: perineal region, etc.
D5	Forelimb
D6	Hindlimb
D7	Tail
D8	Inguinal region
D9	Gluteal region
E	Body cavities: internal regions
E1	Abdominal cavity; peritoneal cavity
E2	Thoracic cavity
S	Organs of higher plants, Spermatophyta
S1	Stem bud, stem tip, immature stem
S2	Mature stem
S3	Root, of the primary root system (exclusive of adventitious roots)
S4	Adventitious root
S5	Vascular bundles (any plant vascular organic unit)
S6	Leaf
S7	Leaf blade
S8	Leaf petiole
S9	Flower
SA	Flower, exclusive of stalk and receptacle
SB	Flower, stalk and receptacle
SC	Ovary, fruit
SD	Seed
SE	Plant embryonic organs

PATHOLOGY CODE

REPRESENTATIVE LIST OF DISEASES AND IDENTIFYING CODE SYMBOLS

Other pathologies may be added to this list and symbols constructed according to the procedures and policies outlined in the Key discussion of the Pathology Code.

The spaces between the fourth and fifth and between the sixth and seventh units of the symbols have no significance in the list except to facilitate analysis of the second and third (anatomical and etiological) parts of the symbol.

The information coded into these symbols assigned to pathologies is, or can be, supplemented by coding in Fields H and T-2, as described in the Key. In a few instances, to describe a pathology adequately, it is necessary to use Field H and, for these pathologies, the definition of each includes specification of that Field H code entry. This is generally the case with infectious diseases entered in the list and with certain others such as dermatomyositis, sprue, arthritis due to rheumatic fever, jaundice, etc.

The anatomy list of Field H should be consulted for the definitions of the second part of the symbol (Columns 19, 20, and 21); the etiology list (following this list of pathologies) should be consulted for the definitions of the third part (Columns 22 and 23). A supplementary list of general pathological manifestations, indicated by letter symbols in Column 25, follows the etiology list.

T110 81 00	Epilepsy, Grand mal
T110 82 00	Petit mal
T110 83 00	Psychomotor seizure
JSC10021	Poliomyelitis (Legio debilitans); Field H: nervous system (1)
JSC10031	Rabies (Formida inexorabilis); Field H: nervous system (1)
T213 00 01	Glaucoma (aqueous humour), cause unspecified
T21E 00 0A	Conjunctivitis, cause unspecified
T310 00 01	Anginal syndrome
T311 00 01	Auricular flutter, cause unspecified
T311 00 02	Auricular fibrillation, cause unspecified
T312 00 01	Ventricular paroxysmal tachycardia
T317 00 0F	Myocardial infarction
T31C 81 00	Sinus arrhythmia
T320 00 01	Thrombosis, unspecified as to whether arterial or venous, cause unspecified
T320 G1 02	Thromboangiitis obliterans
T325 00 01	Arterial thrombosis, cause unspecified
T325 43 00	Hypertensive vascular disease
T325 P2 00	Arteriosclerosis
T325 X2 00	Periarteritis nodosa
T325 X3 00	Atherosclerosis
T325 81 00	Hypertension, essential
T329 00 01	Purpura, non-thrombopenic; capillary purpura, cause not specified
T32D P2 00	Coronary sclerosis
T333 00 01	Anemia, unspecified as to cause or type
T333 00 02	Anemia, macrocytic, unspecified as to cause
T333 00 03	Anemia, hemolytic, unspecified as to cause
T333 00 04	Jaundice, cause unspecified; hyperbilirubinemia. (For all hepatogenous jaundices, code liver, Symbol E, in Field H.)
T333 F9 02	Anemia due to Vitamin B_{12} deficiency
T333 FE 02	Anemia due to deficiency of folic acid and intrinsic factor; pernicious anemia
T333 74 03	Anemia, sickle cell
T339 WS 00	Purpura, idiopathic thrombocytopenic

T339 XJ 00	Hemophilia
T342 00 0H	Splenomegaly, cause unspecified. Splenomegaly due to Gaucher's Disease: Code Gaucher's Disease in Field E and splenomegaly in Fields T-2 and H (T-2: 281; H-1: 342) and the chemical effect by one of Symbols J-R in Field T-1.
T342 43 0H	Splenic anemia. Note: Code the actual anemia of this condition, if specifically treated or affected by treatment, in Field T-2 (853).
T346 63 00	Gaucher's Disease
JS410021	Tonsilitis due to Streptococcus pyogenes; Field H: tonsil (345); Field T-2: inflammation (1132)
T500 00 01	Cough, cause unspecified
T500 L1 01	Cough due to tobacco smoke or other foreign irritant (smoker's cough)
T500 00 02	Dyspnea, cause unspecified
T514 00 0A	Sinusitis (paranasal)
T519 00 1B	Bronchiectasis, cause unspecified
T519 S2 00	Asthma, allergic
JS501014	Tuberculosis; Field H: lungs (52)
T61A 00 0A	Gingivitis, cause unspecified
T660 00 01	Achlorhydia, cause unspecified
T660 00 02	Hypochlorhydria, cause unspecified
T660 00 03	Hyperchlorhydria, cause unspecified
T660 X1 00	Ulcer, gastric
T670 00 01	Diarrhea, cause unspecified
J6301011	Thrush (Candida albicans): Field H: mouth (61)
42101011	Fasciolopsiasis (Fasciolopsis buski); Field H: intestine (67) or gall bladder (E2)
T700 00 01	Hematuria, cause not specified
T710 00 02	Hemaglobinuria, cause not specified
T715 00 0A	Nephritis, cause unspecified
T715 00 0G	Nephrosis, cause unspecified
T818 00 0A	Cervicitis, cause not specified
T930 00 0A	Inflammation of joints; arthritis, cause unspecified. For arthritis due to rheumatic fever, code rheumatic fever in Field E, inflammation (1132) in Field T-2, joint (930) in Field H-1, and the response in Field T-1.
T930 61 0A	Arthritis due to gout
T930 71 0A	Osteoarthritis
T930 90 0A	Rheumatoid arthritis
T970 G1 00	Dermatomyositis; Field H: skin (A1). If an identifiable infective agent is named, this should be coded in lieu of T970G100.
T970 G1 01	Fibrositis
T970 N1 0E	Myasthenia gravis
T9J0 00 0A	Bursitis, cause unspecified
TA10 00 0A	Dermatitis, cause unspecified
TA10 L1 0A	Dermatitis, contact
TB00 00 01	Fever (pyrexia), cause unspecified. Note: It is usually a greater advantage to code fever in Field T-2 (Symbol FD) as a symptom of a pathology coded in Field E or as an abnormal state of the test organism in Field E.
TB00 G1 02	Rheumatic fever. Code the organ affected by the disease and the organ specifically affected by chemical treatment in Field H.
TB00 00 03	Burn. Specify the site of the burn in Field H and any effect of the burn specifically treated by the test compound in Field T-2.
TB00 00 0A	Inflammation, cause unspecified. Code the site of inflammation in Field H, or, if the inflammation is a specific recognized disease entity, construct a new symbol, substituting the symbol for the organ inflamed for the non-specific anatomical part B00.
TB00 00 0B	Shock, not otherwise distinguished
TB00 00 0F	Infarction, not otherwise distinguished
TB00 00 0G	Gangrene, cause and site not specified
TB00 21 00	Lead poisoning
TB00 25 00	Snake venom poisoning. Note: If the specific snake venom is known, the taxonomic symbol for the snake species should be coded in Field E, the victim animal in Field J, and the organ system affected (blood or nervous, e.g.) in Field H.
TB00 26 00	Chloroform poisoning

TB00 S1 00	Anaphylaxis, cause unspecified
TB00 C1 00	Frost bite, site unspecified. If the site is specified, code it in Field H.
TB00 32 0B	Shock, surgical
TB00 C2 0B	Shock due to burn
TB00 C4 0D	Radiation sickness
TB00 44 0F	Infarction due to thrombosis. Code the site of infarction in Field H.
TB00 61 00	Gout
TB00 F1 00	Avitaminosis, not otherwise distinguished
TB00 F2 00	Vitamin A deficiency, not otherwise distinguished
TB00 F3 00	Vitamin B deficiency, not otherwise distinguished
TB00 F7 00	Vitamin B6 pyridoxine deficiency, not otherwise distinguished
TB00 F8 00	Pantothenic acid deficiency
TB00 F9 00	Vitamin B12 deficiency
TB00 FA 00	Vitamin C deficiency, not otherwise distinguished
TB00 FC 00	Vitamin E deficiency, not otherwise distinguished
TB00 FE 00	Sprue. Note: Identify in Field H the structures affected by sprue and the structure responding to chemical treatment.
TB00 FK 00	Boron deficiency, not otherwise distinguished
TB00 FL 00	Calcium deficiency, not otherwise distinguished
TB00 W1 00	Addison's Disease, adrenal insufficiency, adrenal cortical hypofunction
TB00 W4 00	Diabetes mellitus
TB00 W5 00	Hyperthyroidism
TB00 81 00	Alcoholism
TB71 00 1C	Ascites, cause unspecified
TE10 00 01	Fatty liver, cause unspecified
TE10 00 02	Cirrhosis, cause unspecified
TE10 00 0A	Hepatitis, cause unspecified
TE10 42 02	Cirrhosis, due to congestion
TE10 62 0G	Yellow atrophy of the liver
42103011	Clonorchiasis (Clonorchis sinensis); Field H: liver (E)
JS902021	Cirrhosis, syphilitic (Treponema pallidum); Field H: liver (E); Field T-2: Cirrhosis (4189)

CAUSES OF DISEASE

Disease etiologies, classified under several categories and assigned code symbols, to be used in constructing Field E code symbols for specific pathologies.

The following catalog of etiologies is divided into eight basic groups to which Symbols 2, 3, 4, 5, 6, 7, 8, and 9 have been assigned, to be coded in Column 22 as part of the total eight-unit symbol identifying pathologies. To provide an adequate number of symbols for specific etiologies within each category, the numerical symbols are combined with IBM zone punches, giving three letter symbols, in addition to the numerical symbol, in each category. Therefore, the first category is represented by any of Symbols 2, B, K, or S, the second category by any of Symbols 3, C, L, or T, the third by Symbols 4, D, M, or U, etc. A general sub-classification has been made within some of the categories. For example, within the first category, Symbols 2, B, and K have been reserved for specific extraneous poisons and intoxicants, while Symbol S has been reserved for those materials to which individuals are peculiarly sensitive (hypersensitive responses).

Within each sub-category, however, each specific etiology is distinguished simply by assigning it a sequential number for Column 23. Thus, lead was the first of the specific poisonous materials as a cause of pathology listed in the category of poisons and was assigned Symbol 21; subsequently, the next poisonous material added, carbon monoxide, was assigned Symbol 22, etc.

The seventh major category (Symbols 8, H, Q, and Y in Column 22) differs somewhat from the pattern of other categories for designating specific etiologies. This is a category for those diseases for which causes have not been discovered or are highly conjectural (resembling in this respect the sixth category, Symbols 7, G, P, and X) and which result less in morphological change than in physiological disorders. The criterion for distinguishing diseases of this category lies, therefore, in the physiological process affected by the disease and is not actually an etiological classification at all. Here, it has seemed most practical to assign no specific meanings to symbols in Column 23, but rather to allow the symbol in Column 22 to refer generally to functions of the anatomical part coded in Columns 19, 20, and 21. The normal physiological process of the anatomical part which is disrupted by the pathology is merely assigned a sequential number in Column 23. Thus, for each anatomical part coded distinctly in Columns 19, 20, and 21, a very large number of diseases (whose causes are unknown) can be distinguished on the basis of the functional disturbance brought about by the disease. The alternative to this would have been the assignment of specific functional disturbances to the 140 available symbols within this category, only one or a few of which would be applicable to any one anatomical part coded in Columns 19, 20, and 21.

Symbols 2, B, K, and S

Extraneous poisons, intoxicants, and materials to which individuals are sensitive, as causes of pathology.

		2 B K	Poisons and intoxicants
		S	Substances producing hypersensitive reactions
21	Lead	S1	Anaphylactic response, substances producing, unspecified
22	Carbon monoxide		
23	Arsenic	S2	Allergic, hypersensitive reaction, substances producing, unspecified
24	Mercury		
25	Snake venom, unspecified		
26	Chloroform		

Symbols 3, C, L, and T

Trauma and physical agents as causes of disease.

3 Traumas

C Heat, cold, radiation, etc.

L Substances which cause physical injury rather than damage by chemical interaction

31	Trauma, unspecified	C1	Cold, freezing, frostbite	L1	Foreign substances, irritants, etc.
32	Operative wound	C2	Contact burn		
		C3	Sunburn, ultraviolet ray burn		
		C4	X-rays, radium, other radioactive substances, unspecified		

Symbols 4, D, M, and U

Disturbances of circulation as causes of pathology, regardless of the primary cause of the circulatory disturbance.

4 Blood supply and blood pressure

D Abnormality of blood components, character

41	Increased blood supply, due to dilation of vascular bed
42	Stasis
43	Increased blood pressure
44	Thrombosis, disruption of circulation to the part

Symbols 5, E, N, and V

Disturbances of the nervous system as causes of disease, regardless of the primary cause of the nervous disorder.

5 Psychic disturbances

E Reflex disturbances

N1-NI Efferent nerve disorders

NJ-NZ Sensory nerve disorders

V Sympathetic or parasympathetic disturbances

N1	Disturbance of myoneural junction

Symbols 6, F, Ø, and W

Disturbances of metabolism, growth, and nutrition as causes of disease, regardless of the primary cause of the metabolic disorder.

6 Metabolic disorders; toxins of metabolic origin

F, Ø Deficiencies

W1-WR Endocrine functional abnormalities

WS-WZ Growth and development disorders

61 Disturbances of purine metabolism	F1 General vitamin deficiency	W1 Adrenal cortex hyperfunction	WS Arrested or retarded development
62 Toxic products of aberrant metabolism, unspecified	F2 Vitamin A deficiency	W2 Adrenal cortex hypofunction	
63 Lipoid metabolism	F3 Vitamin B deficiency, n. o. s.	W3 Islets of Langerhans, hyperfunction	
	F4 Vitamin B_1 deficiency	W4 Islets of Langerhans, hypofunction	
	F5 Vitamin B_2, riboflavin, deficiency	W5 Thyroid gland, hyperfunction	
	F6 Nicotinic acid deficiency	W6 Thyroid gland, hypofunction	
	F7 Vitamin B_6 deficiency		
	F8 Pantothenic acid deficiency		
	F9 Vitamin B_{12} deficiency		
	FA Vitamin C deficiency		
	FB Vitamin D deficiency		
	FC Vitamin E deficiency		
	FD Vitamin K deficiency		
	FE Folic Acid deficiency		
	FF-FI (Reserved for other vitamin deficiencies)		

Symbols 6, F, Ø, and W (Continued)

FJ Iodine deficiency

FK Boron deficiency

FL Calcium deficiency

FM Copper deficiency

FN- (Reserved for
FZ other mineral
and elemental
deficiencies)

Symbols 7, G, P, and X

Diseases due to unknown causes, with the structural change manifest in the affected part (which may result in a functional disorder).

71- Degenerative
7I

7J- Infiltrative or permeative
7Z

G Inflammatory structural changes

P Proliferative and sclerotic changes

X1- Combined anatomical changes
XI

XJ- Heredity diseases with structural
XZ abnormalities manifest

71	Degenerative, unspecified	G1	Inflammatory changes	P1	Proliferative, unspecified	X1	Necrosis and inflammation	XJ	Inheritable diseases, unspecified
72	Atrophy			P2	Connective tissue proliferation	X2	Inflammation followed by necrosis		
73	Necrosis								
74	Abnormal form, abnormal development			P3	Sclerotic change	X3	Degeneration and infiltration		

Symbols 8, H, Q, and Y

Diseases of unknown cause with a physiological disorder being the principal manifestation. (See the explanation in the introduction to this etiology list.)

Symbols 9, I, R, and Z

Chronic conditions or permanent impairment due to previous infection.

List of General Pathological States
which may be Associated with any
Anatomical Structure Affected Pathologically
(Columns 24 and 25)

These conditions are general states, each of which may be associated with many specifically recognized and named pathologies. They can be used as the final part of pathology symbols in Field E (Columns 24 and 25), serving to distinguish certain pathologies not otherwise adequately described or distinguished by the anatomical and etiological coding in Columns 19-23.

It is planned to use only a single IBM zone punch in Column 25 to distinguish this category of entries having fixed definitions from the other category coded in Columns 24 and 25, with numerical entries in Column 25 and without fixed definitions. (Refer to Division 6 of the discussion of the Pathology Code in the Key.) Thus, only the letter symbols A through I are used in Column 25 combined with numerical symbols in Column 24 (0A-0I, 1A-1I, 2A-2I, etc.). This will permit 90 such general states which is predicted to be adequate for distinguishing all pathological states for which the CBCC will need symbols.

0A	Inflammation	1A	Constriction
0B	Shock	1B	Dilatation
0C	Congestion (blood); for congestion of other fluids (dropsy), use Symbol 1C	1C	Accumulation of body fluids; dropsy; ascites
0D	General malaise or acute general symptoms due to the specific etiology coded		
0E	Reduction of normal physiological function; disturbance of action		
0F	Infarction		
0G	Necrosis, degeneration		
0H	Hypertrophy		
0I	Atrophy		

SEX AND STAGE OF DEVELOPMENT OF THE TEST ORGANISM;

MISCELLANEOUS INFORMATION CONCERNING TUMORS
(See final page of Field F)

*	Male	Use both symbols (* and #) when use of a mixture of sexes is specified. Use neither if it is not known whether the organism is male or female or whether a group of organisms is of all male, all female, or a mixture of individuals. Consult the Key.
#	Female	

Symbol	Vertebrata (Symbol A in Column 18 of Field E)	Invertebrata (cont'd on next page) (Any of Symbols 1 through 9 and E through G in Column 18 of Field E) Sporozoa (Symbol 13 in Columns 18 and 19 of Field E)
1	Spermatocyte and ovum; gametes; haploid stages[1]	Sporont, gametocyte
2	Zygote; fertilized egg	Zygote
3	Early embryo: first cleavages; morula, blastula, and gastrula. (For subsequent stages of differentiation, beginning with the neurula, use Symbol 4.)	Oökinete
4	Stages of differentiation after gastrulation: neurula; fetus; all stages from gastrula to hatching or birth, regardless of the state of maturity at release from the egg membranes or uterus	Oöcyst
5	Infant: early stages beginning with hatching or birth; stages in which the animal is often relatively helpless or to some degree dependent; first period of growth. (Symbol 5 includes all developmental stages of tadpoles of Amphibia.)	Sporozoite
6	Young animal: the stages between infancy and sexual maturity. (Includes young Amphibians from the stage of emergence from a tadpole--in general, from the time all four legs have appeared and assumed functions.)	Trophozoite
7	Young sexually mature animal: any stages between sexual maturity and assumption of characteristic adult size, appearance, and behavior; adolescence of humans	Schizont
8	Adult animal	Merozoite
9	Senile animal: stages of somatic degeneration to death	

[1] If necessary to code a distinction between sperm and egg, it can be accomplished by the IBM zone punches, if the test compound is administered to that particular stage, and/or by Field H-1, when that is the stage (structure) responding to the test compound.

* Male

\# Female

Symbol	Invertebrata (continued from the previous page) (Any of Symbols 1 through 9 and E through G in Column 18 of Field E)	
	Nematoda (Symbol 51 in Columns 18 and 19 of Field E)	Insecta (Symbol 93 in Columns 18 and 19 of Field E)
1	Sperm and egg[1]	Gametes[1]
2	Zygote; fertilized egg	Zygote
3	Embryo (including microfilaria)	Embryo
4	First stage postembryonic juvenile; rhabditoid larva	Larva or nymph at the first or second instar stage[2]
5	Second stage juvenile; filariform larva; juvenile after first molt	Larva or nymph at the third instar stage[2]
6	Third stage juvenile (after second molt)	Larva or nymph at the fourth or later instar stage[2]
7	Fourth stage juvenile (after third molt)	Prepupal stage
8	Immature adult (after fourth molt)	Pupa[3]
9	Mature adult producing eggs/spermatozoa	Adult

[1] (See the footnote with the vertebrate list.)

[2] If the stage of the larva is in no way specified, use Symbol 6, but if there is adequate reason for believing it is an "early" or "late" larva, use Symbol 4, 5, or 6, according to best judgment.

[3] If a distinction is desired between the early and late pupa, it can only be made in the written abstract.

SPECIAL EMBRYONIC AND LARVAL
STAGES OF INVERTEBRATE ANIMALS;
BACTERIA SPORE

Bacteria spore	1	Miracidium	3
Bipinnaria	4	Mysis	7
Branchiolaria	5	Naiad	6
Caterpillar	6	Nauplius	4
Cercaria	6	Pilidium	4
Chigger	6	Planula	4
Cypris	5	Pluteus	4
Cysticercus	7	Polyp	7
Ephyra	6	Protozoea	5
Glochidium	6	Redia	5
Grub	6	Scyphistoma	5
Maggot	6	Seed tick	6
Medusa	2	Sporocyst	4
Megalops	7	Trochophore	4
Metacercaria	7	Veliger	4
Microfilaria	6	Zoea	6

FIELD F
Column 26

* Male

\# Female

Symbol	Spermatophytes (Symbol M in Columns 18 and 19 of Field E)	Basidiomycetes (Symbol J5 in Columns 18 and 19 of Field E)
1	Spore	Basidiospore (a haploid, uninucleate spore, formed by meiotic division of the diploid basidium)[1]
2	Zygote	Young mycelium (haploid, uninucleate ["haplophasic"]), not yet producing haploid, uninucleate spores (oidia; conidia; spermatia of wheat rust, e.g.)[1] (For a binucleate mycelium producing binucleate spores [diplophasic], use Symbols 5 and 6.)
3	Embryo	Mycelium as in Symbol 2, but producing haploid spores (spermatia, e.g.); a haplophasic mycelium reproducing asexually.[1]
4	Seed	Spore, haploid, uninucleate and not formed by meiotic division; spore of haplophasic mycelium; spore that will produce a mycelium as in Symbol 2; oidia; conidia; spermatia.[1] (For haploid, binucleate spores, use Symbol 7.)
5	Seedling	Young mycelium (haploid, binucleate ["diplophasic"])(from the union of two sexes of uninucleate mycelia, or from a union of spermatia [or of spermatium with a hypha] of opposite sexes, or from binucleate haploid spores--e.g., aecidiospore or uredospore) --which is not yet producing basidia (or teleutospores). (If at a reproductive stage, use Symbol 6.)
6	Non-flowering vegetative plant	Mycelium as in Symbol 5, but mature and producing binucleate, haploid spores (aecidiospores or uredospores or teleutospores) or producing basidia. (Use Symbol 6 also for young basidia still in the haploid binucleate stage before nuclear fusion. Use Symbol 8 for the diploid uninucleate stage.)
7	Flowering plant	Spore, haploid, binucleate; aecidiospore or uredospore. Includes young teleutospore (but not basidium) prior to nuclear fusion. (Use Symbol 6 for a basidium prior to nuclear fusion. Use Symbol 8 for any diploid uninucleate stage of a basidium or germinating teleutospore.)
8	Fruiting plant	Basidium or teleutospore, at diploid, uninucleate stage
9	Senescent plant	Basidium at the haploid (2 or 4 nuclei) stage--or germinating teleutospore at the haploid stage (or epibasidium [haploid] stage of germinating teleutospore). Forms basidiospores (Symbol 1).

[1] If necessary to code a distinction between sexes of haploid spores and mycelia, it can be accomplished by the IBM zone punches, if the test compound is administered to that particular stage and/or by Field H-1, when that is the stage responding to the test compound.

(When an author does not specify the stage of the life cycle other than "mycelium", use the symbol for "mature vegetative mycelium producing asexual spores". If spores are not specified beyond "spores", use the symbol for "haploid spores" [i.e., ascospores, basidiospores, or conidia].)

* Male

\# Female

Symbol	Ascomycetes and Fungi imperfecti (Symbols J4 or J6, respectively, in Columns 18 and 19 in Field E)
1	Ascospore (a haploid, uninucleate spore, formed by a meiotic division of the diploid ascus)[1]
2	Young mycelium (haploid, uninucleate) not yet producing conidia nor reproducing sexually[1]
3	Mycelium as in Symbol 2, but producing conidiospores and conidia and/or sex organs[1]
4	Conidium (haploid, uninucleate spore, formed from a haploid, uninucleate mycelium. Will form a mycelium as in Symbol 2.)[1]
5	"Zygote": a binucleate haploid cell resulting from the fusion of protoplasts of two uninucleate sex cells, the ascogonium and the antheridium. Symbol 5 represents the stage prior to nuclear fusion. Included is any mycelium (binucleate, haploid ascogenous hyphae) resulting from this gamete union prior to ascus formation.
6	Ascus-forming stage of a post-zygotic mycelium or of the "zygote". (Use Symbol 7 for ascus.)
7	Ascus at the binucleate, haploid stage, prior to nuclear fusion
8	Ascus after nuclear fusion (uninucleate diploid)
9	Ascus after reduction division (haploid and with 2 or 4 nuclei)

[1](See the footnote under the Basidiomycetes)

FIELD F
Column 26

* Male

\# Female

Symbol	Phycomycetes[1] (Symbol J3 in Columns 18 and 19 of Field E)
1	Gametes, uninucleate or multinucleate, haploid, either isogametes or heterogametes; antherozoid and egg[2]
2	Zygote, diploid, uninucleate or multinucleate (if multinucleate, the diploid condition may be uninucleate or multinucleate according to the number of nuclei contributed by the antherozoid)
3	Germinating zygote, haploid (i.e., after meiosis), multinucleate, forming either spores (Symbol 4) immediately from its protoplast (ordinarily zoospores) or a mycelium (Symbol 5)
4	Spore formed directly from a germinating zygote, haploid.[2] Includes spores which are formed from a special, limited mycelium (not comparable to vegetative mycelium) produced by the germinating zygote. (Use Symbol 7 for a spore from a vegetative mycelium.)
5	Young vegetative (haploid) mycelium (either nonseptate or, if septate, usually having multinucleate cells), not yet producing asexual spores nor gametes.[2] Formed from a zygote or a spore or a mycelial fragment. (If the mycelium is producing spores or gametes, use Symbol 6 or 8, respectively.)
6	Vegetative mycelium as in Symbol 5, but mature and producing haploid spores.[2] (If the mycelium is producing gametes, use Symbol 8.)
7	Spore, haploid, uninucleate (either a motile zoospore or a nonmotile, resting aplanospore), formed from a vegetative mycelium. Includes conidiosporangia (= Phycomycete "conidia") and chlamydospores.[2] (Use Symbol 4 for a spore from a germinating zygote.)
8	Vegetative mycelium as in Symbol 5, but in a stage of producing sex organs, antheridia and/or oogonia, instead of, or in addition to, asexual spores[2]
9	Stages of maturation of gametes within the oogonium or antheridium[2]

[1] Except those Phycomycetes which apparently include an alternation of generations in which the diploid condition is retained from the zygote through a vegetative mycelial stage which reproduces only asexually--to return to the haploid stage by producing haploid spores. In the scheme above, this diploid generation could be represented only by Symbol 2; if finer distinctions are needed, it will be necessary to devise a special list of life cycle stages for Phycomycete members like Allomyces sp.

[2] (See the footnote under the Basidiomycetes.)

* Male

\# Female

Symbol	Algae (Symbols JA through JE in Columns 18 and 19 of Field E)
1	Gametes (haploid); antherozoid and egg[1]
2	Zygote
3	Germinating zygote (haploid after reduction) to produce haploid thallus (Symbol 8) or to produce immediately zoospores (or carpospores of Rhodophyta)(Symbol 7). If the germinating zygote remains diploid (as in Phaeophyta and certain Rhodophyta), use Symbol 4.
4	Germinating zygote (diploid) to produce diploid thallus (sporophyte)
5	Mature diploid sporophyte producing sporangia (diploid) which are either "neutral" sporangia (producing "neutral" diploid spores, Symbol 6) or "unilocular" sporangia (producing haploid zoospores, Symbol 7). Includes diploid sporophytes producing diploid "unilocular sporangia" that functionally are "macrosporangia" or "microsporangia" which produce eggs and antherozoids, respectively, by reduction division (Symbol 1).
6	"Neutral" spore, diploid; will form a diploid thallus as in Symbol 5
7	Spore (haploid), from a haploid thallus (Symbol 8); spore (haploid), from a diploid thallus (Symbol 5); spore (haploid), from a zygote (Symbol 3). The distinction of this spore according to its origin can only be made, if necessary, by the written abstract.
8	Haploid thallus, from a haploid spore, producing only haploid spores (Symbol 7), or producing haploid spores and sex organs, or producing only haploid sex organs (oogonia and antheridia, Symbol 9)
9	Maturation of egg and antherozoid in the oogonia and antheridia

SYMBOLS FOR DESCRIPTION OF TUMORS BEING TREATED

S - Ascitic form of tumor
T - Induced tumor (e. g. , carcinogenic effects)
U - Spontaneous tumor
V - Transplanted tumor
W - Malignant tumor
X - Benign tumor
Y - Metastatic tumor
Z - Dependent tumor (dependent on a specific condition or factor of the host coded in Field J). Describe the dependency in the written abstract.

[1](See the footnote under the Basidiomycetes.)

FIELD G
(Field G-1) (Field G-2)
Column 27 Column 28

PRETREATMENT OR
EXPERIMENTAL STATE OF THE
TEST ORGANISM OR OF THE ORGAN,
TISSUE, OR CELL OF THE TEST ORGANISM

Symbol Z only:
EXPERIMENTAL TREATMENT OF THE TEST
ORGANISM OTHER THAN TREATMENT
WITH THE TEST COMPOUND AND
COMPOUND CODED IN FIELD D

1 ORGANISM, ORGAN, TISSUE, OR CELL IS EXPERIMENTALLY ADAPTED OR CONDITIONED to a particular environment or situation (Pavlov dog, light-adapted cockroach, etc.). Any exposures to particular environments which do not result in specific adaptations are coded by Symbol 3 or 4.

2 ORGANISM, ORGAN, TISSUE, OR CELL IS PRETREATED SURGICALLY (as in the states of Symbols P, Q, and R), OR CHEMICALLY, OR BY ELECTRIC SHOCK, but (in contrast to Symbols P, Q, and R) FOR ANY PURPOSE OTHER THAN ISOLATION OF THE ORGANISM AND AN ANATOMICAL COMPONENT. Includes staining with dyes, surgical exposure of an organ for observation, treatment for rendering an animal or muscular organ quiet or otherwise receptive to treatment by the test compound, etc. (See the Key for a description of Symbols 2, P, Q, R, and B.)

3 ORGANISM, ORGAN, TISSUE, OR CELL IS EXPOSED TO AN ABNORMAL PHYSICAL OR CHEMICAL ENVIRONMENT to which adaptation is not intended, preparatory for or during the test (high atmospheric pressures, changes in O_2:CO_2 ratio, temperature changes, changes in gravitational pull, anaerobic culture conditions, etc.). For radiation exposure, use Symbol 4. When the test organism has become adapted to such an environment (prior to the test), Symbol 1 must be used rather than Symbol 3.

4 ORGANISM, ORGAN, TISSUE, OR CELL IS EXPOSED TO RADIATION which is not responsible for the action coded in Field T-2. If radiation is administered as part of the treatment instead of a pretreatment (i.e., administered with the test compound so that both the chemical and radiation factors are expected to be responsible for the response coded in Field T), Symbol Z must be used.

5 ORGANISM IS EXPERIMENTALLY OR NATURALLY INFECTED. (For non-infectious pathological states of the test organism, use Symbol 7, B, C, D, or E.) If the organism responding as a whole to the test compound has an infection that is restricted to a single organ, use Symbol Ø and code the organ in Field H-2; however, if the infection is restricted to a single tissue and Symbol Ø is used, the tissue can not be coded (neither in Field H-2 or I). (If the organism does not respond as a unit to the test compound, but an organ [in Field H-1] or a tissue [in Field I] is the unit responding to the test compound and having an infection, use Symbol N rather than Symbol 5 or Ø.) If the organism has an organ or tissue implant, either normal or pathological, use Symbol S.

6 ORGANISM, ORGAN, TISSUE, OR CELL HAS BEEN MADE SENSITIVE OR HYPERSENSITIVE to the test compound. (For a sensitive strain, use Symbol H. Use Symbol J for the state of induced resistance to the test compound.)

7 ORGANISM IS IN AN EXPERIMENTAL PATHOLOGICAL STATE not otherwise specified by special symbols--5 (infectious disease), B (hormone deficiency), C (hormone excess), D and E (dietary deficiencies), P (loss of an anatomical part), and S (bearing an implant). Symbol 7 includes all other non-infectious pathologies, including spontaneous tumors (but not implanted tumors). Also, it includes general experimental stress either brought about by administration of excesses of a specific material (e.g., H_2O, salt, CO_2, etc.), removal of an organ (to be described in the written abstract and not coded in Field H-2), or a natural or unspecified

physiological stress. (If the test organism has had removed from it an organ for any purpose other than to produce stress, the condition is coded by Symbol P.) If the organism has an organ or tissue, other than an organ or tissue responding specifically to the test compound (therefore not coded in Field H-1 or I), which is in a pathological state different from the state of the test organism as a whole, use Symbol Ø and, if it is an organ in this pathological state, code it in Field H-2 (if it is a tissue, it can not be coded in Field I). If, instead of the organism as a whole, an organ or tissue is the structure responding specifically to the test compound and is therefore coded in Field H-1 or I, and it is in a pathological state, use Symbol N or S.

8 ORGANISM, ORGAN, TISSUE, OR CELL IS IN AN INACTIVE STATE; e.g., hypnosis, estivation, diapause, dormancy, bacterial resting stage, hibernation.

9 PARABIOTIC

A PARTHENOGENETIC

B ORGANISM, ORGAN, TISSUE, OR CELL IS HORMONE DEFICIENT (the deficiency not being the condition treated). Symbol B has priority over Symbol P in Field G and is used for any experimental hormone deficiency. When an endocrine gland is extirpated to produce the experimental hormone deficiency, code the gland removed or modified in Field H-2. This includes situations in which the hormone deficiency is relative only to the developmental stage of the test organism being treated with the test compound; e.g., the removal of the endocrine gland and juvenile hormone of larval insect stages.

C ORGANISM, ORGAN, TISSUE, OR CELL HAS A HORMONE EXCESS (this excess not being the condition treated). This includes situations in which the excess is relative only to the developmental stage of the test organism being treated with the test compound; e.g., the application of the juvenile hormone to insect stages in which the hormone is normally virtually absent.

D ORGANISM, ORGAN, TISSUE, OR CELL IS DEFICIENT IN ONE OR MORE VITAMINS, ONE OR MORE MINERALS, ONE OR MORE SPECIFIC NUTRIENTS (E.G., A SPECIFIC AMINO ACID), OR WATER. Symbol D is not used for general deficiency in nourishment--see Symbol E. Symbol D is used to code incidental dietary deficiencies of normal organisms; it is not a device for indicating that the organism is a special strain or breed which can not synthesize the nutrient or vitamin. Any special strain, such as one dependent on exogenous nutrient or vitamin sources, is indicated by Symbol F.

E ORGANISM, ORGAN, TISSUE, OR CELL IS UNDERNOURISHED; generally deficient in nutrients; fasted; deficient in caloric intake. For the deficiency of a specific essential dietary component, use Symbol D.

F ORGANISM IS OF A SPECIAL STRAIN: selected, adapted, derived, mutant. (This excludes those special strains for which are provided the specific symbols, G, H, and I, below. Neither is Symbol F used to distinguish a taxonomic strain which is either given special designation in the Taxonomy Code of Field E or is not indicated at all by code.) (See the Key section on Specific Directions and Explanations, Division 9, for the CBCC's exceptional use of Symbol F.)

G ORGANISM IS OF A STRAIN RESISTANT TO THE TEST COMPOUND. (Use Symbol J for an individual organism, of a non-resistant strain, made resistant by a prior exposure to the test compound.)

H ORGANISM IS OF A STRAIN SENSITIVE TO THE TEST COMPOUND. (Use Symbol 6 for an individual, of a non-sensitive strain, sensitized to the test compound by prior exposure.)

I ORGANISM IS OF A STRAIN DEPENDENT ON THE TEST COMPOUND.

Use Symbol F for strains resistant to, sensitive to, or dependent on compounds other than the test compound

J ORGANISM IS OF A NON-RESISTANT STRAIN, OR ORGAN, TISSUE, OR CELL IS OF SUCH AN ORGANISM, AND IS MADE RESISTANT TO (I.E., TOLERANT OF) THE TEST COMPOUND. (Use Symbol 6 for the state of sensitization to the test compound. For a resistant strain, use Symbol G.)

K PREGNANT

L VIRGIN

M ORGANISM, ORGAN, TISSUE, OR CELL IS CONGENITALLY ABNORMAL.

N ORGAN OR TISSUE (SPECIFIED IN FIELD H-1 OR FIELD I) IS IN A PATHOLOGICAL STATE (including infectious and non-infectious pathological states and spontaneous tumors, but not implanted tumors; if a tumor is implanted, use Symbol S). Use of this symbol includes indication of physiological stress on the organ; e. g., the removal of one of a pair of organs, or part of an organ, or an entire organ, or any other special pretreatment to produce the exaggerated condition of in situ experimental stress on the organ specified in Field H-1 or the tissue specified in Field I. The description of the specific pretreatment employed to produce stress is not coded (e. g., the organ removed to produce stress is not coded), but it is included in the written abstract. (Any stress other than in situ is also eligible for being indicated by Symbol N.) The symbol is used when the organ in Field H-1 or the tissue in Field I is infected, but only if that infection is restricted to that organ or tissue or if the organ or tissue is excised (indicated by Symbol R in Field G-1, placing Symbol N in Field G-2); if the infection is more general and the organ or tissue is in situ, use Symbol 5. Similarly, Symbol N is used if the organ in Field H-1 or the tissue in Field I has a non-infectious disease that is restricted to that organ or tissue, but if the disease is more general and the organ or tissue is in situ, use Symbol 7.

Ø ORGAN (TO BE SPECIFIED IN FIELD H-2) IS IN A PATHOLOGICAL STATE DIFFERENT FROM THE STATE (NORMAL OR OTHERWISE) OF THE ORGAN CODED IN FIELD H-1. This organ may be an organ to which the test compound is administered and which is not the specific organ responding (a frequent use of Field H-2), but if Symbol Ø is coded in Field G, it may be ANY pathological organ, treated or not, which is not the organ coded in Field H-1. Use of Symbol Ø includes indicating any pretreatment to produce stress in an organ other than the organ in Field H-1. Symbol Ø is used when an organ other than the organ in Field H-1 is infected or has a non-infectious disease or a spontaneous or implanted tumor.

P ORGANISM (RESPONDING AS A WHOLE TO THE TEST COMPOUND) PREPARED FOR EXPERIMENTAL STUDY BY EXTIRPATING, CUTTING, AMPUTATING, OR DESTROYING AN ORGAN, TISSUE, OR FLUID (or by blocking or anesthetizing in situ a specific organ or tissue). The organ removed or blocked in the organism is coded in Field H-2, though if the structure is a tissue, it can not be coded either in Field H-2 or I. Use Symbol B when an endocrine gland is removed or treated to produce a hormone deficiency. Use of Symbol P does not include removal of one of a pair of organs or part of an organ to produce the exaggerated experimental condition of stress in the organism, for which Symbol 7 is used. Consult the Key for a discussion of Symbols 2, P, Q, R, and B.

Q ORGAN OR TISSUE, IN SITU, (SPECIFIED IN FIELD H-1 AS THE ORGAN, OR IN FIELD I AS THE TISSUE RESPONDING TO THE TEST COMPOUND) IS ISOLATED in some specific way from the organism (denervation, circulatory obstruction, etc.), isolated from a material it normally processes (gastric or intestinal pouch), surgically isolated from one of its tissue components, etc. This includes any in situ nerve-organ preparations. To code the fact that this organ coded by Symbol Q is isolated from another organ or tissue by excision or destruction of that second organ or tissue, code Field G-2 with Symbol P (assuming Symbol Q is in Field G-1) and, if the structure is an organ, code it in Field H-2. Consult the Key for a discussion of Symbols 2, P, Q, R, and B.

R ORGAN, TISSUE, CELL, OR FLUID IS EXCISED (specified in Field H-1 or Field I as the organ or tissue responding to the test compound) for the purpose of isolating it from influences of all other factors of the organism. Includes excised nerve-organ preparations.

S ORGANISM, ORGAN, OR TISSUE RESPONDING TO THE TEST COMPOUND HAS AN ORGAN OR TISSUE (EITHER NORMAL OR PATHOLOGICAL) IMPLANTED IN IT. (E. g., an organism with a tumor implant is treated with a test compound for its analgesic action or its toxicity.) Excluded are situations when the implant is an endocrine gland implanted to create a hormone excess (Symbol C) or an organ implanted to produce a special stress (Symbol 7, N, or Ø). If an implanted organ is identified, it can be coded in Field H-2, but if the implant is a tissue,

it can not be coded. In other words, Field H-2 is used for coding the implanted structure (which differs from the structure in Field H-1) rather than for coding an organ, other than the organ in Field H-1, which is a site of such a transplant. The latter should always be recorded in the written abstract when the situation exists. If an organ or tissue is implanted as a part of the treatment of the test organism and shares with the test compound responsibility for the action coded in Field T-2, Symbol S can not be used; only Symbol Z indicates this situation.

T NORMAL ORGAN, TISSUE, OR CELL IS IMPLANTED IN ANOTHER INDIVIDUAL ORGANISM, ORGAN, OR TISSUE. The implanted structure is specified in Field H-1 or I as the structure responding to the test compound. (The organism, into which these normal organs, tissues, or cells are transplanted, is not coded in Field J as a host, since it is not a host-parasite or host-pathology relationship that is given treatment.) If the structure into which the implant is made is an organ, it can be coded in Field H-2, but if it is a tissue, it can not be coded in Field H-2 or I.

U HOMOGENATE, BREI, OR CELL SUSPENSION OF AN ORGAN OR TISSUE OF THE TEST ORGANISM

V EXTRACT OF A TISSUE OR ORGAN OF THE TEST ORGANISM

W CULTURE OF A TISSUE OR ORGAN OF THE TEST ORGANISM

X SLICE OF A TISSUE OR ORGAN OF THE TEST ORGANISM

The organ or tissue of the definitions of these symbols is the organ or tissue specifically responding to the test compound and therefore coded in Field H-1 or Field I.

Second use of Field G (one symbol only):

EXPERIMENTAL TREATMENT OTHER THAN WITH THE TEST COMPOUND OR SECONDARY COMPOUND

Z ANY TREATMENT (NOT PRETREATMENT) OF THE TEST ORGANISM, ORGAN, TISSUE, OR CELL, OTHER THAN TREATMENT WITH THE TEST COMPOUND (OR OTHER THAN TREATMENT WITH THE TEST COMPOUND AND SECONDARY COMPOUND) AND ACCOMPANYING THE TREATMENT WITH THE TEST COMPOUND (OR ACCOMPANYING THE TREATMENT WITH THE TEST COMPOUND AND SECONDARY COMPOUND). Examples are radiation, thermal, and mechanical treatments. To qualify for being coded by Symbol Z, such treatment must be considered as being in part responsible for the action coded in Field T to the degree indicated in Field Y. Symbol Z is coded in Field G-2 only.

FIELD H-1
Columns 29, 30, and 31

FIELD H-2
Columns 32, 33, and 34

GROSS ANATOMICAL STRUCTURE:[1] ORGAN, SYSTEM, BODY AREA

Field H-1: Primary anatomical structure
Field H-2: Secondary anatomical structure
(Consult the Key for distinctions and uses for Fields H-1 and H-2)

Animal Structures: Symbols 1-- through 9-- and A-- through G--.
Plant Structures: Symbols H through Q.

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* (Column 30 only)--The organ coded in Field H-1 is the organ whose specific response to the test compound is being coded and is an organ affected by the pathology coded in Field E, but THE ORGAN which is actually IN THE PATHOLOGICAL STATE INDICATED BY FIELD E (i.e., the organ infected by a pathogen, the organ in atrophy, the organ that is the focus of the Field E pathology, etc.) IS CODED IN FIELD H-2. Consult the Key about Symbol *

1	Nervous system, in toto; neuromotor system (fibrillar system) of Ciliata; nerve net of Coelenterata
15	Central nervous system, in toto
11	Brain, in toto; suprapharyngeal ganglion of Annelida; supraesophageal ganglion of Arthropoda
111	Cerebrum, in toto
112	Cerebral cortex
113	Corpus striatum
114	Rhinencephalon; olfactory lobe
115	Corpus callosum
116	Epithalamus
117	Thalamus
118	Hypothalamus
119	Midbrain, in toto
11A	Cerebral peduncles (crura cerebri)
11B	Corpora quadrigemina
11C	Hindbrain, in toto
11D	Cerebellum
11E	Pons
11F	Medulla oblongata
11G	Brain stem, in toto (includes the tubular portions of the hindbrain and midbrain, as well as the median portion of the forebrain)
11H	Ventricles of the brain
12	Nerve cord (spinal cord); ventral nerve cord of Annelida and Arthropoda; longitudinal nerve cord of helminths
121	Spinal canal (vertebral canal)
122	Spinal fluid (For cerebrospinal fluid in toto, use Symbol 155.)
123	Connective (e.g., circumesophageal connective) of invertebrate systems
124	Segmental ganglion; annelid and arthropod subesophageal ganglion and other ventral ganglia
13	Peripheral nervous system (somatic nervous system), in toto (excludes autonomic nervous system, Symbol 14)
131	Cranial nerves, in toto
132	Olfactory nerve
133	Optic nerve

[1] Microanatomical structures (tissues, cells, fluids) constitute Field I.

134 Oculomotor nerve
135 Trochlear nerve
136 Trigeminal nerve
137 Abducens nerve
138 Facialis nerve (facial nerve)
139 Auditory nerve (acoustic nerve)
13A Glossopharyngeal nerve
13B Vagus nerve
13C Accessorius nerve (accessory nerve)
13D Hypoglossal nerve
13E Spinal nerves, in toto
14 Autonomic nervous system, in toto
141 Sympathetic nervous system, in toto
142 Parasympathetic nervous system, in toto
15 Central nervous system, in toto. (For parts of the central nervous system, see Symbols 11- and 12-.)
151 Meninges, in toto
152 Dura mater, in toto
153 Arachnoid membrane, in toto
154 Pia mater, in toto
155 Cerebrospinal fluid (cephalorachidian fluid or subarachnoid fluid)
16 Specific peripheral nerve, unnamed
161 Sciatic nerve
162 Phrenic nerve
163 Femoral nerve
164 Radial nerve
(17) Common nerve-organ preparations. (Use only one of the specific symbols, 17-, below.)
171 Vagus-heart preparation
172 Vagus-stomach preparation
173 Sciatic-gastrocnemius preparation
174 Phrenic-diaphragm preparation
18 Sensory nerve, unspecified
19 Motor nerve, unspecified
1J Ganglion, unspecified
1J1 Spinal ganglion, unspecified
(1J2 through 1JI) (Reserved for specific spinal ganglia)
1JJ Autonomic ganglion, unspecified
(1JK through 1JZ) (Reserved for specific autonomic ganglia)
1K Nerve plexus, unspecified
1L Preganglionic fiber, unspecified
1M Postganglionic fiber, unspecified
2 Sense organs
21 Eye; light receptor; eyespot; photoreceptor; stigma (exclusive of light receptors given unique symbols below, such as ocellus, 21G, and compound eye, 21H, etc.)
211 Retina; nervous tunic of eye
212 Vitreous humor
213 Aqueous humor
214 Middle (vascular) tunic of eye, in toto
215 Ciliary body, in toto
216 Ciliary muscle
217 Ciliary process
218 Iris
219 Choroid coat
21A Lens
21B Cornea
21C Sclera

21D Eyelid
21E Conjunctiva
21F Nictitating membrane
133 Optic nerve
971 Extrinsic muscles of the eye, in toto
21G Ocellus
21H Compound eye
22 Ear; tympanal organ
221 External ear, in toto; pinna (auricle) and external auditory canal
222 Tympanic membrane (ear drum)
223 Middle ear, in toto
224 Eustachian tube
923 Auditory ossicles, in toto
225 Inner ear (internal ear or labyrinth)
226 Cochlea
227 Semicircular canals
228 Posterior semicircular canal
229 Superior semicircular canal
22A Lateral semicircular canal
22B Ampulla
22C Utricle
22D Saccule
22E Cochlear duct
139 Auditory nerve
23 Organ of equilibrium (balancing organ). (Use one of the specific symbols, 23-, below.)
231 Statocyst (Crustacea)
227 Semicircular canals
256 Proprioceptor sensory nerve end organs; kinesthetic nerve end organs
24 Chemoreceptor organs. (Use one of the specific symbols, 24-, below.)
241 Gustatory receptor; tastebuds
242 Olfactory receptors (nasal receptors of vertebrates; invertebrate receptors such as antennal olfactory receptors)
25 Mechanoreceptors (specific touch receptors, temperature receptors, pain receptors, and proprioceptors)
251 Specific touch receptor (Meissner's corpuscle)
252 Specific cold receptor (Krause's end bulb)
253 Specific heat receptor (Ruffini's end organ)
254 Specific pressure receptor (Pacinian corpuscle)
255 Pain receptor
256 Proprioceptors, in toto
26 Specific tactile organs (particularly of invertebrate animals)
261 Specific tactile tentacles
262 Antennae, antennule
3 Cardiovascular system
31 Heart; pulsating vessel (both vertebrate and invertebrate vascular circulatory pumps)
311 Atrium, auricle
31D Right auricle
31E Left auricle
312 Ventricle
31F Right ventricle
31G Left ventricle
31L Sinus venosus (more primitive vertebrates)
313 System of tissues conducting impulses across the heart; Bundle of His
31A Pace maker. (For a single specifically named pace maker, use Symbols 31B or 31C. Note also the structures 32M and 32N which affect cardiac pace.)
314 Cardiac valve, including the cardiac ostial valves (pulmonary and aortic). (For a specific valve, use Symbols 31H, 31I, 31J, or 31K.)
31H Left auriculoventricular valve (mitral valve or bicuspid valve)
31I Right auriculoventricular valve (tricuspid valve)
31J Aortic valve (semilunar aortic valve)

31K Pulmonary valve
315 Septum
316 Endocardium
317 Myocardium
318 Pericardium
319 Associated structures of the heart: alary muscles, suspensory ligaments; lateral vessels; diverticula of insect hearts, etc.
31A Pace maker. (For a single specifically named pace maker, use Symbols 31B or 31C. Note also the structures 32M and 32N which affect cardiac pace.)
31B Atrioventricular node (= auriculoventricular node; AV node)
31C Sinus node (= sinal node; sino-atrial node; sino-auricular node)
31D Right auricle
31E Left auricle
31F Right ventricle
31G Left ventricle
31H Left auriculoventricular valve (= bicuspid valve or mitral valve)
31I Right auriculoventricular valve (= tricuspid valve)
31J Aortic valve (semilunar aortic valve)
31K Pulmonary valve
31L Sinus venosus (more primitive vertebrates)
32 Circulatory vessel, not otherwise specified. (For specific vessels or specific vessel types, use one of the symbols below.)
321 Aorta
322 Pulmonary vessel, not otherwise specified. (For pulmonary artery or pulmonary vein, use Symbols 32F or 32G.)
32F Pulmonary artery
32G Pulmonary vein
323 Hepatic portal vein; hepatic portal system
32I Renal portal vein; renal portal system
324 Systemic vessel (= circulatory vessels other than the heart). (For specific vessels or specific vessel types, use one of the symbols below.)
325 Artery; efferent blood vessel. (For specific arteries, use one of the arterial symbols below.)
32F Pulmonary artery
32D Coronary artery
321 Aorta
327 Arteriole
326 Vein; afferent blood vessel. (For specific veins, use one of the symbols below.)
32E Coronary vein
32G Pulmonary vein
32H Vena cava
323 Hepatic portal vein
32I Renal portal vein
327 Arteriole
328 Venule
329 Capillary
32A Lymphatic system. (For specific parts of the lymphatic system, use the symbols below.)
32B Lymphatic vessel
344 Lymph node
32C Coronary vessel
32D Coronary artery
32E Coronary vein
32F Pulmonary artery
32G Pulmonary vein
32H Vena cava
32I Renal portal vein
32J Peripheral blood vessels (as opposed to visceral vascular bed)
32K Visceral blood vessels (as opposed to peripheral vascular bed)
32L Vessels of the extremities
32M Carotid sinus
32N Carotid body (= Carotid gland, intercarotid body, glomus caroticum)

FIELDS H-1 and H-2
Columns 29, 30, 31,
32, 33, and 34

33 Blood
331 Plasma
332 Serum
333 Erythrocyte
334 Reticulocyte
335 Leukocyte, not otherwise specified. (For specific leukocytes, use Symbols 336, 337, 338, 33B, 33C, or 33D.)
336 Lymphocyte (of blood). (For lymphocyte of the lymph, use Symbol 351.)
337 Monocyte
338 Granular leukocyte (= granulocyte). (See Symbols 33B - 33D for specific granulocytes.)
33B Eosinophilic granulocyte
33C Basophilic granulocyte
33D Neutrophilic granulocyte
339 Platelet
33A Formed elements other than those given unique symbols
33B Eosinophilic granulocyte
33C Basophilic granulocyte
33D Neutrophilic granulocyte
34 Hematopoietic system
341 Bone marrow
342 Spleen
343 Adenoid tissue of nasopharynx (adenoids)
344 Lymph node
345 Tonsil
346 Reticulo-endothelial system
35 Lymph
351 Lymphocyte of the lymph
4 (Available for any special organ systems not already in this list)
5 Respiratory system
51 Air passage of vertebrates. (For specific parts of the respiratory tract, use the appropriate symbol below.)
511 Nose
512 Anterior nares, nostril, respiratory pore, spiracle
513 Nasal fossa (nasal cavity); nasal air passage. (For the anterior olfactory region of the nasal fossa, use Symbol 242.)
514 Paranasal sinus, not otherwise specified
515 Nasopharynx
62 Pharynx
343 Adenoid tissue of the nasopharynx (adenoids)
345 Tonsil
516 Larynx
517 Trachea (includes trachea of insect systems)
518 Tracheole (division of insect trachea)
519 Bronchus
51A Bronchiole
51B Alveolus (air sac)
52 Lung, in toto
53 Pleura
531 Parietal pleura
532 Visceral pleura
533 Interlobular pleura
551 Diaphragmatic pleura
54 Gill
541 External gill
542 Internal gill
543 Book gill; book lung
55 Diaphragm
551 Diaphragmatic pleura
6 Alimentary tract. (For associated glands, use symbols of series D2-.)

61	Buccal cavity (oral cavity; ostium; mouth [cavity]; osculum; cytostome; stomodeum). (This symbol is not used for oral orifices, but describes oral cavities and the walls and structures thereof.)
611	Lips
612	Palate
613	Tongue
614	Membranelle; manubrium; velum; oral lobe; hypostome; labium
615	Proboscis; prostomium
616	Mandible; jaw (describing a mount or head area). (Do not use this symbol for the vertebrate mandibular bone, Symbol 924.)
617	Labrum; chelicera
618	Maxilla; maxilliped; pedipalp. (Do not use this symbol for vertebrate maxillary bone, Symbol 925.)
922	Teeth
619	Cheek (lateral wall of buccal cavity)
61A	Gums
61B	Salivary pump
62	Pharynx
621	Mastax (rotifers)
622	Endostyle (tunicates)
63	Esophagus (= gullet)
64	Crop; honey stomach
65	Gizzard; proventriculus
66	Stomach; ventriculus; enteron of coelenterates
661	Cardiac sphincter
662	Cardia (including cardiac sac of the rat)
663	Fundus
664	Pylorus
665	Pyloric sphincter
666	Gastric mill
67	Intestine
671	Small intestine
672	Duodenum
673	Jejunum
674	Ileum
675	Anterior intestine
676	Posterior intestine
677	Large intestine; colon
678	Cecum
679	Appendix
67A	Rectum; proctodeum
67B	Anus
67C	Anal sphincter
67D	Cloaca
68	Peritoneum. (Use Symbol B71 for peritoneal cavity.)
681	Mesentery (visceral peritoneum)
682	Parietal peritoneum
7	Excretory system
71	Kidney. (For invertebrate excretory structures, use other symbols of the 7-- series.)
711	Cortex of kidney
712	Medulla of kidney
713	Pelvis of kidney
714	Malpighian corpuscle (Bowman's capsule and glomerulus)
32I	Renal portal vessel or system
715	Renal tubule
716	Proximal convoluted tubule
717	Loop of Henle
718	Distal convoluted tubule
719	Collecting tubule and duct of Bellini
72	Ureter

73 Bladder (urinary)
731 Bladder sphincter
74 Urethra
75 Contractile vacuole (Protozoa)
76 Flame cell (helminths)
77 Nephridium (annelid)
78 Malpighian tubule (insects)
79 Green gland (Crustacea)
67D Cloaca
8 Reproductive system
81 Female reproductive system, in toto
811 Ovary, in toto; ovariole (egg tube) of insects
CJ Graafian follicle
CK Corpus luteum
814 Oviduct; fallopian tube
D31 Shell gland
D32 Yolk gland of helminths (= vitellaria)
815 Seminal receptacle
816 Uterus (of man); uterus (of flatworms). (For the divided uterus [cornua] of the rat, e.g., use Symbol 817.)
817 Uterine horn (= cornua [of the rat, e.g.])
818 Cervix
819 Placenta
81A Vagina
81B Vulva, external genitalia, ovipositor
67D Cloaca
81C Egg (unfertilized)
82 Male reproductive system, in toto
821 Testis; spermary; in toto
822 Interstitial cells of the testis; cells of Leydig. (Use this symbol only when this part of the testis is affected in size or form by the test compound or when it is the site of a pathology or a tumor. When the test compound specifically affects endocrine function of the interstitial cells, use Symbol CL.)
823 Seminiferous tubule
824 Vasa efferentia (= vas efferens)
825 Epididymis
826 Vasa deferentia (= vas deferens)
D41 Prostate gland
827 Seminal vesicle; male sperm storage sac. (For seminal vesicles which are totally secretory in function, as in man, use Symbol D42.)
D43 Bulbo-urethral gland
D44 Para-urethral gland (= Glands of Littre)
828 Ejaculatory duct
829 Scrotum
82A Penis; cirrus (of flatworms)
82B Sperm; spermatogonium, spermatocyte, spermatid, spermatozoon
83 Ovotestis (of snails, e.g.)
84 Accessory structures
841 Brood chamber
842 Clitellum (of earthworms)
843 Cirrus sac (of flatworms)
85 Asexual reproductive structure of animals. (Excluded are the asexually-produced bud or other immature stage itself.)
851 Blastostyle (of the coelenterate gonangium)
86 Special structures of embryonic stages (either sexually--or asexually--produced stages) not elsewhere in the list with other organ systems
861 Spore wall (Sporozoa)
862 Gemmule wall (Porifera)
863 Statoblast wall (Bryozoa)
864 Brood pouch of sporocysts (Trematoda)

9 Musculo-skeletal system (locomotor system)
91 Notochord
92 Internal skeleton (Chordata), in toto
96 External skeleton (Invertebrata), in toto
921 Skull, in toto
922 Teeth, in toto (vertebrate)
923 Auditory ossicles, in toto
924 Mandible, vertebrate
925 Maxilla, vertebrate
926 Antler; horn; in toto
927 Beak, in toto
(928-92E)(Reserved for addition to the Code of bones of the skull)
92F Vertebra
(92G-92I)(Reserved for vertebral parts)
92J Clavicle
92K Scapula
92L Rib
92M Sternum
93 Skeletal joint (of internal, chordate skeleton)
9K Skeletal joint of invertebrate external skeletal structures
931 Joint capsule. (For a specific ligament, use a symbol of the 95- series.)
94 Tendon, unspecified
95 Ligament, unspecified
96 External skeleton (invertebrate supportive structure)
97 Skeletal muscle, unspecified; striated muscle, unspecified. (To be used for specific skeletal muscle organ only. The tissue defined as skeletal muscle tissue is coded in Field I.)
971 Optic muscles, in toto
972 Gluteus muscle
973 Subscapularis
974 Intercostal muscles, in toto
98 Cartilage, unspecified. (To be used for specific cartilaginous organs only. The tissue defined as cartilage is coded in Field I.)
981 Nasal cartilages, in toto
982 Costal cartilages, in toto
983 Thyroid cartilage
99 Periosteum (considered as an organ associated with a specific bone)
991 Dental periosteum (= periodontal membrane)
9J Bursa
9J1 Plantar bursa
9J2 Prepatellar bursa
9J3 Olecranon bursa
9K Skeletal joints (of invertebrate external skeletal structures)
A Skin (integument) and derivatives, in toto. (This excludes actual hard, completely enveloping exoskeletal structures of arthropods, coelenterates [corals], and Protozoa [Foraminifera], e.g., though integument tissues secreting these supportive coats are included. For the exoskeletal structures, use a symbol of the 9-- series.) Use Symbol A to code the organism's surface, in toto.
A1 Skin; integument (includes simple cuticular layers and local horny skin derivatives)
A2 Hair; feather; scale; spicules and spines formed of or by skin
A21 Hair follicle; feather follicle
D14 Sebaceous gland
922 Teeth
A3 Wattle, comb (birds)
A4 Nail; claw; hoof
A5 Horn covering of skull appendages, beaks and horns. (For horn, in toto, use Symbol 926; for beak, in toto, use Symbol 927.)
D16 Sudoriferous gland (= sudoriparous or sweat gland)
(B) Body regions. (Use Symbol A to code the organism's surface, in toto. Symbol B is used to refer to the organism's mass and surface. For example, Symbol B1 refers to the entire mass [and surface] of the head, etc.)

FIELDS H-1 and H-2
Columns 29, 30, 31,
32, 33, and 34

B1	Head
B11	Face
B12	Scalp
B13	Temporal region
B2	Neck
B21	Throat (anterior part of neck)
B22	Thyroid region of neck
B3	Cephalothorax (arthropods)
B4	Thorax; chest
B41	Supraclavicular region of thorax
B42	Suprasternal region of thorax
B43	Clavicular region of thorax
B44	Sternal region of thorax
B45	Mammary region of thorax
B46	Inframammary region of thorax
B47	Scapular region of thorax
B5	Abdomen
B51	Subcortical region; epigastric region of abdomen
B52	Hypochondriac region of abdomen
B6	Appendage, unspecified
B61	Vertebrate fore limb; wing (vertebrate); arm; pectoral fin; fore paw; hand
B62	Vertebrate hind limb; leg (vertebrate); pelvic fin; hind paw; foot
B63	Tail; caudal fin
B64	Arthropod leg
B65	Arthropod wing
B66	Parapodium (annelid)
B67	Pleopod; swimmeret; arthropod abdominal appendage exclusive of tail
262	Antenna, antennule
616	Mandible in invertebrates (arthropod)
617	Labrum of invertebrates (arthropod)
618	Maxilla, maxilliped, pedipalp (arthropod)
262	Tentacle
B68	Foot of molluscs
B69	Arm of echinoderms
B7	Body cavity, unspecified; coelom; invertebrate body cavity
B71	Peritoneal cavity. Abdominal cavity. (For peritoneal membranes, use Symbol series 68-.)
B72	Pleural cavity; thoracic cavity
61	Buccal cavity
B73	Pericardial cavity
B8	Visceral region, unspecified (as opposed to peripheral, parietal regions)
B81	Visceral region of the thorax, in toto
B82	Visceral region of the abdomen, in toto
B9	Parietal region of the body (as opposed to inner, visceral regions)
C	Endocrine gland, unspecified
C1	Pituitary gland (= hypophysis)
C11	Anterior pituitary gland (= pars anterior)
C12	Posterior pituitary gland (= pars nervosa, neurohypophysis, infundibular body)
C13	Intermedia pituitary gland (= pars intermedia)
C2	Adrenal gland
C21	Cortical (external) adrenal gland; adrenal cortex
C22	Medullary (internal) adrenal gland; adrenal medulla
C3	Island of Langerhans (endocrine body of the pancreas). (For pancreas, as an exocrine gland, use Symbol D23.)
C4	Thyroid gland
C5	Parathyroid gland
C6	Thymus gland
C7	Pineal gland; pineal body
C8	Corpus allatum (insects)
C9	Prothoracic gland (insects)
CJ	Graafian follicle

CK	Corpus luteum
CL	Testicular interstitial cells; cells of Leydig. (If the test compound does not affect specifically the endocrine activity of the testicular tissue, but its size or form, code with Symbol 822.)
D	Exocrine gland, unspecified
D1	Exocrine gland whose product is released directly to the external surface (i.e., as opposed to an exocrine gland of the alimentary or reproductive systems)
D11	Mammary gland
D12	Lacrimal gland; Harderian gland
D13	Meibomian gland
D14	Sebaceous gland
D15	Ceruminous gland
D16	Sudoriparous gland (= sudoriferous gland, sweat gland)
D17	Poison gland (including venom glands of reptiles, even when secreted through oral fangs and orifices)
D18	Silk gland; labial gland
D2	Exocrine gland whose product is released into the alimentary tract
D21	Salivary gland, unspecified
D28	Parotid gland
D22	Gastrointestinal gland
D23	Pancreas (exclusive of the Islands of Langerhans)
D24	Gastric cecum glands
D25	Calcareus, calciferous gland
D26	Digestive gland of invertebrates; "liver" of invertebrates. (Use Symbol E for vertebrate liver.)
D27	Anal gland
D28	Parotid gland
D3	Exocrine gland of the female reproductive system, unspecified
D31	Shell gland
D32	Yolk gland of helminths (vitellaria)
D4	Exocrine gland of the male reproductive system, unspecified
D41	Prostate gland
D42	Seminal vesicle (in the case of animals such as man in which this structure is glandular rather than a sperm reservoir)
D43	Bulbo-urethral gland
D44	Para-urethral gland
E	Liver of vertebrates
E1	Parenchymal portion of liver
323	Hepatic portal system or vessel
E2	Gall bladder
E3	Bile duct
E4	Sphincter of Oddi
F	Specialized organs; miscellaneous organs not fitting conveniently into one of the other systems
F1	Luminescent organ
F2	Electric organ
G	Embryonic structures
G1	Amnion; amnionic sac
G2	Chorion; chorionic sac
G3	Placenta
G4	Allantoic sac
H	Root
H1	Root hair
H2	Adventitious root
H21	Haustorium
H3	Primary root; tap root
H4	Secondary root; lateral root
H5	Root tip
H51	Root cap
H52	Meristematic zone of root tip
H53	Elongation zone of root tip
H54	Maturation zone of root tip

H6 Root primordium
I Stem; shoot (unspecified as to whether it is a main stem, branch, aerial, subterranean, or otherwise specially modified). (Use this symbol also for plants having only one of the two stem types, aerial or subterranean. See Symbols I7 and I8.)
I1 Node
K Leaf
J1 Axillary bud (or J2 or J3)
I2 Internode, otherwise unspecified
I21 (To be used in Field H-1 only.) Internode below a site of local application of the test compound. (Code the plant part to which application is made [e.g., internode, node, leaf, or branch] in Field H-2.)
I22 (To be used in Field H-1 only.) Internode above a site of local application of the test compound; internode developed after the test compound is applied locally to a plant part or after general application (e.g., spraying). (Code the plant part to which application is made [e.g., internode, node, leaf, or branch] in Field H-2.)
I3 Main stem (as opposed to secondary stems branching from the main stem)
I4 Secondary stem; branch
I5 Terminal portion of stem (including stem tip or stem bud and young nodes and internodes)
I6 Inflorescence stem (only stem structures of the flower), in toto; pedicel and receptacle, in toto
I61 Pedicel (exclusive of receptacle)
I62 Receptacle
I7 Underground stem. (To be used only for plants which normally have both specific aerial and specific subterranean stems--to distinguish which of these responds or is treated. See also Symbol I.)
I8 Aerial stem. (To be used only for plants which normally have both specific subterranean and specific aerial stems--to distinguish which of these responds or is treated. See also Symbol I.)
I9 Lenticel of stem
J Bud (an organization of meristematic tissue which, by formation of typical plant tissues and organs, is the focus of formation of new stems or modified stems with associated appendages)--dormant or actively developing
J1 Axillary, lateral stem bud with only leaf primordia (axillary leaf bud)
J2 Axillary, lateral stem bud with only flower primordia (axillary flower bud)
J3 Axillary, lateral stem bud with both leaf and flower primordia (axillary mixed bud)
J4 Terminal stem bud with only leaf primordia (terminal leaf bud)
J5 Terminal stem bud with only flower primordia (terminal flower bud)
J6 Terminal stem bud with both leaf and flower primordia (terminal mixed bud)
K Bud scale
J7 Adventitious bud (a bud other than a terminal bud and other than a bud arising from a node)
J71 Adventitious stem bud arising from the root
J72 Adventitious stem bud arising from the leaf petiole or leaf blade
J73 Adventitious stem bud arising from a stem site other than a node (e.g., a bud arising from the tissues of old stems in which nodal and internodal distinctions have been submerged by secondary thickenings). (For an adventitious "flower bud", use Symbol J74.)
J74 Adventitious stem bud, having only one or more flower primordia, arising from a stem site other than a node
K Leaf; mature, typical leaf. (Use Symbols K4 and K5 for typical seedling leaves.)
K1 Stoma and guard cell
K2 Petiole; leaf stalk (exclusive of stipules); sheath (of grass leaf)
K3 Leaf blade
K31 Leaf tip; leaflet tip
K32 Leaf margin; leaflet margin
N34 Cotyledon
K4 Primary leaf (= first true leaf of a seedling; first leaf above cotyledon; leaf at the first node above the cotyledon)
K Typical leaf, after the primary leaf, unspecified as to whether it is second, third, etc.
K5 Second true leaf of a seedling (= leaf at the second node above the cotyledon)
K6 Third true leaf of a seedling (= leaf at the third node above the cotyledon)
K7 Fourth true leaf of a seedling (= leaf at the fourth node above the cotyledon)

K8 Stipule
K9 Bract
KJ Leaf primordium
KK Bud scale
KL Leaf base forming a segment of a bulb (e.g., a segment of an onion bulb). (For use with plants whose bulbs are formed of leaves whose upper parts are aerial.)
KM Leaf, in toto, forming a segment of a bulb (e.g., a segment of a lily bulb). (For use with plants whose bulbs are formed of modified leaves [scales] that are totally subterranean and which form aerial stems usually with typical aerial leaves.)
KN (To be used in Field H-1 only.) Leaf other than the treated leaf and unspecified as to whether it is above or below the treated leaf. (The treated leaf, Symbol K, K4, or K5, will always be coded in Field H-2 when Symbol KN is in Field H-1.)
KN1 (To be used in Field H-1 only.) Leaf below (older than) the site of local application of the test compound. (Code the plant part to which application is made [e.g., internode, node, leaf, or branch] in Field H-2 when Symbol KN1 is in Field H-1.)
KN2 (To be used in Field H-1 only.) Leaf above (distal to and younger than) the site of local application of the test compound. (Code the plant part to which application is made [e.g., internode, node, leaf, or branch] in Field H-2 when Symbol KN2 is in Field H-1.)
L Flower
L1 Sepal
L2 Petal
L3 Stamen
L31 Anther
L32 Pollen
L33 Filament
L4 Pistil
L41 Carpel; carpel wall; ovary
L42 Ovule and placental tissue
N1 Integument (also, N11 and N12)
L43 Style
L44 Stigma
L45 Nucellus
L46 Embryo sac
I62 Receptacle
I61 Pedicel
I6 Receptacle and pedicel, in toto
M Fruit
I61 Pedicel
M1 Pericarp
M11 Exocarp
M12 Mesocarp
M13 Endocarp
N Seed
N1 Integument; testa; seed coat
N11 Outer integument
N12 Inner integument
N13 Hilum
N14 Micropyle
N2 Endosperm
N3 Embryo
N31 Plumule
N32 Hypocotyl
N33 Radicle
N34 Cotyledon; scutellum
N35 Coleoptile

(The symbols beginning with Ø are not to be used with plants of the phylum Spermatophyta. They represent structures of the gametophyte generation of more primitive plant groups.)

(Ø) (Structure of a gametophytic generation plant)

FIELDS H-1 and H-2
Columns 29, 30, 31,
32, 33, and 34

Ø1 Antheridium; microgametangium
Ø11 Microgamete
Ø2 Archegonium; oogonium; megagametangium
Ø21 Megagamete

(The symbols beginning with P are not to be used with plants of the phylum Spermatophyta. They represent structures of the sporophyte generation of more primitive plant groups.)

(P) (Structure of a sporophyte generation plant)
P1 Sporangium
P2 Spore (of the sporophyte generation of plants)
P3 Sporangiophore
P4 Sporophore
(Q) (Special plant structures)
Q1 Thallus
Q2 Mycelium
S Organ (plant or animal) unspecified. (This symbol is to be used in Field H-2 only, when the test compound is applied to an unspecified organ which is not the primary organ in Field H-1 and the coding in Field S-3 does not adequately indicate that the organ to which the test compound was administered is not the organ in Field H-1.)

TISSUES, CELLS, AND FLUIDS

1	Epithelium
11	Simple squamous epithelium
12	Endothelium (of blood vessels and heart)
13	Mesothelium (of peritoneal, pericardial, and pleural cavities)
14	Columnar epithelium
15	Cuboidal epithelium (= low columnar epithelium)
16	Glandular epithelium (= a modified columnar [or cuboidal] epithelium)
17	Pseudostratified epithelium
18	Ciliated epithelium (usually a type of pseudostratified epithelium)
19	Stratified squamous epithelium Epidermis (= stratified squamous epithelium of the skin) (19). (For plant epidermis, use Symbol 74.)
1A	Stratified columnar epithelium
1B	Transitional epithelium
1C	Basement membrane of epithelial tissue
1D	Epithelial duct of the gland coded in Field H-1 (as contrasted to the "glandular" epithelium of the gland, Symbol 16)
2	Connective tissue, unspecified as to type
21	Fibrillar connective tissue
22	Areolar fibrillar connective tissue (= fibro-elastic)
23	White fibrous connective tissue
24	Elastic connective tissue (fibrillar connective tissue with preponderance of elastic fibers)
25	Reticular connective tissue
26	Adipose connective tissue (= fat tissue)
27	Pulp of teeth (dental pulp)
2A	Fibroblast (cells forming connective tissue fibers)
2B	Histiocyte (= macrophage)
2C	Pigment cells of connective tissue
3	Muscle tissue, unspecified; contractile tissue
31	Skeletal muscle; striated muscle
32	Smooth muscle; visceral muscle, unspecified as to whether the fibers are arranged as oblique, longitudinal, or circular muscle
33	Longitudinal smooth muscle (fibers parallel to the longitudinal axis of the organ)
34	Circular smooth muscle (fibers encircling the long axis of the organ)
35	Oblique smooth muscle (fibers oblique to the long axis of the organ)
36	Cardiac muscle
4	Nervous tissue
41	Sensory nerve fiber; afferent nerve fiber (supplying the organ coded in Field H-1)
42	Motor nerve fiber; efferent nerve fiber (supplying the organ coded in Field H-1)
43	Preganglionic fiber (of the nerve coded in Field H-1)
44	Postganglionic fiber (of the nerve coded in Field H-1)
45	Ganglion (of the nerve coded in Field H-1)
46	White matter (= myelinated nervous tissue) of the central nervous system part coded in Field H-1
47	Grey matter (= non-myelinated nervous tissue) of the central nervous system part coded in Field H-1
48	Neuron; nerve cell
49	Nerve cell body
4A	Axon (defined as a nerve cell process conducting impulses from the nerve cell body, regardless of the physical structure of the process. By this definition, all motor nerve fibers are axons.)
4B	Dendrite (defined as nerve cell process conducting impulses to the nerve cell body, regardless of the physical structure of the process. By this definition, all sensory nerve fibers are dendrites.)
4C	Nerve fiber (= nerve cell process including any sheaths)
4D	Motor end plate
4E	Sensory ending
4F	Neuroglia

4G Myelin sheath (= medullary sheath)
4H Neurilemma (= sheath of Schwann)
5 Supportive tissue, unspecified
51 Cartilage, unspecified
52 Hyaline cartilage
53 Elastic cartilage
54 Fibrous cartilage
55 Bone tissue, unspecified
56 Intramembranous bone tissue (to be used when a test compound affects this bone tissue type differently than it affects intracartilaginous bone)
57 Intracartilaginous bone tissue (to be used when a test compound affects this bone tissue type differently than it affects intramembranous bone)
58 Dentine of teeth
59 Enamel of teeth
27 Pulp of teeth
6 Body fluid, unspecified; plant fluid, unspecified
61 Extracellular fluid (= intercellular fluid; intercellular lymph); tissue juice.
(Lymph: This liquid tissue, contained in lymphatic vessels, is not coded in Field I, but always in Field H as an organ. See Field H, symbol series 35-.)
(Blood: This liquid tissue and its components [plasma and cells], contained in circulatory vessels, are not coded in Field I, but always in Field H as an organ and its parts. See Field H, symbol series 33-.)
62 Synovial fluid (= synovia)
63 Cerebrospinal fluid (to be used when the cerebrospinal fluid of a particular part of the central nervous system [coded in Field H-1] is affected. When the cerebrospinal fluid, as a whole, is affected, it is coded in Field H-1 [Symbol 155].)
64 Secretion (product of a gland) (to be used only when a test compound affects the composition of a gland's secretion. When only the volume of secretion is affected, the effect is adequately coded by indicating increase or decrease of secretion in Field T and the gland affected in Field H-1.)
65 Thyroid gland colloid substance
7 Plant tissues, in toto
71 Meristem
72 Sclerenchyma
73 Cortex; cortical parenchyma; collenchyma; cortical sclerenchyma
74 Epidermis; cuticle (--in leaves, unspecified as to whether it is upper or lower epidermis or cuticle or both upper and lower). (For upper or lower epidermis specifically, use Symbols 7R or 7S.)
75 "Bark". (This term is defined to include all tissues outside the cambium layer.)
76 Pith; pith parenchyma
77 Endodermis
78 Cambium; vascular cambium. (For cork cambium, use Symbol 7E.)
79 Pericycle
7A Xylem. (For specific xylem elements, use Symbols 7F, 7G, 7I, 7M, and 7N.)
7B Phloem. (For specific phloem elements, use Symbols 7J, 7K, 7L, 7Ø, and 7P.)
7C Mesophyll of leaves
7D Cork
7E Cork cambium
7F Xylem vessel
7G Xylem tracheid
7H Resin duct; latex vessel (= lactiferous duct)
7I Wood parenchyma; xylem parenchyma
7J Phloem sieve tube
7K Phloem companion cell
7L Phloem parenchyma cell
7M Primary xylem
7N Secondary xylem
7Ø Primary phloem
7P Secondary phloem
7Q Vascular bundle, in toto
7R Upper epidermis of leaf

7S	Lower epidermis of leaf
7T	Parenchyma (tissue of origin unspecified)
8 and 9	Reserved for additional specific tissues
(A)	Cells. The items of this symbol series (A-) are to be used to distinguish between cells differing in the characteristic specified (e.g., dye affinity) or to distinguish particular unique cells of an organ coded in Field H. Symbol A, alone, is not intended for coding use.
A1	Acidophile; eosinophile
A2	Basophile
A3	Neutrophile; chromophobic cell; heterophile (including "polymorphs" of blood)
A4	Reticulo-endothelial cell; Kupffer cell of the liver
(B)	Cell components and cell inclusions. Symbol B, alone, is not intended for coding use.
B1	Nucleus, in toto
B2	Nucleolus
B3	Nucleoplasm; karyoplasm
B4	Nuclear membrane
B5	Cytoplasm
B6	Cell membrane (protoplasmic membrane)
B7	Cell wall of plants (of cellulose, lignin, etc.)
B8	Middle lamella (of plant cell wall)
B9	Primary wall (of plant cell wall)
BA	Secondary wall (of plant cell wall)
BB	Plasmodesma
BC	Mitochondria; chondriosome
BD	Golgi body; Golgi apparatus
BE	Fibril (including neurofibril and myofibril)
BF	Basophile granule; Nissl granule
BG	Cilium; flagellum
BH	Vacuole
BI	Intracellular fluid; cell sap
BJ	Secretion granule; zymogen
BK	Plastid (including chloroplast, leukoplast, chromoplast, and pyrenoid)
C	Structures (other than specific tissue types) which are components of an organ coded in Field H.
C1	Blood vessel
C2	Capillary; capillary bed; capillary plexus
C3	Artery
C4	Vein
C5	Lymph vessel
C6	Lymphoid nodule (of a specific body area)
C7	Lymphoid tissue
C8	Venous sinus
C9	Mucous membrane
CA	Acinus (of the gland coded in Field H-1)
CB	Dermis, in toto (of the body part coded in Field H-1)
D	Embryonic tissue
D1	Ectoderm
D2	Endoderm
D3	Mesoderm
D4	Mesenchyme
D5	Embryonic membrane, unspecified
D6	Allantoic sac
D7	Yolk sac
D8	Amnion
D9	Chorion

FIELD J
Columns 37, 38, 39, 40, 41, and 42

HOST ORGANISM OR TEST ENVIRONMENT

LIVING HOSTS

1	Protozoa
11	Sarcodina
111	Amoebozoa
112	Foraminifera
113	Heliozoa
114	Radiolaria
115	Mycetozoa
12	Ciliata
13	Sporozoa
14	Mastigophora
15	Suctoria
2	Porifera
3	Coelenterata
4	Platyhelminthes
5	Nemathelminthes
6	Echinodermata
B	Acanthocephala
C	Entoprocta
D	Ectoprocta
7	Mollusca
8	Annelida
E	Echiuroidea
F	Sipunculidoidea
G	Priapulidoidea
9	Arthropoda
A	Chordata
A1	Petromyzones
A2	Myxini
A3	Fish
A4	Amphibians
A5	Reptiles
A6	Birds
A61	Galliformes
A611	Meleagrididae
A61101	Turkey, unspecified as to variety (Meleagris gallopavo, breed unspecified)
A612	Phasianidae
A61201	Chicken, unspecified as to variety (Gallus domesticus, variety unspecified)
A61202	White Leghorn chicken
A61203	White Plymouth Rock chicken
A61204	Rhode Island Red chicken
A61205	White Wyandotte chicken
A61206	Jersey Black Giant chicken
A61207	Barred Rock chicken
A62	Struthioniformes
A63	Anseriformes
A631	Anatidae
A63101	Duck, unspecified as to species or variety
A63102	Domestic duck, unspecified as to variety (Anas boschas, variety unspecified)
A64	Columbiformes
A641	Columbidae
A64101	Pigeon, unspecified as to species or variety
A64102	Columba livid; pigeon
A65	Passeriformes
A651	Fringellidae
A65101	Canary, unspecified as to strain (Serinus canarius, strain unspecified)
A7	Mammals
A71	Artiodactyla
A711	Bovidae
A71101	Domestic cow, breed unspecified (Bostaurus, breed unspecified)
(A71102 through A7110Z)	(Reserved for domestic cow breeds)
A71111	Domestic goat, breed unspecified (Capra hircus, breed unspecified)
(A71112 through A7111Z)	(Reserved for domestic goat breeds)
A71121	Domestic sheep, species or breed unspecified (Ovis species, unspecified)
(A71122 through A7112Z)	(Reserved for domestic sheep species or breeds)
A72	Carnivora
A721	Canidae
A72101	Dog (Canis domesticus, breed unspecified)
(A72102 through A7211Z)	(Reserved for dog breeds)
A72121	Wolf, Canis nubilis, variety unspecified
(A72122 through A72125)	(Reserved for Canis nubilis varieties)
A72126	Coyote, Canis latrans, variety unspecified
(A72127 through A7212A)	(Reserved for Canis latrans varieties)
A7212B	Fox, variety and species unspecified (Urocyon species)
A7212C	Gray fox (Urocyon cenereoargenteus scotti)
A722	Felidae
A72201	Domestic cat, breed unspecified (Felis catus, breed unspecified)
(A72202 through A7220Z)	(Reserved for cat breeds)

A73	Rodentia
A731	Muridae, unspecified
A73101	Rat, unspecified as to species or breed
A73102	Black rat, variety unspecified (Rattus rattus, variety unspecified)
(A73103 through A73109)	(Reserved for Rattus rattus varieties)
A7310A	Norway rat, strain unspecified (Mus norvegicus, variety and strain unspecified)
(A7310B through A7317Z)	(Reserved for varieties and strains of the Norway rat, Mus norvegicus)
A7310B	Norway rat, variety Albino (Mus norvegicus albinus, strain unspecified)
A7310C	Albino; P. Aptekman inbred strain (King Albino)
A7310D	Albino mutant strain (no further specification)
A7310E	August variety (line unspecified)
A7310F	August variety, line 990
A7310G	August variety, line 7322
A7310H	August variety, line 28807
A7310I	August variety, line 35322
A7310J	AxC variety (strain or line unspecified)
A7310K	AxC variety, 9935 Hooded strain
A7310L	AxC variety, 9935 Irish strain
A7310M	Bagg
A7310N	Buffalo
A7310Ø	Copenhagen
A7310P	Fischer variety, strain unspecified
A7310Q	Fischer variety, line 230
A7310R	Fischer variety, line 344
A7310S	Gray Norway
A7310T	Albino waltzer
A7310U	Black
A7310V	Blue
A7310W	Chocolate
A7310X	Chocolate shaggy
A7310Y	Cinnamon
A7310Z	Curly-coated
A73111	Fawn
A73112	Tawny
A73113	White shaggy
A73114	Yellow black eye
A73115	Yellow red eye
A73116	Heston
A73117	Holtzman
A73118	Hooded
A73119	Long-Evans
A7311A	Marshall
A7311B	Osborn-Mendel
A7311C	Sherman
A7311D	Slonaker
A7311E	Sprague-Dawley
A7311F	White
A7311G	Wistar albino ("Wistarat")
A7311H	Spotted Wistar
A7311I	Yale
A7311J	Zimmerman
(A7311K through A7317Z)	(Reserved for additional varieties, strains, lines, etc., of the Norway rat)
A73181	Mouse, Mus musculus, strain unspecified
(A73182 through A731KZ)	(Reserved for varieties, strains, and lines of Mus musculus)
A73182	85
A73183	89
A73184	101
A73185	129
A73186	1194
A73187	1394
A73188	3 CAMG
A73189	A
A7318A	AB (Albino-Bluhm)
A7318B	ADW
A7318C	A_fB
A7318D	A/He
A7318E	A/L (A subline Lilly)
A7318F	A/x
A7318G	AK/G1
A7318H	AK/Jax
A7318I	A/Jax
A7318J	AK/M
A7318K	AK/N (AK-n)
A7318L	AKA
A7318M	AKR (AK, AKM, AfB, R.I.L., RIL)
A7318N	AK4
A7318Ø	AKR/Du
A7318P	ANOPH B
A7318Q	AKR/Fu
A7318R	AKR/Jax
A7318S	AKR/LW
A7318T	AKR/M
A7318U	BL (Bagg L)
A7318V	BALB (Bagg, Bagg Albino)
A7318W	BALB/c (B alb c, c inbred)
A7318X	BALB/GW (Ba. inbred)
A7318Y	BALB/ci (BALB/Lafayette)
A7318Z	BCHP
A73191	BUC
A73192	BDP
A73193	BLCP (BLcp, Blcp)
A73194	BRS (BR-S, BR-s)
A73195	BRSUNT (Br Sunt)
A73196	BTRU
A73197	BTWB (BTwb)
A73198	BUA

FIELD J
Columns 37, 38, 39, 40, 41, and 42

A73199	BUB
A7319A	BUD
A7319B	C
A7319C	CAF
A7319D	CBA (XXXIX)
A7319E	CBA_f (ABC, CBA_fC3H)
A7319F	CBAN
A7319G	CBAN-p^r
A7319H	CDE (cdE, DE)
A7319I	CE (ce)
A7319J	CF1
A7319K	CFCW
A7319L	CFW
A7319M	CHI
A7319N	CHI-s
A7319Ø	CHI-ps
A7319P	C3H (Z)
A7319Q	C3H/Andervont
A7319R	C3H/Ks
A7319S	C3H/He
A7319T	C3H/JFe ($C3H_b$)
A7319U	C121 (He)
A7319V	C57BL (C57 black)
A7319W	C57BL-a^t
A7319X	C57BL-b
A7319Y	C57BL/6
A7319Z	C57BL/6Ks
A731A1	C57BL/10
A731A2	C57BR
A731A3	C57BR/a
A731A4	C57BR/cd
A731A5	C57L (M, L, LN)
A731A6	C58
A731A7	C58-a^t
A731A8	da-ab
A731A9	DBA (dba, dbr, D)
A731AA	DBA_f
A731AB	DBA/1
A731AC	DBA/2 (= DBA/2J)
A731AD	$DBA/2_f$
A731AE	DBA/Wa
A731AF	DBA/2bWy
A731AG	E
A731AH	Edinburgh
A731AI	F
A731AJ	Flex
A731AK	FUCFW
A731AL	G
A731AM	GFF
A731AN	H
A731AØ	HD
A731AP	I
A731AQ	I-c^{ch}
A731AR	IF
A731AS	IFS
A731AT	IVB
A731AU	JK
A731AV	K
A731AW	Klnk
A731AX	KICF
A731AY	KL
A731AZ	L (LCW)
A731B1	Line 11 (LP)
A731B2	Longacre
A731B3	MA
A731B4	N
A731B5	NB
A731B6	NBT
A731B7	ND (MA/My)
A731B8	NH
A731B9	NIH General purpose
A731BA	0
A731BB	020 Leewenhoek-Huis
A731BC	P
A731BD	PBR (pBr)
A731BE	PK
A731BF	PL (PL[B])
A731BG	PLA
A731BH	PMG
A731BI	RI
A731BJ	RIET
A731BK	RIII
A731BL	$RIII_fB$ (RIIIX)
A731BM	RIII/Jax
A731BN	RIII/La
A731BØ	RIII/Wy
A731BP	RF
A731BQ	R1
A731BR	S
A731BS	SEA/Gn-se
A731BT	SEA/se (Sese-Ab)
A731BU	SEC/dse (Sese-C)
A731BV	SEC/Gn-dse
A731BW	SEC/1-se (Sese-C1)
A731BX	SEC/10n-se
A731BY	SEC/2-d (Sese-C2)
A731BZ	SEC/2 gn-d
A731C1	Short-tailed
A731C2	Snowy
A731C3	ST (Street)
A731C4	STOLI
A731C5	STR
A731C6	Strong A
A731C7	SWR (Swiss)
A731C8	TG
A731C9	WHL/Br (White Label)
A731CA	WG
A731CB	WHL/Kr (Kreyberg)
A731CC	WR
A731CD	XVII
A731CE	XXXV
A731CF	XLII
A731CG	XLV
A731CH	XLVIII
A731CI	XLIX
A731CJ	Y
A731CK	YBL
A731CL	YBL/Rr
A731CM	YBL/Wi
A731CN	Z

A731CØ	ZR (Zr/Chase)
A731CP	ZRD
(A731CQ through A731KZ)	(Reserved for additional varieties, lines, strains, etc., of Mus musculus)
A732	Caviidae
A73201	Guinea pig, variety unspecified (Cavia porcellus, variety unspecified)
(A73202 through A7321Z)	(Reserved for varieties and strains of Cavia porcellus)
A733	Geomyidae
A73301	Hamster (Large European), variety unspecified (Cricetus cricetus, variety unspecified)
A73302	Golden hamster, variety unspecified (Mesocricetus auratus, variety unspecified)
(A73303 through A73309)	(Reserved for Mesocricetus auratus varieties)
A7330A	Cotton rat, unspecified variety (Sigmodon hispidus, variety unspecified)
A74	Primates
A741	Hominidae
A74101	Man
A742	Cercopithecidae
A74201	Macaca (species unspecified)
A75	Perissodactyla
A751	Equidae
A75101	Domestic horse (Equus caballus, breed unspecified)
(A75102 through A7511Z)	(Reserved for breeds of domestic horses)
A76	Marsupalia
A77	Lagomorpha
A771	Leporidae
A77101	Domestic rabbit, breed unspecified (Oryctolagus cuniculus, unspecified)
(A77102 through A7711Z)	(Reserved for breeds of domestic rabbits)
A78	Insectivora
A781	Talpidae
A78101	Mole, European (Talca europaea)
B	Acanthocephala
C	Entoprocta
D	Ectoprocta
E	Echiuroidea
F	Spiunculidoidea
G	Priapulidoidea
J	Thallophyta
J1	Myxothallophyta
J2	Lichens
J3	Phycomycetes
J4	Ascomycetes
J5	Basidiomycetes
J6	Fungi Imperfecti
J7	Fungi (otherwise unspecified)
JF	Algae (otherwise unspecified)
JA	Brown Algae (Phaeophyceae)
JB	Blue-Green Algae (Cyanophyceae)
JC	Red Algae (Rhodophyceae)
JD	Yellow-Green Algae (Chrysophyceae)
JE	Green Algae (Chlorophyceae)
JF	Algae (otherwise unspecified)

(The bacteriophage hosts in this list are taken from the CBCC data sheet files and from the American Type Culture Collection, Catalog of Bacteriophages, 1957. For the ATCC numbered entries, the following items are given in sequence for each entry: the name of the host organism, its ATCC accession number, name and address of the donor, donor's designator for the host strain, his designator [in parentheses] of the phage strain, and the year deposited in the ATCC.)

JS	Schizomycetes
JS1	Pseudomonadales
JS11	Pseudomonadaceae
JS1101	Pseudomonas, unspecified
JS1102	Pseudomonas aeruginosa, unspecified
JS1103	Pseudomonas aeruginosa, strain C_{10}
JS12	Spirillaceae
JS1201	Vibrio, unspecified
JS1202	Vibrio comma, unspecified
JS1203	Vibrio sp. ATCC #11985. A. P. Krueger, U. Cal., 1954
JS2	Chlamydobacteriales
JS3	Hyphomicrobiales
JS4	Eubacteriales
JS41	Azotobacteraceae
JS4101	Azotobacter, unspecified
JS4102	Azotobacter vinelandii, unspecified
JS4103	Azotobacter vinelandii, ATCC #12518. O. Wyss, U. Texas. (Strain 0) 1956
JS42	Rhizobiaceae
JS4201	Rhizobium, unspecified
JS4202	Rhizobium leguminosarum, unspecified
(JS4203 through JS4209)	(Reserved for Rhizobium species and strains)
JS420A	Agrobacterium, unspecified
JS420B	Agrobacterium tumefaciens, unspecified
JS43	Enterobacteriaceae
JS4301	Escherichia, unspecified

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JS4302	Escherichia coli, unspecified
JS4303	Escherichia coli, B/URBANA
JS4304	Escherichia coli, ATCC #11303. S. E. Luria, U. Ill., Strain B (complete t phage series). 1952
JS4305	Escherichia coli, ATCC #12404. I. N. Asheshov Collection, N.Y. Botanical Garden. Strain alpha (phage strain 2 and 4). 1955
JS4306	Escherichia coli, ATCC #12141. I. N. Asheshov Collection, N.Y. Botanical Garden. Strain C (phage strain 5) (from J. Ward McNeal Collection). 1955
(JS4307 through JS431F)	(Reserved for Escherichia coli strains)
JS431G	Erwinia, unspecified
JS431H	Erwinia amylovora, unspecified
JS431I	Erwinia cartovora, unspecified
JS431J	Erwinia aroideae, unspecified
(JS431K through JS432B)	(Reserved for Erwinia species and strains)
JS432C	Serratia, unspecified
JS432D	Serratia marcescens, unspecified
(JS432E through JS432L)	(Reserved for Serratia species and strains)
JS432M	Salmonella, unspecified
JS432N	Salmonella paratyphi, unspecified
JS432Ø	Salmonella Type Poona, ATCC #12177. I. N. Asheshov Collection, N.Y. Botanical Garden. (From J. Ward McNeal Collection) (2 phage strains, 1 and 2) 1955
JS432P	Salmonella schottmuelleri, ATCC #12178. Same sources as above. Strain 2, 1955
JS432Q	Salmonella schottmuelleri, ATCC #12410. Same source as above. Strain 1, 1955
(JS432R through JS4362)	(Reserved for Salmonella species strains)
JS4371	Shigella, unspecified
JS4372	Shigella dysenteriae, unspecified
JS4373	Shigella dysenteriae, ATCC #11456a. G. Bertani, U. Ill., URBANA Strain Sh (phage strain P2). 1953
JS44	Brucellaceae
JS4401	Pasteurella, unspecified
JS4402	Pasteurella pestis, unspecified
JS45	Micrococcaceae
JS4501	Staphylococcus, unspecified
JS4502	Staphylococcus aureus var. aureus, unspecified
JS4503	Staphylococcus aureus var. aureus, Oxford H strain, #6571A
JS4504	Staphylococcus sp. ATCC #12145. I. N. Asheshov, N.Y. Botanical Garden. (D'Herelle Labs., Paris). 1955
JS46	Lactobacillaceae
JS4601	Streptococcus, unspecified
JS4602	Streptococcus cremoris, unspecified
JS4603	Streptococcus cremoris, ATCC #11602. C. C. Prouty, Wash. State College, Pullman, Washington. Strain HP (phage strain hp). 1954
JS4604	Streptococcus sp. ATCC #12164. I. N. Asheshov Collection, N.Y. Botanical Garden. (From D'Herelle Labs., Paris) Strain 3. 1955
JS4605	Streptococcus sp. ATCC #12168. Same source as above. Enterococcus strain 5/7 S. 1955
JS47	Corynebacteriaceae
JS4701	Corynebacterium, unspecified
JS4702	Corynebacterium diphtheriae, unspecified
JS4703	Corynebacterium sp. ATCC #12052. D. H. Howard, U. Cal. Strain DLC 842/50 (phage strain DLC 2921/49). 1954
JS48	Bacillaceae
JS4801	Bacillus, unspecified
JS4802	Bacillus megaterium, unspecified
JS4803	Bacillus cereus var. mycoides, ATCC #11986. A. P. Krueger, U. Cal. Strain N. 1954
JS4804	Bacillus subtilis ATCC #12139. I. N. Asheshov Collection, N.Y. Botanical Garden. Strain CSC (from Commercial Solvents Corp.). 1955
JS5	Actinomycetales
JS51	Mycobacteriaceae
JS5101	Mycobacterium, unspecified
JS5102	Mycobacterium phlei, unspecified
JS5103	Mycobacterium phlei, ATCC #11728. J. M. Desranleau, Ministry of Health, Montreal, Canada. 1954
JS52	Streptomycetaceae
JS5201	Streptomyces, unspecified
JS5202	Streptomyces griseus, unspecified
JS5203	Streptomyces griseus, ATCC #11984. F. Carvajal, Schenley Labs., Laurenceburg, Ind. (Strain SL-842) 1954

K	Bryophyta
L	Pteridophyta
M	Spermatophyta
MA	Monocotyledonae
MA1	Pandales
MA2	Helobiae
MA3	Triuridales
MA4	Glumiflorae
MA41	Gramineae
MA4101	Zea mays (corn)
MA4102	Lolium perenne
MA4103	Lolium multiflorum
(MA4104 through MA4109)	(Reserved for additional Lolium species)
MA410A	Hordeum vulgare (barley)
(MA410B through MA410I)	(Reserved for additional Hordeum species)
MA410J	Avena sativa (oat)
(MA410K through MA410R)	(Reserved for additional Avena species)
MA410S	Triticum aestivum (wheat)
(MA410T through MA410Z)	(Reserved for additional Triticum species)
MA5	Principes
MA6	Synanthe
MA7	Spathiflorae
MA8	Farinosae
MA9	Liliflorae
MA91	Liliaceae
MA9101	Asparagus officinalis var. altilis (garden asparagus)
MB	Dicotyledonae
MB1	Verticillatae
MB2	Piperales
MB3	Salicales
MB4	Myricales
MB5	Balanopsidales
MB6	Leitneriales
MB7	Juglandales
MB71	Juglandaceae
MB7101	Juglans (walnut) (species unspecified)
MB8	Fagales
MB81	Fagaceae
MB8101	Quercus (oak) (species unspecified)
MB82	Betulaceae
MB8201	Alnus (alder) (species unspecified)
MB9	Urticales
MB91	Ulmaceae
MB9101	Ulmus (elm) (species unspecified)
MB92	Moraceae
MB9201	Humulus (hop) (species unspecified)
MBA	Proteales
MBB	Santalales
MBC	Aristolochiales
MBD	Polygonales
MBD1	Polygonaceae
MBD101	Rumex (dock, sorrel) (species unspecified)
MBE	Centrospermae
MBE1	Chenopodiaceae
MBE101	Beta vulgaris (beet)
MBE2	Amarantaceae
MBE201	Amarantus (Amaranthus, amaranth) (species unspecified)
MBF	Ranales
MBF1	Lauraceae
MBF101	Persea americana (avocado)
MBG	Rhoeadales
MBG1	Cruciferae
MBG101	Brassica (species unspecified)
MBG102	Brassica oleracea var. gemmifera (brussels sprouts)
MBG103	Brassica oleracea var. capitata (cabbage)
MBG104	Brassica oleracea var. botrytis (cauliflower)
MBG105	Brassica oleracea var. italica (broccoli)
(MBG106 through MBG109)	(Reserved for additional species and varieties of Brassica)
MBG10A	Raphanus sativus (radish)
MBH	Sarraceniales
MBI	Rosales
MBI1	Crassulaceae
MBI101	Bryophyllum (Kalanchoe) (species unspecified)
MBI2	Saxifragaceae
MBI201	Ribes (currants, gooseberries) (species unspecified)
MBI3	Rosaceae
MBI301	Rubus (species unspecified)
(MBI302 through MBI309)	(Reserved for species of Rubus)
MBI30A	Prunus (species unspecified)
(MBI30B through MBI30I)	(Reserved for species of Prunus)
MBI30J	Rosa (rose) (species unspecified)
(MBI30K through MBI30R)	(Reserved for species of Rosa)
MBI30S	Fragaria (strawberry) (species unspecified)
(MBI30T through MBI30Z)	(Reserved for species of Fragaria)
MBJ	Geraniales
MBJ1	Geraniaceae
MBJ101	Pelargonium (species unspecified)
MBJ2	Linaceae
MBJ201	Linum usitatissimum (flax)
MBJ3	Tropaeolaceae

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MBJ301	Tropaeolum major (garden nasturtium)
MBJ4	Rutaceae
MBJ401	Citrus (species unspecified)
MBJ402	Citrus limon (lemon)
MBJ403	Citrus aurantifolia (lime)
MBJ404	Citrus paradisi (grapefruit)
MBJ405	Citrus sinensis (sweet orange)
MBJ5	Euphorbiaceae
MBJ501	Ricinus communis (castor bean)
MBK	Sapindales
MBK1	Aceraceae
MBK101	Acer (maple) (species unspecified)
MBL	Rhamnales
MBL1	Vitaceae
MBL101	Vitis (grape) (species unspecified)
MBM	Malvales
MBM1	Malvaceae
MBM101	Gossypium hirsutum (cotton)
MBN	Parietales
MBØ	Opuntiales
MBP	Myrtiflorae
MBQ	Umbelliflorae
MBQ1	Umbelliferae
MBQ101	Daucus carota var. sativa (carrot)
MBQ102	Apium graveolens var. dulce (celery)
MBR	Ericales
MBS	Primulales
MBT	Ebenales
MBU	Contortae
MBU1	Apocynaceae
MBU101	Vinca (perwinkle) (species unspecified)
MBU2	Asclepiadaceae
MBU201	Asclepias (milkweed) (species unspecified)
MBV	Tubiflorae
MBV1	Convolvulaceae
MBV101	Ipomoea batatas (sweet potato)
MBV2	Solanaceae
MBV201	Lycopersicon esculentum (tomato)
MBV202	Nicotiana tabacum (tobacco)
(MBV203 through MBV209)	(Reserved for species and strains of Nicotiana)
MBV20A	Solanum tuberosum (potato)
MBV20B	Solanum melongena var. esculentum (eggplant)
MBW	Plantaginales
MBX	Rubiales
MBY	Campanulatae
MBY1	Cucurbitaceae
MBY101	Cucurbita mixima (autumn squash, winter squash)
MBY102	Cucurbita pepo (pumpkin)
(MBY103 through MBY109)	(Reserved for species and strains of Cucurbita)
MBY10A	Citrullus vulgaris (watermelon)
(MBY10B through MBY10I)	(Reserved for species and strains of Citrullus vulgaris)
MBY10J	Cucumis sativus (cucumber)
MBY10K	Cucumis melo (muskmelon)
(MBY10L through MBY10S)	(Reserved for additional species and strains of Cucumis)
MBY2	Compositae
MBY201	Chrysanthemum frutescens (marguerite, Paris daisy)
(MBY202 through MBY209)	(Reserved for species and strains of Chrysanthemum)
MBY20A	Helianthus annuus (sunflower)
(MBY20B through MBY20I)	(Reserved for species and strains of Helianthus)
MBY20J	Lactuca sativa (lettuce)
(MBY20K through MBY20R)	(Reserved for species and strains of Lactuca)
MBY20S	Xanthium (cocklebur) (species unspecified)
MN	Gymnospermae
MN1	Coniferales
MN11	Pinaceae
MN1101	Pinus (pine) (species unspecified)
(MN1102 through MN1109)	(Reserved for species and strains of Pinus)
MN110A	Abies (fir) (species unspecified)
(MN110B through MN110I)	(Reserved for species and strains of Abies)
MN110J	Picea (spruce) (species unspecified)
(MN110K through MN110R)	(Reserved for species and strains of Picea)

NON-LIVING HOSTS

S	Gaseous mixture
S1	Air
T	Water
T1	Fresh water
T2	Sea water
T3	Brackish or Tidal water
T4	Saline solution
T41	Ringer's solution
T42	Locke's solution
T43	Tyrode's solution
T44	Ringer-Locke solution
T5	Buffer solution (unspecified)
T51	Bicarbonate buffer solutions
T511	Kreb's bicarbonate buffer solution
T52	Phosphate buffer solution
T521	Kreb's phosphate buffer solution

T6	Sugar solution
T61	Glucose solution
U	Soil, potting media, etc. (unspecified as to composition)
U1	Gravel
U11	Washed gravel (washed with dilute acid to remove mineral nutrients)
U12	Unwashed gravel (not washed with dilute acid)
U2	Sand
U21	Washed sand (washed with dilute acid to remove mineral nutrients)
U22	Unwashed sand (not washed with dilute acid)
U3	Loam soil
U31	Sandy loam soil
U32	Sandy soil
U33	Clay loam soil
U4	Clay soil
U5	Vermiculite
U6	Perlite
U7	Humus
U8	Compost or compost soil mixture
U9	Manure
V	Plant products
V1	Wood (timber, lumber)
V11	Bark
V12	Heartwood
V13	Sapwood
V2	Paper
V3	Straw
V4	Latex
V5	Dried seeds (as in storage)
V51	Grains (wheat, corn, barley, rice, etc.)
V52	Legumes (beans, peas, peanuts, etc.)
V6	Processed plant products
V61	Rolled or cracked grain
V62	Flour or meal
V63	Macaroni products
V64	Chocolate and cocoa products
V65	Tobacco products
V66	Dried fruits (raisins, prunes, etc.)
V67	Yeast concentrates
W	Animal products
W1	Meat and meat products
W2	Eggs
W3	Animal fiber (raw hides, fur, feathers, silk)
W4	Honeycomb
W5	Processed animal products
W51	Cheese
W52	Dried milk products
W53	Egg powder
W54	Leather
X	Medium (culture medium, nutrient medium)
X1	Medium prepared chiefly from natural products; includes complex, or ill-defined media, or media described only as "minimal" (e.g., meat extract, broth). If the natural product is a body fluid, such as blood, use Symbol X12.
X11	Medium as in X1 (exclusive of specific body fluids), but including organisms whose association (other than as a host) is essential for successful maintenance of the test organism. Use X11 only if the associated organism is not identified specifically--as a bacterium, protozoan, or other form.
X111	Medium as in X1, with Bacteria as the associated organism
X112	Medium as in X1, with Protozoa as the associated organism
X12	Medium containing blood, serum, plasma, albumin, etc. (body or plant cavity fluids or fractions of the same)
X121	Medium as in X12, but including organisms whose association (other than as a host) is essential for successful maintenance of the test organism. Use X121 only if the associated organism is not identified specifically--as a bacterium, protozoan, or other form.
X122	Medium as in X12, with Bacteria as the associated organism
X123	Medium as in X12, with Protozoa as the associated organism
X2	Medium consisting chiefly of a mixture of essential inorganic compounds in water (or other non-nutritive medium); mineral nutrient solutions (plant sciences, including bacteriology)
X21	Medium as in X2, but including organisms whose association is essential for successful maintenance of the test organism. Use X21 only if the associated organism is not identified specifically--as a bacterium, protozoan, or other form.
X211	Medium as in X2, with Bacteria as the associated organism
X212	Medium as in X2, with Protozoa as the associated organism

FIELD J
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Y	Fabricated products
Y1	Plant, animal, or mixed origin
Y11	Cloth
Y12	Clothing (includes shoes)
Y13	Upholstery
Y14	Rubber goods
Y2	Synthetics
Y21	Plastics
Y22	Film or sheet plastic
Y23	Fiber or woven plastic
Y3	Paint
Y4	Masonry
Y5	Metal
Y6	Glass
Z	Buildings
Z1	Storage houses
Z2	Shower rooms

SEX AND STAGE OF DEVELOPMENT OF THE HOST ORGANISM

The code symbols for Field K (the sex and stage of development of the host in Field J) can be found by consulting Field F (pp. 88-93), since the items for the two fields are the same.

Note that the Symbols S through Z are never used in Field K.

FIELD L
Column 44

PRETREATMENT OR
EXPERIMENTAL STATE OF THE
HOST ORGANISM OR OF THE ORGAN,
TISSUE, OR CELL (OF THE HOST ORGANISM)
WHICH IS THE SITE OF THE
PARASITE, NON-INFECTIOUS PATHOLOGY,
OR TUMOR CODED IN FIELD E

Symbol Z only:
EXPERIMENTAL TREATMENT OF THE
HOST OTHER THAN TREATMENT
WITH THE TEST COMPOUND
AND COMPOUND CODED IN FIELD D

1 HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) IS EXPERIMENTALLY ADAPTED (i.e., conditioned) to a particular environment or situation (to facilitate its acceptance of the test organism or test compound, e.g.). Any exposure to particular environments which do not result in specific adaptations, are coded by Symbols 3 or 4.

2 HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) IS PRETREATED SURGICALLY (as in the states of Symbols P, Q, and R), CHEMICALLY, BY ELECTRIC SHOCK, ETC., but (in contrast to Symbols P, Q, and R) for any purpose other than isolation of the host and an anatomical unit. Includes staining with dyes, surgical exposure of an organ only to facilitate observation, treatment for rendering an animal host quiet or otherwise receptive to treatment with the test compound. Also, special pretreatment for making the host more receptive to introduction of an infectious organism or the chemical treatment, such as special diet, removal of hair, feathers, or scales, skin laceration, etc.

3 HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) IS EXPOSED TO AN ABNORMAL PHYSICAL OR CHEMICAL ENVIRONMENT, preparatory for or during the test, to which adaptation is not intended. (Included are high atmospheric pressures, changes in O_2:CO_2 ratio, temperature changes, changes in gravitational pull, anaerobic culture conditions, etc.) For radiation exposure, use special Symbol 4. When the host has become adapted to such an environment (prior to the test), Symbol 1 must be used rather than Symbol 3.

4 HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) IS EXPOSED TO RADIATION which is not intended as treatment or part of the treatment for the parasite or pathology or tumor coded in Field E. If radiation is administered as part of the treatment of the host instead of a pretreatment (i.e., administered with the test compound so that both the chemical and radiation factors are expected to be responsible for the response coded in Field T), Symbol Z must be used.

5 HOST IS EXPERIMENTALLY OR NATURALLY INFECTED or parasitized with an organism other than the parasitic or infectious organism specifically treated by the test compound, or in addition to the non-infectious pathology or tumor being specifically treated. (For non-infectious pathological states of the host, other than the pathology or tumor coded in Field E, use Symbol 7, B, C, D, or E). If this incidental infection is restricted to a single organ, use Symbols N or Ø.

6 HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) HAS BEEN MADE SENSITIVE OR HYPERSENSITIVE to the test compound. (For a host strain sensitive to the test compound, use Symbol H. Use Symbol J for the state of induced resistance to the test compound.)

7 HOST IS IN AN EXPERIMENTAL PATHOLOGICAL STATE other than the pathology coded in Field E and not otherwise specified by special symbols--5 (infectious disease), B (hormone deficiency), C (hormone excess), D and E (dietary deficiencies), P (loss of an anatomical part), and S (bearing an implant). Symbol 7 is used for all other non-infectious pathologies (other than the pathology in Field E), including spontaneous tumors (but not implanted tumors). Also, it includes general experimental stress either brought about by administration of excesses of a specific material (e.g., H_2O, salt, CO_2, etc.), or removal of an organ (to be described in the written

abstract and not coded in Field H-2), etc., or a natural or unspecified physiological stress. (If the host has had removed from it an organ for any purpose other than to produce stress, the condition is coded by Symbol P.) If the pathology of Field E is specifically of an organ or tissue (coded in Field H-1 or I) and that structure has a second pathological state, use Symbol N or S. If the host has an organ or tissue, other than the organ or tissue site of the pathology (therefore, not coded in Field H-I or I) which is in a pathological state different from the pathological state coded in Field E, use Symbol Ø and, if the structure in this secondary pathological state is an organ, code it in Field H-2 (if it is a tissue, it can not be coded in Field I).

8 HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) IS IN AN INACTIVE STATE; e.g., hypnosis, estivation, diapause, dormancy, bacterial resting stage, hibernation.

9 PARABIOTIC

A PARTHENOGENETIC

B HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) IS HORMONE DEFICIENT (the deficiency not being the condition treated). Symbol B has priority over Symbol P in Field L and is used for any experimental hormone deficiency. When an endocrine gland is extirpated to produce the hormone deficient state (when the deficiency is not a condition being treated), code the gland removed or modified in Field H-2. This includes situations in which the hormone deficiency is relative only to the developmental state of the host being treated with the test compound.

C HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) HAS A HORMONE EXCESS (the excess not being the condition treated). This includes situations in which the excess is relative only to the developmental stage of the host being treated with the test compound.

D HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) IS DEFICIENT IN ONE OR MORE VITAMINS, ONE OR MORE MINERALS, ONE OR MORE SPECIFIC NUTRIENTS, OR WATER. (The symbol is not used for general deficiency in nourishment. See Symbol E.) Symbol D is used to code incidental dietary deficiencies of normal host organisms. It is not a device for indicating that the host is a special strain which can not synthesize the nutrient, vitamin, or inorganic compound. Any special strain, such as one dependent on exogenous nutrient or vitamin sources, is indicated by Symbol F.

E HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) IS UNDERNOURISHED; generally deficient in nutrients; fasted, deficient in caloric intake. For the deficiency of a specific essential dietary component, use Symbol D.

F HOST IS OF A SPECIAL STRAIN, selected, adapted, derived, mutant. (This excludes those special strains for which are provided the specific symbols, G, H, I, or Y below. It also excludes designation of taxonomic strains which have been adequately distinguished by special host symbols in Field J. Symbol F (and Symbols G, H, I and Y) are used only to designate physiological strains not distinguished by a unique strain name in Field J. (See also the Key, Specific Directions and Explanations, Division 9.)

G HOST IS OF A STRAIN RESISTANT TO THE TEST COMPOUND. (Use Symbol J for an individual host organism, of a non-resistant strain, made resistant by prior exposure to the test compound.) A strain resistant to the test organism is indicated by Symbol Y.

H HOST IS OF A STRAIN SENSITIVE TO THE TEST COMPOUND. (Use Symbol 6 for an individual host organism, of a non-resistant strain, sensitized to the test compound by previous exposure.)

I HOST IS OF A STRAIN DEPENDENT ON THE TEST COMPOUND.

Use Symbol F for an organism of a strain resistant to, sensitive to, or dependent on compounds other than the test compound

J HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY), IS OF A NON-RESISTANT STRAIN AND IS MADE RESISTANT TO (I.E., TOLERANT OF) THE TEST COMPOUND. (Use Symbol 6 for the state of sensitization to the test compound. For a resistant strain, use Symbol G). A host made resistant to the test organism is indicated by Symbol Y.

FIELD L
Column 44

K PREGNANT

L VIRGIN

M HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) IS CONGENITALLY ABNORMAL.

N ORGAN OR TISSUE OF THE HOST (SPECIFIED IN FIELD H-1 OR I AS THE SITE OF THE PATHOLOGY OR TUMOR BEING TREATED) IS IN A PATHOLOGICAL STATE other than the pathological state being treated (specified in Field E). Use of this symbol includes indication of physiological stress on the organ when this stress is not a condition being treated by the test compound; e. g. , the removal of one of a pair of organs of the host, or part of an organ, or an entire organ, or any other special pretreatment to produce the exaggerated condition of in situ experimental stress of an organ specified in Field H-1 or of the tissue specified in Field I. The description of the specific treatment to produce stress is not coded (e. g. , the organ removed to produce stress is not coded in Field H-2, but it is included in the written abstract). The symbol is used only if that secondary pathology or infectious organism which is not being specifically treated is restricted to that organ or tissue or if the organ or tissue is excised (indicated by Symbol R in Field G-1, placing Symbol N in Field G-2); if the secondary pathology is more general and the organ or tissue is in situ, use Symbol 5 or 7.

Ø ORGAN OF THE HOST (TO BE SPECIFIED IN FIELD H-2 AS AN ORGAN OTHER THAN THE SPECIFIC SITE OF THE PATHOLOGY BEING TREATED, IN FIELD H-1) IS IN A PATHOLOGICAL STATE OTHER THAN THE PATHOLOGICAL STATE BEING TREATED (SPECIFIED IN FIELD E). This includes the state of experimental physiological stress on an organ (Field H-2) other than the site of the pathology being treated (Field H-1), when this stress is not a condition being treated by the test compound. (Symbol N indicates stress on the organ in Field H-1.) This symbol is used only if the secondary pathology is confined to an organ; if the secondary pathology is more general, Symbol 5 or 7 will be used and nothing will be coded in Field H-2.

P HOST (CONSIDERED AS A WHOLE) HAS HAD REMOVED--PRIOR TO INFECTION OR PRIOR TO THE TEST--AN ORGAN, TISSUE, OR FLUID, FOR ANY REASON OTHER THAN SERVING AS A PART OF THE TREATMENT FOR THE PATHOLOGY CODED IN FIELD E. (The organ removed from the host is not a specific site of the pathology and is therefore coded in Field H-2.) Symbol B is used if an endocrine gland is removed to produce a hormone deficiency. Symbol P is not used to indicate removal of an organ to produce experimental stress on the organism; this can be indicated only by Symbol 7. If the removal of an organ is part of the treatment of the pathology in Field E, of which the test compound treatment represents the other part, never use Symbol P, but only Symbol Z.

Q ORGAN OR TISSUE OF THE HOST, IN SITU (SPECIFIED IN FIELD H-1 AS THE ORGAN OR IN FIELD I AS THE TISSUE WITH THE INFECTION OR PATHOLOGY TREATED WITH THE TEST COMPOUND) ISOLATED IN SOME SPECIFIC WAY FROM THE HOST ORGANISM (denervation, circulatory obstruction, etc.), isolated from the material it normally processes, surgically altered solely for the facility of observation, or isolated from one of its tissue components, etc. See the Key for a discussion of uses of Symbols 2, P, Q, R, and B.

R ORGAN, TISSUE, OR FLUID OF THE HOST, EXCISED (specified in Field H-1 or I as the organ or tissue in the pathological condition coded in Field E), isolating it from influences of all other factors of the host organism, and maintained in a "secondary, non-living host" (saline bath, nutrient medium, perfusate, etc.) described in the written abstract.

S HOST (OR ORGAN OR TISSUE SITE OF THE PATHOLOGY) HAS AN ORGAN OR TISSUE (EITHER NORMAL OR PATHOLOGICAL) INCIDENTALLY IMPLANTED IN IT, but this implant is not the pathology being treated nor is it part of the treatment for the pathology coded in Field E. (E. g. , rats with a tumor implant are treated with a candidate anthelmintic [coded as the test compound] for tapeworm prophylaxis. The tumor implant would be indicated better by Symbol S than by Symbol 7.) Excluded are situations when the implant is an endocrine gland implanted in the host to produce a hormone excess (Symbol C) or an organ implanted to produce special stress (Symbol 7, N, or Ø). Such an implant can be coded in Field H-2, if it is an organ; if it is a tissue or a tumor, it can not be coded, but should be included in the written abstract. The site of implant can not be coded, but should also be included in the written abstract.

T THE HOST ORGANISM IS IN A SECONDARY HOST ORGANISM OR NON-LIVING SECONDARY HOST, described in the written abstract. If a plant is the host and is maintained in an artificial medium or water, e.g., instead of its usual soil, indicate it by use of Symbol T rather than by Symbol 3. (Symbol T is never used to indicate that a specific organ or tissue [site of the pathology] has been transplanted to a secondary host.)

U HOMOGENATE, BREI, OR CELL SUSPENSION OF AN ORGAN OR TISSUE OF THE HOST.

V EXTRACT OF A TISSUE OR ORGAN OF THE HOST.

W CULTURE OF A TISSUE OR ORGAN OF THE HOST.

X SLICE OF A TISSUE OR ORGAN OF THE HOST.

The organ or tissue of the definitions of these symbols is the organ or tissue specifically the site of the parasite, non-infectious pathology, or tumor and therefore is coded in Field H-1 or I.

Y HOST HAS PARTIAL RESISTANCE TO THE TEST ORGANISM due to previous exposure or due to being a strain that has more resistance than other strains of the species. (Use Symbol G for strains resistant to the test compound and Symbol J for individual host organisms made resistant to the test compound.)

Second use of Field L (one symbol only):

EXPERIMENTAL TREATMENT OF THE HOST OTHER THAN WITH THE TEST COMPOUND OR SECONDARY COMPOUNDS

Z ANY TREATMENT OF THE HOST (OR ORGAN, TISSUE, OR CELL SITE OF THE PATHOLOGY) AGAINST THE PARASITE, NON-INFECTIOUS PATHOLOGY, OR TUMOR CODED IN FIELD E, OTHER THAN TREATMENT WITH THE TEST COMPOUND (OR OTHER THAN TREATMENT WITH THE TEST COMPOUND AND SECONDARY COMPOUND) AND ACCOMPANYING THE TREATMENT WITH THE TEST COMPOUND (OR ACCOMPANYING THE TREATMENT WITH THE TEST COMPOUND AND SECONDARY COMPOUND). Examples are radiation, thermal, and mechanical treatments and administration of anti-toxins specific for the test organism, etc. To qualify for being coded by Symbol Z, such treatment must be considered as in part responsible for the action coded in Field T to the degree coded in Field Y.

DOSAGE (CONCENTRATION COMPONENT)

UNIT OF MEASURE Column 45		QUANTITATIVE VALUE Column 46			
1 Parts per million (ppm = mg/liter, γ/cc, g/1000 liter, μg/ml, 1×10^{-6}, γ/g)	1			<.04	
	2	.04	thru	.2	
	3	>.2	thru	1	
	4	>1	thru	5	
	5	>5	thru	25	
	6	>25	thru	125	
	7	>125	thru	625	
	8	>625	thru	2,525	
	9	>2,525			
2 Molar Concentration (M)--or--Millimoles/cubic centimeter (mM/cc) --or-- 3 Molal concentration	1			$<10^{-7}$	
	2	10^{-7}	thru	10^{-6}	
	3	$>10^{-6}$	thru	10^{-5}	
	4	$>10^{-5}$	thru	10^{-4}	
	5	$>10^{-4}$	thru	10^{-3}	
	6	$>10^{-3}$	thru	10^{-2}	
	7	$>10^{-2}$	thru	10^{-1}	
	8	$>10^{-1}$	thru	1	
	9	>1			
4 Per cent weight or volume; also g/100 cc	1			<.000001%	
	2	>.000001	thru	.00001	
	3	>.00001	thru	.0001	
	4	>.0001	thru	.001	
	5	>.001	thru	.01	
	6	>.01	thru	.1	
	7	>.1	thru	1	
	8	>1	thru	10	
	9	>10	thru	100	
5 Pounds/100 gallons (lbs/100 gal.)	1			<.39	
	2	.39	thru	.65	
	3	>.65	thru	1.09	
	4	>1.09	thru	1.81	
	5	>1.81	thru	3.02	
	6	>3.02	thru	5.04	
	7	>5.04	thru	8.4	
	8	>8.4	thru	12	
	9	>12			
6 Units/milliliter (units/ml)	1			<.01	
	2	.01	thru	.1	
	3	>.1	thru	1	
	4	>1	thru	10	
	5	>10	thru	100	
	6	>100	thru	1,000	
	7	>1,000	thru	10,000	
	8	>10,000	thru	100,000	
	9	>100,000			

UNIT OF MEASURE Column 45		QUANTITATIVE VALUE Column 46			
7 % saturation	1			<10	
	2	10	thru	20	
	3	>20	thru	30	(Do not use grid with this scale)
	4	>30	thru	40	
	5	>40	thru	50	
	6	>50	thru	60	
	7	>60	thru	70	
	8	>70	thru	80	
	9	>80	thru	90	
	0	>90	thru	100	
8 Milligrams per liter of air (mg/l)	1			<1.56	
	2	1.56	thru	3.12	
	3	>3.12	thru	6.25	
	4	>6.25	thru	12.5	
	5	>12.5	thru	25	
	6	>25	thru	50	
	7	>50	thru	100	
	8	>100	thru	200	
	9	>200			
9 Normality (N)	1			$<10^{-7}$	
	2	10^{-7}	thru	10^{-6}	
	3	$>10^{-6}$	thru	10^{-5}	
	4	$>10^{-5}$	thru	10^{-4}	
	5	$>10^{-4}$	thru	10^{-3}	
	6	$>10^{-3}$	thru	10^{-2}	
	7	$>10^{-2}$	thru	10^{-1}	
	8	$>10^{-1}$	thru	1	
	9	>1			
A Micro curies per milliliter (μ curies/ml)	1				<.001
	2	.001	thru		.01
	3	>.01	thru		.1
	4	>.1	thru		1
	5	>1	thru		10
	6	>10	thru		100
	7	>100	thru		1,000
	8	>1,000	thru		10,000
	9	>10,000			
B mg/ml	1				<.00001
	2	.00001	thru		.0001
	3	>.0001	thru		.001
	4	>.001	thru		.01
	5	>.01	thru		.1
	6	>.1	thru		1
	7	>1	thru		10
	8	>10	thru		100
	9	>100	thru		1,000

Column 46: Symbol

* (= 12 zone punch) The dosage is in terms of the biologically active portion of the molecule.

\# (= 11 zone punch)

(a) When Field J is coded: The dosage coded is not the dosage administered to the host, but is the dose to which the test organism is exposed.

(b) When Field J is not coded: The dosage coded is not the dosage administered to the test organism, but is the dosage to which the organ or tissue of the test organism is exposed.

0 (= 0 zone punch) Only when Field J is coded (with symbols other than S through Z in Column 37): The dosage coded is not the dosage administered to the host but is the dose to which the organ or tissue of the test organism is exposed.

FIELD N
Columns 47 and 48

DOSAGE (QUANTITY COMPONENT)

UNIT OF MEASURE Column 47		QUANTITATIVE VALUE Column 48
1 Micrograms (μg) (γ)	1	< 0.012
	2	0.012 thru 0.036
	3	> 0.036 thru 0.11
	4	> 0.11 thru 0.33
	5	> 0.33 thru 1
	6	> 1 thru 3
	7	> 3 thru 9
	8	> 9 thru 27
	9	> 27 thru 81
2 Milligrams (mg) --or-- 3 Microliters (μl)	1	> 0.081 thru 0.243
	2	> 0.243 thru 1
	3	> 1 thru 3
	4	> 3 thru 9
	5	> 9 thru 27
	6	> 27 thru 81
	7	> 81 thru 243
	8	> 243 thru 729
	9	> 729 thru 2,187
4 Grams (g) --or-- 5 Milliliters (ml)	1	2 thru 4
	2	> 4 thru 8
	3	> 8 thru 16
	4	> 16 thru 32
	5	> 32 thru 64
	6	> 64 thru 128
	7	> 128 thru 256
	8	> 256 thru 512
	9	> 512
6 Milligrams per kilogram (mg/kg) (= Micrograms per gram [μg/g])	1	< 0.04
	2	0.04 thru 0.2
	3	> 0.2 thru 1
	4	> 1 thru 5
	5	> 5 thru 25
	6	> 25 thru 125
	7	> 125 thru 625
	8	> 625 thru 2,525
	9	> 2,525
7 Micrograms per square centimeter (μg/sq cm) --or-- 8 Milligrams per square foot (mg/sq ft)	1	< 0.06
	2	0.06 thru 0.25
	3	> 0.25 thru 1
	4	> 1 thru 4
	5	> 4 thru 16
	6	> 16 thru 64
	7	> 64 thru 256
	8	> 256 thru 1,024
	9	> 1,024

UNIT OF MEASURE Column 47		QUANTITATIVE VALUE Column 48
9 Microliters per square centimeter (μl/sq cm)	1	< 1
	2	1 thru 2
	3	> 2 thru 4
	4	> 4 thru 8
	5	> 8 thru 16
	6	> 16 thru 32
	7	> 32 thru 64
	8	> 64 thru 128
	9	> 128
A Microliters per kilogram (μl/kg)	1	< 0.04
	2	0.04 thru 0.2
	3	> 0.2 thru 1
	4	> 1 thru 5
	5	> 5 thru 25
	6	> 25 thru 125
	7	> 125 thru 625
	8	> 625 thru 2,525
	9	> 2,525
B cc/ft^3 (soil, etc.) g/ft^3	1	< .03
	2	.03 thru .087
	3	> .087 thru .261
	4	> .261 thru .782
	5	> .782 thru 2.35
	6	> 2.35 thru 7.04
	7	> 7.04 thru 21.12
	8	> 21.12 thru 63.34
	9	> 63.34
C Pounds per acre (lbs/acre)	1	< 0.036
	2	.036 thru 0.11
	3	> .11 thru 0.33
	4	> .33 thru 1
	5	> 1 thru 3
	6	> 3 thru 9
	7	> 9 thru 27
	8	> 27 thru 81
	9	> 81
D Gallons per acre (gal acre)	1	< 0.33
	2	.33 thru 1
	3	> 1 thru 3
	4	> 3 thru 9
	5	> 9 thru 27
	6	> 27 thru 81
	7	> 81 thru 243
	8	> 243 thru 729
	9	> 729

UNIT OF MEASURE Column 47		QUANTITATIVE VALUE Column 48		
E Units	1			<.01
	2	.01	thru	.1
	3	>.1	thru	1
	4	>1	thru	10
	5	>10	thru	100
	6	>100	thru	1,000
	7	>1,000	thru	10,000
	8	>10,000	thru	100,000
	9	>100,000		
F Units/gram (units/g) --or-- G Units per kilogram (units/kg)	1			<.001
	2	.001	thru	.01
	3	>.01	thru	.1
	4	>.1	thru	1
	5	>1	thru	10
	6	>10	thru	100
	7	>100	thru	1,000
	8	>1,000	thru	10,000
	9	>10,000		
H Millimols per kilogram (mM/kg)	1			<.04
	2	.04	thru	.2
	3	>.2	thru	1
	4	>1	thru	5
	5	>5	thru	25
	6	>25	thru	125
	7	>125	thru	625
	8	>625	thru	2,525
	9	>2,525		

UNIT OF MEASURE Column 47		QUANTITATIVE VALUE Column 48		
I Mols	1			<.000001
	2	.000001	thru	.00001
	3	>.00001	thru	.0001
	4	>.0001	thru	.001
	5	>.001	thru	.01
	6	>.01	thru	.1
	7	>.1	thru	1
	8	>1	thru	10
	9	>10		
J Micro-curies (μ curies)	1			<.001
	2	.001	thru	.01
	3	>.01	thru	.1
	4	>.1	thru	1
	5	>1	thru	10
	6	>10	thru	100
	7	>100	thru	1,000
	8	>1,000	thru	10,000
	9	>10,000		

Column 48: Symbol

* (= 12 zone punch) The dosage is in terms of the biologically active portion of the molecule.

\# (= 11 zone punch)
(a) When Field J is coded: The dosage coded is not the dosage administered to the host, but is the dose to which the test organism is exposed.
(b) When Field J is not coded: The dosage coded is not the dosage administered to the test organism, but is the dosage to which the organ or tissue of the test organism is exposed.

0 (= 0 zone punch) Only when Field J is coded (with symbols other than S through Z in Column 37): The dosage coded is not the dosage administered to the host but is the dose to which the organ or tissue of the test organism is exposed.

FIELD O
Column 49

(1) DOSAGE FREQUENCY

(2) SEQUENCE OF ADMINISTRATION OF THE SECONDARY COMPOUND AND THE TEST COMPOUND

I

1 Single administration, when a continuous supply to the test organism is not insured. (No entry in Field P.)

2 Single administration, when a continuous supply to the test organism is insured. (Duration of application of the dose is specified in Field P.) Ad libitum administration. (Consult the Key for a discussion of the use of Symbol 2.)

3 Repeated doses at intervals more frequent than specified below. (Duration of treatment specified in Field P.)

4 Hourly administration of the dose in Field M and/or N. (Duration of treatment specified in Field P.)

5 Three-times-daily administration of the dose in Field M and/or N. (Duration of treatment specified in Field P.)

6 Twice-daily administration of the dose in Field M and/or N. (Duration of treatment specified in Field P.)

7 Daily administration of the dose in Field M and/or N. (Duration of treatment specified in Field P.)

8 Every-other-day administration of the dose in Field M and/or N. (Duration of treatment specified in Field P.)

9 Every-three-days, or less frequent, administration of the dose in Field M and/or N. (Duration of treatment specified in Field P.)

II

0 Test compound given before the secondary compound. (The time period is specified in Field P and the secondary compound is specified in Field D.)

Test compound given after the secondary compound. (The time period is specified in Field P and the secondary compound is specified in Field D.)

* Test compound given simultaneously with the secondary compound. (The secondary compound is specified in Field D. No entry is made in Field P, unless one of Symbols 1 through 9 is also coded in Field O, in which case Field P is coded with the duration of treatment with the test compound.)

DURATION OF TREATMENT
-or-
TIME BETWEEN ADMINISTRATION OF THE
TEST COMPOUND AND A SECONDARY COMPOUND

Scale 1

1		< 0.5 seconds
2	0.5 thru	1.
3	> 1. thru	2.
4	> 2. thru	4.
5	> 4. thru	8.
6	> 8. thru	16.
7	> 16. thru	32.
8	> 32. thru	64.
9	> 64.	

Scale 2

1		< 2 seconds
2	2 thru	4
3	> 4 thru	8
4	> 8 thru	16
5	> 16 thru	32
6	> 32 thru	64
7	> 64 thru	140 seconds
8	> 140 thru	5 minutes
9	> 5 minutes	

Scale 3

1		< 16 seconds
2	16 thru	32
3	> 32 thru	64
4	> 64 thru	140 seconds
5	> 140 thru	5 minutes
6	> 5 thru	10
7	> 10 thru	20
8	> 20 thru	45
9	> 45 minutes	

Scale 4

1		< 64 seconds
2	64 thru	140 seconds
3	> 140 thru	5 minutes
4	> 5 thru	10
5	> 10 thru	20
6	> 20 thru	45
7	> 45 thru	90
8	> 90 thru	3 hours
9	> 3 hours	

Scale 5

1		< 10 minutes
2	10 thru	20
3	> 20 thru	45
4	> 45 thru	90 minutes
5	> 90 thru	3 hours
6	> 3 thru	6
7	> 6 thru	12
8	> 12 thru	24
9	> 24 hours	

Scale 6

1		< 45 minutes
2	45 thru	90 minutes
3	> 90 thru	3 hours
4	> 3 thru	6
5	> 6 thru	12
6	> 12 thru	24
7	> 24 thru	48
8	> 2 thru	4 days
9	> 4 days	

Scale 7

1		< 6 hours
2	6 thru	12
3	> 12 thru	24
4	> 24 thru	48
5	> 2 thru	4 days
6	> 4 thru	8
7	> 8 thru	16
8	> 16 thru	32
9	> 32 days	

Scale 8

1		< 24 hours
2	24 thru	2 days
3	> 2 thru	4 days
4	> 4 thru	8
5	> 8 thru	16
6	> 16 thru	32
7	> 32 thru	2 months
8	> 2 thru	4 months
9	> 4 months	

Scale 9

1		< 8 days
2	8 thru	16
3	> 16 thru	32 days
4	> 32 thru	2 months
5	> 2 thru	4
6	> 4 thru	8
7	> 8 thru	16
8	> 16 thru	32
9	> 32 months	

Scale A

1	Several seconds
2	Several minutes
3	Several hours
4	Several days
5	Several months

FIELD Q
Column 52

SIZE OF INOCULUM OR IMPLANT

Number of cells
-or-
number of larvae or number of individuals
of any parasitic stage of the implanted test organism

Symbol	Number of cells or individuals
1	<10
2	10 thru 10^2
3	$>10^2$ thru 10^3
4	$>10^3$ thru 10^4
5	$>10^4$ thru 10^5
6	$>10^5$ thru 10^6
7	$>10^6$ thru 10^7
8	$>10^7$ thru 10^8
9	$>10^8$

1	<10
2	10 thru 100
3	>100 thru 1,000
4	>1,000 thru 10,000
5	>10,000 thru 100,000
6	>100,000 thru 1,000,000
7	>1,000,000 thru 10,000,000
8	>10,000,000 thru 100,000,000
9	>100,000,000

TIME OF TREATMENT
RELATIVE TO:
(1) INOCULATION
(2) TUMOR IMPLANTATION
(3) SENSITIZATION
(4) INCITATION OF NON-INFECTIOUS PATHOLOGY

Administration of the test compound occurs (single dose) or begins (multiple or continuous dose[s]):

I	at the same time as infection, tumor implantation, inoculation, sensitization, or initiation of a test. (This includes any time up to [but not including] one hour after infection, etc.)
2	1 thru 24 hours after infection, etc.
3	>24 thru 48 hours after infection, etc.
4	>2 thru 3 days after infection, etc.
5	>3 thru 4 days after infection, etc.
6	>4 thru 5 days after infection, etc.
7	>5 thru 6 days after infection, etc.
8	>6 thru 7 days after infection, etc.
9	>7 thru 8 days after infection, etc.
A	>8 days after infection, etc.
B	after infection, etc., but time not specified in the data.

Administration of the test compound is discontinued after infection and occurs (single dose) or ends (multiple or continuous dose[s]):

1	at the same time as infection, tumor implantation, inoculation, sensitization, or initiation of a test. (This includes any time up to [but not including] one hour before infection, etc.)
C	1 thru 24 hours prior to infection, etc.
D	>24 thru 48 hours prior to infection, etc.
E	>2 thru 3 days prior to infection, etc.
F	>3 thru 4 days prior to infection, etc.
G	>4 thru 5 days prior to infection, etc.
H	>5 thru 6 days prior to infection, etc.
I	>6 thru 7 days prior to infection, etc.
J	>7 thru 8 days prior to infection, etc.
K	>8 days prior to infection, etc.
L	prior to infection, etc., but time not specified in the data.

Administration of the compound occurs or begins:

M	prior to infection and continues after infection, etc. (The time prior to and after infection is not further considered with this symbol.)

FIELD S-1
FIELD S-2
FIELD S-3
Columns 54, 55, and 56

ROUTE AND MANNER OF ADMINISTRATION OF:

(1) INOCULUM OR IMPLANT (FIELD S-1)

(2) SECONDARY COMPOUND (FIELD S-2)

(3) TEST COMPOUND (FIELD S-3)

Any symbol of this list not otherwise marked may be used for coding Field S-1, Field S-2, or Field S-3. Certain symbol definitions relate in a specific manner to Fields S-2 and S-3 and those are designated in each case by a separate definition for Field S-1 (Symbols 8, B, E, G, J, and R) or by a notation that the symbol as it is defined is not applicable to Field S-1 (Symbols C and M).

FIELD S-3 ONLY: Certain of the items of this list can employ Field H-2 to indicate more specifically the route of the test compound. In the case of each of these items with which Field H-2 is used, this is indicated at the end of that definition. (There is no similar way by which the manner of administration can be more specifically coded, except that the information about the state of the test compound coded in Field A often contributes to an understanding of the coded manner of administration. However, none of the symbols of Field S-3 make special reference to coding in Field A. This is discussed in Division 4 of the section on Specific Directions and Explanations for Field S-3, in the Key.)

Note that certain of the symbols (0, 1 through 9, A through I, P and Q, and S through Z) represent routes and methods of application directly to the organism or some part of the organism. Symbols J through Ø and Symbol R represent methods by which application is to the environment as well as, or instead of, to the organism so that the organism receives--or may receive--all or part of the material from the environment (with the possible exception of Symbol L, since the organism in that case is removed from the treated environment). This latter method most frequently permits less control of the quantity the organism receives, but often represents a more natural method for evaluation of the chemical for use in practical field application.

When the words "dose" and "compound" (or "chemical") appear in these definitions, they should be interpreted, for Field S-2, as "dose of the secondary compound" and, for Field S-3, as "dose of the test compound"; for Field S-1, however, substitute "quantity of" and "inoculum" for the expressions "dose of" and "compound".

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0 Parenteral. (Any manner of administration by parenteral route.) This symbol is to be used only when the parenteral route is not more specific, such as intravenous, subcutaneous, etc. (Opposed to parenteral are the enteral [alimentary tract] routes, Symbols 1, 2, 3, 4, and T.)

1 Oral route, method unspecified. (For specific methods of oral administration, see Symbols 2 and 4. For other enteral routes, use Symbol 3 or T.)

2 Oral route, administration of a measured dose by feeding or placing in the oral cavity the free compound, undiluted or mixed with food or other materials. (For administration techniques whereby the compound is not free to contact the oral parts, use Symbol 3. For unmeasured doses by either oral method, use Symbol 4.)

3 Postoral enteral route by which is administered a measured dose by by-passing the oral cavity; examples: stomach tube, capsule (even when the capsule is taken orally and voluntarily swallowed), duodenal tube, or other means (including surgical) of introduction into a specific part of the alimentary lumen (except by anal approach, Symbol T). (Use Symbol 3 also for injection of a measured dose into the lumen of an exteriorized intestinal loop.) (For unmeasured doses, use Symbol 4.) Field S-3: Field H-2 may be used to specify the part of the alimentary

tract into which administration of the test compound is directly made, if it is not the specifically responding part coded in Field H-1.

4 Oral route or postoral route, administration of an unmeasured dose (uncontrolled feeding, for example). Use Symbol 4 for ad libitum feeding, but only when no final measure of the intake is made; when a measure of the intake is made after ad libitum feeding, use Symbol 2. Use Symbol N when a treated environment is consumed (or potentially consumed) by the test organism (e.g., cloth impregnated against moth larvae). Field S-3: Almost without exception administration of an unmeasured dose of a test compound is oral, but if it is postoral, Field H-2 can be used with Symbol 4 as it is used with Symbol 3.

5 Intravascular injection, unspecified or specified as intravenous, intra-arterial, intraportal, or intracardial. (Use Symbol 5 for injections into closed vascular systems. Use Symbol 6 for invertebrate, "open" vascular systems [e.g., insect vessels].) Field S-3: With Symbol 5, Field H-2 can be used to distinguish the intravascular injections by coding in it the vein, artery, portal vessel, heart, or other specific vessel to which injection is made, unless that vessel is also the organ specifically responding to the test compound and coded in Field H-1.

6 Intraperitoneal injection. Also, injection into an invertebrate body cavity (e.g., insect body cavity) or into an invertebrate "open" vascular system. Coelomic injection.

7 Intramuscular injection. Field S-3: Field H-2 can be used to specify the body area or specific muscle into which the test compound was injected, if this is not the anatomical part specifically responding coded in Field H-1.

8 Subcutaneous injection; intradermal, intracutaneous injection. Use Symbol 8 for iontophoresis and for injection into lymph sacs of frogs. Field S-1: Use Symbol 8 for exposure to active cutaneous penetration of parasites (larval nematodes, trematodes, insects, etc.) Field S-3: Field H-2 can be used to specify the body area into which the test compound was injected, if this is not the anatomical part specifically responding, coded in Field H-1.

9 Tracheal injection.

A Intracellular injection.

B Injection in--or topical application on--or dipping of--an EXPOSED OR ISOLATED ORGAN OR TISSUE (when application is single or repeated, but not when it is continuous for which use Symbol C). I.e., use Symbol B for applications which do not assure exposures (of the isolated or exposed organ or tissue) to a constant level of the test compound. If administration is made by single, non-continuous injection into a vessel of an exposed (but not isolated) organ, use Symbol 5 rather than Symbol B. Also, a single or repeated "injection" into a flowing, but non-circulating liquid perfusing an EXPOSED OR ISOLATED ORGAN OR TISSUE (but not into a static or circulating [i.e., a closed-system] bathing liquid for which use Symbol C). (Use Symbol C for administration by which the organ or tissue is exposed to a relatively constant quantity--e.g., administration to a static bath or a closed-system, circulating perfusate [coded in Field J, if the isolated part is of a test organism, or written in Field J, if the isolated part is of a host].) Field S-1: Use Symbol B to code an injection of, or topical application of, an inoculum into an exposed or isolated organ or tissue. Field S-3: A specific, exposed (but not isolated) organ to which single or repeated (but not continuous) application is made can be coded in Field H-2, if that organ is not the organ specifically responding to the test compound and coded in Field H-1.

C Application as (or as a constituent of) a perfusion or bath (circulating or non-circulating, open or closed flowing system) of an ISOLATED OR SURGICALLY EXPOSED ORGAN OR TISSUE, thereby providing a relatively constant concentration and continuous exposure. This includes the Warburg technique for an organ, tissue, homogenate, or any enzyme preparation. Symbol C is also used for topical applications to isolated or surgically exposed organs or tissues, such as a salve, smear, ointment, etc., which provides a constant coat and exposure. (For single or repeated injections to an isolated or surgically exposed organ or tissue, which do not provide a constant dose level, use Symbol B. For topical application to the intact organism, use Symbol G. For immersion of the intact organism use Symbol E (brief immersion) or Symbol N

(continuous immersion). When the perfusion or bath is not the pure chemical, treat the bathing or perfusing medium (e.g., normal saline, glucose solution, etc.) as a host of the organ or tissue: if the organ or tissue is of a test organism, code this medium in Field J, but if the organ or tissue is of a host organism, the medium can only be written in the abstract for Field J. Field S-1: Symbol C as it is defined here is applicable only for Fields S-2 and S-3 and is not intended for use in Field S-1. Application of an inoculum to an exposed or isolated organ or tissue is coded by Symbol B. Field S-3: A specific, exposed (but not isolated) organ to which continuous (but not single or repeated) application is made can be coded in Field H-2, if that organ is not the organ specifically responding to the test compound and coded in Field H-1. If the bath or perfusing medium is coded in Field J, the concentration of the test compound should be coded in Field M with Symbol # in Column 46 (or in Field N, if the dosage is expressed in "units", with Symbol # in Column 48).

D (Plants only) Administration to a relatively INTACT PLANT by adding the compound to (or substituting the compound, if a liquid, for) water, nutrient medium, or soil, so that it is carried through the root, stem, and other parts. Also, use Symbol D for "injection" into plants (ordinarily a continuous administration, from a reservoir, through a fixed injection tube or needle). Field S-3: The specific plant organ through which the test compound enters or is injected can be coded in Field H-2, if that part is not the part specifically responding coded in Field H-1.

E Brief, direct exposure to the surface or part of the surface of the intact organism; for example, dipping (i.e., essentially a surface exposure by relatively brief immersion) of the whole, intact organism or of a specific surface (an organ or tissue forming part of the body surface) of the intact organism. Also, a wash of brief duration, such as eye or nose drops which are rather quickly washed from the mucosal surfaces. (If an organ or tissue is isolated or an internal organ or tissue has been surgically exposed, use Symbol B, rather than Symbol E, to code its being given only brief surface exposure, e.g., dipping. Symbol E is opposed also to Symbols N and G in that N is used to code prolonged, continuous immersion and perfusion and G is used to code a more or less prolonged exposure to a material applied to the surface as a smear, ointment, salve, etc., even if that surface coating which provides a continuous exposure is applied by dipping. Symbol E also differs from Symbols K and L in that K and L are ordinarily for coding mass applications to a group of organisms [i.e., to a population]; in any case, K and L are not used to code specific controlled treatment of a single individual organism.) The dipping medium or wash (solvent or carrier) is never considered to be a host and is not coded in Field J. Field S-1: Use Symbol E to code the introduction of the test organism to the surface of the intact host by relatively brief exposure of the host, such as dipping or washing with the inoculum. If the test organism actually actively penetrates the skin rather than attaches locally, use Symbol 8 rather than Symbol E or G. Field S-3: If brief exposure (e.g., dipping) is restricted to only a specific part (organ or tissue) of the intact organism, Field H-2 can be used to code that specific part, if it is not the part specifically responding coded in Field H-1.

G Prolonged, continuous exposure by direct application to the surface--or to some specific part of the surface--of the intact individual organism. Such direct surface applications are referred to as topical, local, percutaneous, etc. Examples: inunction, ointment applications, application by lanolin paste, screw worm smears, etc. For such application to excised organs (e.g., an orange, considering the fruit as an organ), use Symbol B. Symbol G is not used to code immersion of the intact organism for continuous exposure (e.g., for administration as part of the liquid environment of the organism) for which there is the special Symbol N. Field S-1: Use Symbol G to code the introduction of the test organism to the surface of the intact host by relatively protracted exposure of the host, --for example, by forcing the host to stand partly submerged in the inoculum. If the test organism actually actively penetrates the skin rather than attaches locally, use Symbol 8 rather than Symbol E or G. Field S-3: In the case of Symbol G, the application is usually restricted to the area coded in Field H-1 rather than to the entire surface of the organism. However, if application is to the entire body surface (Symbol A of Field H) or to a restricted area other than the area coded in Field H-1, that area (organ or body region) should be coded in Field H-2.

I Administration through respiratory organs. Field S-3: If the test compound is administered to a specific part of the respiratory tract, that part should be coded in Field H-2 if it is not the organ specifically responding in Field H-1.

J Fumigation (i. e., administration as a gas, aerosol, or mist) of the HABITAT with the organism present. Under the conditions for which Symbol J should be used, the administration is not implicitly by inhalation (Symbol I), nor does the administration involve determined direct application to the surface of the organism (Symbols K and L), nor is the administration to an environment prior to the organism's contact with the surface of the habitat (Symbol M). The administration to a habitat in which the administered material is absorbed or mixed, i. e., a habitat through which it is dispersed and therefore diluted, is coded by Symbol N, except that if this is accomplished by the process of fumigation and the organism is present at the time of fumigation, Symbol J should be used. Field S-1: It is possible that administration of the test organism (microorganisms) might be made by a process of dispersing a suspension of the organism in a mist, etc. (i. e., by a dispersion analogous to "fumigation" with a test compound or secondary compound). For such an administration of the test organism, Symbol J should be used.

K Direct application to both the surface of an organism (implying the total surface, not any specific part of the surface) and its environment when the dose per individual is not controlled and the organism is not removed from the treated environment. For example, spraying of PLANTS and the soil and other environmental components of the plants, or spraying of INSECTS and the plants on which the insects are as well as other environmental components of the insects, etc., when the organisms are not removed from the treated environment. Use Symbol L for this application method, when the treated organism is removed from the environment. See the definitions for Symbols G, J, and N to further distinguish the uses of Symbol K.

L Application as defined for Symbol K, but the treated organism is removed from the environment after the treatment. Examples: Peet-Grady fly spray technique, certain settling tower methods, etc. See the definitions for Symbols E and J to further distinguish the uses of Symbol L.

M Application to the habitat prior to the organism's contact with the SURFACE of that environment. (The application may be either to the surface only [a glass plate, e. g.]--or to an absorbent environmental material [paper, e. g.,] which nevertheless retains on its surface some of the applied compound.) Examples (Fields S-2 and S-3): the panel test for house flies, an application to foliage or other surface for residue tests, impregnated paper barriers for rodent repellency (also other similar repellency tests), the apple-plug technique, a pre-emergency herbicide test, etc. (Use Symbol N or J when the application is to an environment throughout which the applied material is dispersed and IN which (not on which) the organism is, or will be, living and which the organism may consume as food. Use Symbols K or L when the application is to the surface [or mixed with] the environment with the organism present.) (Note: For Field S-1, it is so improbable that an inoculum would be administered to a host by such a circuitous route as that described by Symbol M, the symbol is considered as inapplicable to Field S-1.)

N Application to the habitat throughout which the applied material is dispersed and diluted (i. e., impregnation of, mixing with, diffusion in, saturation of the habitat), in which the intact organism is, or will be, living (mosquito larvae in water or nematodes or plant seeds in soil) and which it may consume (moth larvae in cloth). Examples: wood impregnation as protection against or treatment for infesting organisms (termites, fungi, marine borers, etc.), treatment of flour or grain for action against weevils or other infesting organisms (except by fumigation for which Symbol J is specially provided), addition to water in which aquatic organisms are living, addition to media in which are microorganisms, etc. (If the organism contacts only the surface of the habitat subsequent to application, use Symbol M. Symbol M is always used for repellency studies involving such applications. If the application as described for Symbol N is by fumigation and the organism is present at the time of application, use Symbol J which is specially provided for this. Symbol N differs from Symbol K in that Symbol K refers to applications which are essentially to the test organism and incidentally to whatever structures and materials of the habitat on which the applied material falls (there is implication that the environment has the applied material evenly distributed in it by diffusion, saturation, or impregnation), whereas Symbol N refers to applications essentially to the habitat through which the applied material is diffused to reach the organism. If the applied material is added to a liquid and this mixture is applied only briefly as a dip or wash, use Symbol E.)

Ø Administration to a parent organism containing--or to which is attached--its developing young, when the test is for effects on the embryo and/or offspring. (If administration is directly to

the developing offspring rather than indirectly through its parent, use an appropriate symbol other than Symbol Ø. If administration is by injection directly to the embryonic membranes, use Symbol S.) Field S-3: The parental structure to which the test compound is administered (if known) should be coded in Field H-2, the developmental stage of the offspring at the time of application should be coded in Field F, and the dose given to the parent should be coded in Fields M and N (unless the dose to which the embryo is exposed is determined, in which case that dose should be coded in Fields M and N with Symbol # in Columns 46 and/or 48). See Field F, Key, Specific Directions and Explanations, Division 3, paragraph 3.

P Administration to and through meninges and to the central nervous system, manner unspecified (ordinarily by injection). Examples: intramedullary, subdural, intraspinal, intracranial, intrathecal, intracisternal. For intracerebral application, use special Symbol V. Field S-3: The specific structure to which the test compound is applied should be coded in Field H-2 if that organ is not the organ specifically responding coded in Field H-1.

Q Administration intra-sinusoidal to paranasal sinuses, manner unspecified

R Application to a single point on or in an environmental medium through which the applied chemical diffuses to establish a diffusion gradient to which the test organism (present at the time of application or introduced subsequent to application) is exposed. Example: Oxford Plate Technique. (When such an application results in no gradient [i.e., results in complete mixing with the medium], only Symbol N can be used.) Field S-1: Application of the inoculum to a single restricted area on a culture medium over or through which it subsequently grows.

S Injection directly into embryonic membranes of the developing organism. Example: injection into allantois of chick embryo. Field S-3: The specific embryonic membrane to which the test compound is applied can be coded in Field H-2, if that membrane is not the specifically responding structure coded in Field H-1.

T Rectal or colonic administration. Example: colonic lavage.

F Intra-osseous injection. Field S-3: The specific bone structure to which the test compound is applied can be coded in Field H-2, if that structure is not the specifically responding structure coded in Field H-1.

H Intra-pleural injection

U Vaginal administration

V Intra-cerebral administration

W Intra-testicular

X Intra-ocular

Y Intra-tumoral

Z Intra-organal (organ other than specified above and other than introduction directly into any part of the alimentary lumen [Symbols 3 or T]). Field S-3: Use Field H-2 to name the specific organ to which the test compound was applied if that organ is not the specifically responding structure coded in Field H-1.

SPECIFIC ACTION OF THE TEST COMPOUND ON THE BIOLOGICAL STATE, QUALITY, OR PROCESS CODED IN FIELD T-2

The test compound:

1 Increases, stimulates, facilitates, lowers threshold (for the physiological phenomenon of Field T-2), enlarges.
Speeds, accelerates, increases rate or progress (of the physiological process or pathological condition of Field T-2).

2 Decreases, depresses, raises threshold (for the physiological phenomenon of Field T-2), reduces, partially inhibits, partially blocks, partially stops, partially prevents.
Slows, retards, delays, decreases rate or progress (of the physiological process or pathological condition of Field T-2).
(Note: When the test compound causes complete stoppage or completely inhibits or prevents the physiological process or pathological condition of Field T-2, use Symbol 3.)

3 Stops, blocks, inhibits (completely), prevents, abolishes, cures.
(Note: This symbol indicates complete stoppage of a process. However, Symbol 3 can never be used to indicate the complete kill of a group of organisms, i.e., the complete reduction of the number of organisms; the test compound's causing death is indicated in Field T-1 only by Symbol 7 and the fact that the compound caused 100% kill is indicated only by appropriate coding in Field Y.)

4 Increases, speeds, etc. (see Symbol 1) and subsequently decreases, slows, etc. (see Symbol 2). I.e., the biological condition or process of Field T-2 is first increased or speeded then is reversed to be decreased or slowed, as a complex response to a single administration of the test compound.

5 Decreases, slows, etc. (see Symbol 2) and subsequently increases, speeds, etc. (see Symbol 1). I.e., the biological condition or process of Field T-2 is first decreased or slowed then is reversed to be increased or speeded, as a complex response to a single administration of the test compound.

6 Makes irregular, arrythmic, acyclic, fluctuating.
(Note: Symbol 6 suggests disruption of control, due to the test compound, causing the biological process or behavior to proceed in a fashion more irregular than can be described by Symbols 1, 2, 3, 4, or 5. Use Symbol 6 also when the test compound effect is to disrupt a balanced biological system or process [e.g., acid-base balance, blood cell proportion, nitrogen balance]; Symbols 1, 2, 3, 4, or 5 would not appropriately express the balance disruption.)

7 Produces, causes, does, initiates, induces, brings about (also, stimulates, in the sense of initiating, not in the sense of accelerating for which Symbol 1 is used).
(Note: Use Symbol 7 in the passive sense, when the test compound "undergoes" some alteration [Field T-2 Symbol series FE--] and when the test compound "is" excreted, synthesized, stored, absorbed, etc. [Field T-2 Symbols FF-B, FAB, FBB, FGB, and FIB]. Use Symbol 7 also when the test compound "permits" or "initiates" a secondary compound's alteration, excretion, uptake as a nutrient, synthesis, etc. [Field T-2 Symbols FE--, FF--, F6--, etc.].)

8 Synergizes or potentiates the biological response (identified only as a biological condition or process in Field T-2) to the secondary compound (coded in Field D). Use Symbol 8 also to indicate that the test compound is essential for (permits or initiates) the action of a secondary compound (coded in Field D). However, when the test compound permits or is essential for the synthesis, alteration, or metabolism of a secondary compound (Field T-2 Symbols FE--, FF--, F6-, F8-, etc.), use Symbol 7 instead of Symbol 8.
(Note: When Symbol 8 is used, Field T-1 can not indicate the synergized action of the secondary compound; always include the secondary compound's action synergized in the written abstract portion of Field T-2.)

9 Antagonizes, antidotes, inhibits, neutralizes, decreases, blocks the biological response (identified only as a biological condition or process in Field T-2) to the secondary compound (coded in Field D). (Field T-2: Write the secondary compound's antagonized action.)

A Simulates (replaces) the secondary compound's action on the biological condition or process in Field T-2; the secondary compound is coded in Field D.

C Has an additive effect with the secondary compound (coded in Field D) to produce or affect the biological response (coded as a biological condition or process in Field T-2). I. e., the test compound and secondary compound summate (with a single, coincidental administration of both) to increase, decrease, stop, induce, or make irregular the biological condition or process coded in Field T-2; when Symbol C is used, Field T-1 can not indicate which of these effects is the result of the summative action of the two compounds (write the action in Field T-2).

D Inhibition of nerve action on its end organ, when the nerve is an accelerator or initiates the end organ's activity. (Reduces normal biological response to the action of the nerve indicated in Field H-1, as evidenced by the test compound's allowing the biological condition or physiological process [Field T-2] to be produced or increased by the stimulated and chemically treated nerve only to a degree less than that to which it is normally increased or caused by the stimulated but chemically untreated nerve.)

E Inhibition of nerve action on its end organ, when the nerve is an inhibitor of the end organ's activity. (Reduces normal biological response to the action of the nerve indicated in Field H-1, as evidenced by the test compound's allowing the biological response or physiological process [Field T-2] to be decreased by the stimulated and chemically treated nerve only to a degree less than that to which it is normally depressed or prevented by the stimulated but chemically untreated nerve.)

F Intensification of nerve action on its end organ, when the nerve is an accelerator or initiates the end organ's activity. (Intensifies the normal biological response to the action of the nerve indicated in Field H-1, as evidenced by increase of the biological condition or physiological process [Field T-2] by the stimulated and chemically treated nerve beyond the degree to which it is normally increased or caused by the stimulated but chemically untreated nerve.)

G Intensification of nerve action on its end organ, when the nerve is an inhibitor of the end organ's activity. (Intensifies the normal biological response to the action of the nerve indicated in Field H-1, as evidenced by decrease of the biological condition or physiological process [Field T-2] by the stimulated and chemically treated nerve below the degree to which it is normally decreased by the stimulated but chemically untreated nerve.)

The following six symbols, J through R, can be used only when Field E is coded with a pathological state and when a symptom is coded in Field T-2 by a symbol whose definition represents a normal biological condition or process which, however, (1) has been made abnormal by the pathology coded in Field E and which (2) is specifically treated or affected by the test compound. If the Field T-2 entry (a pathology symptom) is a symbol whose definition identifies it specifically as a pathological condition or process and if it is tested or affected by the test compound, Symbol 3 must be used instead of Symbol J, K, or L; Symbol 2 instead of Symbol M, N, or Ø; or Symbol 1 instead of Symbol P, Q, or R. Consult the Key.

J Returns the subject to normal (i. e., cures the host in Field J) by increasing or speeding the pathologically reduced or retarded biological condition or process coded in Field T-2. Symbol J implies complete relief from the pathological symptom coded in Field T-2; if only improvement but not cure is provided by the test compound, use Symbol M.

K Returns the subject to normal (i. e., cures the host in Field J) by decreasing or slowing the pathologically intensified or accelerated biological condition or process coded in Field T-2. Symbol K implies complete relief from the pathological symptom coded in Field T-2; if only improvement but not cure is provided by the test compound, use Symbol N.

L Returns the subject to normal (i. e., cures the host in Field J) by affecting the pathological biological condition or process coded in Field T-2, when restoration of normalcy is not a matter of correcting an abnormally intensified (or speeded) or decreased (or slowed) condition or process. For example, a disturbed nitrogen balance or specific behavior of the host of the disease can not properly be described as being returned to normal by "increasing" or "decreasing" the balance or behavior, but only by restoring its normalcy. Symbol L can also be used when the test compound re-initiates a normal physiological process stopped by the pathology coded in Field E and thereby restores the process to its normal state or rate (i. e., when a cure is effected). Symbol L implies complete relief from (i. e., cure of) the pathology symptom (e. g., balance or behavior) coded in Field T-2; if only improvement but not cure is provided by the test compound or if a pathologically totally suspended process is re-initiated but not restored to the normal state, use Symbol Ø.

M Returns the subject toward normal (i. e., improves but does not cure the host in Field J) by increasing or speeding the pathologically reduced or retarded biological condition or process coded in Field T-2. Symbol M implies only partial relief from the pathological symptom coded in Field T-2; if the test compound cures the host, use Symbol J.

N Returns the subject toward normal (i. e., improves but does not cure the host in Field J) by decreasing or slowing the pathologically intensified or accelerated biological condition or process coded in Field T-2. Symbol N implies only partial relief from the pathological symptom coded in Field T-2; if the test compound cures the host, use Symbol K.

Ø Returns the subject toward normal (i. e., improves but does not cure the host in Field J) by affecting the pathological biological condition or process coded in Field T-2, when restoration of normalcy is not a matter of correcting an abnormally increased (or speeded) or decreased (or slowed) condition or process. (See the examples with the definition of Symbol L.) Symbol Ø is also used when the test compound initiates again a normal physiological process stopped by the pathology coded in Field E but does not thereby restore it to its fully normal state or rate. Symbol Ø implies only partial relief from the pathological symptom (e. g., balance or behavior) coded in Field T-2; if the host is restored to normalcy or if a pathologically totally suspended process is re-initiated and thereby restored to normalcy, use Symbol L.

P Exacerbates the subject's pathological state (i. e., intensifies the pathological condition of the host in Field J) by further decreasing or slowing the depressed or slowed biological condition or process coded in Field T-2.

Q Exacerbates the subject's pathological state (i. e., intensifies the pathological condition of the host in Field J) by further increasing or speeding the intensified or accelerated biological condition or process coded in Field T-2.

R Exacerbates the subject's pathological state (i. e., intensifies the pathological condition of the host in Field J) by making further deviant the pathological disbalance or behavior coded in Field T-2 (i. e., when the exacerbation is not adequately expressed as "increasing" or "decreasing" the pathologically affected condition or process coded in Field T-2). (See the examples with the definition of Symbol L.)

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0 Causes no effect. To be used only when the test compound was not tested for a specific action on any specific biological condition or process of Field T-2 and it did not produce any specific action. This symbol is used only with Symbol 1 of Field T-2 which is a symbol for a collective general term, in contrast to all other items of Field T-2 which are specific conditions or processes. Consult the Key.

FIELD T-2
Columns 58, 59, 60, and 61

BIOLOGICAL STATE, QUALITY, OR PROCESS ACTED ON OR PRODUCED BY THE TEST COMPOUND OR SECONDARY COMPOUND

1 Gross response. (Use Symbol 1 only with Symbol 0 of Field T-1; together, the symbols mean "does not cause response of any type".)

Death caused by the test compound (Symbols 11 and 111, below) when administration has been by a single dose (not continuous) or when the administration has been continuous or by repeated doses for a maximum of 24 hours or less. The time to death may be >24 hours, if the administration is by a single dose, but if administration is continuous or multiple, death must occur within 24 hours in order to be coded by Symbols 11 or 111.

11 Death produced under the conditions described above, but only when the lethal dose has not been determined for the individual treated (or not determined for the individual of a group treated collectively).

111 Death produced under the conditions described above, but only when the lethal dose has been determined for the individual treated (or for the individual of a group treated collectively).
ACUTE TOXICITY

Death caused by the test compound (Symbol 112) when administration has been only by continuous or multiple doses for more than 24 hours and when the time to death is more than 24 hours.

112 Death produced under the conditions described immediately above, whether the lethal dose has or has not been determined for the individual treated (or for the individual of a group treated collectively).
CHRONIC TOXICITY

Note: Use of Symbols 11, 111, and 112 is restricted to coding death caused in larger organisms, including arthropods not infesting a living host. Death of parasitic, pathogenic, and all microorganisms is coded by symbols of the 17-- and 18-- series. Death in a population of arthropods infesting a living host is coded by symbols of the 13-- series. Consult the Key.

113 Local toxicity. (In addition to these states of toxic response, there are other pathological states listed throughout Field T-2, especially in the symbol series 4---.)
1131 Irritation
1132 Inflammation
1133 Depilation
1134 Vesication
1135 Pruritus
1136 Scorching, burning
1137 Abscess
1138 Contact dermatitis (primary irritation)
1139 Allergic dermatitis (sensitization)
113A Foreign body giant cell formation
113B Water-soaking or water-logging (plant tissues or organs)
114 Systemic toxicity
1141 Acute toxic symptoms
1142 General, non-acute toxic symptoms; "side effect" such as general malaise, lassitude, sleepiness, headache, dizziness, nausea, vomiting, etc.
115 Paralysis
1151 Undefined paralysis; catalepsy. (Use this symbol for "knockdown" effect of insecticide tests.)
1152 Flaccid paralysis
1153 Spastic paralysis
1154 Collapse; prostration
1155 Syncope
9E Coma; stupor
116 Convulsion
1161 Tonic convulsion
1162 Clonic convulsion

1163 Epileptiform convulsion
1164 Opisthotonos
117 Shock, unspecified
1171 Shock, hemorrhagic. To code hemorrhage, use Symbol 871.
1172 Shock, anaphylactic. To code sensitization, use Symbol 58. To code the anaphylactin-anaphylactogen combination itself, use Symbol 8A1. Use Symbol 1172 to code the complex reactions of the organism resulting from the anaphylactin-anaphylactogen combination and known as anaphylactic shock.
1173 Photosensitive reaction
9A1 Motor coordination
12 Viability; ability to survive (resistance to death due to) environmental hazards to which the organism (coded in Field E), or the developmental stage of the organism (coded in Field F), is normally exposed; survival time, as a measure of viability described above. Note: Do not use Symbol 12 for an organism's ability to survive pathology (pathology in Field E and the host in Field J); instead use Symbol 1621, 1631, 1753, or 1754. See the Key discussion of Symbol 12.
13 Reduction of the degree of arthropod infestation of living hosts, when general application is made to the host or hosts bearing the arthropod and the arthropod thereby receives the same application as the surface of the host. Use Symbol 131 or 132, according to the terms in which the results are expressed.
131 Reduction of the number of arthropods infesting a living host (one or many infested host individuals treated). Use Symbol 131 when results are expressed in terms of a percentage of arthropods affected.
132 Reduction of the degree of arthropod infestation of a living host (one or many infested host individuals treated). Use Symbol 132 when results are expressed in terms of the degree of the host's relief from the infestation, rather than in terms of the number or percentage of arthropods disposed of.
14 A biological state or process indicated by the coding of the general type of action in Field T-3. (Use Symbol 14 only when the biological state or process is of a nature that can not be expressed as a single specific response, such as repulsion or attraction to the test compound and when the author describes the test compound effect only by a general term of Field T-3. See the Key.)
15 An unspecified process of the organ or tissue coded in Field H-1 or I. (Use Symbol 15 only when the author does not state the biological process responding more specifically than by reference to an anatomical structure's unspecified functions. See the Key.)

Symbols of the following two series, 16-- and 17--, are used for coding effects on any infectious or non-infectious pathology coded in Field E, EXCLUDING: (1) effects on tumors coded in Field E, for which Symbols 44 through 47 are used, (2) effects on infestation by any arthropod, for which ordinarily only Symbol 131 or 132 is used, and (3) effects on any pathogenic organism which is not on its living hosts; effects on pathogens or any microorganism on a non-living host are coded by symbols of the 18-- series.

16 Exacerbation of (intensification of) the pathological condition in Field E.
161 Increase in numbers of individuals of the pathogenic organism species coded in Field E. (See Symbol 1611 for a maximum degree of increase of numbers and Symbol 1612 for an increase in numbers due to the test compound's causing a reduction of resistance of the host to the pathogen.)
1611 Increase in number of individuals of the pathogenic organism species to the lethal level of the disease. Evaluation in Field Y is to be based on the dose of the compound needed or the time needed for the compound to bring about death, due to its influence in increasing the number of pathogen individuals.
1612 Increase in number of individuals of the pathogenic organism species due to the test compound's causing a reduction of resistance of the host to the pathogenic organism.
162 Acceleration of the progress of the disease (toward the normal peak of the disease).
Note: Use Symbol 162 only for the exacerbation of diseases which are in themselves ordinarily not fatal; if the disease is also fatal in untreated controls, code the acceleration as a decrease in survival time, Symbol 1621. Acceleration of the progress of a non-fatal disease (Symbol 162) must be evaluated by a criterion other than 12 or 57.

1621 Hastening of death due to the pathology (in Field E) which is lethal to untreated controls; decrease in survival time. Acceleration of the progress of a fatal disease is ordinarily evaluated in Field Y by Criterion 12 or 57, coding the decrease in survival time in Field U.

163 Intensification of the disease by specifically increasing the disease beyond its normal peak intensity; i.e., intensification by influencing the disease to a greater intensity than that to which it would normally progress.

1631 Decrease of the number of survivors of the pathology (in Field E) which causes a known mean mortality rate when untreated; increase in the number of deaths due to such a pathology which is lethal to untreated controls. With Symbol 1631, evaluation in Field Y is based on the percentage decrease of survivors and the expression, decrease of the number of survivors, should be in the written portion of Field T-2.

164 Increase in duration of the pathology; prolongation of the symptoms beyond the normal duration.

17 Relief (general or unspecified) from the pathology condition in Field E. (See the note prior to Symbol 16.) Use other symbols of this 17-- series for specific degrees of alleviation of the pathology and for preventive actions.

171 Decrease in number of individuals of the pathogenic organism species coded in Field E. This symbol is used for effects on infectious diseases only. Evaluation in Field Y is to be based on the decrease of the number of pathogens, Criterion 62 or 01 (or 03 or 04). Use Symbol 171 if the reduction of pathogens is incomplete; when the reduction is complete, use Symbol 1711; when reduction is due to an increase in the resistance of the host to the pathogen, use Symbol 1712.

1711 Biological cure (infectious diseases). Demonstrated, 100% decrease in the number of individuals of the pathogenic organism species coded in Field E; sterilization of the host coded in Field J. Evaluation in Field Y is to be based on the potency of the test compound for bringing about cure, not on the percentage of decrease in individuals of the infecting pathogen.

1712 Decrease in the number of individuals of the pathogenic organism species due to the test compound's causing an increase in the resistance of the host to the pathogenic organism.

172 Clinical cure (non-infectious diseases as well as infectious); permanent eradication of symptoms. (In the case of clinical cure of infectious diseases, use Symbol 172, if sterilization is not demonstrated but symptoms do not reappear. Use Symbol 1711, if sterilization is demonstrated. Use Symbol 1721, if the pathogen is demonstrated to persist in spite of clinical cure. Use Symbol 173, if the pathogen is demonstrated to persist after disappearance of symptoms and subsequently causes symptoms again.)

1721 Carrier state (infectious diseases). Use Symbol 1721 for clinical cures caused by the test compound in which the pathogenic organism remains demonstrable in the host but the symptoms prove to have been permanently eradicated.

173 Temporary cure. (Non-infectious diseases: use Symbol 172, if the disease is demonstrated to be permanently clinically cured. Infectious diseases: use Symbol 1721, if the pathogen remains with its host but produces no symptoms thereafter, due to the test compound's effect; however, use Symbol 173, if the pathogen remains with its host but produces symptoms subsequent to a clinical cure.)

174 Prevention of the infectious or non-infectious pathology. If the test compound acts only after the disease has been contracted, use Symbol 176 or other symbols. If application results in the test compound's being a physical barrier on the skin or mucous membrane preventing penetration by pathogenic organisms, or preventing damage due to physical agents such as radiation, use Symbol 178.

175 Repression of either an infectious or non-infectious existing pathology treated by the test compound. Use Symbols 1751 or 1752, if the nature of repression is demonstrated and fits the description of one of those symbols.

1751 Retardation of progress of the infectious or non-infectious existing pathology. (Slowing of the development of the disease which nevertheless progresses to its normal peak.)
Note: Use Symbol 1751 only for retardation of diseases which are in themselves ordinarily not fatal; if death is the ultimate result of the disease in untreated controls, the retarding effect should be coded as an

increase in survival time, Symbol 1753. Slowing of progress of a non-fatal disease must be evaluated by criteria other than 12 or 57.

1752 Restraint of the infectious or non-infectious existing pathology. (Restriction of the disease intensity to a given level or to a given range of intensity indefinitely, not permitting it to progress to a normal peak or to cause death.)

1753 Delay of death due to the pathology (in Field E) which is fatal to untreated controls; increase in survival time. If death is prevented in all individuals which are affected with the disease and to which the test compound is administered, use another symbol to describe the amelioration (Symbol 1711, 172, or 1752). Delay of death is ordinarily evaluated in Field Y by Criterion 12 or 57, coding the increase in survival time in Field U.

1754 Decrease in the number of deaths due to the pathology (in Field E) which is lethal (or which causes a known mean mortality rate) to untreated controls; increase of the number of survivors of such a pathology. If all treated organisms are permitted to survive such a pathology or if the increased number of survivors is known to be also an increase of cure or restraint, use Symbol 1711, 172, or 1752, instead of Symbol 1754. If Symbol 1754 is used, evaluation in Field Y must be on the basis of per cent decrease of deaths and the expression, decrease of the number of deaths, should be used in the written portion of Field T-2.

176 Abortion of early infection. Use Symbol 174 rather than 176 to code prevention of an infection.

177 Decrease of the effect of a specific toxin of a pathogenic organism. (Administration of the test compound with the extract of, or killed cells of, a pathogenic organism.) The toxin, which should have been given a specific code identity, should be coded in Field D. If the test compound antidotes the toxic action 100%, use Symbol 1771.

1771 Prevention of the effect of a specific toxin (coded in Field D) of a pathogenic organism. (If the effect of the toxin is only decreased less than 100%, use Symbol 177.)

178 Protection (for skin and mucous membranes, coded in Field H-1 or I). Prevention of damage due to physical agents such as radiation, temperature extremes, etc. Use Symbol 178 also for coding the chemical's prevention of penetration by pathogenic organisms such as trematode larvae, nematode larvae, or arthropod larvae. Use Symbol 1781 or 1782 only when the specific nature of the protection, as defined by those symbols, is known.

1781 Protection that is essentially mechanical in character. (See Symbol 178.)

1782 Protection that is essentially chemical in character. (See Symbol 178.)

Symbols of the following series, 18--, are used generally only for indicating normal growth, reproduction, etc., of pathogenic or non-pathogenic microorganisms maintained on non-living hosts such as nutrient agar or broth. (Use symbols of the 17-- series for pathogenic microorganisms on living hosts.) If, for any reason, a non-pathogenic microorganism were treated on a living host, this 18-- series might be used.

18 Growth of the microorganism colony; number of individuals in a cultured colony. Symbol 181 or 1812 is always preferred to Symbol 18, except when the author does not distinguish an inhibitory chemical action as being lethal (1812) or merely repressive (181), in which case Symbol 18 may be used (with Symbol 3 of Field T-1).

181 Growth of the microorganism colony; number of individuals in a cultured colony. Use Symbol 181 for either general decrease (stasis) or general increase in the microorganism on the non-living host; if the decrease is demonstrated to be specifically a lethal effect on all or any percentage of the microorganisms in the colony, use Symbol 1812. Use Symbol 1, 2, or 3 in Field T-1.

1812 Death of the microorganism. (Use only with Symbol 7 of Field T-1.) Use Symbol 1812 if a lethal ('cidal) action has been demonstrated on any percentage of the microorganism individuals or on any percentage of the colony.

19 Crop yield, unspecified as to whether it is in terms of the number, size, or frequency of the units, or total mass of the substance, of the crop.

191 Number of crop units (number of fruits, number of flowers, number of leaves, etc.). The organ is coded in Field H-1.

192 Size of crop units (size of fruits, size of flowers, size of leaves, etc.). Use Symbol 281, rather than Symbol 192, if the size is not in terms of a quality of a crop but in terms of the unit as an organ or as the organism.

193 Frequency of bearing of crop units (frequency of production of fruit, flowers, leaves, or other units)

194 Total amount of crop yield (when the "crop" is produced as a mass of a substance rather than as units such as in 191, 192, and 193)

1A Change in flavor or odor of the organism or of the product of the organism. (Symbol 7 of Field T-1.) Use Symbol 1A when the change is qualitative rather than quantitative or when the quantitative change is not expressed either as increase or decrease.

1A1 Intensification of flavor or odor (Symbol 7 of Field T-1)

1A2 Diminution of flavor or odor (Symbol 7 of Field T-1)

2 Growth and differentiation

21 Cell division

211 Mitosis

2111 Prophase

2112 Metaphase

2113 Anaphase

2114 Telophase

2115 Spindle activity

212 Meiosis

22 Cell growth; growth and normal form of the cell and of its essential structures.

221 Ultimate size of the cell

2211 Elongation of the cell. Plant "curvature": Symbol 2211 may be used to code curvature of plant parts due to elongation of cells of one side of the plant structure (stem, petiole, etc.).

222 Shape of the cell

223 Formation of membranes of the cell

2231 Thickening of the cell wall

2232 Sculpturing of the cell wall

2233 Chemical composition of the cell wall

224 Cytoplasmic volume of the cell

225 Nuclear size

226 Nuclear shape

227 Nuclear number

228 Nucleolar size

229 Nucleolar shape

22A Nucleolar number

23 Cell differentiation. Use Symbol 23 for the process of differentiation of certain cell parts. Use Symbol 27 for general differentiation of a cell from a non-specific embryonic type to its mature form (e.g., differentiation to become a unit of a specific type of tissue).

231 Cell inclusion, unspecified. Symbols of the 231- series represent the character of certain cell parts differentiated within the cell during its development.

2311 Vacuole size

2312 Vacuole number

2313 Plastid size

2314 Plastid number

2315 Number (or activity) of mitochondria, Golgi bodies, etc.

25 Spore germination (including pollen and megaspore "germination"). See Symbol AA2 for spore formation.

251 Percentage of spore germination

252 Length of germ tube

26 Seed germination. (Use Symbol 26 only if it can not be determined whether the process affected is in terms of the germinative process or the total gross process ending with emergence.)

261 Seed germination, regardless of emergence

262 Emergence of seeds from the soil or other material in which they were planted. Use Symbol 262 for the activity of germinating seeds in emerging from the soil, as well as for germination expressed in terms of the emerged seedlings.

27 Tissue differentiation. For tissue degeneration, use Symbol 418D (histolysis) or a symbol of the atrophy series, 411-.

271 Tissue formation (organization from embryonic origins)

272 Tissue regeneration (e.g., wound healing)

2721 Granulation; the formation of granulation tissue

2722 Organization of regenerative tissue

2723 Cicatrization

2724 Fibrosis, the formation of fibrous tissue

2725 Fibrosis specifically for adhesion

2726 Replacement fibrosis, specifically replacing fatty tissue

2727 Replacement fibrosis, tissue replaced unspecified

28 Organ formation; organ growth; organ size. Use Symbol 28 only when the data do not clearly indicate whether it is the formation, growth process, or ultimate size of the organ that is affected.

281 Organ size; ultimate dimension

2811 Organ weight

282 Organ shape. (Use only with Symbol 6 of Field T-1.)

283 Organ growth. (If the rate of growth is the aspect affected, use Symbol 2831.)

2831 Rate of growth of the organ

284 Organ formation from undifferentiated tissues

29 Molting; metamorphosis; the process of an individual's change from any juvenile stage to another or to the adult. Consult the Key.

291 Ecdysis

2A Organism development, growth, size; (multicellular organisms only; for growth of individuals of unicellular Protozoa, Fungi, etc., use symbols of series 22--; for growth of the mass or colony of individuals of a unicellular organism, use a symbol of the 17-- or 18-- series). Use Symbol 2A only when the data do not clearly indicate whether it is the development (structural organization during growth, 2A2) or growth (increase in size in terms of linear measure or mass, 2A1; weight, 2A11; etc.) that is affected.

2A1 Organism size (mass) and form; ultimate normal dimensions and shape

2A11 Organism weight

2A12 Organism surface area

2A13 Organism volume

2A14 Organism shape, normal proportions

2A2 Organism development (structural organization during growth, disregarding increase in mass)

2A3 Organism growth process; increase in mass in normal proportions

2A4 Regional growth of the entire plant; growth of specific anatomical areas of the plant. For plant growth expressed as weight, volume, etc., use symbols of series 2A1-.

2A41 Terminal growth of the entire plant (as opposed to lateral growth, Symbol 2A42). The "terminal" part includes all structures (leaf, stem, flower) at the apex of the plant and does not refer to any one of these parts such as terminal leaf; however, Symbol 2A41 can be used for coding terminal growth of the primary "stem" or "trunk". Use Field T-1 Symbol 1, 2, 3, etc.

2A42 Lateral growth of the entire plant (as opposed to terminal growth, Symbol 2A41). The "lateral" part includes all structures (leaf, branch, flower) growing below the apical region of the entire plant. Use Field T-1 Symbol 1, 2, 3, etc.

2B Maturing process of the organism; assumption of the mature adult characteristics, in animals and annual and biennial plants usually associated with maturing of reproductive organs, but in perennial plant individuals, it is more a matter of age and size limitations imposed by genetic constitution. For certain organisms (certain arthropods and amphibia), maturing may be coded by Symbol 29, if expressed specifically as "metamorphosis".

2C Aging; the process of degeneration of both reproductive and somatic parts and activities, following maturation of the individual multicellular organism, ending in death.

2D Inactive state, unspecified

2D1 Dormancy, hibernation, estivation

2D2 Diapause. (This term refers only to arrests of insect development.)

2E Hatching process

2F Blooming process. Use Symbol 2F for the normal opening and functioning of the flower or flower crop of a plant. (Use a symbol of the 28-- series for the general development of the flower as an organ [size, weight, etc.] and symbol F924, FA24, or 416 for color of the flower.)

2G Excystment process. Use Symbol 2G for successful emergence from a protective coating, the cyst wall or capsule, of a quiescent stage (described as the "cyst" stage of certain organisms), at the beginning of a new active stage. Do not use Symbol 2G for the emergence of insects from the pupa case which would be more appropriately an item under the 29-- series.

3 Genetic change, unspecified. Symbols of the 3--- series are concerned with modification of the material or structures of cells which are genetic determiners, chromatin, chromosomes, genes. Included are (a) the specific modifications, (b) the normal incidence of these modifications, and (c) specific changes in the anatomy or physiology of the organism (for which a chromosome is the determiner) due to a known modification of the chromosome or gene.

31 Structural change of the cellular elements which are determiners for the organism's characteristic structure and physiology.

311 Polyploidy, haploidy

312 Chromosome modification, unspecified, involving the normal number of chromosomes

3121 Translocation
3122 Inversion
3123 Deletion
3124 Fragmentation
3125 Gene mutation
32 Physiological change of the organism, unspecified, due to a specific genetic modification
33 Incidence of an unspecified genetic change. (Use with Symbol 1 or 2 of Field T-1.)
34 Somatic mutation
35 Anatomical change of the organism, unspecified, due to a specific genetic mutation
4 Pathological states involving abnormal growth and differentiation or degeneration
41 Abnormal morphological states, exclusive of tumors and unspecified concrements and casts (see Symbols 421, 43, etc.)
411 Atrophy, including toxic atrophy. (Use Symbol 411 only if the atrophy is not specified according to a general type indicated by Symbol 4111, 4112, etc.) For abnormally diminutive morphological structures due to faulty development (e.g., hypoplasia), use symbols of the 28-- or 2A-- series.
4111 Simple atrophy
4112 Pyknosis
4113 Inflammatory atrophy
844 Cytolysis
418D Histolysis
412 Hypertrophy (a process or state of the component cells' enlarging or being enlarged rather than an abnormal increase in number of cells)
413 Hyperplasia other than tumors (Symbol 43--, 44--, etc.). A process or state of the component cells' increasing in number, yet essentially retaining their normal character.
414 Altered form. Abnormal form of the organism or the structure in Field H or I, due to abnormal growth of some part or parts of the organism or structure.) Monstrosity. Abnormal caste form (e.g., abnormal body form of the individual of a bee or ant colony). Abnormal type of colony (fungal or bacterial colony form, e.g.). Use Symbol 414 for abnormal form of plant parts, such as leaf roll, petal roll, abnormal leaf or petal shape, or abnormal leaf or petal pattern. If the change is a plant "curvature" due to unequal cell elongation, use Symbol 2211 rather than 414.
415 Texture change, unspecified (abnormal thickness, stiffness, harshness, elasticity). For specific texture changes, use a specific symbol such as 4151 (abnormal hardness, abnormal softness, abnormal thickness, etc.)
4151 Abnormal hardening; sclerosis
416 Discoloration (different hue or intensity than normal to the individual or variety). See also Symbols 8771, FA24, etc.
4161 Russeting (of fruits)
4165 Chlorosis, unspecified as to cause
4166 Abnormal increase in depth of green color of plants
FA24 Icterus (with bile coded in Field D)
874 Cyanosis
8771 Flushing, erythema (skin)
8781 Pallor due to blood withdrawal from the skin
8531 Pallor due to anemia
FA24 Melanosis
417 Lesion (e.g., a wound or mechanical injury or toxic lesion), destructive process or state other than those indicated by other symbols of the 4--- series and by symbols of the 113- and 114- series. This symbol is generally used only for symptoms (of a disease coded in Field E) treated by the test compound, rather than injury caused by the test compound. Symbol 417 is used for destructive injury that is unspecified yet can not be indicated by Symbol 41 because the latter indicates only unspecified change including hypertrophy as well as destructive change.
418 Degeneration, unspecified
4181 Necrosis, unspecified
418A Necrosis, liquefactive
418B Necrosis, coagulative
418J Necrosis, hemorrhagic
418K Necrosis, caseous
4182 Caries
4183 Cloudy swelling (parenchymatous degeneration)
4185 Hydropic degeneration
4186 Fatty degeneration and/or fatty infiltration
4187 Hyaline degeneration
4188 Amyloid degeneration
418F Mucinoid degeneration
418G Fibrinoid degeneration
4189 Cirrhosis
418A Necrosis, liquefactive
418B Necrosis, coagulative; infarction; thrombotic or embolic necrosis, unspecified. (See Symbol series 87--.)
418D Histolysis or unspecified autolysis
844 Cytolysis
418E Necrobiosis

845 Karyolysis or karyorrhexis
418F Mucinoid degeneration
418G Fibrinoid degeneration
418H Demyelination
418J Necrosis, hemorrhagic
418K Necrosis, caseus
2724 Fibrosis; the formation of fibrous tissue
2725 Fibrosis specifically for adhesion
2726 Replacement fibrosis, specifically replacing fatty tissue
2727 Replacement fibrosis, tissue replaced unspecified
421 Casts, concretions, unspecified. Use Symbol 421 only if specific casts or concretions are not identified (Symbols FA2-, FA3-, or FA4-, for mineral deposits, calcifications, urate or cholesterol deposits).
43 Neoplasia (the formation of a new, abnormal growth [neoplasm] the component cells increasing in number and being altered from a normal character though they may retain some similarity to the normal cells from which they are derived). Use Symbol 413 for hyperplasia (enlargement of a part due to increase of cells which retain their normal character, not a neoplasm). Use Symbol 43 only with Symbol 7 (or 8, 9, A, or C) in Field T-1 and identify the tumor or tumor type produced in Field E; i.e., use Symbol 43 only when the test compound produces (or is tested to produce) a tumor (indicating carcinogenic action). If a pre-existing tumor is treated with the test compound, use Symbol 44, 45, or 46.
44 Tumor growth; size of a pre-existing tumor (treated by the test compound) or rate of tumor growth. Use Symbol 44 only with Symbol 1, 2, or 3 (or 8, 9, A, or C) of Field T-1. Code Field E with the tumor identity, if known, or the tumor type or with Symbol S. (Use only Symbol 43 for tumor production by the test compound.) Acceleration or retardation of a lethal tumor is always evaluated in Field Y by Criterion 12 or 57, using Symbol 44 in Field T-2 and Symbol 1, 2, or 3 in Field T-1.
45 Tumor regression; reduction in size of a pre-existing tumor treated by the test compound. Symbol 45 will ordinarily be reasonably used only with Symbol 7 (or 8, 9, A, or C) in Field T-1. Its use with Symbol 1 or 2 of Field T-1 to code slowing or speeding of a naturally regressing tumor is improbable. Code Field E with the tumor identity, if known, or tumor type, or with Symbol S. (Use only Symbol 43 for tumor production by the test compound.)
46 Tumor metastasis (process of); spread of a pre-existing tumor treated by the test compound (not the growth rate of any one secondary growth). Use Symbol 46 with Symbol 7, 1, 2, or 3 (or 8, 9, A, or C) in Field T-1. Code Field E with the tumor identity, if known, or tumor type, or with Symbol S. Code the primary site of the tumor in Field H-1; do not code the site of metastasizing. (Use only Symbol 43 for tumor production by the test compound.)
47 Tumor incidence; incidence of spontaneously occurring tumors or incidence of tumors induced by physical factors other than the test compound. Use Symbol 47 only with Symbol 1 or 2 (or 8, 9, A, or C) of Field T-1. Code Field E with the tumor identity, if known, or tumor type, or with Symbol S. (Use only Symbol 43 for tumor production by the test compound.)
5 Adaptive effects. (Symbol 5 is of improbable use; specific adaptive effects are indicated by 51, 511, 512, etc.)
51 Tolerance; resistance; refractoriness; lack of sensitivity. Use Symbol 51 only when it is not known whether the phenomenon occurs in an individual of the test organism species during its lifetime (Symbol 512 or 513) or occurs to the species due to selection over several generations (Symbol 511). Consult the Key for an explanation of the use of Symbol 51 and the coding of Field T-1 when this symbol is in Field T-2.
511 Inheritable tolerance; production of a race tolerant to the test compound due to exposure to the test compound. Consult the Key for an explanation of the use of Symbols 51, 511, and 512.
512 Individual tolerance (physiological tolerance); increase in tolerance to the test compound during the lifetime of the individual of the test organism species due to administration of the test compound. Consult the Key for an explanation of the use of Symbols 51, 511, and 512.
513 Tolerance by tachyphylaxis. Consult Key for an explanation of the use of Symbols 51, 511, 512, and 513.
5131 Cross-tachyphylaxis; tolerance to a secondary compound (Field D) due to tachyphylaxis by the test compound. Consult the Key.

514 Cross-tolerance; tolerance to a secondary compound (Field D) due to administration of the test compound. (Consult the Key.)

5C Resistance (tolerance) of an organism (host) to a pathogen, parasite, non-infectious pathology, or tumor. (See Symbol Series 5C. For tolerance of the test compound or secondary compound, use Symbol 51, 511, 512, 513, 5131, or 514.)

52 Pathogenicity of the parasite; virulence. Use only Symbol 1 of Field T-2 with Symbol 52 to code the increase of virulence of the pathogen. Use Symbol 2 in Field T-1 with Symbol 52 to code attenuation (decrease of virulence) of the pathogen. Use Symbol 52 itself only if it is not known whether the effect is on the virulence of the individual of the species within its lifetime (Symbol 522) or an inheritable effect on the virulence of the species (Symbol 521). Use Symbols 52, 521, and 522 to include all aspects of successful infection by the parasite, as well as ultimate intensity of symptoms it can cause, such as the ability to penetrate the host, the ability to establish in the host, etc.

521 Inheritable pathogenicity of the parasite. (See the definition of Symbol 52.)

522 Pathogenicity of the individual parasite. (See the definition of Symbol 52.)

53 Motility

54 Tropistic response, unspecified

541 Phototropism or phototaxis (unspecified as to whether negative or positive)

5411 Positive phototropism; positive phototaxis

5412 Negative phototropism; negative phototaxis

542 Photophobia

543 Chemotropism or chemotaxis (unspecified as to whether negative or positive)

5431 Positive chemotropism or positive chemotaxis

5432 Negative chemotropism or negative chemotaxis

55 Behavior of the individual. (Use Symbol 55 only with Symbol 6 [or L, O, or R] of Field T-1.)

56 Behavior of the group. (Use Symbol 56 only with Symbol 6 [or L, O, or R] of Field T-1.)

57 Abscission (e.g., leaf or flower abscission) or autotomy (separation by an animal of one of its parts)

58 Sensitization. Use Symbol 58 only for the phenomenon which results from the administration of certain test compounds (ordinarily non-toxic proteins), develops during an incubation period following administration, and which results in a characteristic and more or less violent reaction on a subsequent administration of the test compound. This sensitization is a process known to involve stimulating production of antibodies and the sensitive reaction (e.g., anaphylactic) is due to the antigen-antibody combination. For sensitivity increases not falling within the specific definition of sensitization, use symbols of the 51-- series.

581 Anaphylactic sensitization; stimulation of anaphylactin by anaphylactogen

1172 Anaphylactic shock

582 Photosensitization

59 Lag period (recovery period) following inoculation. Use Symbol 59 only to indicate the period between introduction of a microorganism into a nutrient medium and the time at which it begins to grow. Symbol 59 is not to be used for latent periods following muscle or nerve stimulation (Symbol Series 81-- and 9---).

5A Addiction, habituation, dependence

5B Photoperiodism. Use Symbol 5B only with Symbol 6 (or 8, 9, A, C, L, O, or R) of Field T-1.

5C Resistance (tolerance) of an organism (the host, coded in Field J) to a pathogen, parasite, tumor, or non-infectious disease (coded in Field E), unspecified as to cause. Do not use Symbol 5C itself with Symbol 1 or 2 of Field T-1. Use Symbol 5C only if the test compound causes resistance to the pathogen, tumor, or non-infectious pathology of Field E (Symbol 7 of Field T-1). Use Symbol 5C1, 5C2, or 5C3 for an effect of the test compound on a specific type of resistance to pathology.

5C1 Resistance of an organism to a pathogen, parasite, tumor, or non-infectious pathology, due to exposure to a vaccine or other chemical coded in Field D. (Use Symbol 5C1 only with Symbol 1 or 2 of Field T-1.)

5C2 Resistance of an organism to a pathogen, parasite, tumor, or non-infectious pathology, due to exposure to the pathogen, tumor, or pathology in Field E. (Use Symbol 5C2 only with Symbol 1 or 2 of Field T-1.)

5C3 Natural resistance of an organism to a pathogen, parasite, tumor, or non-infectious pathology. (Use Symbol 5C3 only with Symbol 1 or 2 of Field T-1.)

7 Enzyme and enzyme action. (See the note below.)

> Note: If the test compound affects, or is tested to affect, metabolic action of any enzyme (including any metabolic action for which there is a specific Field T-2 symbol), Field T-2 is always coded with the specific enzyme (see the special Enzyme Code of Field T-2) rather than the metabolic activity of the enzyme disturbed by the test compound. See the Key.

8 Tissues, cells, fluids (specific conditions or processes of tissues, cells, fluids). Symbol 8 is not intended particularly for use for coding even unspecified conditions or processes. It is intended here merely as a heading for this series dealing with the structures indicated.

81 Muscle activity

811 Excitability

8111 Refractory period. Do not use Symbol 8111 for the normal latent period following muscle stimulation.

812 Conduction (transmission)

813 Contraction. Use Symbol 813 only for normal muscle contraction. Use other symbols for abnormal contraction (e.g., contracture, Symbol 818; muscle spasm, Symbol 8136, and muscle rigor, Symbol 819).

8131 Force of normal contraction

8132 Rate of normal contraction

8133 Amplitude of normal contraction

8134 Peristalsis

8135 Spontaneous contraction other than peristalsis

8136 Muscle spasm (including muscle twitching)

814 Normal relaxation of muscle

815 Action of specific anatomical muscles or muscle groups, unspecified. (Use symbols of the 815- series to code a result of muscle contraction or of muscle relaxation, which may be caused or affected by the test compound. For example, flexions, extensions, constrictions, dilations, etc. of the body of the animal or its parts.

8151 Vasoconstriction (of the vessel specified in Field H-1 or Field H-2). Contraction of the muscular coats of blood vessels. This is not tantamount to increase in blood pressure (Symbol 8211).

8152 Vasodilation (of the vessel specified in Field H-1 or Field H-2). Relaxation of the muscular coats of blood vessels. This is not tantamount to decrease in blood pressure (Symbol 8212).

8153 Extension of the invertebrate (e.g., molluscan) body from its encasement, shell, or tube. (Consult the Key.)

817 Tonus

818 Contracture (prolonged contraction which is reversible; irreversible [permanent] contraction is not contracture but rigor, Symbol 819)

819 Rigor

81A Muscle fatigue

81B Tetany

81C Fibrillation of skeletal muscle. (For cardiac muscle fibrillations, see Symbol Series C---.)

9A3 Tremor

82 Body fluid pressure, unspecified as to which fluid.

821 Blood pressure, unspecified as to whether increased, decreased, venous, arterial, etc. Symbol 1 or 2 of Field T-1 may not be used with Symbol 821. Consult the Key.

8211 Increased blood pressure (above the pressure characteristic of the individual treated) due only to vasopressor action which causes the increase in pressure through vasomotor stimulation and vascular constriction. (Vasoconstriction, however, is not tantamount to an increase in blood pressure. Use Symbol 8151 for the specific state of vasoconstriction.) Use Symbol 8211 for any vasopressor effect resulting in increased blood pressure and caused by the test compound (Symbol 7 of Field T-1) or (as a symptom of a pathology) affected by the test compound (Symbol 1 or 2 of Field T-1). Do not use Symbol 8211 for increased blood pressure due to any cause other than vasopressor effect (e.g., do not use 8211 for increased pressure due to increase in blood volume). Identify the vessel, artery or vein, in Field H-1.

8212 Decreased blood pressure (below the pressure characteristic of the individual treated) due only to vasodepressor action which causes the decrease in pressure through vasomotor depression and vascular dilation. (Vasodilation is not tantamount to decrease in blood pressure. Use Symbol 8152 for the specific state of vasodilation.) Use Symbol 8212 for any vasodepressor effect resulting in decreased blood pressure and caused by the test compound (Symbol 7 of Field

T-1) or (as a symptom of a pathology) affected by the test compound (Symbol 1 or 2 of Field T-1). Do not use Symbol 8212 for decreased blood pressure due to any cause other than vasodepressor effect (e.g., do not use 8212 for decreased pressure due to a decrease in blood volume). Identify the vessel, artery or vein, in Field H-1.

824 Spinal fluid pressure
825 Intraocular pressure
83 Protoplasmic state, protoplasmic processes, and general activity of the protoplasmic unit, the cell. Symbol 83 itself is not intended to be used for a state that can be affected by the test compound; only the symbols of this series, 831, 832, etc., indicate specific protoplasmic states or processes that may be caused or affected by the test compound.
831 Streaming of protoplasm
832 Viscosity of protoplasm
833 Sol-gel transformation
834 Coagulation of protoplasm. (Coagulation of blood is coded by Symbol 873. Coagulation precipitation of a precipitinogen is coded by Symbol 837.)
835 Agglutination of cells other than blood cells. Use Symbol 854 rather than 835 for blood cell adherence. (Use only Symbol 7 [or 8, 9, A, or C] with Symbol 835.)
836 Phagocytic activity of cells
837 Precipitation by the production of precipitin by cells
838 Osmotic pressure of the cell
839 Spreading factor
83A Birefringence of protoplasm
83B X-ray diffraction of protoplasm
83C Opacity of protoplasm
83E Reactivation of cells (after inactivation, by irradiation, e.g.)
83E1 Photoreactivation (recovery [from irradiation damage] by exposure to white light)
84 Membrane character; membrane activity. (If the membrane is of a tissue or cell of a multicellular test organism, specify the tissue in Field I.)
841 Surface activity of membranes
842 Permeability. (Use Symbol 842 when the character of the membrane's permeability is demonstrated to have been altered by the test compound. When the test compound effect is observed to be selectively on the passage of a particular secondary compound across the membrane, the effect should be coded by use of Symbol FG-- rather than Symbol 842.)
95 Bioelectric (resting) potential
844 Cytolysis. (Use Symbol 844 to code hemolysis, with red blood cell coded in Field H-1.)
845 Karyolysis; karyorrhexis
4112 Pyknosis
85 Blood cells, unspecified. (Use only Symbol 851, 852, etc., for specific qualities of blood cells. Symbol 85 itself has no particular use.)
851 Normal number of blood cells. (Use Symbol 851 for the normal blood cell number which may be affected by the test compound. Use Symbol 853 for any decreased number of blood cells, which condition may be relieved or exacerbated by the test compound.)
852 Normal proportion of blood cells. (Use Symbol 852 only with Symbol 6 of Field T-1.)
853 Anemia, unspecified as to being a decrease in blood cells, or a decrease in hemoglobin, or both.
8531 Pallor of anemia
854 Blood cell adherence (exclusive of thrombosis, embolism, and clotting)
8541 Rouleaux formation
8542 Blood cell clumping; blood sludging
855 Blood cell fragility
86 Cell-plasma ratio of blood, hematocrit. (Use Symbol 86 only with Symbol 6 of Field T-1.)
861 Sedimentation rate
87 Blood, plasma, body fluid; state and activity of fluid tissues, unspecified. This symbol is not intended so much for use in coding as it is intended as a heading for a category of symbols. For example, for decrease in blood, use Symbol 871; for effects on blood clotting, use Symbol 873, etc.
871 Decrease in blood volume; hemorrhage; bleeding; diminished blood volume
1171 Hemorrhagic shock
1154 Collapse (associated with depression and circulatory failure)
1155 Syncope
872 Abnormal extravascular accumulation of body fluid, unspecified
8721 Edema, unspecified; dropsy, unspecified
8722 Ascites
873 Clotting processes, unspecified
8731 Prothrombin time
8732 Clotting time
8733 Thrombosis
8734 Embolism
8735 Bleeding time
874 Cyanosis
875 Dehydration

877 Hyperemia (active or passive); blood congestion of specific body parts (specify the body part in Field H-1), except skin; use Symbol 8771 specifically for blood congestion in skin.

8771 Flushing of skin; erythema; hyperemia of skin. (Do not use Symbol 8771 for the flash or temporary flushing of the skin due to vasodilation and increased blood flow, but only for actual blood congestion of some longer duration.)

878 Ischemia; temporary blood deficiency, chiefly due to local constriction of blood vessels (name the body part in Field H-1), except skin; use Symbol 8781 specifically for temporary blood deficiency of the skin. For permanent blood deficiency (leading to infarction), use Symbol 418B.

8781 Pallor due to drainage of blood from the skin

418B Obstruction of circulation (permanent blood deficiency of a specific body part), leading to necrosis of the affected part; infarction; coagulation necrosis; thrombotic or embolic necrosis, unspecified.

87A Exudation

87B Filtration of blood or lymph; selective filtration and removal of specific blood components or lymph components, unspecified

88 Normal chemical balance of protoplasm, cells, tissues, and body fluids, unspecified

881 pH

882 Eh (oxidation-reduction potential)

883 Alkaline reserve

884 Acid-base balance

89 Serum. (Note; The items listed under Symbol 89 describe and are related to serum and its components, their properties, and their normal and abnormal states. Use symbols of the 8A-- series for coding the phenomena associated with specific serum components involved in immunological activity.)

891 Antibody production (except histamine-specific antibody production, Symbol 8911)

8911 Histamine-specific antibody production. Use Symbol 8911 only with Symbol 1, 2, or 3 (or 8, 9, A, or C) of Field T-1.

892 Complement

8A Immunity; immunological reactions (involving specific substances of the serum [as well as cells of the organism in general], whose production is coded by symbols of Series 89--), unspecified.

Note: The general processes of an organism's becoming more tolerant or more sensitive to the test compound, secondary compound, or other organisms or of being sensitized are coded as adaptive processes by symbols of the 5--- series (51--, 5C--, and 58). The complex of reactions resulting from administration of the test compound to an organism made sensitive or sensitized is generally more suitably coded with special symbols of the 115-, 116-, or 117- series (e.g., Symbol 1172). Use Symbols of the 8A series only for the reactions at the cellular/tissue level.

8A1 Anaphylaxis. Use Symbol 8A1 only for the actual combination of anaphylactin-anaphylactogen. Use Symbol 581 for the particular sensitization process stimulating anaphylactin production. Use Symbol 1172 for response to the anaphylactin-anaphylactogen combination, anaphylactic shock.

581 Anaphylactic sensitization

1172 Anaphylactic shock

8A2 Allergic manifestations other than anaphylaxis, unspecified. See the notes accompanying Symbols 8A and 8A1.

582 Photosensitization

1173 Photosensitive reaction

51 Reduction of sensitivity. (See all symbols of the 51-- series.)

8B Organelle function, unspecified. (Function of special structure of a cell.)

8B1 Trichocyst discharge; nematocyst discharge

9 Function (normal or abnormal) of nerve tissue or of the nervous system, unspecified

91 Psychic state, unspecified

911 Disorientation, confusion

912 Hallucination; hallucinosis

93 Excitation and transmission in nerve tissue

931 Threshold

932 Accommodation, adaptation

933 Refractory period of nerve

934 Supernormal period

94 Chronaxie

95 Action potential and resting potential

96 Brain wave

97 Synaptic transmission, unspecified; ganglionic transmission, unspecified

971 Presynaptic transmission

972 Postsynaptic transmission

98 Neuromuscular transmission

981 End-plate potential

982 Muscle potential

983 Neuromuscular delay
99 Reflex activity, unspecified
991 Patellar reflex (knee jerk)
992 Light reflex
993 Crossed extension reflex
994 Conditioned reflex, unspecified
995 Flexor reflex
996 Herring Breuer reflex
9961 Herring Breuer inflation reflex
9962 Herring Breuer deflation reflex
997 Tonic neck reflex
998 Pressoreceptor reflex (carotid sinus, aortic body)
9981 Carotid sinus reflex
9982 Aortic body reflex
9983 Aortic depressor reflex
9984 Cardiac reflex, left
9985 Cardiac reflex, right
9986 Bainbridge reflex
9987 Pulmonary depressor
9988 Coronary chemoreflex (Bezold-Jarisch effect)
9989 Pulmonary chemoreflex
999 Respiratory chemoreceptor reflex
9991 Carotid body chemoreceptor reflex
99A Righting reflex
99B Swallowing reflex. Use Symbol FFA- for coding emesis (vomiting). Use Symbol 99F for the vomiting reflex.
99C Clonus
99D Corneal reflex (wink, lid reflex)
99E Scratching reflex
99F Vomiting reflex. Use Symbol FFA- for the process of vomiting as a method of elimination or loss of foreign materials from the organism.
99F1 Retching movement
99G Cough reflex
9A Motor activity, unspecified. (Note that general motility is coded with Symbol 53.)
9A1 Motor coordination
9A2 Nystagmus
9A3 Tremor
9A4 Hyperactivity
9A5 Asthenia, weakness, fatigue
9A6 Lethargy, apathy
9A7 Shivering
9A8 Decerebrate rigidity
9B Sensory activity, unspecified
9B1 Perception of stimulus (irritability, excitability)
9B2 Discrimination
9B3 Photoreception (vision)
9B4 Hearing
9B5 Equilibrium
9B6 Vertigo
9B7 Chemoreception
9B71 Gustatory chemoreception
9B72 Olfactory chemoreception
9B8 Pain
9B9 Tactile sensation
9BA Temperature change perception
9BB Nausea
9BC Appetite
9C Proprioreception
9D Sedation
9E Coma, stupor
9F Hypnosis, sleep production
9G Stimulation, analepsis, insomnia
A Reproductive process or activity, unspecified
A1 Gamete formation, unspecified
A11 Spermatogenesis
A12 Oögenesis
A2 Gamete motility
A3 Gamete release
A31 Ovulation
A4 Fertilization; gamete fusion
A5 Oviposition, egg-laying
A51 Implantation of ovum
A6 Sexual activity, unspecified; function of gonads and accessory organs, unspecified
A61 Abortion
A62 Parturition
A63 Menstruation
A9 Self sterility (of monoecious or hermaphroditic organisms)
AA Asexual reproduction
AA1 Vegetative reproduction; budding
AA2 Spore formation
AA3 Parthenogenesis
AA4 Parthenocarpy
B Ventilation process, unspecified
B1 Gross respiratory activity, unspecified as to phase or quality
B11 Depth of intake
B12 Minute volume
B13 Rate
B14 Cough
B15 Dyspnea
B16 Orthopnea
B17 Hyperpnea
B18 Cheyne-Stokes respiration
B19 Sneeze
B1A Hiccough
B2 Spiracular movement
B3 Gaseous diffusion
C Cardiovascular activity
C1 Cardiac rate
C11 Auricular functional abnormality, unspecified
C111 Auricular premature contraction
C112 Auricular tachycardia
C113 Auricular fibrillation
C114 Auricular flutter
C12 Ventricular functional abnormality, unspecified

C121 Ventricular premature contractions, extra systoles, idioventricular coupling, ectopic beats
C122 Ventricular tachycardia
C123 Ventricular fibrillation
C13 Pace maker and conduction abnormality, unspecified
C131 Sinus arrhythmia
C132 Sinus bradycardia
C133 Sinus tachycardia
C134 Sino-auricular block
C135 Sinus arrest
C136 Auricular-ventricular block
C137 Nodal rhythm
C2 Amplitude of heart beat
C21 Force of contraction; systolic force
C22 Cardiac output
C23 Ballistocardiogram
C4 Electric activity (electrocardiogram)
C6 Circulatory rate
C8 Circulation (specify the organ in Field H-1)
C81 Blood flow
C811 Acceleration of blood flow
C812 Retardation of blood flow
C9 Standstill, heart arrest
C91 Systolic standstill
C92 Diastolic standstill
F Metabolic activity, unspecified
F1 Respiration and fermentation, unspecified. Symbol F1 is used for metabolic respiration; to code ventilation, breathing, etc., use symbols of series B---. If an enzyme is specified, use the symbol for the enzyme (Enzyme Code) rather than a symbol of the F--- series.
7 Enzyme and enzyme action. (See the note accompanying Symbol 7, following the 5--- series.)
F11 Oxygen uptake
F12 Carbon dioxide uptake
F121 Aerobic respiration
F122 Anaerobic respiration
F13 Respiratory quotient
F14 Bioluminescence
F15 Gas formation, unspecified
F16 Acid production, unspecified
F17 Nitrogen utilization
F171 Nitrogen balance. Use Symbol F171 only with Symbol 6 of Field T-1.
F18 Carbohydrate and phosphate utilization
F19 Fat utilization
F2 Function of a vitamin or mineral "trace element", unspecified. Use symbols of the F2-- series only for functions of those dietary components needed in relatively minute quantities and which frequently serve more as regulatory substances than as materials for growth and energy source. For functions of proteins, fats, carbohydrates, water, major minerals (elements, ions, salts) which serve as energy sources, as materials for structural growth, or as regulatory or osmotic and acid-base balance, etc., use symbols of series F4--.
F3 Dietary intake; intake of all components of the diet; ingestion. (For coding the plant process of taking in materials from the soil, water, or other medium in which the plant grows, use Symbol F6-- rather than Symbol F3.)
9BC Appetite
F4 Function of protein, carbohydrate, fat, water, or major salt, either as an energy source (catabolism) or as a material for growth (anabolism). Symbols of the F4-- series are generally for use only with Symbol A of Field T-1 to indicate that the test compound can replace the specific energy source (F4i-) or replace the material normally incorporated for growth (F42). (The compound replaced is identified in Field D.) Symbol 7 of Field T-1 may be used with these symbols, however, to indicate that the test compound "has" the function as defined by F41- or F42-.
F4i Function of components of the biological organism as sources of energy (catabolism). (Protein, carbohydrate, or fat--functioning as sources of energy.) Unspecified. (See the definition for Symbol F4.)
F42 Function of components of the biological organism, or of its diet, as materials for growth (anabolism). (Protein, carbohydrate, fat, salt, water, etc., as materials eligible for incorporation for protoplasmic growth or specific deposit.) Unspecified. (See the definition for Symbol F4.)
F5 Basal metabolism
F7 Photosynthesis
F71 Photosynthetic CO_2 uptake
F72 Photosynthetic O_2 output
FD Body temperature. To code "fever" or hypothermia, use Field T-1 Symbols 1, K, N, or Q or Symbols 2, J, M, or P, respectively.

FIELD T-2
Columns 58, 59, 60, and 61

The code symbols on this page, Symbols F6--, F8--, F9--, FA--, FB--, FC--, FG--, FH--, and FI--, require appending one of the code symbols of the opposing list (Symbols --1, --11, etc.) to indicate the chemical whose metabolic handling is affected by the test compound. They are coded with Symbols 7, 1, 2, or 3 of Field T-1 (only Symbol 7, in the case of Symbol FH--), unless the test compound affects a secondary compound's effect on the metabolic handling of compounds of the opposing list (Symbols 8, 9, A, or C of Field T-1). Symbol FA-- and FB-- (and, when a pathology is coded in Field E, Symbols F8-- and FI--) can be combined with Symbol --B (to make Symbols FAB, FBB, F8B, and FIB) and coded with Symbol 7 (never with Symbols 8, 9, A, or C) of Field T-1 to indicate that the test compound is stored, absorbed, synthesized, or withdrawn. Each of the nine symbols is defined only briefly here to permit all nine being on a single page for convenience in matching and combining them with the symbols of the opposing list. The Key continues the definition for each separately, indicating specifications and limitations of their use; reference must be made to those Key definitions and explanations to use the symbols correctly.

In each case, identify in Field D the specific secondary compound (indicated in Field T-2 only by type, by the last two units of the symbol), if known, except when Field T-1 is coded with Symbol 8, 9, A, or C, when the secondary compound (whose effect on the metabolism of the compound indicated by one of the symbols of the following list is affected by the test compound) is coded in Field D and the specific identity of the compound whose metabolism is affected is only written, not coded, in Field T-2.

F6-- Nutrient uptake; uptake of the type of nutrient indicated by the last two units of the symbol.

F8-- Chemosynthesis; synthesis of the type of secondary compound indicated by the last two units of the symbol; synthesis of the test compound indicated by Symbol F8B (ONLY when synthesis of the test compound is a symptom of a pathology coded in Field E).

F9-- Distribution of the type of secondary compound indicated by the last two units of the symbol.

FA-- Storage, deposit, concentration, or tissue level of the type of secondary compound indicated by the last two units of the symbol; storage, deposit, or tissue level of the test compound, indicated by Symbol FAB.

FB-- Absorption of the type of secondary compound indicated by the last two units of the two units of the symbol; absorption of the test compound, indicated by Symbol FBB.

FC-- Excretion, secretion, guttation, or exudation (resulting in loss or with the objective of discard) of the type of normal secondary compound indicated by the last two units of the symbol. For endocrine secretion or other secretion not representing loss or discard, use symbols other than FC--. Consult the Key. (Use Symbol FC-- only for excretion or secretion of compounds normal to any of the normal excretory or secretory organs or tissues.) Use Symbol FF-- (defined after symbols of the FE-- series) to code excretion or secretion of the test compound or any other compound not normal to the excretory or secretory tissue or organ.

FG-- Ability to permeate or penetrate; ability, of the type of secondary compound indicated by the last two units of the symbol, to permeate or penetrate cells, tissues, or membranes.

FH-- Incorporation of the test compound per se into the type of secondary compound indicated by the last two units of the symbol.

FI-- Withdrawal of the type of secondary compound indicated by the last two units of the symbol; withdrawal of the test compound indicated by Symbol FIB (ONLY when this withdrawal of the test compound is a symptom of a pathology coded in Field E).

--1	Carbohydrate
--11	Monosaccharide
--12	Glycoside
--13	Disaccharide
--14	Polysaccharide
--15	Glycogen
--16	Starch
--17	Uronic acids (glucuronides, etc.)
--2	Nitrogenous material
--21	Protein
--22	Non-protein nitrogen (NPN)
--23	Respiratory pigment
--24	Pigment, other than respiratory pigment
--25	Amino acid
--26	Serum protein
--27	Nucleic acid
--28	Purines and/or pyrimidines
--29	Peptides
--3	Lipid and/or steroid
--31	Fatty acid
--32	Ketone body
--33	Phospholipids
--34	Lipoproteins
--35	Carotenoids (animals only)
--36	Plant sterols
--37	Bile acid
--4	Mineral
--41	Apatite
--5	Hormone
--51	Sex hormone, male
--52	Sex hormone, female
--53	Cortical hormones
--54	Plant hormones
--6	Vitamin
--7	Enzyme
--71	Coenzyme
--8	Alkaloid
--9	Electrolytes other than HCO_3^-
--A	Respiratory gases and HCO_3^-
--B	Test compound. Combine --B only with Symbol FA-- or FB--, or (when a pathology is coded in Field E and synthesis or withdrawal of the test compound is a symptom) with Symbol F8-- or FI--.
--C	Antibiotic
--D	Toxin
--E	Water
--F	Miscellaneous chemicals not covered by other items
--G	Plant acids

The following symbols of the FE-- series are to be used for coding specific alterations of the test compound. They are also used for coding specific alterations of secondary compounds when that alteration is affected (increased, decreased, stopped) by the test compound or when the test compound is essential for the secondary compound's alteration. Finally, they are used for coding specific alterations of a third compound which are affected by a secondary compound when that effect of the secondary compound is affected (synergized, antagonized, etc.) by the test compound. In the case of each of the last two uses of symbols of the FE-- series, Symbol * must be coded in Column 61. The specific directions for the coding procedure when these symbols are used are very important. They are included only in the Key which must be consulted to assure coding Fields T-1 and D correctly with these symbols.

- FE Alteration, unspecified. (Symbol FE can be used to indicate that the test compound is a precursor for [and altered to] a specific biological product coded in Field D.)
- FE1 Detoxification, unspecified
- FE2 Oxidation, unspecified (Symbol FE2 is not used for C-C bond cleavage.) Use Symbol FEA for glucose oxidation, etc.
- FE21 Aliphatic hydrocarbon → alcohol
- FE22 Alcohol → aldehyde or ketone
- FE23 Aldehyde → acid
- FE24 Alcohol → acid
- FE25 Dehydrogenation of an aliphatic chain or carbocyclic ring (unsaturation)
- FE26 Peroxidation
- FE27 Aromatic hydrocarbon → phenol
- FE28 Phenol → quinone
- FE29 Sulfhydryl → sulfide
- FE2J S-O bond formation or oxidation (e.g., SO_4 from SO_3, sulfone formation)
- FE2K Valence change (e.g., ++ to +++), for elements other than N, O, P, and S
- FE2L β-oxidation
- FE2M Omega oxidation
- FE3 Reduction, unspecified
- FE31 Alcohol aliphatic hydrocarbon
- FE32 Aldehyde or ketone → alcohol
- FE33 Acid → aldehyde
- FE34 Acid → alcohol
- FE35 Hydrogenation of an aliphatic chain (saturation)
- FE36 Hydrogenation of an aromatic ring (loss of aromaticity)
- FE37 Quinone → phenol
- FE38 Imino → amino
- FE39 Sulfide → sulfhydryl
- FE3J Reduction of S-O compounds (e.g., SO_4 → SO_3)
- FE3K Valence change (e.g. +++ to ++) for elements other than N, O, P, and S
- FE4 Conjugation, combination, unspecified
- FE41 Conjugation with glucuronic acid or other sugar acid
- FE42 Conjugation with glycine or other amino acid
- FE43 Conjugation with sulfate
- FE44 Formation of mercapturic acids
- FE45 Detoxification with glutamine
- FE5 Acylation, unspecified
- FE51 Acetylation
- FE52 Acylation with other aliphatic acids (e.g., formylation)
- FE53 Acylation with aromatic acids (e.g., benzoylation)
- FE6 Esterification, unspecified
- FE61 Esterification with phosphoric acid
- FE62 Esterification with ATP, ADP
- FE63 Esterification with CoA
- FE7 Hydrolysis, unspecified
- FE71 Hydrolysis of a simple ester
- FE72 Hydrolysis of a peptide bond
- FE73 Hydrolysis of a sulfur-carbon bond (e.g., Acetyl coenzyme A)
- FE74 Deacylation (e.g., hydrolysis of acetylcholine)
- FE75 Deconjugation (e.g., hydrolysis of glucuronides)
- FE76 Hydrolysis of phosphate ester linkages; dephosphorylation (e.g., Glucose-6-PO_4)
- FE77 Hydrolysis of pyrophosphate linkages (e.g., ATP, ADP)
- FE78 Hydrolysis of N-P linkages (e.g., phosphocreatine)
- FE79 Hydrolysis of acetal linkages (e.g., sucrose)
- FE8 Deamination, unspecified
- FE81 Oxidative deamination
- FE82 Transamination
- FE83 Deamidation
- FE84 Deamidination
- FE9 Binding
- FE91 Chelation
- FE92 Protein-binding
- FEA Degradation, unspecified
- FEA1 Degradation to unidentified products
- FEA2 Carbon bond cleavage; loss of carbon atoms
- FEA3 Decyclization, ring cleavage and opening
- FEA4 Ring contraction
- FEA5 Decarboxylation
- FEA6 Oxidative decarboxylation
- FEA7 Depolymerization

FEA8	Fermentation
FEB	Alkylation
FEB1	Transmethylation
FEB2	Demethylation
FEB3	Alkylation, other than CH_3
FEB4	Dealkylation, other than CH_3
FEC	Phosphorylation, unspecified
FEC1	Phosphorylation with phosphoric acid
FEC2	Phosphorylation with ATP, ADP
FED	Dehalogenation
FEE	Halogenation (e.g., iodination of tyrosine)
FEF	Dehydration, unspecified
FEF1	Dehydration with production of a double bond
FEF2	Dehydration with production of anhydride
FEG	Amination, unspecified
FEG1	Imination
FEG2	Peptidation
FEG3	Amidation
FEG4	Amidination
FEG5	Transpeptidation
FEH	Condensation, unspecified
FEH1	Carboxylation, addition of CO_2
FEH2	Formation of C-C bonds
FEH3	Formation of C-S bonds (e.g., Acetyl CoA)
FEH4	Cyclization
FEH5	Ring expansion
FEH6	Polymerization, polysaccharides
FEH7	Polymerization, proteins
FEH8	Polymerization, nucleic acids
FEI	Isomerization, unspecified
FEI1	Optical isomerization; racemization
FEI2	Cis-trans isomerization
FEI3	Keto-enol isomerization, tautomerization
FEI4	Double bond shift
FEI5	Molecular rearrangements, shift of entire functional groups (e.g., mutase reactions)

FIELD T-2
Columns 58, 59, 60, and 61

FF-- Excretion, secretion, guttation, exudation of the test compound or any other type of foreign compound (indicated by the last unit of the symbol) via the excretory or secretory path indicated by the third unit of the symbol. Symbol FF is never used alone (with no coding in Columns 60 and 61), but only as one of the FF- series (FF1, FF2, FF3, etc.), combined with a symbol of a second series (---1, ---2, etc.). Note that symbols of the FF-- series are used only when the material excreted or secreted is the test compound or when it is any material not normally excreted or secreted over the specific excretory or secretory path involved. (It may be a material normally excreted or secreted by the organism, but if it is over an abnormal path, it should be coded by a symbol of the FF-- series.) If it is not the test compound whose excretion or secretion is being coded or if it is a material normally excreted or secreted over the secretory or excretory path, use Symbol FC-- instead of Symbol FF--. The two symbol series referred to above, by which symbols of the FF-- series are composed, are presented together, below, for convenience in referring to both.

The items of each of the following two lists are represented by incomplete symbols. Any symbol of one list must be combined with one of the symbols of the other to form a complete symbol. In other words, any of the materials of the first list (the test compound, ---B, or any other foreign material, ---1, ---2, etc.) can be indicated as being excreted or secreted over any excretory or secretory path (FF1- [FF11, FF12, etc.], FF2- [FF21, FF22, etc.], etc.). See the preceding definition of FF--. If the foreign material secreted or excreted is not the test compound and if its specific identity is determined, code the specific material secreted or excreted in Field D.

General types of materials foreign to the test organism (including the test compound); materials which may not be foreign to the test organism, but are secreted or excreted over paths over which they are not normally excreted or secreted. If known, code the specific identity in Field D. (Use only Symbol FC-- for excretion or secretion of normal materials, excreted or secreted over normal paths.)

---1	Carbohydrate
---2	Ketone body
---3	Lipid and/or steroid
---4	Mineral
---5	Hormone
---6	Vitamin
---7	Enzyme
---B	Test compound
---E	Water
---F	Miscellaneous chemicals not covered by other items
---G	Metabolite of the chemical specified in Field D
---H	Metabolite of the test compound
---I	Pigment (including protein pigment); dyes
---J	Protein (other than pigments)
---K	Amino acid
---L	Non-protein nitrogen (NPN)

Secretory or excretory path. The following items are anatomical structures, the products of structures, or processes, each of which represents a path over which the test compound or other material of the opposing list may be eliminated. Use of an item of this list does not supplant coding in Fields H-1 and/or I and the specific structure indicated by the symbol used from this list must be coded in Fields H-1 and/or I. Of this list, Symbol FFA- (vomiting) represents a rejective elimination and not excretion or secretion. It is used in preference to any other symbol, however, to code such elimination of the test compound or other foreign material ingested.

FF1-	Urine
FF2-	Feces
FF3-	Lungs
FF4-	Sweat
FF5-	Bile
FF6-	Cuticle
FF7-	Milk
FF8-	Saliva
FF9-	Transpiration
FFA-	Emesis, vomiting
FFB-	Roots
FFC-	Tears
FFD-	Gastric juice

ENZYME CODE

71

71	Proteases
710	Proteinases
7101	Peptidase, tobacco
7102	Polypeptidase, yeast
7103	Salmon pepsin
7104	Prolidase
7105	Prolinase
7106	Protaminase
7107	Renin
7108	Rennin
7109	Trypsin
710A	Solanain
710B	Streptokinase
710C	Thrombin
710D	Tabernamontanain
710E	Antistreptokinase
710F	Antifibrinolysin
710G	Profibrinolysin
710H	Prorennin
710I	Trypsinogen
710J	Antiprofibrinolysin
710L	Prothrombin
710M	Antithrombin
710N	Thromboplastin
710P	Antithromboplastin
710R	Fibrinokinase
710S	Venom thrombin
710T	Venom thromboplastin
710U	Platelet factors
710V	Ac-globulin
711	Aminopolypeptidases
7111	Leucine aminopeptidase
7112	Aminotripeptidase
7113	Lymphopeptidase
712	Arachain
7121	Aspergillus oryzae proteinase
7122	Streptococcus A proteinase
7123	Streptococcus A proteinase precursor
7124	Bacillus subtilis gelatinase
7125	Bacillus amyloliquefaciens proteinase
7126	Clostridium histolyticum collagenase
7127	Clostridium welchii collagenase
7128	Micrococcus lysodeikticus gelatinase
7129	Bacillus pyocyaneus proteinase
713	Asclepain m
714	Asclepain s
7141	Syriana asclepain
715	Bromelin
716	Bacterial peptidase
7161	Bacillus botulinus proteinase
717	Carboxypeptidase
7171	Carboxypolypeptidase
718	Cathepsin I
719	Cathepsin II
7191	Cathepsin C
7192	Cathepsin V
71A	Cathepsin III
71B	Cathepsin IV
71D	Chymotrypsins
71D1	α-Chymotrypsin
71D2	β-Chymotrypsin
71D3	Chymotrypsinogen
71D4	γ-Chymotrypsin
71D5	Δ-Chymotrypsin
71D6	Pi-Chymotrypsin
71D7	B-Chymotrypsin
71D8	Chymotrypsinogen-B
71E	Dehydropeptidase I
71E1	Dehydropeptidase II
71F	Dermopeptidase
71G	Depeptidases
71G1	Glycylglycine dipeptidase
71G2	Glycyl-L-leucine dipeptidase
71G3	Carnosinase
71G4	Alanylglycine dipeptidase
71G5	Glutathionase
71G6	Cysteinylglycinase
71H	Enterokinase
71I	Erepsin
71J	Euphorbain
71K	Ficin
71L	Fungi peptidase
71M	Gelatinase
71M1	Collagenase
71M2	Elastase
71N	Hurain
71Ø	Hypertensinase
71P	Keratinase
71Q	Leucoprotease
71R	Mexicanain
71S	Papain
71S1	Papain peptidase I
71S2	Papain peptidase II
71T	Pepsin
71T1	Pepsinogen
71U	D-Peptidase
71V	L-Peptidase
71W	Pinguinain
71X	Fibrinolysin
71Y	Papain α-trypsinase
71Z	Papain β-trypsinase

72

72	Esterases
721	Acetylesterase
722	Renal acylase 1
723	Acetanilide acylase
724	Meperidine esterase
725	Diisopropyl fluorophosphate esterase
726	Succinic daecylase

73

73	Amidases
732	Adenosine deaminase
7321	Adenase
733	5-Adenylic acid deaminase
7331	3-Adenylic acid deaminase
734	Allantoicase
736	Arginase
7361	Guanidodesimidase
737	Asparaginase I
7371	Asparaginase II
738	Benzamidase
739	Canavanase
73A	Creatinase
73B	Cytidine deaminase
73C	Glutaminases
73C1	Glutaminase I
73C2	Glutaminase II
73C3	Brain glutaminase
73C4	Bacterial glutaminase
73D	Guanase
73D1	Cytosine deaminase
73E	Guanosine deaminase
73F	Guanylic acid deaminase
73G	Hippuricase
73H	Histidase
73I	Phosphoaminase
73I1	Kidney phosphoamidase
73I2	Venom phosphoamidase
73I3	Rice bran phosphoamidase
73I5	DPN pyrophosphatase
73J	Urease
73K	Urocanase
73L	Creatininase
73M	Hydantoinase
73N	Glycocyaminase
73P	Acetamidase
73Q	Histidine α-deaminase
73R	Formylisoglutaminase
73S	Isoglutaminase

74

74	Glycosidases
7401	Protopectinase
7402	Prunase
7403	Seminase
7404	Stachyase
7405	Synthiase
7407	β-Thioglucosidase
7409	Trehalase
740A	Xylanase
741	Amygdalase
742	α-Amylases
7421	Hog pancreas α-amylase
7422	Human pancreas α-amylase
7423	Salivary α-amylase
7424	Malt α-amylase
7425	Bacillus subtilis α-amylase
7426	Aspergillus oryzae α-amylase
7427	Muscle amylase
7428	Liver α-amylase
7429	Bee amylase
743	β-Amylases
7431	Barley β-amylase
7432	Wheat β-amylase
7433	Sweet potato β-amylase
7434	Malt β-amylase
7435	Rye β-amylase
7436	Rhizopus delemar β-amylase
744	Bacillus macerans amylase
7441	Dextranase
7442	Isoamylase
745	Amylokinase
746	Arabanase
747	α-D-Arabinosidase
748	β-D-Arabinosidase
74A	Cellulase
74B	Chitinase
74B1	Chitodextrinase
74B2	Chitobiase
74C	Clarase
74D	Cytases
74E	Glucosaccharase
74E1	Invertase
74F	Fructopyranosidase
74G	α-D-Galactosidase
74H	β-D-Galactosidases
74H1	Almond β-D-Galactosidase
74H2	Yeast β-D-galactosidase
74I	β-D-glucosidases
74I1	Almond emulsin
74I2	Yeast emulsin
74I3	Animal β-glucosidase
74J	β-(N-acetyl)-Glycosaminidase
74K	β-D-Glucosaminidase
74L	α-D-Glucosidases
74L1	Yeast maltase
74L2	Barley maltase
74L3	Aspergillus oryzae maltase
74L4	Intestine mucosa maltase
74L5	Skeletal muscle maltase
74L6	Bacterial maltase
74L7	α-Methylglucosidase
74L8	Amylo-1, 6-glucosidase
74L9	Z enzyme
74M	β-Glucuronidase
74Ø	Mucases
74P	Hyaluronidases
74P1	Bacterial hyaluronidase
74P2	Animal hyaluronidase
74P3	Hyaluronate mucodextrinase
74P4	Hyaluronic acid oligomucase
74P5	Bacterial sulfomucase
74P6	Heparinase
74P7	Sulfomucodextrinase
74P8	Oligosulfomucase
74Q	Inulase
74R	Lichenase

74S Lysozyme
74T α-D-Mannosidase
74U α-L-Mannosidase
74V β-D-Mannosidase
74W β-L-Mannosidase
74X Polygalacturonase
74Y Pectin depolymerase
74Z Polidase

75

*75 Oxidases
*751 Ascorbic acid oxidase
752 Butyric oxidase
753 Catalase
754 Cytochrome a
7541 Cytochrome a_1
7542 Cytochrome a_2
7543 Cytochrome a_4
755 Cytochrome b
7551 Cytochrome b_1
7552 Cytochrome b_2
*7501 Glutathione reductase
7553 Cytochrome f
756 Cytochrome c
757 Cytochrome c peroxidase
758 Cytochrome oxidase
759 Histaminase
75A Dioxymaleic acid oxidase
75B DOPA oxidase
75C Glutathione oxidase
75C1 Desulfinase
75C2 Cysteine oxidase A
75C3 Cysteine oxidase B
75C4 Cystine oxidase
75C5 Thiocyanate oxidase
75C6 Cystine disulfoxide decarboxylase
75C7 Cysteine sulfinic acid decarboxylase
75C8 Aliinase
75C9 Cystathionase
75D Laccase
75E Lipoxidases
75E1 Plant lipoxidase
75E2 Animal lipoxidase
75E3 Lipoxidase activator
75F Monoamine oxidase
75G Ortophenolase
75H Peroxidases
75H1 Plant peroxidase
75H2 Milk peroxidase
75H3 Myeloperoxidase
75H4 Paraperoxidase
75H5 Peroxidase II
75H6 Salivary peroxidase
75H7 Tryptophan peroxidase
75I Tyrosinase
75J Monophenol oxidase
75K Polyphenol oxidase
75L Cytochrome system
75M Kidney laccase
75N Phenol dehydrase
75P α-Hydroxacid oxidase, animal
75P1 α-Hydroxacid oxidase, plant
75Q Indoleacetic acid oxidase
75R Inositol oxidase
75R1 Lactose oxidase
75S Choline oxidase
75S1 Betaine aldehyde oxidase
75T Glycollic acid oxidase
75U Succinoxidase system
75V Slater factor
75W Quinine oxidase
75X β-Hydroxybutyric acid dehydrogenase, bacterial
75Y Sarcosine oxidase
75Z Phenylalanine oxidase system

76

76 Nucleases
761 Desoxyribonucleases
7611 Thymus desoxyribonuclease
7612 Pancreas desoxyribonuclease
7613 Yeast desoxyribonuclease
7614 Streptococcal desoxyribonuclease
762 Nucleosidases
7621 Purine nucleosidase
7622 Pyrimidine nucleosidase
7623 Ribonucleic acid phosphorylase
7624 Nucleotide-N-ribosidase
7625 Coenzyme I nucleosidase
7626 Inosine phosphorylase
7627 Thymidine phosphorylase
7628 Uridine phosphorylase
7629 Uridine nucleosidase
764 Ribonuclease

77

77 Phosphorylases
771 α-1, 4- Phosphorylases
7711 Animal phosphorylase
7712 Plant phosphorylase
7713 Muscle phosphorylase a
7714 Muscle phosphorylase b
7715 PR enzyme
7716 Liver phosphorylase
772 β-1, 6- Phosphorylase
7721 β-1, 6- Phosphorylase, animal
7722 β-1, 6- Phosphorylase, plant
773 α-Glucosan phosphorylase
778 Sucrose phosphorylase
779 Maltose phosphorylase
77A Q enzyme, potato
77A1 Q enzyme, protozoan
77B Amylosucrase
77C Amylomaltase
77D Maltose transglucosidase
77E Transfructosidase
77F P enzyme

77G Isomaltomaltase
77H Inulosucrase
77I Trans-N-glycosidase
77J Laminarinase
77K Transacetylase
77L CoA transphorase
77M CoA pyrophosphate transacetylase
77N Acetoacetate-synthesizing enzyme
77Ø Glutamo-transferase
77P Asparto-transferase
77Q Glutamo-transphorase
77R Phosphatidic acid transferase

78

78 Transphosphorylases
781 Creatine kinase
782 ADP-Creatine transphosphorylase
782A ATP-Arginine transphosphorylase
783 Phosphoglyceric phosphokinase
784 Pyruvic phosphokinase
785 TPN kinase
786 Phosphofructokinase I
787 Phosphofructokinase II
788 Glucokinase
789 Hexokinase
78A Myokinase
78B Acetokinase
78D Adenosine kinase
78E Acetyl kinase
78F Pyridoxal kinase
78G DPN kinase
78H Choline phosphokinase
78I Xylokinase
78J Triosekinase
78K CoA kinase
78L Flavokinase
78M FAD-synthesizing enzyme
78N Thiamine kinase
78P Galactokinase
78Q Mannokinase
78R Ribokinase
78S Arabokinase
78T Gluconokinase
78U Fructokinase, liver
78V Fructokinase, muscle
78W Phosphoglucokinase
78X Glutamine-synthesizing system
78Y Glycerol kinase

79

79 Hydrase or dehydrase
791 Aconitase
792 Aspartase I
7921 Aspartase II
793 Carbonic anhydrase
794 Cysteine desulfhydrase
795 Enolase
796 Fumarase
797 Glyoxalase
798 Serine dehydrase
799 Exocystine desulfhydrase
79A Homocysteine desulfhydrase
79B Threonine deaminase
79C Malease

7A

7A Mutase
7A1 Aldehyde mutase
7A2 Phosphoglucomutase
7A3 Phosphoglyceromutase
7A4 Pyruvic dismutase system
7A7 Phosphofructomutase
7A8 Phosphoribomutase
7A9 Phosphodesoxyribomutase

7B

7B Lipases
7B1 Castor bean lipase
7B2 Gastric lipase
7B3 Pancreatic lipase

7C

7C Isomerases
7C1 Phosphohexoisomerase
7C2 Phosphotrioseisomerase
7C4 Phosphopentose isomerase
7C5 Phosphomannose isomerase
7C6 Phosphogalactose isomerase

7D

7D Desmolases
7D1 Acetoacetic acid carboxylase
7D2 α-Acetolactic carboxylase
7D3 L-Alanine decarboxylase
7D4 Aspartic acid decarboxylase
7D5 Pyruvic carboxylase
7D6 Condensing enzyme
7D7 Decarboxylase, animal
7D8 Decarboxylase, plant
7D9 Desoxyribose phosphate aldolase
7D91 Hydrogenase
7D92 Pyridine nucleotide transhydrogenase
7D93 Ribose phosphate aldolase
7DA α-Ketoglutaric carboxylase
7DB Oxaloacetic carboxylase
7DC Oxalosuccinic carboxylase
7DD L-Arginine decarboxylase
7DE Cysteic acid decarboxylase
7DG L-3, 4-Dihydroxyphenylalanine decarboxylase
7DG1 Phenylalanine decarboxylase
7DH L-Glutamic acid decarboxylase, bacterial
7DH1 L-Glutamic acid decarboxylase, plant

7DH2	L-Glutamic acid decarboxylase, animal
7D	L-Histidine decarboxylase, bacterial
7DI1	L-Histidine decarboxylase, plant
7DJ	L-Lysine decarboxylase
7DK	L-Ornithine decarboxylase
7DL	Pyruvate oxidase system
7DM	L-Tyrosine decarboxylase, bacterial
7DM1	L-Tyrosine decarboxylase, animal
7DM2	p-Hydroxyphenylserine decarboxylase
7DN	Tryptophan decarboxylase, bacterial
7DN1	Tryptophan decarboxylase, animal
7DØ	Aldolase
7DP	Carboligase, yeast
7DP1	Aerobacter aerogenes carboligase
7DP2	Animal carboligase
7DP3	Formaldehyde-pyruvate carboligase
7DP4	Succinic acid decarboxylase
7DQ	Tryptophanase
7DR	Tryptophan desmolase
7DS	Kynureninase, bacterial
7DS1	Kynureninase, animal
7DT	6-Phosphogluconate oxidase system
7DU	α-Ketoglutarate-isocitrate carboxylase system
7DU1	α-Ketoglutarate-isocitrate carboxylase system, yeast
7DV	Glyoxylic acid carboxylase
7DW	Lactic carboxylase
7DX	Malic enzyme, liver
7DX1	Malic enzyme, bacterial

7E

7E	Dehydrogenases
7E01	Xanthine oxidase
7E1	Alcohol dehydrogenase
7E11	Alcohol dehydrogenase, animal
7E12	Alcohol dehydrogenase, plant
7E13	Aldehyde dehydrogenase
7E14	Retinene reductase
7E15	Acetaldehyde dehydrogenase
7E2	D-Amino acid oxidase
7E21	D-Amino acid oxidase, molds
7E22	D-Amino acid oxidase, bacterial
7E23	D-Aspartic acid oxidase
7E3	L-Amino acid oxidase
7E31	Ophio-L-amino acid oxidase
7E32	L-Amino acid oxidase, molds, insoluble
7E33	L-Amino acid oxidase, molds, soluble
7E34	L-Amino acid oxidase, bacterial
7E35	L-Proline oxidase
7E5	Citric acid dehydrogenase
7E51	Nitrate reductase
7E52	Nitro reductase
7E6	Cytochrome c reductase I
7E7	Cytochrome c reductase II
7E8	Diaphorase I
7E9	Diaphorase II
7EA	Fatty acid dehydrogenase
7EB	Formic acid dehydrogenase
7EB1	Formic dehydrogenase, bacterial
7EC	Fumaric hydrogenase
7ED	Glucose dehydrogenase
7ED1	Sorbitol dehydrogenase
7ED2	Glycerol dehydrogenase
7EE	Glucose oxidase
7EF	Glucose-6-phosphate dehydrogenase
7EF1	Ribose-5-phosphate dehydrogenase
7EG	Glutamic acid dehydrogenase, liver
7EG1	Glutamic acid dehydrogenase, yeast
7EG2	Glutamic acid dehydrogenase, animal
7EG3	L-Amino acid dehydrogenase
7EG4	Choline dehydrogenase
7EG5	Glyoxal dehydrogenase
7EG6	Glycollic acid oxidase
7EH	Glycine oxidase
7EI	α-Glycerophosphate dehydrogenase
7EJ	α-Glycerophosphate dehydrogenase I
7EK	α-Glycerophosphate dehydrogenase II
7EM	β-Hydroxybutyric dehydrogenase
7EN	Isocitric acid dehydrogenase
7EN1	Isocitric acid dehydrogenase, plant
7EØ	α-Ketoglutarate oxidase system
7EP	Lactic acid dehydrogenase
7EP1	Lactic acid dehydrogenase, animal
7EP2	Lactic dehydrogenase, yeast
7EQ	Liver aldehyde oxidase
7ER	Malic acid dehydrogenase I
7ES	Malic dehydrogenase II
7ET	New yellow enzyme
7EU	Old yellow enzyme
7EV	Phosphogluconic dehydrogenase
7EW	Triosephosphate dehydrogenase, yeast
7EY	Succinic dehydrogenase
7EZ	Triosephosphate dehydrogenase, muscle

7F

7F	Transaminases
7F1	Glutamic-alanine transaminase
7F2	Glutamic-aspartic transaminase
7F3	Ornithine-pyruvate transaminase
7F4	Ornithine-oxalacetic transaminase
7F5	Ornithine-α-ketoglutaric transminase
7F6	Pyridoxamine phosphate-pyruvate transaminase

7G

7G1	Antinvasin I
7G2	Antinvasin II
7G3	Dextransucrase
7G5	Lactic acid racemase
7G51	Alanine racemase
7G52	Glutamic acid racemase
7G6	Levansucrase
7G7	Luciferase
7G8	Nitrilase
7G9	Oxynitrilase
7GA	Penicillinase

7GB	Pitocinase
7GC	Proinvasin I
7GD	Pyrocanase
7GE	Rhodanase
7GF	Saturase
7GG	Thiaminase
7GH	Transmethylases
7GJ	Uricase
7GL	Citrulline-arginine enzyme
7GM	Cyanase
7GN	Streptomycinase
7GØ	Triacetic enzyme
7GP	Pantothenic acid-synthesizing enzyme
7GQ	Choline-homocysteine transmethylase
7GR	Methionine-nicotinamide transmethylase
7GS	Methionine-guanidoacetic transmethylase
7GT	Methionine-ethanolamine transmethylase
7GU	α-Methyltryptophan demethylase

7K

7K	Phosphatases
7K01	Acid nucleotidase
7K02	Alkaline nucleotidase
7K05	Phosphomonoesterase III
7K06	Phosphomonoesterase IV
7K07	Ethyl phosphatase
7K08	2, 3-diphosphoglycerate phosphatase
7K1	Adenosinediphosphatase
7K2	Adenosinetriphosphatases
7K21	Ophio-adenosinetriphosphatase
7K22	Apyrase
7K23	Brain adenosinetriphosphatase
7K24	Liver adenosinetriphosphatase
7K25	Muscle adenosinetriphosphatase
7K26	Yeast adenosinetriphosphatase
7K3	Amylophosphatase
7K4	Phospholipase D
7K5	Phospholipase C
7K6	Glucose-6-phosphatase
7K7	Metaphosphatases
7K71	Yeast metaphosphatase
7K72	Mold metaphosphatase
7K73	Yeast hexametaphosphatase
7K74	Erythrocyte hexametaphosphatase
7K75	Liver trimetaphosphatase
7K76	Yeast tetrametaphosphatase
7K9	Nucleotidases
7KA1	Phosphomonoesterase II
7KA2	Phosphomonoesterase I
7KA3	Hexose diphosphatase
7KA4	Glycerophosphatase
7KA5	5-Nucleotidase
7KA6	Diphosphopyridine nucleotidase
7KA7	Nonphosphatasic diphospyridine nucleotidase
7KA8	Flavinadenine dinucleotidase
7KB	Phosphoproteinphosphatase
7KC	Phosphodiesterases
7KC1	Serum phosphodiesterase
7KC2	Liver phosphodiesterase
7KC3	Dialkylfluorophosphatase
7KD	Phosphomonoesterases
7KE	Phytase
7KF	Pyrophosphatases (inorganic)
7KF1	Pyrophosphatase I
7KF2	Pyrophosphatase II
7KF3	Pyrophosphatase III
7KH	Thiamine pyrophosphatase
7KJ	Acetylphosphatase
7KK	Polyphosphatases

7S

7S	Phospholipases
7S1	Acetylmorphinesterase
7S2	Cholesterolesterase
7S3	Choline acetylase
7S4	Cholinesterases
7S41	Cholinesterase, true
7S42	Cholinesterase, pseudo
7S5	Chlorophyllase
7S6	Chondrosulfatase
7S7	Glucosulfatase
7S8	Phospholipase A
7S9	Phospholipase B
7SA	Myrosulfatase
7SB	Pectin-methylesterase
7SC	Phenol sulfatase
7SD	Tannase
7SE	Procainesterase
7SF	Tropacocainesterase
7SG	Acetylsalicylate esterase
7SH	Atropinesterase
7SI	Cocainesterase
7SJ	Succinyl deacylase

CATEGORY OF THE TEST COMPOUND'S EFFECT REPRESENTING PRACTICAL USE

Series 1--

Categories of agents candidate for practical use in controlling populations of the test organism (i.e., in causing death, repulsion, or attraction of the test organism).

101 Air disinfecting agent
102 Water disinfecting agent
103 Anti-fouling agent
104 Anti-viral activity
105 Rickettsicide
106 Antibacterial agent; bactericide or bacteriostat
107 Antifungal (fungitoxic) agent; fungicide or fungistat
108 Herbicide (referring to killing of higher plants only)
109 Antimalarial agent
110 Protozoacide (exclusive of antimalarial agents for which Symbol 109 is used)
111 Vermicide; anthelmintic
112 Molluscacide
113 Insecticide
114 Acaricide
115 Rodenticide
116 Repellent
117 Attractant
118 Gametocide; spermatocide

Series 2--

Categories of agents candidate for practical pharmacological use in controlling certain physiological processes or pathological conditions.

201 Analgesic; a compound which relieves pain without producing unconsciousness
202 Androgenic: a compound which promotes development of secondary sex organs of the male, spermatogenesis, descent of testes, etc.
203 Anesthetic, general: a compound which produces reversible loss of the sense of touch, pain, and other modalities of sensation and consciousness by action on the central nervous system
204 Anesthetic, local: a compound which reversibly blocks excitation and conduction in nerve tissue
205 Anti-arthritic; a compound which decreases signs and symptoms of arthritis
206 Anti-coagulant: a compound which prevents coagulation or gelation of plasma or other tissue fluid. (Use Symbol 238 to classify a compound as a blood coagulant.)
207 Anti-convulsant: a compound which reduces or prevents convulsions (natural or drug induced); Anti-epileptic
208 Anti-histaminic: a compound which antagonizes any of histamine's actions; prevents allergic reaction
209 Anti-metabolite: a compound which prevents or abolishes effects of a normally occurring metabolite specified as the secondary compound in Field D
210 Anti-motion sickness; a compound which relieves or prevents syndromes of dizziness, vertigo, nausea, and vomiting due to rhythmic motion (e.g., airplane, ship, swing)
211 Anti-rheumatic: a compound which decreases signs of rheumatic disease
212 Anti-spasmodic: a compound which reduces or prevents contractions of smooth muscle, whether natural or drug induced contractions (except acetylcholine and histamine induced contractions, the reduction or prevention of which is coded by Symbols 225 and 208 by priority)

213 Anti-thyroid: a compound which increases the size of the thyroid, or causes hyperplasia, hypertrophy, or decreases the iodine content of the thyroid gland; a compound which decreases the activity of the thyroid gland

214 Anti-vitamin: a compound which prevents or abolishes effects of a vitamin specified as a secondary compound in Field D

215 Astringent: a compound which draws tissues together by precipitating protein

216 Blood substitute: a compound which restores blood volume (exclusive of cellular or formed elements) via osmotic properties such as those of plasma proteins for treatment of shock

217 Diuretic: a compound which increases formation of urine

218 Estrogenic: a compound that promotes development of secondary sex organs of the female, feminization of pubic hair distribution, growth of mammary glands, etc.

219 Fibrinolytic: a compound that destroys fibrin

220 Keratolytic: a compound that destroys the horny layer of the skin

221 Miotic: a compound which decreases the size of the pupil either by contracting circular muscles or relaxing radial muscles of the iris

222 Mydriatic: a compound that increases the size of the pupil either by contracting radial muscles or by relaxing circular muscles of the iris

223 Narcotic: a compound that produces relief from pain accompanied by sleep or stupor

224 Oxytocic: a compound that produces contraction of the uterus both in vivo and in vitro

225 Parasympatholytic; cholinergic blocking agent (an agent showing anti-muscarine-like activity): a compound which antagonizes muscarine-like effects of acetylcholine and cholinergic compounds and which prevents effects of post-ganglionic stimulation of parasympathetic nerves. E. g., atropine and atropine-like compounds.

226 Parasympathomimetic; cholinergic agent (an agent showing muscarine-like activity): a compound that simulates or synergizes acetylcholine's peripheral action; simulates the effect of post-ganglionic stimulation of parasympathetic nerves. E. g., mecholyl.

227 Sympatholytic: a compound that antagonizes the effect of adrenaline (epinephrine) or noradrenaline (norepinephrine or arterenol) or other sympathomimetic drug; blocks the effects of sympathetic nerve stimulation. E. g., dibenamine, priscoline.

228 Sympathomimetic: a compound that simulates or synergizes effects of adrenaline (epinephrine) or noradrenaline (norepinephrine or arterenol). Adrenergic drug; simulates the effects of sympathetic nerve stimulation.

229 Curariform: a compound that competitively blocks the motor-end plate or myoneural junction; simulates the effects of curare, d-tubocurarine, etc.

230 Antipyretic: a compound that produces a fall in temperature in fever; tends to return the body temperature of a hyperpyrexic animal to normal. E. g., antipyrine.

231 Depressant of the central nervous system only; hypnotic; sedative: a compound that produces sedation and sleep (exclusive of narcotic type of effect, Symbol 223). E. g., paraldehyde.

232 Analeptic: a compound that reverses the effects of hypnotics and narcotics; stimulates medullary centers of the brain. E. g., picrotoxin, metrazol.

233 Cardiac: a compound that stimulates or depresses the heart directly; digitalis-like effect. E. g., cardiac glycosides, khellin.

234 Gastro-intestinal drug: a compound that affects various functions of the gastro-intestinal system; anorexics; cathartics; emetics; constipating agents; and anti-emetics

235 Ganglionic blocking agent: a compound that antagonizes the nicotine-like action (ganglionic-stimulating effects) of acetylcholine and cholinergic compounds; prevents the effects of preganglionic nerve stimulation. E. g., TEAC (tetraethyl ammonium chloride).

236 Nicotine-like drug: a compound that simulates or synergizes nicotine actions of acetylcholine and cholinergic drugs; simulates the effects of pre-ganglionic nerve stimulation

237 Anti-anemic: a compound that prevents, or cures anemia or reduces the severity of the disease; returns the blood picture of an anemic organism to normal.

238 Coagulant: a compound that promotes blood coagulation; prevents, antagonizes, or reduces the actions of anti-coagulants

239 Thyroxin-like drug: a compound that simulates the effects of hormone(s) of the thyroid gland, such as a rise in B. M. R., an increase in oxygen consumption, etc. E. g., tri-iodothyronine.

240 Adrenal-corticoid: a compound that simulates effects of adrenal cortical hormones on electrolyte, carbohydrate, protein, and skin pigment metabolism; simulates effects on collagenous tissue

270 Carcinogenic agent; carcinogen: a compound that induces neoplastic growth, malignant or benign (exclusive of non-neoplastic hypertrophy). Use Symbol 270 only with Symbol 43 or 47 of Field T-2.

271 Co-carcinogenic: a compound that possesses no carcinogenicity of its own, but causes an increase in the carcinogenic action of another agent. Use Symbol 271 only with Symbol 8 coded in Field T-1 with Symbol 43 or 47 coded in Field T-2 (or, if a virus is the cause of the neoplasm, Symbol 1 coded in Field T-1 with Symbol 43 or 47 coded in Field T-2).

272 Carcinostatic: a compound that temporarily or permanently slows or halts the growth of a tumor, but does not cause its regression. Use Symbol 272 when Symbol 44, 46, or 47 of Field T-2 is coded with Symbol 2 of Field T-1; also, when Symbol 44 or 46 of Field T-2 is coded with Symbol 3 of Field T-1; and when Symbol 43 or 47 of Field T-2 is coded with Symbol 9 of Field T-1. Do not use Symbol 272 for compounds that cause a tumor to regress.

273 Carcinoclastic: a compound that produces a lasting destructive effect on a tumor as judged by regression (degeneration) attributable to the action of the test compound. Use Symbol 273 only when Field T-2 is coded with Symbol 45 and Field T-1 is coded with Symbol 1 or 7 (or when Field T-2 is coded with symbols of the 418- series and this degeneration coded in Field T-2 refers to the tumor coded in Field E).

Series 3--

Categories of agents candidate for practical use in affecting growth and development and physiological processes of plants. (For control of plant populations, see symbols of series 1--, Symbols 104, 107, and 108.)

301 Plant growth-affecting agent; stimulant or depressant of plant growth. Use Symbol 301 in Field T-3 when any of the following specific processes or qualities (Field T-2) are increased or decreased above or below the normal (Symbol 1 or 2 of Field T-1):

	Field T-2 symbols, inclusive
Infection; infestation	18 - 181
Crop yield	19 - 194
Cell division	21 - 212
Cell growth	22 - 227
Spore germination	25 - 252
Seed germination	26 - 262
Growth of plant organ	28 - 2831
Growth of the entire plant	2A - 2A42

Also use Symbol 301 for growth-influencing agents which are essential for (Symbol 7 of Field T-1) or decrease or prevent (Symbol 2 or 3 of Field T-1) any of the following specific processes or qualities (Field T-2):

Cell differentiation	23 - 2315
Tissue differentiation	27 - 272
Organ formation	284
Abnormal tissue or organ formation, except tumors	412 - 4151
Neoplasia or incidence of tumors	43, 44, 47

302 Maturation agent. Use Symbol 302 for agents which promote, decrease, or prevent (Symbol 1, 2, or 3 of Field T-1) any of the following specific processes of Field T-2. (For agents affecting flower formation or formation of any other specific organ's development and maturation, use Symbol 301; for agents affecting reproductive maturation of the organism, use Symbol 305.)

	Field T-2 symbols, inclusive
Ripening, maturing process	2B
Aging symptoms	2C
Normal pigmentation and coloring as indication of maturation	F824 and FA24

FIELD T-3
Columns 62, 63, and 64

303 Agents affecting normal distribution and translocation within plants. Use Symbol 303 for agents which promote, decrease, or prevent (Symbol 1, 2, or 3 of Field T-1) any of the following processes or qualities of Field T-2:

	Field T-2 symbols, inclusive
Nutrient uptake	F6--
Distribution	F9--
Storage, concentration	FA--
Absorption	FB--
Loss via secretion	FC--
Loss via cuticle	FF6- and FC--
Loss via transpiration	FF9- and FC--
Loss via roots	FFB- and FC--
Permeability	842
Dehydration	875

304 Agents affecting normal chemosynthesis by plants. Use Symbol 304 for agents which increase, decrease, or prevent (Field T-1, Symbol 1, 2, or 3) any of the following chemical processes of plants:

	Field T-2 symbols, inclusive
Photosynthesis	F7 - F72
Chemosynthesis	F8--
Alteration	FE - FEI

305 Agents affecting reproductive processes of plants. Use Symbol 305 for agents which increase, decrease, or prevent (Symbols 1, 2, or 3 of Field T-1) any of the following Field T-2 reproductive functions:

	Field T-2 symbols, inclusive
Reproductive activities	A1 - AA4

MISCELLANEOUS TIME VALUES

A. Duration of response
(time after response begins)

1. Duration of response
2. Duration of delay of death
(alteration of survival time)

B. Duration of the period
preceding response

3. Time to response:
3a. Time to any response other than death
3b. Time to death (killing time)

C. Duration of a compound's
ability to produce response

4. Persistence of the activity of a residue of the test compound

Place the Symbol * in Column 66 when the data deal with persistence of activity of a residue of the test compound.

Scale 1

1		< 0.5 seconds
2	0.5 thru	1.
3	> 1. thru	2.
4	> 2. thru	4.
5	> 4. thru	8.
6	> 8. thru	16.
7	> 16. thru	32.
8	> 32. thru	64.
9	> 64.	

Scale 2

1		< 2 seconds
2	2 thru	4
3	> 4 thru	8
4	> 8 thru	16
5	> 16 thru	32
6	> 32 thru	64
7	> 64 thru	140 seconds
8	> 140 thru	5 minutes
9	> 5 minutes	

Scale 3

1		< 16 seconds
2	16 thru	32
3	> 32 thru	64
4	> 64 thru	140 seconds
5	> 140 thru	5 minutes
6	> 5 thru	10
7	> 10 thru	20
8	> 20 thru	45
9	> 45 minutes	

Scale 4

1		< 64 seconds
2	64 thru	140 seconds
3	> 140 thru	5 minutes
4	> 5 thru	10
5	> 10 thru	20
6	> 20 thru	45
7	> 45 thru	90
8	> 90 thru	3 hours
9	> 3 hours	

Scale 5

1		< 10 minutes
2	10 thru	20
3	> 20 thru	45
4	> 45 thru	90 minutes
5	> 90 thru	3 hours
6	> 3 thru	6
7	> 6 thru	12
8	> 12 thru	24
9	> 24 hours	

Scale 6

1		< 45 minutes
2	45 thru	90 minutes
3	> 90 thru	3 hours
4	> 3 thru	6
5	> 6 thru	12
6	> 12 thru	24
7	> 24 thru	48
8	> 2 thru	4 days
9	> 4 days	

FIELD U
Columns 65 and 66

MISCELLANEOUS TIME VALUES

(Continued)

Scale 7

1		< 6 hours
2	6 thru	12
3	> 12 thru	24
4	> 24 thru	48
5	> 2 thru	4 days
6	> 4 thru	8
7	> 8 thru	16
8	> 16 thru	32
9	> 32 days	

Scale 8

1		< 24 hours
2	24 thru	2 days
3	> 2 thru	4 days
4	> 4 thru	8
5	> 8 thru	16
6	> 16 thru	32
7	> 32 thru	2 months
8	> 2 thru	4 months
9	> 4 months	

Scale 9

1		< 8 days
2	8 thru	16
3	> 16 thru	32 days
4	> 32 thru	2 months
5	> 2 thru	4
6	> 4 thru	8
7	> 8 thru	16
8	> 16 thru	32
9	> 32 months	

TIME TO EVALUATION

Group 1

1			< 0.5 seconds
2	0.5	thru	1
3	> 1	thru	2
4	> 2	thru	4
5	> 4	thru	8
6	> 8	thru	16
7	> 16	thru	32
8	> 32	thru	64
9	> 64	thru	120 seconds

Group 2

A	> 2	thru	5 minutes
B	> 5	thru	10
C	> 10	thru	20
D	> 20	thru	45
E	> 45	thru	90 minutes
F	> 90	thru	3 hours
G	> 3	thru	6
H	> 6	thru	12
I	> 12	thru	24 hours

Group 3

J	> 1	thru	2 days
K	> 2	thru	4
L	> 4	thru	8
M	> 8	thru	16
N	> 16	thru	31 days
Ø	> 1	thru	2 months
P	> 2	thru	4
Q	> 4	thru	8
R	> 8	thru	16 months

Group 4

S	> 16	thru	32 months
T			> 32 months

Indefinite time expressions:

U	Several seconds
V	Several minutes
W	Several hours
X	Several days
Y	Several months
Z	Immediately after treatment (no quantitative time measure given)

A. QUALIFICATION OF THE NEGATIVE AND POSITIVE CHARACTER OF TEST RESULTS AND QUALIFICATION OF THE CODED DOSE

B. INFORMATION ABOUT SLOPE OF THE DOSAGE-RESPONSE CURVE

Introduction to Field W
Symbols J through Q and *

A. The basic objective of the symbols of Field W, with the exception of Symbol *, is to classify the character of the negative or positive biological response (whose quantitative measure or evaluation is coded in Field Y according to a criterion coded in Field X) and of the dose (coded in Fields M, N, O, and P) according to whether the test coded demonstrated:

Field W symbols are only J, K, L, M, N, Ø, P, and *, defined on the following pages.

(1) Inability of the test compound to produce the response when administered to the test organism at any level below a toxic level or below any level impractical to administer: Symbol K (Symbol J indicates that the test did not prove the test compound was unable to produce the response even though the response did not occur at the dose administered);

(2) The maximum intensity of test organism response which the test compound is capable of inducing; Symbol M, N, or Ø (Symbols L and P indicate that the test did not prove that the intensity of response was maximal, since a dose larger than the largest tested might cause a higher response intensity);

(3) The minimum dose of test compound needed for the intensity of response produced in the test organism, whether or not it is the maximum intensity of which the compound is capable: Symbol P (if the intensity of response is threshold intensity or any intensity below maximum intensity or if the intensity is not known to be maximum intensity) or Symbol Ø (if the intensity of response is known to be maximal). (Symbols L, M, and N indicate that the test did not prove that the coded dose was the minimal needed.)

The classification will be seen to be dependent at certain points (Symbols J, K, L, and M) on whether information is known about the toxic character of the chemical tested and the limitations placed on the chemical's application by that character. Whether the test compound has such limitations can ordinarily be determined only by having performed, prior to or contemporary with the test being coded, one or more other tests at different dose levels, the limiting toxic effect being revealed by one of the higher dose levels in one of the tests. Thus, incidentally, Field W conveys further information about the character of the dose coded in Fields M, N, O, and P as follows:

(4) The dose coded in Fields M, N, O, and P is known to be the maximum tolerated or (if the test compound causes no toxic effect at any dose) the largest dose that can be administered, for any reason other than toxicity and limitation of availability: Symbol K or M and (only if Symbol 21 is in Field X) Symbol Ø or P; the use of Symbol N or Ø implies that the coded dose is known <u>not</u> to be the MTD, except when Symbol 21 is in Field X with Symbol Ø in Field W; (Symbol J, L, or P: the coded dose is not known either to be or not to be the MTD, unless Symbol 21 is in Field X with Symbol P in Field W).

For sake of clarity, the definition for each of Symbols J through Q is presented as a set of brief statements, the statements collectively setting forth the conditions under which the symbol is used and the implications made by it. The definition and use of each of the symbols are discussed in more detail in the Key section on General Use of Fields W, X, and Y.

B. One Field W symbol is also provided to be used when the data (of a journal article, laboratory report, etc.) include information on the slope of the dosage-response curve. This symbol (Symbol *) does not itself code information about the curve, but is only a key to the fact that the information exists with the data. The written abstract on the Code Sheet must be consulted to find the information or reference must be made to the original data.

A. QUALIFICATION OF THE NEGATIVE AND POSITIVE CHARACTER OF TEST RESULTS AND QUALIFICATION OF THE CODED DOSE

B. INFORMATION ABOUT SLOPE OF THE DOSAGE-RESPONSE CURVE

Negative Response

The following two symbols, J and K, are used only when the response coded in Field T has not been produced by the test compound. Thus, when these symbols are used, Field X must be coded with Criterion 01, 02, or 62 and Field Y must be coded with Symbol 1. With any other coding in Fields X and Y, only Symbol L, M, N, Ø, or P can be used in Field W.

J The response does not occur at the coded dose. (When the response is "death", refer to the final statement in parentheses, below.)

The maximum tolerated dose level has not been determined; the coded dose is not known to be the MTD.

The dose administered (the coded dose) has not been determined to be the largest dose that could be administered.

The compound is not demonstrated to be inactive below the toxic level (or other level) that prohibits administration of larger doses.

(If "death" is coded in Field T-2 and is not caused by any doses administered, use Symbol J if it seems that administration of a larger dose is possible and therefore death at a larger dose might be possible. I.e., use Symbol J only if it seems not to have been demonstrated that the test compound could not cause death. When Criterion 21, maximum tolerated dose, is used in Field X, the dose coded is the dose not causing the toxic effect or death coded in Field T-2, for which reason there may be temptation to use Symbol J [or K] in Field W; do not use Symbol J [or K] when Criterion 21 is used, but use only Symbol Ø [or P] to indicate that the toxic effect or death has been demonstrated even though the dose coded is just below the threshold dose.)

K The response does not occur at the coded dose. (When the response is "death", refer to the final statement in parentheses, below.)

The maximum tolerated dose level has been determined; the coded dose is known to be the MTD.

The dose administered (the coded dose) is demonstrated to be the largest that can be administered, for reasons of associated toxicity, e.g.

The compound is demonstrated to be inactive below the toxic level (or other level) that prohibits administration of larger doses.

(If "death" is coded in Field T-2 and is not caused by any doses administered, use Symbol K if it seems that administration of a larger dose is impractical or even impossible. I.e., use Symbol K only if it seems to have been demonstrated that the test compound could not cause "death" under conditions of the test. When Criterion 21, maximum tolerated dose, is used in Field X, do not use Symbol K in Field W, for reasons explained in the definition for Symbol J.)

Positive Response

The following five symbols, L, M, N, Ø, and P, are used only when the response coded in Field T has been positively produced by the test compound. Thus, when one of these symbols is used in Field W, Field X must not be coded with Criterion 01, 02, or 62 with Symbol 1 in Field Y. With the latter coding in Fields X and Y, only Symbol J or K or possibly Q can be used in Field W.

L Only one dose level has been tested (the coded dose). (When the response is "death", refer to the final statements in parentheses, below.)

The maximum tolerated dose level has not been determined; the coded dose is not known to be the MTD.

The response intensity has not been demonstrated to be the maximum intensity of which the compound is capable.

The dose tested has not been demonstrated to be the minimum dose needed to cause the response intensity produced.

(When "death" [coded in Field T-2] is the response to the single dose level tested, Symbol L can not be used in Field W, unless [1] the single test dose level has been applied to a population, [2] the percent kill is less than 100%, and [3] the dose level is not, or is not known to be, the largest dose practical or possible to administer; if the dose level is known to be the largest dose practical or possible to administer and response is less than 100% kill, use Symbol M. When death is produced in the individual organism, when only a single organism is treated, or in 100% of the organisms of a population treated, when only a single dose level is tested [i.e., the dose is not demonstrated to be the minimum needed], use Symbol M.)

M Only one dose level has been tested (the coded dose), but it is known from previous tests to be the maximum tolerated dose. (When the response is "death", refer to the final statements in parentheses, below.)

Because the dose administered is the MTD, the response intensity is the maximum possible, even though it is not known whether, barring its associated toxicity, the compound would not produce greater response with a larger dose.

The coded dose has not been demonstrated to be the minimal needed to cause the response intensity produced in the test being coded.

(When "death" [coded in Field T-2] is the response to the single dose level tested, Symbol M is used whether or not the dose level tested is known to be the largest dose that can be administered--if the death has been caused in a test using a single individual or if the death occurs in 100% of a population treated. However, if application is to a population and "death" [coded in Field T-2] occurs in less than 100% of the population, Symbol M is used only if the test compound was applied at the dose level known to be the largest practical or possible to administer; if this is not known or is known not to be the case, Symbol L must be used for less-than-100% kill.)

N Two or more tests have been performed, each with a different dose level. (When the response is "death", refer to the final statements in parentheses, below.)

All those doses tested have produced the response and at the same intensity.

Because all doses tested produce the same response intensity, the response intensity of the test being coded is maximal (barring a complex dosage-response curve which rises after a plateau on which the tested doses have fallen).

The dose administered (the coded dose) is not demonstrated to be the minimum needed to cause the response intensity produced.

(If "death" [of the individual or of a percentage of a population] is the response for which the minimum dose needed has not been demonstrated [demonstrated by all of the two or more dose levels tested having caused death to the individual or caused death to the same percentage of a treated population], Symbol N is used in Field W, with some criterion other than Criterion 20 or 21 in Field X.)

Ø Three or more tests have been performed, each with a different dose level. (When the response is "death", refer to the final statement in parentheses, below.)

Two or more of the doses tested produce the same intensity of response and one or more of the doses tested produce a lower intensity of response.

The maximum intensity of response of which the test compound is capable has been demonstrated (the intensity on which the coded evaluation is based).

The minimum dose needed to cause the maximum intensity of response has been demonstrated (the coded dose). Do not use Symbol Ø when Criterion 20 is used in Field X, unless "death" (or other "all-or-none" response) is coded in Field T-2, as explained below.

(If "death" [of the individual or of a percentage of a population] is the response for which the minimum dose needed has been demonstrated [demonstrated by one of the doses administered not having caused death to the individual or not having caused any deaths when the next larger dose (the threshold dose) causes 100% kill in a treated population], Symbol Ø is used in Field W and Criterion 20 or 21 may be used in Field X. If maximum response is 100% kill and the minimum dose for causing 100% kill is demonstrated, yet the threshold dose causes less than 100% kill, use of Criterion 20 or 21 demands a coded dose smaller than the minimum dose needed to cause maximum response and Symbol Ø can not be used in Field W, but only Symbol P.)

P Two or more tests have been performed, each with a different dose level. (When the response is "death", refer to the final statement in parentheses, below.)

All of the doses tested produce different response intensities (the larger the dose, the greater the response intensity).

The maximum response intensity of which the test compound is capable has not been demonstrated; the intensity produced by the largest dose tested (the intensity on which code evaluation is based) may or may not be the maximum intensity which the test compound is capable of producing.

For each intensity produced in any of the tests, the dose producing it is the minimum needed (i.e., for the test being coded, a reasonable relationship exists between the dose coded and the response intensity produced). When the threshold dose has been demonstrated and Symbol 20 is used in Field X, Symbol P must be used in Field W except under special conditions when "death" is coded in Field T-2, as explained in the final statements defining the use of Symbol Ø.

(When "death" is coded in Field T-2 and administration is to a population and each dosage level administered causes a different percentage kill, Symbol P is used in Field W and some criterion other than Criterion 20 or 21 must be used in Field X. [See the final statements below for the situation in which the threshold percentage kill by any dose administered to a population is determined, when Symbol P is used with Criterion 20 or 21.] "Death" to a single treated individual or "death" to 100% of a treated population represent non-variable response intensities [they must either occur as totalities or do not occur at all, at any dose] and Symbol P can not be used to apply to them; use only Symbol N or Ø [or Symbol M, if the compound is tested at only one dose level, or Symbol J or K, if death did not occur]. Symbol P is used when Criterion 20 is coded in Field X and the response for which the dosage coded and shown by the test to be the threshold quantity is not death; Symbol P is used with Criterion 20 or 21 when the response is "death" but only when application of the chemical has been to a population, the threshold response is shown to be less than 100% kill, and increasingly larger doses cause increasingly greater percentages of kill, meaning that the coded dose is not the minimum causing the maximum response [for which Symbol Ø is used],

but is the dose causing minimum response [minimum kill, Criterion 20 with Symbol P] or the dose just lower than the dose causing any deaths [MTD, Criterion 21 with Symbol P]. Finally, Symbol P is used when Criterion 21 is used to evaluate a test compound on the basis of the dose level just below the threshold dose causing a toxic response other than "death" [regarding MTD as the maximum dose tolerated without causing non-lethal toxic effects, as well as without causing death, prohibiting its use].)

Questionable Response

Q The occurrence or non-occurrence of the response coded in Field T (non-toxic response, non-lethal toxic response, or death), as reported by the author, is questionable, due to limiting factors of the test method and observation. This symbol should be used only rarely and ordinarily only when the author has expressed doubts and reasons for the doubts as to whether the evidence is valid for the response being positive or negative.

Second use of Field W:
Information about Slope of the
Dosage-response Curve

* Information about the slope of the dosage-response curve is included with the original data. Reference to the Code Sheet should be made for this information. (When coding Symbol * in Field W, the written abstract of the field should include the information about the slope, as defined and discussed in the Key.)

FIELD X
Columns 69 and 70

FIELD Y
Column 71

FIELD X: THE CRITERION FOR EVALUATION OF THE TEST COMPOUND'S BIOLOGICAL ACTIVITY

FIELD Y: THE EVALUATION OF THE TEST COMPOUND'S BIOLOGICAL ACTIVITY (RELATIVE TO THE SPECIFIC BIOLOGICAL RESPONSE)

Field X Columns 69 and 70	Field Y Column 71
Note: When the data are negative (when the test compound did not cause to any statistically significant degree the specific response coded in Field T), coding in Field X is limited to one of three criteria, 01, 02, or 62 (coded with Symbol 1 in Field Y). When the response coded in Field T is caused by the test compound, any appropriate criterion can be used (including any of 01, 02, or 62 used with Field Y symbols other than 1).	
Criterion code symbol and description of the criterion	Evaluation scale (code symbols) and definitions of evaluation symbols for Field Y
01 Author's statement of evaluation (i.e., author's verbal evaluation). Coder's general evaluation (in absence of any quantitative data and of author's statement of evaluation). Note: Do not use this criterion if quantitative data allow any other criterion of Field X to be used.	1 "Inactive": inactivity, including any measure which suggests activity but which the author does not interpret as actually being positive response due to the method of measurement being too coarse. (Refer to the Key.) 3 "Slight activity"; used for demonstrated positive responses even though they may happen to be too low to be considered by the author as "significant" for a practical application. (Refer to the Key.) 5 "Moderate", "intermediate" (i.e., more than "slight", but less than "fair", "good", "satisfactory", etc.) 7 "Fair", "good", "satisfactory" (i.e., more than "moderate", or "intermediate", but less than "severe", "high", etc.) 9 "Severe", "high", "intense", "excellent", etc. 0 Positive response of unspecified degree.

FIELD X
Columns 69 and 70

FIELD Y
Column 71

Field X	Field Y
02 Author's scoring system. (Two samples of such scoring schemes are shown, with the author's scoring units assigned code symbols.)	1 - - 3 + 5 ++ + 7 +++ 9 ++++ ++
-or-	
Evaluation according to an author's statement of an estimate expressed in terms of percentage of maximum response. (E. g., "about half", "approximately a third", "nearly all", "in the neighborhood of 25%", etc.) Note: When an exact measure or count is made, providing a precise percentage expression, use Criterion 62.	1 0% response 0 <1% thru 10% response A >10% thru 20% response 2 >20% thru 30% response 3 >30% thru 40% response 4 >40% thru 50% response 5 >50% thru 60% response 6 >60% thru 70% response 7 >70% thru 80% response 8 >80% thru 90% response 9 >90% thru 100% response
03 The degree of biological response caused by the test compound--compared to the degree of biological response caused by a specific standard compound, when the test compound is administered (in the test being evaluated) in the same quantity as was the standard compound (tested separately). Note: The standard compound must be named and coded in Field D and Symbol * must be coded in Column 17 of Field D. Ratio: $\frac{\text{Degree of response to the test compound}}{\text{Degree of response to the standard compound}}$	1 <.05 thru .05 (1/20 of the biological response made to the standard compound, or less) 3 >.05 thru 0.5 (>1/20 thru 1/2) 5 >0.5 thru 5 (>1/2 thru 5 times the biological response made to the standard compound) 7 >5.0 thru 50 (>5 times thru 50 times) 9 >50 (>50 times) When the data are not sufficiently quantitative to permit the calculation of the values of the scale above, but only general verbal comparisons are made, use the following scale: 4 The biological response to the test compound was less than to an equal quantity of the standard compound. 5 The biological response to the test compound was equal to the response to an equal quantity of the standard compound. 6 The biological response to the test compound was greater than to an equal quantity of the standard compound.

FIELD X
Columns 69 and 70

FIELD Y
Column 71

Field X	Field Y
04 The quantity (preferably minimum) of test compound needed to cause the same degree of response as a standard compound --compared to the quantity (preferably minimum) of standard compound causing that degree of response. Note: The standard compound must be named and coded in Field D and Symbol * must be coded in Column 17 of Field D. Ratio: $\frac{\text{Dosage of standard compound causing "X" degree of response}}{\text{Dosage of test compound causing "X" degree of response}}$	1 <.05 thru .05 (20 times more, or more than 20 times more, test compound than standard compound is needed to cause the same degree of response as the standard compound) 3 >.05 thru 0.5 (<20 thru 2 times more test compound than standard compound) 5 >0.5 thru 5.0 (<2 times as much thru 1/5 as much test compound as standard compound) 7 >5.0 thru 50 (<1/5 thru 1/50 as much test compound as standard compound) 9 >50 (<1/50 as much test compound as standard compound) When the data are not sufficiently quantitative to permit the calculation of the values of the scale above, but only verbal comparisons are made, use the following scale: 4 A quantity of test compound greater than the quantity of standard compound is required to cause a given intensity of biological response. 5 A quantity of test compound equal to the quantity of standard compound will cause the same intensity of biological response as the standard compound. 6 A quantity of test compound smaller than the quantity of standard compound is adequate to cause a given intensity of biological response.

FIELD X
Columns 69 and 70

FIELD Y
Column 71

Field X	Field Y
Note: Criteria 10, 11, 12, and 13 are to be used when the response is measured only in terms of one of the time values defined below. If the data indicate the percentage of individuals to which a given time value applies (e.g., "40% of individuals are dead after 10 minutes"), Criterion 54 (instead of 13), 57 (instead of 12), 58 (instead of 10), or 59 (instead of 11) should be used and the data plotted on the Grid. If, in addition to the time values, the data include information about the intensity of response in the individual (e.g., 50% increase in blood pressure or 20% decrease in urine output), a code evaluation of this measure can only be accomplished by constructing another code line using Criterion 62.	
10 Time to specific action other than death. (Killing time as a criterion is coded with Symbol 11 as defined below.) Speed with which the test compound produces the specific action. Time from beginning of administration of the test compound to the first appearance of the response.	Criteria 10 and 11 only: In the case of these two criteria, the brevity of the time periods (Field U, Symbols 1, 2, and 3, e.g:) is a measure of the test compound's ability to cause the response. I.e., the shorter the time period, the greater is the test compound's activity. Therefore, transfer the reciprocal of the symbol coded in Field U (Column 66) to Field Y.
11 Killing time. Speed with which the test compound kills. Time from the beginning of administration of the test compound to the death of the organism.	
12 Alteration of survival time. The test compound's increase or decrease of the time taken by some lethal factor (other than the test compound, e.g., a pathogen, poison, or radiation) to kill the test organism.	Criteria 12 and 13 only: In the case of these two criteria, the longer the time period (Field U, Symbols 9, 8, 7, e.g.) the greater is the test compound's activity indicated to be. Therefore, transfer the symbol coded in Column 66 of Field U to Field Y as the measure of the compound's comparative intensity of activity.
13 Duration of action. The length of time over which the test compound causes the specific response in the test organism.	

If Column 66 is coded with Symbol:	--code Field Y with Symbol:
1	9
2	8
3	7
4	6
5	5
6	4
7	3
8	2
9	1

FIELD X
Columns 69 and 70

FIELD Y
Column 71

Field X	Field Y
14 Therapeutic index: $\frac{\text{Minimum fatal dose}}{\text{Minimum curative dose}}$	1 <4 thru 4 3 >4 thru 16 5 >16 thru 64 7 >64 thru 256 9 >256
15 Chemotherapeutic index: $\frac{\text{Minimum curative dose}}{\text{Minimum tolerated dose}}$	1 >0.25 3 >0.03 thru 0.25 5 >0.0035 thru 0.03 7 >0.0004 thru 0.0035 9 <0.0004 thru 0.0004
16 Chemotherapeutic index: $\frac{\text{Dose killing 50\% of individuals to which it is administered}}{\text{Dose therapeutically effective (to a given degree, curative or otherwise) in 50\% of individuals to which it is administered}}$ $\frac{LD_{50}}{ED_{50}}$	1 <4 thru 4 3 >4 thru 16 5 >16 thru 64 7 >64 thru 256 9 >256
17 Repellency index: Note: This is a special criterion used for coding tests on rats only. The index and its description are included in the Key.	1 <80 thru 80 3 >80 thru 87 5 >87 thru 91 7 >91 thru 96 9 >96 thru 100
18 Tolerance increase ("tolerance production" or "sensitivity decrease"): Ratio: $\frac{\text{Final tolerated dose (or, preferably, final maximum tolerated dose)}}{\text{Initial maximum tolerated dose}}$ Tolerance increase is indicated only when the above ratio value is more than 1.0.	1 >1.0 thru 1.5 2 >1.5 thru 2.0 3 >2.0 thru 5.0 4 >5.0 thru 10.0 5 >10.0 thru 25.0 6 >25.0 thru 50.0 7 >50.0 thru 75.0 8 >75.0 thru 100.0 9 >100.0

FIELD X
Columns 69 and 70

FIELD Y
Column 71

Field X	Field Y
19 Sensitivity production ("sensitivity increase" or "tolerance decrease"): Ratio: $\frac{\text{Final dose not producing the toxic symptom}}{\text{Initial maximum dose not producing the toxic symptom}}$ -or- Ratio: $\frac{\text{Final threshold dose producing the toxic symptom}}{\text{Initial threshold dose producing the toxic symptom}}$ Sensitivity production is indicated only when the above ratio value is less than 1.0.	1 < 1.0 thru 0.9 2 < 0.9 thru 0.8 3 < 0.8 thru 0.7 4 < 0.7 thru 0.6 5 < 0.6 thru 0.5 6 < 0.5 thru 0.25 7 < 0.25 thru 0.1 8 < 0.1 thru 0.01 9 < 0.01
20 Threshold dose size. Minimum effective dose size. Evaluations according to: (a) threshold concentration, Field M, or (b) threshold quantity, Field N, or (c) threshold duration of administration, Field P. Note: If the data reveal the variation in and distribution of the threshold of response in a group of individuals (i.e., several threshold doses and the percentage of organisms showing threshold response with each), use Criterion 51, 52, or 53. When Criterion 20 is used, only Symbol P or, when "death" is coded in Field T-2 (and then only under certain circumstances), Symbol Ø is coded in Field W. Consult the Code definitions and instructions for Symbols Ø and P of Field W.	The smaller the quantity of test compound needed to cause a given intensity of response (threshold response, in this case), the greater is the potency of the test compound. Therefore, code Field Y with the reciprocal of the symbol coding the dose (Column 46 of Field M or Column 48 of Field N or Column 51 of Field P). If Column 46 (or 48 or 51) is coded with: --code Field Y with Symbol: 1 9 2 8 3 7 4 6 5 5 6 4 7 3 8 2 9 1

FIELD X
Columns 69 and 70

FIELD Y
Column 71

Field X	Field Y
21 Maximum tolerated dose (abbreviation: MTD). Most frequently this is understood to be the greatest quantity that can be administered without causing death (Field T-2, Symbol 11, 111, or 112) of the test organism; i. e., the dose just smaller than the minimum lethal dose. (Consult the Key's discussion of Criterion 21.) The maximum tolerated dose (coded in the dosage fields, M, N, and P) can be more specifically defined as: (a) maximum tolerated concentration, Field M, (b) maximum tolerated quantity, Field N, (c) maximum tolerated duration of administration, Field P. Note: If, in a group of individuals, test data demonstrate the variation in and distribution of the individuals' maximum tolerances for the test compound (i. e., several MTD levels for each of which is determined the percentage of individuals for which it represents the MTD), use Criterion 51, 52, or 53. When Criterion 21 is used, only Symbol P or, when "death" is coded in Field T-2 (and then only under certain circumstances), Symbol Ø is used in Field W. Consult the Code definitions and instructions for Symbols Ø and P of Field W.	The greater the quantity of test compound tolerated, the greater is the test compound's rating as a safe therapeutic agent. Therefore, code Field Y with the same symbol coding the dose (Column 46 of Field M, Column 48 of Field N, or Column 51 of Field P). If Column 46 (or 48 or 51) is coded with: --code Field Y with Symbol: 1 → 1 2 → 2 3 → 3 4 → 4 5 → 5 6 → 6 7 → 7 8 → 8 9 → 9
22 Antagonism of the biological action of a secondary compound. In other words, dosage of the test compound needed to prevent the test organism's demonstrated response to the secondary compound alone, when both compounds are administered together. Note: Evaluation by Criterion 22 of a test compound's ability as an antagonist of the specific action of a given secondary compound is not modified by the degree of antagonism (i. e., partial reduction of the response to the secondary compound). Criterion 22 should be used only when antagonism of the secondary compound's action has been totally prevented (100% reduction of response to the secondary compound). If, in a group of individuals, the data reveal the variation and distribution of antagonism ratio (see the evaluation of antagonism, Field Y), use Criterion 55.	Evaluation of antagonism with Criterion 22 is on the basis of the amount of secondary compound antagonized per unit of test compound. The greater the amount of secondary compound antagonized per unit quantity of test compound, the greater is the test compound's potency for antagonizing the action of that secondary compound. Ratio: $\frac{\text{Amount of secondary compound whose effect is antagonized 100\% (i. e., prevented)}}{\text{Minimum amount of test compound (antagonist) needed to antagonize the secondary compound's effect 100\%}}$ The value from the calculation above is used to derive a code evaluation for Field Y according to the following scale: 1 < 0.05 thru 0.05 3 > 0.05 thru 0.5 5 > 0.5 thru 5 7 > 5 thru 50 9 > 50

FIELD X
Columns 69 and 70

FIELD Y
Column 71

Field X	Field Y
30 Weight of the thyroid gland, expressed in terms of milligrams of thyroid gland per 100 grams of body weight.	The evaluation with Criterion 30 is based on the ability of the test compound to decrease the thyroid activity, as indicated by the gland's hypertrophy. Thus, the greater the gland's hypertrophy, the greater should be the test compound code evaluation. 1 <8 thru 8 3 >8 thru 16 5 >16 thru 24 7 >24 thru 32 9 >32
31 Iodine content of the thyroid gland, expressed in terms of milligrams of iodine per 100 grams of thyroid gland.	The evaluation with Criterion 31 is based on the ability of the test compound to decrease iodine in the thyroid. Therefore, the smaller the quantity of iodine in the gland, the more is the test compound's anti-thyroid ability. 1 >40 3 >20 thru 40 5 >10 thru 20 7 >5 thru 10 9 <5 thru 5

Note: Criteria 51, 52, 53, 54, 57, 58, 59, and 55 are used only when the data include information on the percentage of individuals responding to each dose level of test compound (Criteria 51, 52, 53, and 55) or to each duration of response, increase of survival time, etc. (Criteria 54, 57, 58, and 59). For evaluations by these eight criteria, the Log-Probit Grid must be used.

51 Concentration expressed in Field M vs. cumulative percentage of individuals responding. 52 Quantity expressed in Field N vs. cumulative percentage of individuals responding. 53 Duration of administration expressed in Field P vs. cumulative percentage of organisms responding.	Consult the Key for the explanation of the use of the Grid and the use of these three criteria with which Field Y is coded with one of five symbols: 1 3 5 7 9 These five symbols represent positive response from "low" (large dose and/or few individuals responding) to "high" (small dose and/or most or all indivlduals responding), regardless of the intensity of response in the individual (e.g., percentage increase of heart rate, percentage change of rate of development). Criteria 51, 52, and 53 are used mostly for evaluating the test compound's lethal activity on a group of individuals of the test organism.

FIELD X
Columns 69 and 70

FIELD Y
Column 71

Field X	Field Y
Note: In the case of Criteria 54 and 57, below, the reciprocal of the symbol used in Column 66 of Field U is used on the abscissa scale of the Grid. (In essence, this means merely that that abscissa scale of the Grid is reversed.) This is because a long duration of response or long survival time increase or decrease represents a high level of chemical activity; for this same reason, when basing evaluation on the time alone (Criteria 13 and 12), the symbol coded in Field U is used in Field Y rather than the reciprocal of that Field U symbol.	
54 Duration of response (the time period coded in Field U) vs. the cumulative percentage of individuals in which the response endures the period coded in Field U.	With Criterion 54, the evaluation to be coded in Field Y is based on the point at which the response has ended for any given percentage of individuals. (Study the example given in the Key, Specific Directions and Explanations for Fields W, X, and Y, Division 20.) Evaluation symbols: 1, 3, 5, 7, or 9, according to the Grid area involved.
57 Survival time increase or survival time decrease (the time period coded in Field U, representing the time differential between the survival times of treated and untreated organisms) vs. the cumulative percentage of individuals whose survival time was affected to the degree indicated in Field U.	With Criterion 57, evaluation is based on the cumulative percentage of individuals whose survival time has been increased (or decreased) a given period. (Study the example given in the Key, Specific Directions and Explanations for Fields W, X, and Y, Division 20.) Evaluation symbols: 1, 3, 5, 7, or 9, according to the Grid area involved.
Note: In the case of Criteria 58 and 59, below, the symbol used in Column 66 of Field U is used on the abscissa of the Grid. This is because a short time to the specific action represents a high level of chemical activity; for this same reason, when basing evaluation on the time alone (Criteria 10 and 11), the reciprocal of the symbol coded in Field U is used in Field Y as an evaluation.	
58 Time to specific action other than death (the time period from beginning of administration to the first appearance of the response, coded in Field U), vs. the cumulative percentage of individuals responding within the time period coded in Field U.	With Criterion 58, evaluation is based on the cumulative percentage of individuals responding (other than by dying) after a given period of time. (Study the example given in the Key, Specific Directions and Explanations for Fields W, X, and Y, Division 20.) Evaluation symbols: 1, 3, 5, 7, or 9, according to the Grid area involved.

FIELD X
Columns 69 and 70

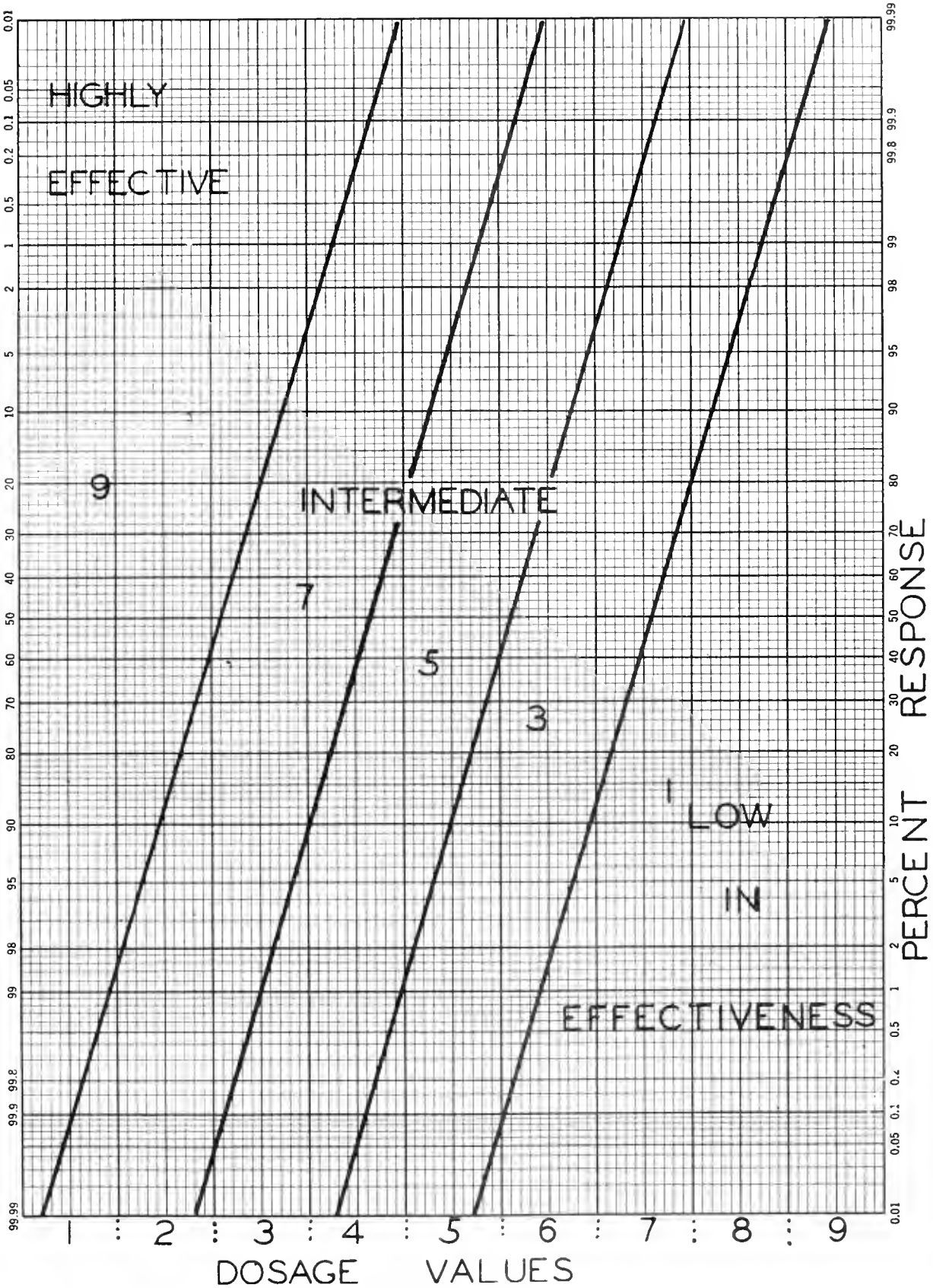
FIELD Y
Column 71

Field X	Field Y
59 Killing time (the time period from beginning of administration to the point of death, coded in Field U), vs. the cumulative percentage of individuals killed within the time period coded in Field U.	With Criterion 59, evaluation is based on the percentage of individuals killed after a given period of time. (Study the example given in the Key, Specific Directions and Explanations for Fields W, X, and Y, Division 20.) Evaluation symbols: 1, 3, 5, 7, or 9, according to the Grid area involved.
55 Antagonism dosage vs. incidence of antagonism in a group of individuals. Dosage (concentration, quantity, or duration of administration) of test compound causing antagonism of the biological action of the secondary compound vs. the cumulative percentage of individuals in which that dosage causes antagonism. Note: Evaluation by Criterion 55, of a test compound's ability as an antagonist of the specific action of a given secondary compound is not modified by the degree of antagonism (i.e., partial reduction of the response to the secondary compound). Criterion 55, as well as Criterion 22, should be used only when the secondary compound's action has been prevented (100% reduction of the response to the secondary compound). If antagonism is demonstrated only in an individual (the test not demonstrating incidence of antagonism in a group of individuals), use Criterion 22.	For Criterion 55, the two quantitative dosage values are related by the following ratio: Ratio: $\frac{\text{Minimum amount of test compound (antagonist) needed to antagonize the secondary compound's action 100\%}}{\text{Amount of secondary compound whose effect is antagonized 100\% (i.e., prevented)}}$ The value derived from the above calculation is placed on the abscissa of the Grid with the assistance of the following table of ranges: Grid abscissa segment / Ranges of minimum test compound quantities needed to antagonize one unit of the secondary compound 1: <0.05 thru 0.05 2: >0.05 thru 0.15 3: >0.15 thru 0.5 4: >0.5 thru 1.5 5: >1.5 thru 5 6: >5 thru 15 7: >15 thru 50 8: >50 thru 150 9: >150 Each of the nine ranges above represents one of the nine equal segments of the scale of the abscissa of the Grid. The dosage ratio value should be located on the abscissa scale at the appropriate point within the range (i.e., within the abscissa scale segment) indicated in the table above. Evaluation symbols: 1, 3, 5, 7, or 9, according to the Grid area involved.

FIELD X
Columns 69 and 70

FIELD Y
Column 71

Field X	Field Y
61 Degree of response greater than 100%; intensity of response; percentage of response. Criterion 61 is used principally to evaluate on the basis of the degree (percentage) of increase of a pre-existing condition (i.e., percent increase of a normal physiological function or a pathological state) in response to the test compound. The criterion is also used to evaluate synergistic responses, the percentage increase (>100%) of response to a secondary compound due to the presence of (the action of) the test compound.	Use Criterion 61 only for evaluating the intensity of response in the organism and only when that response is over 100%. For responses of 100% or under 100%, use Criterion 62. Code Field Y according to the ranges of the following table: Symbol for Field Y — Ranges of percentage responses 3 — >100% thru 400% 5 — >400% thru 700% 7 — >700% thru 1000% 9 — >1000%
62 Degree of response 0% through 100%; intensity of response; percentage of response. Criterion 62 is intended for evaluation on the basis of the degree (percentage) of increase (or decrease) of a pre-existing condition (a normal physiological function or a pathological state) in response to the test compound. The criterion is also used to evaluate synergistic responses, the percentage increase (0% through 100%) of response to a secondary compound due to the presence of (the action of) the test compound. In addition to using Criterion 62 for evaluating on the basis of degree of response of the organism, this criterion is used to record intensity of response expressed as a percentage of individuals responding to the test compound (administered to a group of individuals) at a given level of intensity of response of the individual.	Code Field Y according to the ranges of the following table: Symbol for Field Y — Ranges of percentage response 1 — 0% 0 — >0% thru 10% A — >10% thru 20% 2 — >20% thru 30% 3 — >30% thru 40% 4 — >40% thru 50% 5 — >50% thru 60% 6 — >60% thru 70% 7 — >70% thru 80% 8 — >80% thru 90% 9 — >90% thru 100%


HIGHLY
EFFECTIVE
9
INTERMEDIATE
7
5
3
1
LOW
IN
EFFECTIVENESS
PERCENT RESPONSE
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9
DOSAGE VALUES

APPENDIXES

The contents of these Appendixes represent an extension of the descriptions of the Introduction. The Introduction deals particularly with the background and description of the Biology Code, while in Appendix A are described the CBCC procedures related to the use of the Biology Code, including the procedures of the Center for collecting information for coding, organization for administration of the coding process, and handling of the coded and IBM-punched information. Finally, in Appendix B, some general observations are made about the Code and Key and the significance of the Center's activities.

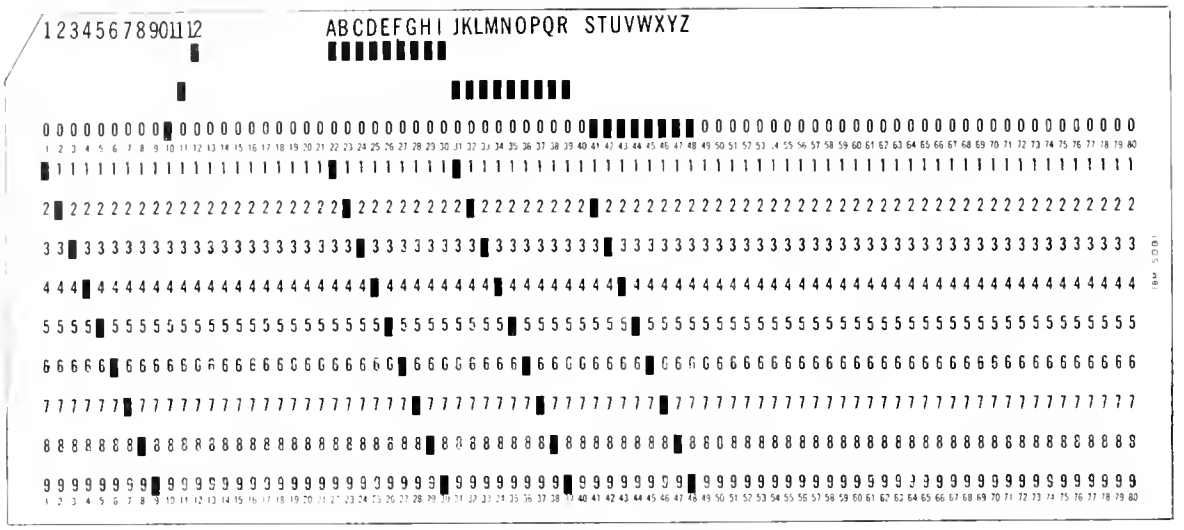


Figure 1--Standard IBM Punched Card

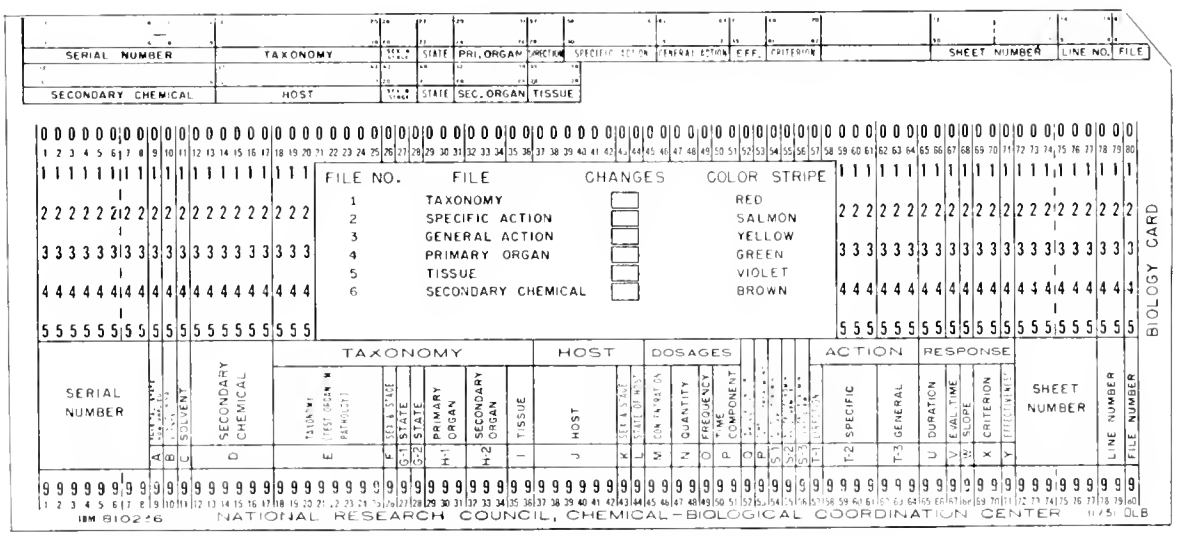


Figure 2--Biology IBM Punched Card

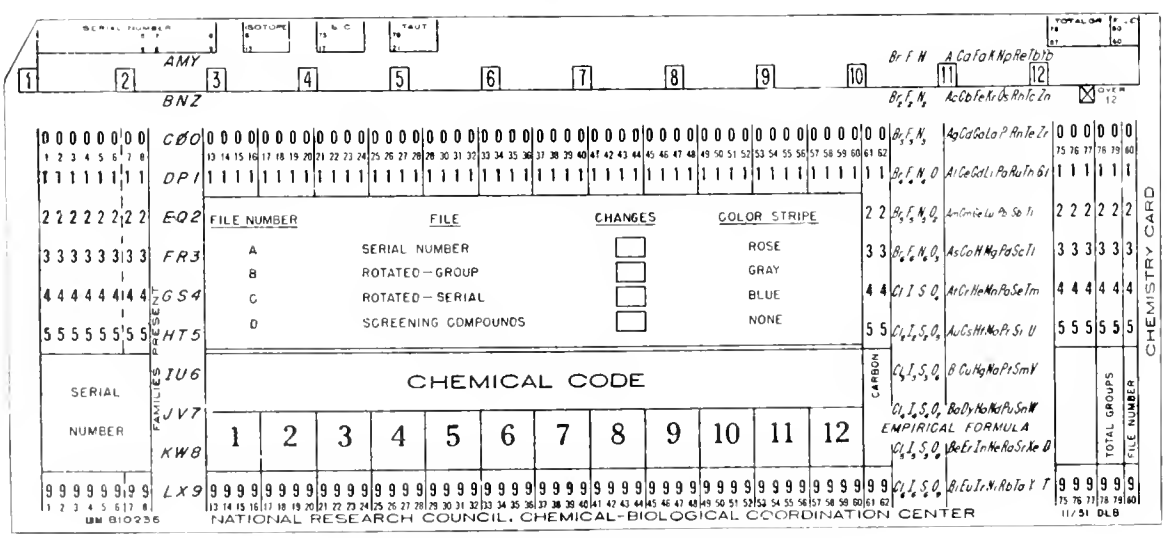


Figure 3--Chemistry IBM Punched Card

APPENDIX A

I. THE BIOLOGY IBM PUNCHED CARD

It will be noted that the standard IBM card (Figure 1) is divided into 80 columns in each of which are printed the numbers 1 through 9 and, at the top of the column, 0. Thus, it may be immediately apparent that in each column there are at least ten positions for perforation, representing ten available symbols. The machines can make two additional perforations at the top of the columns beyond the 0 position. These are referred to as the 11 and 12 positions on the column. Therefore, in all, there are actually twelve basic punching positions in each column, representing twelve available symbols.

It is possible to multiply the number of symbols available in any one column by using the three upper positions of the column (0, 11, and 12) as designators for combination with any one of the remaining number positions. This permits the 26 combinations which are assigned the letters of the alphabet as symbols. Figure 1 illustrates each punch and punching combination which can subsequently be distinguished and interpreted as a symbol. While any or all of these may be used in any one column of the card, each is illustrated in a separate column in the figure, with the interpretation at the top of the column. In each of the first twelve columns, the card in Figure 1 is punched with only a single punch, the punching being interpreted, at the top of the card, as numerical symbols 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 11, and 12. In Columns 22 through 39 and 41 through 48, the punching illustrates combinations of position 12, 11, or 0 with position 1, 2, 3, 4, 5, 6, 7, 8, or 9, this punching being interpreted, at the top of the card, as letters A through Z. It will be noted that the combination of punches in positions 0 and 1 is not made, due to the proximity of the two perforations in the same column; punching in adjacent positions in the same column is never recommended, to prevent any possible confusion in machine interpretation and sorting.

The three topmost punching positions (12, 11, and 0) are commonly referred to as "zone punches", the remaining ("low") positions in the column being the "digit punches". The former are sometimes referred to as the "first", "second", and "third" zone punches, but throughout the Code and Key they are referred to as the "12", "11", and "0" zone punches, respectively.

In addition to using the zone punches in combination with digit punches for 26 alphabetical symbols, it is possible to assign definitions to each of the zone punches alone; in other words, the 0, 11, or 12 position could be punched, uncombined with any numerical punch, to indicate a specific meaning assigned to that single punch, as well as being used in combination with digit punches to indicate a specific meaning assigned to that combination. In that case, the number of available symbols in any one column would be 38 (1 through 9, A through Z, and the 3 zone punches used alone). The CBCC, however, has never used any zone punch alone as a symbol when it has been used already as a designator for letter symbols. Therefore, in the case of the CBCC Biology Code, any one IBM punched card column may be considered to be limited to a maximum of 35 symbols each. Reference to the following list will make clear the number of symbols available to the CBCC in any one column, according to the use made of the zone punches.

Symbols used	Number of symbols available in one column
1 through 9 and A through Z (no zone punches used alone)	35
1 through 9, A through R, and the 0 zone punch used alone	28
1 through 9, J through Z, and the 12 zone punch used alone	27
1 through 9, A through I, S through Z, and the 11 zone punch used alone	27
1 through 9, A through I, and the 11 and 0 zone punches used alone	20
1 through 9, S through Z, and the 12 and 11 zone punches used alone	19
1 through 9 and the 12, 11, and 0 zone punches used alone	12

Some types of information need fewer symbols than others. Consequently, the pattern of zone punch combinations with digit punches (one of the seven above) varies from column to column, according to the information category, though it can not vary within a given column once it is established. The first of the seven possible combinations might be appropriate for information coded in one column (because more than 28 symbols are needed for the category of information coded in that column), while the second or third or any other of the last six possible combinations could be established for information coded in another column (if 28 or fewer symbols are adequate for that particular information category).

When a zone punch is not used for combinations with the numerical punches (any of the last six possibilities of the seven listed above), the CBCC has considered it to be available for a specific definition, if needed. However, if a special meaning is assigned to a zone punch, the CBCC considers

that zone punch unavailable (and not needed) for combination with the numerical punches. For example, if a given column appears to need fewer than 29 symbols and a special meaning is assigned to the 12 zone punch (see the third, sixth, and seventh items of the list above), the letters A through I are never used for symbols in that particular column. In the same column in which the 12 zone punch has been used for a unique meaning, however, if the 11 and 0 zone punches have not also been assigned special meaning (see the third possibility of the list above), the letters J through R and S through Z would be available as symbols.

In cases where the CBCC has assigned specific meanings to zone punches used alone (any of the last six possibilities listed above, when the major category of information coded in the column needs only 28 or fewer symbols), that specific meaning is of a different category of information than is coded by the remaining symbols of the column. For example, the information category, stage of development of the test organism, has been found to be adequately classified by nine items (nine developmental stages), needing only the nine numeric symbols; thus, a different category of information (sex) has been assigned to zone punches 12 and 11 used alone, the 12 zone punch designating the male sex and the 11 zone punch the female.

The 12 and 11 zone punches used alone are never written on the Code Sheet as Symbol "12" and Symbol "11", since it can be confusing to have a symbol with two digits to be written in one column. Instead, the CBCC always uses the two symbols, "*" and "#", respectively. The written Symbol "*" is therefore always represented on the IBM card by a perforation at position 12 (the 12 zone punch) and Symbol "#" by a perforation at position 11 (the 11 zone punch). The 0 zone punch, however, is always written literally as Symbol "0".

As has been explained above, for each column of the punched card, 35 symbols are potentially available. If, instead of using only one column for a given type of information, two columns are used, the number of symbols available is greatly increased. For example, the CBCC has reserved both of Columns 23 and 24 for indicating the genera belonging to the family indicated by Columns 21 and 22. Thus, each genus and each family has a symbol of two units. This means that each of the 35 available symbols of one column can be combined with any of the 35 symbols of the second column so that 1225 symbols are available for that number of genera (Columns 23 and 24) or families (Columns 21 and 22) of test organisms. If three columns were used, the number of symbols available for any given type of information would be correspondingly greater.

The biology IBM punched card (Figure 2) differs from the ordinary card of Figure 1 only in the special CBCC designations printed on the card. The top of the biology punched card is divided into areas in which the IBM Interpreter can enter the code symbols represented by perforations in certain of the columns. All the punched information of the card is not included, but only the serial number of the chemical tested and symbols for the test organism, sex and stage of the test organism, state of the test organism, primary organ, action of the chemical, effectiveness, criterion of effectiveness, secondary chemical, host, sex and stage of the host, state of the host, secondary organ, and tissue. Since room at the top of the card is limited, only that coded information to which reference is most frequently made is included. It will be noted that the interpretation of a punched column need not be directly above the column, but the IBM Interpreter can be wired to inscribe the interpretation at another position. For example, the criterion for evaluation is punched in Columns 69 and 70 (see the lower part of the card), yet the Interpreter can print the interpretation at the top of the card in a position fixed above Columns 54-57.

The printing which appears horizontally across the 6, 7, and 8 punching positions of the biology card represents a guide to anyone attempting to interpret directly the punching on the card; it shows the division of the card into 31 punching "fields" of information about the biology test and four additional punching "fields" which are for other information categories (Chemical Serial Number, Code Sheet Number, Code Line Number, and File Number). The central area of the card is occupied with reference to the several special files of the IBM cards (files supplementary to the principal file of IBM cards arranged by Chemical Serial Number). Since the last revision of these entries on the card, two additional files were established, the Host File and the Supplementary Taxonomy File. These files and the Code Sheet are described later. The file to which a given card belongs is indicated by a colored strip at the upper edge, a necessary means of distinction, since cards punched identically will be in three of the files and may be in all of the files. When removed from its file, the manual refiling of the card into its proper cabinet is assured by the color identification. The cards of the principal file, the "Serial File", are distinguished by being entirely blue.

The clipping of the upper right corner of the biology punched card is merely to distinguish the punched card as containing biology information. CBCC chemistry punched cards are clipped in the opposite corner.

II. THE BIOLOGY CODE SHEET

The earliest CBCC coding was on special 8-1/2" x 11" sheets referred to as "work sheets". The sheets were redesigned to fit the final pattern of the Code (the fifth edition) and have since been termed "Code Sheets". On these Code Sheets, coders translate the information into code symbols, accompanying the coding with a written abstract. The Code Sheets bear reference to the source of information and the identity of the specific test compound, as well as a reference to themselves, a number which is assigned to each Code Sheet after it is coded and which facilitates its retrieval after being filed in a special Code Sheet File. The Code Sheets are 17" x 11". For filing and ease in handling, they are folded once to become 8-1/2" x 11". A Code Sheet is illustrated on the following pages.

On the inner side of the Code Sheet (Figure 5), sixty-five of the eighty columns of the IBM punched card are depicted (Columns 9 through 71, 78 and 79). These are organized into several areas or "fields", each of which represents a distinct type of information commonly associated with tests for biological responses to chemicals. A description of the type of information assigned to each field is printed at the top of the Code Sheet, as a "title" of the field. Below this area naming the coding fields (regarding the lower long edge of the Sheet as the bottom edge), the Sheet is divided into four equal areas by horizontal rulings. The areas are labelled as I, II, III, and IV on the Code Sheet illustration. Considering only one of these areas, it will be seen to consist of two bands across the Sheet (labelled as A and B in the illustration), the broader of which is divided by vertical rulings according to coding fields and the narrower of which is divided according to the sixty-five IBM columns. In the broader band is written the information about the test; for example, the name of the test organism, tumor, or pathology is written in Field E, a description of the response is written in Fields T-1 and T-2, the exact dose administered is written in Fields M and/or N, etc. This, then, represents a written abstract of the test, to be filed and to which reference is made from the IBM punched card index. The area is referred to throughout the Code and Key as the "written abstract" portion of the code line or sometimes as the "language" portion. In the narrow band, the information is coded, placing the code symbols from the Biology Code in the appropriate "code boxes", in other words, in the places representing the appropriate IBM punched card columns. Completed, this written abstract and the coding of the information represents one "code line". On each Sheet, then, space is provided for four code lines, each representing one action of a given chemical tested (i. e., one response of an organism) as shown by any one test from any given source of information. As a reference from the IBM punched card to the code line, each line is numbered (at the right end of the line) and this reference number ("Line No. ") is punched in Columns 78 and 79 of the IBM card.

As indicated previously, each Code Sheet is assigned a reference number (the Code Sheet Number) which is placed at the upper right corner of the inner surface of the Code Sheet and is punched in Columns 72 through 77 of the IBM card. This Code Sheet Number has no significance other than a reference number. It is used in filing (see the description of the Code Sheet Files) and it assists in keeping records of the Sheets as they are checked, processed by chemists, punched, etc. The Numbers are assigned strictly by the sequence of the Code Sheets being returned from the coder. In referring to them, the term "serial" has never been applied in order to avoid confusion with the number designations assigned to chemicals which the CBCC commonly refers to as the "CBCC Serial Number".

The "CBCC Chemical Serial Number" referred to above (which has been abbreviated to "CBC Number") is placed in the upper left corner of the inner side of the Biology Code Sheet. This number is a reference to the identity of the chemical tested and will be explained in the next section, discussing the coding of chemical information.

Because one compound may be reported from a single information source as having been demstrated to have caused several responses or it may have been tested in several ways, four code lines are frequently not sufficient. The coder then uses a second Code Sheet (a "continuation Sheet") or as many Sheets as are necessary to record all information about that one compound from that one information source; all of these Code Sheets, the first and all the continuation Sheets, are assigned the same Code Sheet Number. At the top of the Sheet and to the right of the center, the coder indicates the total number of Code Sheets used for this purpose (note the designation, "of Total") and, of that total, the sequential number which the Code Sheet represents ("Sheet No. "), the initial Sheet being Sheet No. 1, the first continuation Sheet being Sheet No. 2, etc.

Finally, a space is provided at the top of the Sheet in which the coder and the person checking the coding enter their identifying initials ("Coded by" and "Checked by"). If it proves that coding

difficulties make necessary a resident staff member's reviewing the coder's and checker's work, this "arbitrator's" initials are also entered here ("Arbitrated by").

As the illustration of the Code Sheet indicates, this side of the Code Sheet on which the actual coding is entered is considered to be the "inside" of the Sheet. When folded for mailing or filing, then, this coding is on the inner surface and the reverse side (the outer surface) forms a "front" and "back" of the Code Sheet.

The front side (Figure 6) is generally self explanatory of entries to be made identifying the chemical tested, the information source, and the Code Sheet Number. In the space in which coders are instructed not to make an entry, only the CBCC resident chemists enter the name of the chemical tested, using, for consistency, the name by which the chemical has been filed in the CBCC Chemistry Files, generally conforming to Chemical Abstracts nomenclature.

The back side of the folded Code Sheet (Figure 4) is also generally self explanatory, being for the coders' recording of properties of the test compound, whenever such information is given by the information source.

All completed Code Sheets, after being assigned Code Sheet Numbers, checked, arbitrated, and processed by the chemists and IBM punch operators, are filed in a Code Sheet File which serves as a master file of the information collected by the CBCC. This file is described later.

III. RECORDING OF INFORMATION ABOUT CHEMICALS AND CODING OF CHEMICAL STRUCTURES

Space does not permit more than an outline of the procedures the Center used for handling information about chemicals used in chemical-biological tests. The Chemistry Code[1] was published in 1950. By this Code, the CBCC recorded on IBM punched cards the structures of compounds tested for their biological effects. The actual process of coding the chemical information paralleled that of coding biological data. For each compound, every effort was made to determine its molecular structure, all its properties, and the name by which it is indexed in the most universally used reference to current chemical literature, Chemical Abstracts. In addition, the chemists recorded all information given about alternate chemical names, proprietary names, common names, commercial sources, and natural sources. Also, a reference was recorded to the literature article or other source of chemical-biological information in which the chemical was first encountered by the CBCC.

Each identified chemical was assigned a reference number at the time of recording the information about it. The reference number must be understood to be distinct from the coding of chemicals' specific structures; the number represents essentially only the sequence in which the chemical was recorded and coded by the CBCC. The numbers are referred to as the CBCC Chemical Serial Numbers (abbreviated to "CBC Numbers"). This Serial Number is basically of six units; an additional two units can be appended (separated by a dash from the sixth unit) to the basic Serial Number to indicate the compound's various salts, solvates, and isotopes used in biological tests.

All information about a single compound was written on a special sheet, the Chemistry Code Sheet, including the compound's Serial Number and its structure, both as a structural formula diagram and as a coded molecular formula. The Chemistry Code Sheet, front and back, is illustrated by Figures 7 and 8.

The coded structure of each compound and its Serial Number were punched on IBM cards (occasionally, two IBM cards were needed for a compound of especially large molecular structure). The specially printed IBM card used for punching chemical structures is illustrated in Figure 3. The files of chemistry IBM punched cards and of the Chemistry Code Sheets are described later.

---

[1] A Method for Coding Chemicals for Correlation and Classification (1950): $1.50. National Research Council, Washington, D. C.

M.W.

M.P.

B.P.

D. or Sp.G.

REFRACT. INDEX N_D

OPTICAL ROTATION $[\alpha]_D$

SOLUBILITY

STABILITY

ANALYSIS

IMPURITIES

OTHER PHYSICAL PROPERTIES

PHYSICAL STATE

PRECAUTIONS

NATURAL SOURCES

Figure 4
BIOLOGY CODE SHEET
Back side of outer
surface, when folded

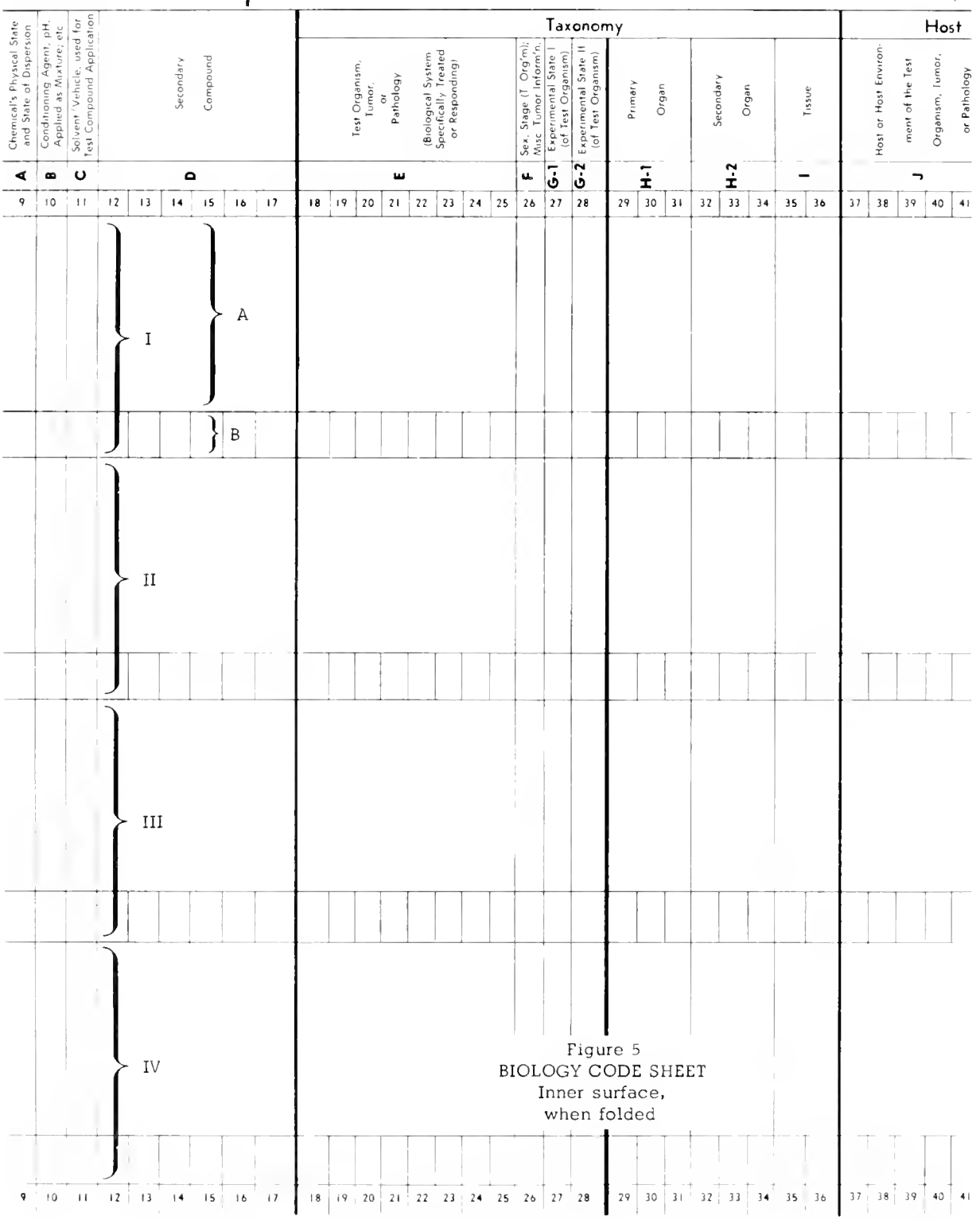


Figure 5
BIOLOGY CODE SHEET
Inner surface,
when folded

Sheet No of Total

Code Sheet No.

			Dosage						Size of Inoculum	Seq & Interval between Pathol. Initiat'n & Treatm't	Route of Administration of Inoculum or Implant	Route of Administration of Secondary Compound	Route of Administration of Test Compound	Action			Response							
	Sex and Stage (Host Organism)	Experimental State (Host Organism)	Concentration		Quantity		Frequency; Test/2nd Cpd Admin. Sequence	Duration of Treatment; Interval between Admin. of Test Cpd and 2ndary Cpd						Specific Action of Test Compound	Biological State, Quality, or Process Acted on or Produced by the Test Cpd. or Secondary Cpd.; Alteration or Metabolic Fate of a Compound		General Category of Biological Effect of the Test Compound	Duration of Response; Survival Time Alter'n; Time to Spec. Effect, Residue Persistance	Time from Administration to Evaluation	Evaluation; Dosage Qualification; Slope	Criterion for Evaluation of Effectiveness	Effectiveness	Page(s) and Page Area(s) of the Source of Data	
	K	L	M		N		O	P	Q	R	S-1	S-2	S-3	T-1	T-2		T-3	U	V	W	X	Y		
42	43	44	45	46	47	48	49	50 51	52	53	54	55	56	57	58	59 60 61	62 63 64	65	66	67	68	69	70	71	78	79
																									LINE NO	
																									LINE NO	
																									LINE NO	
																									LINE NO	
42	43	44	45	46	47	48	49	50 51	52	53	54	55	56	57	58	59 60 61	62 63 64	65	66	67	68	69	70	71	78	79

CBC No.	No. of Compounds In Article	Compound No.	CODE SHEET No.

MOL. FORM.

OTHER NUMBERS

NAME (CBCC Chemistry Department only) CODERS ARE NOT TO WRITE IN THIS SPACE!

REFERENCE, TITLE

NAME (Coder's entry only)

CODE EDITION NO.

STRUCTURE (CBCC Chemistry Department only)
CODERS ARE NOT TO WRITE IN THIS SPACE!

SOURCE OF COMPOUND

STRUCTURE (Coder's entry only)

Figure 6
BIOLOGY CODE SHEET
Front side of outer surface, when folded

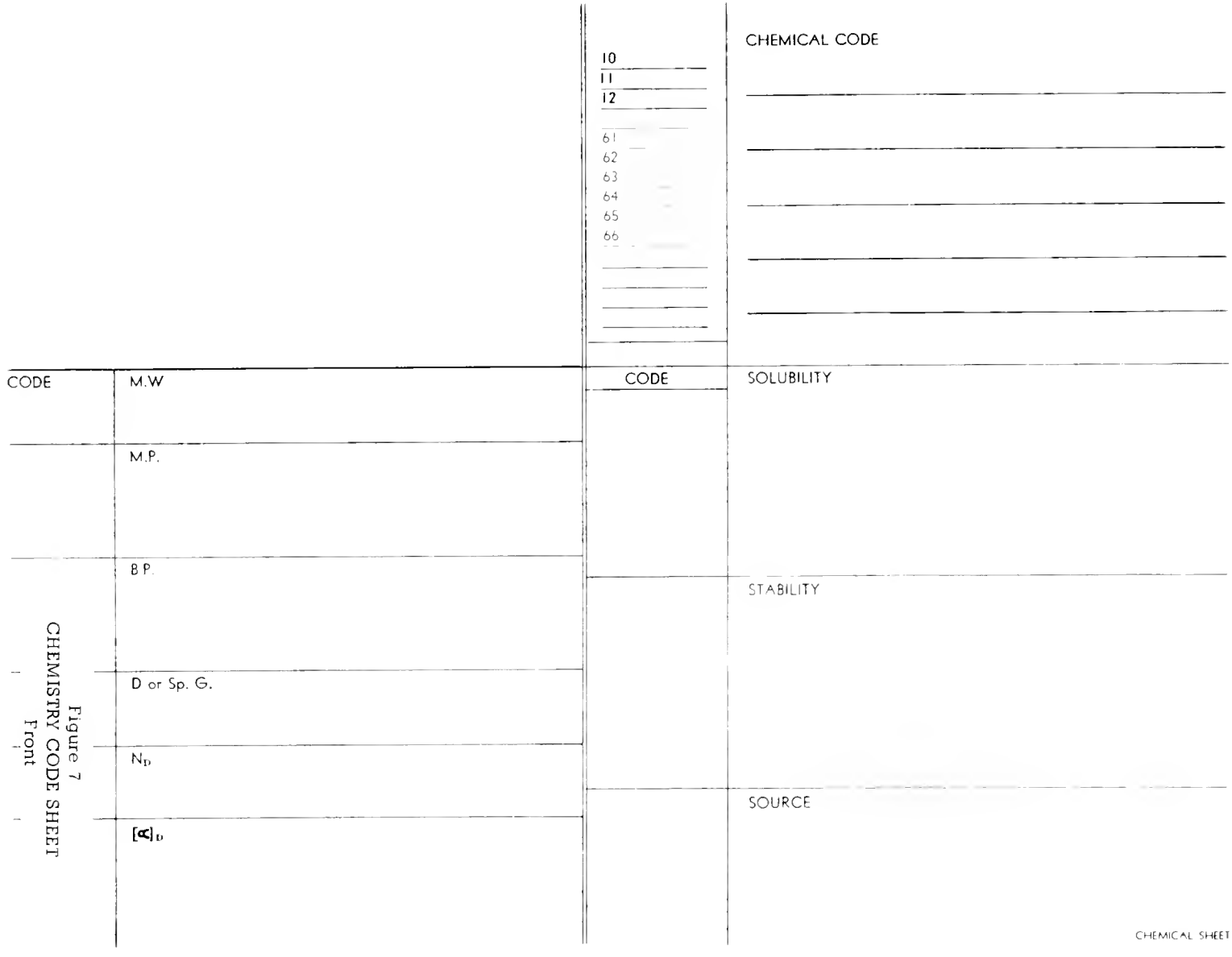


Figure 7
CHEMISTRY CODE SHEET
Front

CODE

MISC. CHEMICAL INFORMATION

PHYSICAL STATE

PRECAUTIONS

NATURAL SOURCES

ECONOMIC USES

REFERENCES

Figure 8
CHEMISTRY CODE SHEET
Back

In addition to the Chemistry IBM Punched Card File and the Chemistry Code Sheet File, information about each chemical was recorded in a third way, on 3" x 5" index cards. A card was prepared for each chemical, giving its Serial Number, its molecular formula, the name by which it is indexed in Chemical Abstracts, and, whenever known, its structural formula. A typical Chemistry Index Card is illustrated by Figure 9. The CBCC maintained three complete files of these index cards; arrangement was by Chemical Serial Number (CBC Number) in one, by Chemical Abstracts name in the second, and molecular formula in the third. Duplication of each card (for the three files and for other purposes) was by typing the information originally on a 3" x 5" Ditto master; all Ditto masters were kept in a fourth file for any future duplication needs.

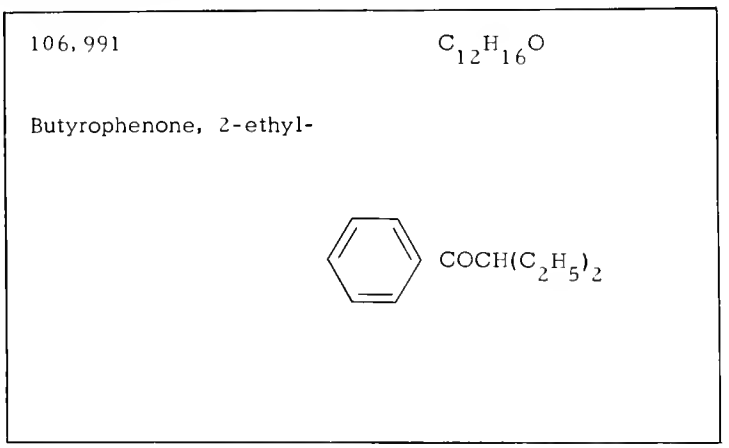


Figure 9
Chemistry Index Card

IV. THE CBCC FILES

Although the Center's activities have been terminated, the information files, at the date of this publication, have not been destroyed nor placed in permanent storage. On the basis of their being still available and on the assumption that even as static files they will have value for a period of time, the following descriptions imply their current existence.

Code Sheet Files:

It has been explained that all the biological information recorded by the CBCC is on the Biology Code Sheets and the information on specific chemicals is on the Chemistry Code Sheets. These were the prime sources of information at the Center, just as books are the basic sources of information in a library. The Biology Code Sheets and Chemistry Code Sheets are both filed according to CBCC Chemical Serial Numbers in the same cabinets.

Inasmuch as information from tests on any one compound may be derived from several sources, a compound may be represented in the file by many Biology Code Sheets. Under any one Chemical Serial Number, therefore, all Biology Code Sheets bearing that Serial Number are filed according to the Biology Code Sheet Numbers. Each chemical for which there are biological test data in the file is represented by only a single Chemistry Code Sheet, so the total Chemical Code Sheet File is of considerably smaller proportions than the Biology Code Sheet File.

Regarding the Code Sheet File independently (i.e., without the Biology IBM Punched Card Files), Sheets can be associated and retrieved only by the Chemical Serial Number under which they are filed. No index file of Code Sheet Numbers was maintained for the Code Sheet File; therefore, a Sheet known only by its Sheet Number can not be retrieved. (This was occasionally an inconvenience and consideration was given to establishing this index file.) Neither were indexes maintained of authors or information sources (journals and other publications, CBCC Screening Program test reports, etc.) by which Code Sheets might be reassembled to represent all information of a given article, a given screening laboratory, a given author, etc. These are not, however, regarded as deficiencies of the Code Sheet Files, since, operating within its specific objectives, the CBCC found little reason for associating the information in these ways. The only approach to the information on the Code Sheets, beyond the chemical identities by which they are organized, is through the index provided by the IBM Punched Card Files, described below.

Biology IBM Punched Card Files:

The coded information of the Biology Code Sheets and Chemistry Code Sheets was placed on IBM punched cards and filed in standard IBM card cabinets. The coded and punched information on these cards may be regarded in two ways.

First, the entries on the card serve to index the Biology Code Sheet File which contains the information about chemical-biological tests in detail as a written abstract. The advantages of this index (more correctly, a complex of indexes) have already been discussed in the Introduction and will be continued here and in a subsequent part of the Appendix.

Secondarily, the CBCC considered the information of the Biology Code Sheet File to be coded to such detail that, for some purposes, the information of the Biology Punched Card Files might be regarded reasonably as an adequate substitute for the Code Sheet File. At the same time, it was recognized that the coded information on the punched cards was not adequate for all purposes. Details unique to special tests are often not coded for lack of a coding provision and certain information is abbreviated to code only by expressing it as an approximation; for example, the coded dosage would be known to lie somewhere within a coded range. Furthermore, since the CBCC IBM punched cards were actually designed having in mind only their use at the Center in conjunction with the Code Sheets, no provision was made for including the source of information on the cards. Thus, for final interpretation, it is often necessary to go to the Biology Code Sheet to which reference is made by the punched card. For reference to the original information source, it is always necessary to go to the Code Sheet. This suggests that a desirable eventual refinement would be the design of some means whereby the punched card would include the information source and even a reproduction of the related Code Sheet Line which the punched card represents. Nevertheless, the IBM Punched Card Files can be regarded, for some purposes, as bearing enough information in code to be used independently of the Code Sheets as a medium for transfer of information.

Because the Punched Card Files and their use represents such an important aspect of the CBCC, it is appropriate to dwell on their arrangement and the reasons behind that arrangement, in an effort to make clear their significance and to give a general idea of the way they were used. However, it is not possible here to outline all the patterns for use of the punched card files in searching for specified information. The pattern varies according to the information requested and, except for certain more simple requests, some "programming" for sorting of punched cards is necessary.

Reference has already been made to the Introduction's description of the punching of coded information on cards in terms of indexing the Code Sheet Files in which the information is deposited as a written abstract. The information in the Code Sheet File can be considered as being indexed, not merely by the order by which the punched cards are filed (according to chemicals tested, e.g.), but according to every category of information coded and punched on the cards (i.e., according to the chemical tested, organism, anatomy, host, response, etc.). Furthermore, it has been pointed out in the Introduction that an advantage to using machines and punched cards is that it permits having all these indexes in a single file rather than having a duplicate set of cards for every index, each arranged according to that index classification. For example, even though the cards were arranged according to the chemical tested, if information were wanted about a given organism or group of organisms (e.g., information on Mollusca), the speed of machines makes possible a rapid examination of the entire file and sorting out those cards punched to indicate Mollusca; the results of this machine sort is identical to the result that would be achieved by having a separate file of punched cards arranged according to code symbols for organisms, from which all the cards referring to Mollusca could be taken manually.

These basic observations would lead to the assumption that the CBCC needed but a single file of IBM punched cards to index its information collection. Since the Center actually established several files of its IBM punched cards, differing only by the way they were arranged (according to organism, to response, etc.), the above observations need modifying to explain, first, why a single file was inadequate for the CBCC and, secondly, that the advantages described above apply and are utilized even though the several card files are needed.

For these explanations, two major factors should be considered, (1) the speed of the machines used and (2) the size of the information collection and the corresponding size of the file of IBM punched cards. Machine sorting for cards on which is punched a specified symbol, from a group of one hundred, or even five hundred, cards is one thing, but sorting by machine from a file of many thousands of cards is quite another. It is not a matter of the machines used by the CBCC not being able to accomplish this, but a matter of speed; compared to the speed by which cards for Mollusca, for example, can be taken manually from a file in which the cards are arranged according to organisms, the time for machine

sorting all cards of the file arranged according to chemicals is too great to be practical (again, speaking with respect to machines with the speed of those used by the CBCC). Another factor related to this can not be ignored, the vulnerability of the cards to a certain amount of damage with handling and the passage of time. Since their practical "life" is of limited duration even with minimal use, the frequent passage of all the cards of a single file through machines would inevitably demand frequent card replacement due to damage.

The answer to this problem was to reduce to a practical minimum the number of cards to be machine handled in any given card sort. To do this, the CBCC established eight card files, supplementary to the principal file which was arranged according to the Serial Numbers of chemicals tested. For example, for the "Taxonomy Punched Card File", a duplicate was made of every card in the major file (i.e., the "Serial File") and the cards were arranged according to the symbols coded in Field E (organism, tumor, or pathology tested); in six other files, the cards were arranged according to the coding in Field T-2 (the biological state, quality, or process affected), in Field T-3 (the category of effect of the test compound reflecting practical use), in Field H (the organ affected), in Field I (the tissue affected), in Field J (the host of the test organism), and in Field D (a chemical synergized, antagonized, or used as a standard for comparison in evaluating the effect). More recently, an additional (eighth) supplementary file was established which resembles the Taxonomy Punched Card File just described in that the cards are arranged according to symbols coded in Field E; it differs in that its arrangement is not on the basis of the finest classification unit (i.e., species of test organisms), but on the basis of major classification units (e.g., bacteria, dicotyledonous plants, arthropods, etc.); under each of these major taxonomy classification units, all the cards are arranged by Chemical Serial Number, whereas in the principal Taxonomy Punched Card File, the cards are arranged by Chemical Serial Number under each species.

Thus, in all, there are nine separate Biology Punched Card Files. The nine files are not all of equal size, because certain of the information categories are not represented on every card and, if a card is not punched in a field for which a special punched card file was established, that card is not included in that file. The Serial File and the two files arranged by entries in Field E and Field T-2 are all of equal size, each containing a card for every code line. On the other hand, the files arranged according to tissues and secondary compounds are small enough to be accommodated by a few cabinet drawers.

It should be noted that, for most of the fields (i.e., indexes), such as Field A (state of the chemical), Field G (experimental state of the organism), Fields M and N (dose size), and Field S-3 (path of administration of the chemical), no special punched card files were established. This is because of the improbability that the entire Serial File would ever need be sorted for that information. In other words, separate punched card files were maintained only for those categories of information most frequently sought and for which a machine sort of the entire punched card file arranged by Chemical Serial Number would be necessary but impractical. For example, if there were wanted all information about tests made on a specified organism or group of organisms, or on a specified organ, or for a specified response, the file search would begin with punched cards bearing the identifying symbol for the organism, organ, or response in question; the cards would be obtained by manual selection from the punched card file arranged according to test organisms, from the file arranged according to the organs responding, or from the file arranged according to specific responses.

The type of question asked of the CBCC files was seldom so simple as the examples given above, but was most frequently qualified by stipulations of a second or more information categories. For example, a request might be for information about tests made for a specified response on a specified organism; this might be further qualified by stipulating interest in only positive data and in chemicals effective at doses lower than a specified maximum. No special files of IBM punched cards are maintained by the CBCC with cards arranged according to evaluation of effectiveness (negative or positive or the degree of positive activity) and dose size. These are not categories of information for which a primary search through the entire card file would ever be likely. Therefore, the first step would not be to machine sort the entire punched card Serial File, but to go to the appropriate supplementary punched card file, in this case either the file arranged according to test organisms or the file arranged according to responses, or both. At that point, depending on the number of cards which had been found for the specified organism or for the specified response, the decision would be made as to whether the machines could be used to advantage in sorting for the cards meeting the other specifications (data which is positive and at doses lower than a given maximum). It is possible that the cards resulting from the primary step may be so few that, for the secondary sort, reading and sorting the cards manually would take less time than it would take to carry the cards to the machines, make out specifications for machine operators, etc.

The objective in having the eight supplementary punched card files is demonstrated by the foregoing example; the files permit an initial and efficient manual selection of cards from the total punched card file, resulting in a group of cards which is of a size practical for handling by machines, if necessary.

With the preceding as background, it can now be explained how the CBCC used the machines to the advantage they have been described as offering. Though machines are not used by the CBCC to sort through the entire punched card file, the advantage of machines is not lost. It is merely transferred to the secondary step. The cards resulting from manual selection might be regarded as a temporary and specialized file of cards; regarded in this way, it is seen to be cross-indexed by punches according to every one of the information categories coded by the Biology Code. All the advantages described earlier for coding and machine handling in general apply to this special small file which results from the initial manual selection. To carry this idea to the example of cards selected from the punched card file arranged according to organisms, we can regard cards resulting from the selection as a special file, the "special" feature in this example being restriction of information to that on one or more specified organisms. If only the cards for one species of organism were selected, the cards in this specialized file resulting from that initial selection would be arranged according to Chemical Serial Numbers, since that is the way the cards are arranged secondarily under any one species in the punched card file. The remaining information punched on the card (i. e., other than test organism identity) represents indexes which, however, can be efficiently used as indexes only by applications of machine sorting of all the cards (unless the cards are so few that inspection of the punches of the card or interpretation at the top of the card would be faster than machines). For example, if the initial manual selection results in five hundred cards (all punched with the symbols for the organism in question), the sorting of those cards for only those which are punched with symbols for a specified response or for a specified organ is made practical by use of machines.

For practical retrieval of information by machines, using only a single file comparable to the CBCC Serial Punched Card File, machines used must have a far greater capacity for rapid selection, assembly, and reproduction from that single file than the IBM equipment used by the CBCC.

Chemistry IBM Punched Card Files:

The major file of Chemistry IBM Punched Cards is arranged according to the CBCC Chemical Serial Number and is referred to as the "Chemical Serial File". This single file is not sufficient for the most practical retrieval of information about chemicals of specified structure and therefore a subsidiary file is maintained for these cards.

This second file is arranged according to structural components instead of the Chemical Serial Number. For this particular file, the coding of each compound is in most cases necessarily punched on more than one card, the number of cards for any compound being equal to the number of types of structural groups which are contained in the molecule and which are given a distinct code symbol. (The Chemistry Code should be examined to understand the specific structural groups assigned unique symbols.) On these two or more punched cards representing one chemical compound, the punching of the coded structural groups is "rotated". To explain this "rotation" requires first explaining that the punching of code symbols for structural groups of a compound is not fixed to a definite area of the Chemistry Punched Card in the way that a given type of biology information (e. g., the test organism identity) is fixed to one area of the Biology Punched Card (e. g., only Columns 18 through 25 of the Biology Punched Card, for test organisms); instead, on the Chemistry Punched Card, the coding for one structural group can be punched in Columns 13 through 16, or punched in Columns 17 through 20, or 21 through 24, etc. (Coding of any structural group requires only four IBM punched card columns, three columns for the code identity of the group and a fourth column to indicate the number of times the structural group occurs in the molecule.) Therefore, the punched sequence of the coded structural groups can be varied on the cards for any one compound so that each group appears in turn at the beginning (i. e., at the left of the Chemistry Punched Card, Columns 13 through 16). For example, a compound with three structural components (for which there are three distinct, four-unit code symbols) would occupy Columns 13 through 16, 17 through 20, and 21 through 24 on any punched card (refer to the illustration of the Chemistry Punched Card, Figure 3), but in this special "rotated" file, three cards would be punched, differing only in that the coding for each structural group appears on one of these cards in Columns 13 through 16. This file is referred to as the "Chemistry Rotated File" and it permits manual selection of all compounds containing any given structural group, because the file is arranged according to the coded structural group punched in Columns 13 through 16.

Two other files of Chemistry IBM Punched Cards, indicated on the card illustrated in Figure 3, are special files maintained more for CBCC internal convenience than for actual retrieval or correlation

of information on Code Sheets. In one of these, a duplicate of each of the cards of the Chemistry Rotated File (described immediately above) is filed according to Chemistry Serial Numbers. The fourth file contains the punched cards for only the compounds obtained and distributed for testing by the special CBCC Screening Program and was useful mostly for reference to that program.

Miscellaneous Files:

The process of collecting chemical-biological information (selecting, coding, checking, and otherwise processing it) demanded keeping careful records at the Center and there were several files needed for this. The files maintained for all this processing cannot be described in detail here. One example is the file maintained for each of the journals reviewed for information, to avoid duplication of review and coding and to provide a current record of the segment of literature covered by the collection in the CBCC files. Another example was the file of authors and articles coded, though this was used solely for assistance in maintaining Sets of Code Sheets as they were coded, checked, arbitrated, processed by chemists, etc. Neither of these two files was referenced through Chemical Serial Number to the Biology Code Sheet File and they could not (nor were they intended) to be used for reassembling coded information from a given journal or article or by a given author, after the Code Sheets were filed.

The Chemistry 3" x 5" Index Card Files have already been described in the preceding section dealing with the recording and coding of chemicals.

The Center maintained limited files of original data which had been coded and punched. One file contained miscellaneous publications or unpublished compilations of test results, retained for practical reasons of reference. Also, a file was maintained of the reports from the Center's own Screening Program. The Center did not purchase and maintain any of the many periodical publications from which data was selected, but depended solely on libraries available to its non-resident coders and those of the Washington, D. C., area.

V. CBCC PROCEDURES FOR SELECTION, CODING, PROCESSING, AND FILING CHEMICAL-BIOLOGICAL INFORMATION

The following will be limited to descriptions of procedures used by the CBCC in collecting and storing information. The methods for handling the coded and punched information, once it was integrated into the CBCC files, is dealt with elsewhere in the Appendixes and in the Introduction. In Appendix B, time needed for the procedures described below is discussed under the heading, Currency of the CBCC Files.

Selection of Chemical-Biological Information:

The quantity of information of chemical effects on biological systems is so vast that the CBCC, with its limited staff and means, could not pretend to be able to collect but a part of it. In view of this, emphasis was placed on obtaining information known not to have been published or to have been published obscurely and which is therefore less apt to be indexed in other places. On the other hand, a serious effort was made by the CBCC, within the limits of its means, to review the current literature for all appropriate data. This review regularly included the journals determined by a preliminary survey to be most rewarding in terms of the quantity of information on chemical-biological tests included in them.

A restriction in this selection was that of omitting clinical data on responses to chemotherapy. While this policy was not followed slavishly to the total exclusion of any data that can be conceivably regarded as being clinical, it was adhered to generally. This was not because clinical data were regarded as without value, but because they so frequently lack the experimental control typical of laboratory-conducted tests and tend to be repetitious. Had adequate facilities and staff been available, the CBCC would have collected all clinical data and included them in its coded files.

In 1951, when the procedures for selection of information were established, it was decided to attempt to review back to 1946 all issues of the journals selected for routine review while, at the same time, reviewing current issues. For most of those journals, this was successfully accomplished.

All review of the literature and selection of information from other sources was made by the resident biology staff of the Center. Each staff member assumed responsibility for a quota of scientific journals, including those specialized journals of his own field of scientific interest and training.

Selection of chemical-biological information from the literature is rarely a task which persons with little or no academic background in the biological sciences can do adequately. This is perhaps best realized only through experience.

Examination of the literature for appropriate information amounts to considerably more than a rapid and superficial scanning. While a considerable proportion of the data are revealed by the titles of journal articles, they are by no means always apparent thereby and to select data, it is never enough merely to examine a journal's table of contents. Having found data from chemical-biological tests in the literature, it was necessary for the CBCC reviewer to be able to evaluate it, to note any special problems that might be encountered in coding it and make provision for them, and to omit the data representing information which he happened to recognize as having been placed in the CBCC files already.

In this process of selecting articles from the literature, the staff member recorded any selection on a form especially designed for the purpose, referred to as an Assignment Sheet. A separate Assignment Sheet was used for each journal (and frequently, for each issue), in order to be able to file the Sheets later according to the name of the journal. All articles selected for assignment to coders were entered on an Assignment Sheet, indicating the name of the journal, volume and issue numbers, and date of issue; for each article selected, the Sheet carried the name of the author or authors, pages on which the article appears, and any special instructions or admonitions for the article's coding.

The Assignment Sheets were used also for any data other than that selected from the literature, such as data from the Center's Screening Program which were assigned to coders for coding.

Each Assignment Sheet was typed in triplicate, one copy being retained in a permanent file, described in the previous section, under Miscellaneous Files.

Assignment and Coding of Information:

Most coding of information was done by persons not resident at the Center. Each applicant for CBCC coding (as well as each prospective resident member of the professional staff) was required to study the Biology Code and Key, perform some basic coding according to a set of typical coding problems devised by the Center as a "Primer", and finally to submit a set of approximately 100 lines of coded data from the literature. The applicant's suitability for CBCC coding was determined by the results of the coding of the Primer problems and his first 100 lines. Many applicants were discouraged by finding the analysis of data and its conversion to code a more difficult task than they had supposed, others found that it required more concentrated periods of time than their schedules permitted, and possibly some found the type of work not to their particular disposition. Most of the applicants and many of those who coded regularly for the Center could contribute only part of their professional time to the activity. All coders were persons with considerable biological academic backgrounds, many of them possessing doctorates in their special biological fields. Of most significance, however, were a basic interest in their particular field of biology, their familiarity with experimental methods and statistics, and their ability to find coding a satisfying occupation.

Compensation for coding was made on the basis of the number of code lines submitted; at least fifty lines per month, as a practical minimum, was requested from each coder. If coding fell below this minimum regularly, the coder's accuracy and CBCC efficiency was found to be also below a practical level. It should be said also that, beyond the monetary compensation, many CBCC coders found not a little incentive for their work in the knowledge that they were contributing to the Center as a project with no precise precedent whose objectives they believed to be important. Further observations on the coders and the CBCC operational procedures are made in Appendix B.

Every month, each coder received from the Center a coding assignment, selected from the accumulated Assignment Sheets; the selection was tailored to the coder's special biological interests, whether botanical, pharmacological, bacteriological, etc. This policy often needed modification for reasons of inaccessibility of certain journals to a coder particularly qualified to code from them; furthermore, because the scope of certain journals is very broad and because it was impractical to complicate assignments further by making them on the basis of an article as an assignment unit rather than an entire journal issue, the assignment of an entire issue of such a journal often confronted one coder with articles of widely varied nature. Duplicates of the Assignment Sheets were retained at the Center for a record.

It was the coder's responsibility to obtain the journals containing the articles assigned for coding. Being located geographically where journals are not readily available on loan was unfortunately a situation ordinarily disqualifying a candidate for coding.

At the end of every month, each coder mailed to the Center the Code Sheets representing completely coded journal articles (preferably, completely coded journal issues), completely coded sets of Screening Program test reports, etc., accompanied with a record of the number of lines coded and time spent. Also accompanying the Code Sheets were special "Coder's Comment Sheets" on which the coder explained any problems encountered in coding the particular data, etc. These Comment Sheets are discussed later in Appendix B.

Checking of Coding; Arbitrating between Checker and Coder:

The Center treated a shipment of Biology Code Sheets from the coder as a "Set", for convenience in maintaining records. The Set was given a number which, however, was solely for purposes of maintaining its integrity through the several processing steps prior to final filing. Each Code Sheet was at this point assigned its Code Sheet Number and other records were made for it. The Set of Code Sheets was then ready to be checked.

It was discovered that errors made in interpretation and coding were far too frequent and serious ever to permit coding being punched and the Code Sheets filed without having first been checked once by a second person. Ordinarily, those coders who had developed the most skill and who had demonstrated superior accuracy and comprehension of coding procedures were regularly assigned coding from other coders for checking. However, none of the persons did only checking, but each was always given some coding assignment which was subsequently checked by another of the more experienced coders.

Checked coding was returned from its checker at the end of each month, accompanied by a record of the number of code lines checked, the number of code lines prepared by the coder which the checker had deleted, the number of code lines added by the checker, and coded Sheets added by the checker. Also accompanying the work were comments (on special Checker's Comment Sheets); these were addressed by the checker to the coder of the Set and pointed out errors made in coding, reasons for deletions and additions, etc. Finally, the checker sent with the Set an explanation of any coding problems he was unable to solve, items that needed to be added to the Code or Key, and questions about procedure for which the Key had no explanation.

Upon receipt of the checker's work at the Center, the Checker's Comment Sheets were recorded and mailed to the coder of the Set and the Set was processed (any added Code Sheets were given Code Sheet Numbers, etc.). Each Set was assigned then to one of the resident biology staff members.

It was the policy of the Center that a resident staff member examine at least superficially each Set of checked coding. If the checker had sent comments indicating difficulties or disagreement with the coder, these comments were studied with the Set. Frequently, it was necessary to obtain the original data in order to arrive at a solution of the difficulty or to make a special coding provision. This examination and correction of the coder's and checker's work the Center referred to as "arbitrating". While this might possibly seem to require a minimum of time, it actually was a very tedious and time-consuming task; the results of any decisions needed to be transmitted to both the checker and coder who pointed out the difficulty (or who erred in coding) and, if additions and changes in the Code and/or Key were necessary, all coders had to be advised of them. An accumulation of such changes was largely responsible for the regular Supplements to the Code and Key, issued to the coders.

Each Code Sheet was initialed by the coder, checker, and arbitrator. When the staff member completed his arbitration of the Set, it was returned to the clerical staff for notation of its having been arbitrated.

Processing of Biology Code Sheets by Chemists:

The arbitrated Code Sheets had all the information about the test compound which the author gave, but only that information. None of the biologists (the coder, checker, or arbitrator) had identified the test compounds with their CBCC Chemical Serial Numbers; the coders and checkers, being non-resident, did not have access to the CBCC chemistry files and the arbitrators, though resident biologists, had no reason to develop the proficiencies in identifying chemicals which the chemical staff was specialized to do. Therefore, the Set of arbitrated Biology Code Sheets was submitted to the Center's chemistry staff. There all the chemical information recorded on the Code Sheets by the biology coder was used to determine the test compound's identity with one of the compounds already entered in the CBCC chemistry files. If the information on the Biology Code Sheet were inadequate to ascertain the identity, the chemists frequently wrote to the author for more information. If the chemical were new to the CBCC chemistry files, it was coded on a Chemistry Code Sheet and index cards were made for it.

On the Biology Code Sheets, the chemists entered the compound's Serial Number and the name by which it is indexed by Chemical Abstracts.

When all of an entire Set of Biology Code Sheets had been processed by the chemists, it was again returned to the clerical staff which recorded the Set's progress toward the final file.

Transfer of Coded Information to IBM Punched Cards:

After being released from both the biology and chemistry staffs, each Set of Biology Code Sheets was submitted to the IBM staff. Special operators, familiar with the CBCC biology and chemistry coding, punched onto IBM cards the code symbols which had been written on the Biology Code Sheets. Each code line on the Biology Code Sheets was punched on a separate IBM card and on each card was also punched the Chemical Serial Number (which the chemists had written on the Biology Code Sheet), the Code Sheet Number (which was assigned to the Code Sheet immediately after coding), and the Line Number (which was written at the end of each line by the coder).

When the punching operation was complete, the Set of Biology Code Sheets was returned to the clerical staff once more.

Final Filing of the Biology Code Sheets and Biology IBM Punched Cards:

After the coding of the Biology Code Sheets was punched onto IBM cards and the Set of Sheets was returned, the Set was released to the person responsible for the Code Sheet Files who filed each Code Sheet under the correct CBCC Chemical Serial Number.

The filing of IBM punched cards was done by the IBM staff.

Correction after Final Filing:

Whenever a change was made in the Biology Code which involved information already coded, it was necessary to retrieve all the Biology Code Sheets and IBM punched cards on which that coding being altered appeared. Such corrections were always made by the resident staff. The IBM staff subsequently re-punched the corrected coding on new IBM cards; the Biology Code Sheets and the new IBM cards were then re-filed.

VI. ADVANTAGES OF THE CBCC SYSTEM FOR CODING AND MACHINE HANDLING OF CHEMICAL-BIOLOGICAL INFORMATION

The Introduction has described the coding fields in terms of indexes to the information collected by the CBCC and a preceding section of the Appendix (the description of the Biology IBM Punched Card Files) has described the use of the punched cards for the multiple indexing of information in the Biology Code Sheet File. The following attempts to clarify the specific advantages of the multiple indexes as the means to the ultimate objectives of the Center.

The CBCC was not unique in indexing chemical-biological information in more than one way. Indexing and abstracting services such as Chemical Abstracts, Biological Abstracts, Helminthological Abstracts, etc., include in their coverage information of this type as it occurs in the published literature and they subject-index it by chemical name and organism name; in some cases, it may be indexed even by response.

The ability to prepare and publish subject indexes by indexing and abstracting services has limitations, however, and a few comparative observations on this subject will be appropriate here, as an introduction to the explanation of the advantages for the multiple indexing attempted by the CBCC.

Published subject index entries (chemical, organism, or response) are necessarily brief and not always or even frequently satisfactorily cross-referenced. Thus, the chemical entry does not necessarily indicate any or all organisms treated or responses produced; the organism entry does not necessarily indicate any or all of the chemicals administered or the organism's responses; the response entry does not necessarily indicate any or all of the chemicals and organisms tested for the response. The entries, of course, do refer directly to a published abstract and subsequently to the original published data. Most frequently, these published indexes are prepared from the published abstracts which the index accompanies or follows, rather than being prepared from the original data. It is

appropriate, then, to consider the thoroughness of published abstracts with regard to the chemical-biological data with which the Center was concerned.

However high the quality of the published abstract, it yet remains by definition a condensation of the original data, frequently omitting most experimental details; for practical reasons, a published abstract is restrained to the briefest summary of test data. It can not be expected to describe all the information comparable to that coded by the CBCC, partly because of the limitations in publication space and partly because abstracters do not prepare abstracts according to fixed rules comparable in detail to those for CBCC abstracting. There is often no real assurance that an abstract identifies all the organisms used or all the chemicals tested, or all the responses demonstrated in a given article, not to speak of doses, paths of administration, evaluation details, etc.

It would be expected that an agency whose efforts were concentrated on a given type of information would collect that information more assiduously and in greater detail than would an agency whose literature coverage is either far greater in scope or of a different specialization. Thus, in the case of the CBCC, having established exactly the details wanted for its purposes, chemical-biological test data was abstracted to include meticulously all organisms, all compounds, and all responses from any given chemical-biological information source (to restrict the observation for the moment to those three more commonly published subject indexes). This factor of thoroughness is not implied here to be an advantage offered by the CBCC system or procedure precisely, so much as an advantage resulting from the CBCC's specialization.

Sometimes observations of biological responses are reported incidentally in an article. In other words, there occasionally occur, and are mentioned in passing, responses not further discussed or explored by the author nor are they included in the article's summary. Whatever the reasons may be, the fact remains that it is not unusual for such "incidental" observations to be made obscurely in literature articles. Many examples will come to mind of "discoveries" made, such as the inhibitory action of penicillin or the herbicidal action of chlordane, effects which had been observed and more than once noted incidentally in the literature--to be overlooked until favorable circumstances brought about the recognition of the practical significance of the observations. It is not to be expected that published abstracts and indexes would unfailingly include all such incidental observations from each article, nor could the Center claim infallibility in recording all incidental effects in its files. The abstracting policy of the CBCC, however, intended that chemical-biological information from the literature (as well as from other sources) should be thoroughly examined and all effects, including those defined as "incidental" should be included, as the previous paragraph has implied. The fact that the Center frequently omitted coding specifically the many subjective effects described as common "side effects" caused by therapeutic administration of test compounds (headache, nausea, dizziness, etc.) should not be interpreted to mean that there are ever omitted observations made in the literature representing specific biological responses to test compounds, however incidental they may be to the original intent of the tests.

The comparative observations of the preceding paragraphs are based essentially on the three criteria by which chemical-biological information is frequently indexed and to some degree cross-indexed by subject in published indexes to literature.

There is a practical limit to cross-indexing in a published index as well as a limit to cross-indexing in index card files. Indeed, there is a practical limit to all cross-indexing, including that done by a center such as the CBCC which concentrates on a given type of information. The practical extent of the cross-indexing depends on many factors and is not identical for all purposes, all systems, or all types of data.

In the case of the CBCC, it has already been explained that every coding field of the Biology Code represents essentially a distinct indexing criterion. Beyond indexing according to the chemical affecting the biological system, the biological system affected, and the response, all test information is indexed according to any hosts (of non-infectious pathology, parasitic organisms, or tumors) involved, any organs, any tissues, the quantities of test compounds needed for given effects, any compounds whose biological effects test compounds influence, developmental stages and the sexes of organisms affected, routes of administration, and so on.

Experience with published indexes provides the most convincing evidence of the time necessary to search through volume after volume of the published abstracts to literature or through volumes of the literature itself (to which the published indexes have given reference) to find specific chemical-biological information. When cumulative indexes are not prepared, the task includes searching through consecutive volumes of the index. Compared to the use of published indexes to find information about

specific chemicals, organisms, and responses, a search in the CBCC punched card files (where chemicals, organisms, and responses, as well as other index subjects, are all cross-indexed) is far more rapid and, with regard to that chemical-biological literature covered by the CBCC, more thorough. That it may not be as thorough as certain published indexes, with respect to the total number of journals covered, must be regarded as reflecting only the limitations of the Center during its developing years for covering that quantity of published information.

The preceding observations have been concerned in general with abstracting published information and indexing it according to chemical, organism, and response, for sake of comparison with published abstracts and indexes. It should be recalled, however, that the CBCC made efforts to collect information that had not been published or that was in more obscure or irregular publications and reports given limited distribution. Many tests of a screening nature remain unpublished because of the low priority ordinarily given to such masses of data under circumstances of high costs of publication and the large volume of technical information competing for publication. One reason for the reluctance to publish data of this type is the general disregard for "negative" data which characterizes much of the information from routine screening tests.

In summary, the multiple-indexing, coupled with the speed afforded by machines for selection of desired index combinations, represents the basic advantage offered by the CBCC system. Added to this are the two further advantages, (1) the fact that the CBCC attempted to collect unpublished or obscurely published information not apt to be covered by published indexes and (2) thoroughness in abstracting and indexing original chemical-biological data, whether published or unpublished, resulting from the Center's concentration on that specific area of information.[1]

By these means and policies, the Center attempted to develop a system of handling chemical-biological information whereby, having collected the data as thoroughly and carefully as possible, it could be retrieved and correlated as efficiently as possible, by as many subject indexes as that particular information is apt ever to be approached.

[1] A particularly fine description of the CBCC, presented against the background of a dissertation on discoveries of therapeutic properties of chemicals, will be found in an article by J. R. M. Innes, The Work of the Chemical-Biological Coordination Center in Relation to Chemotherapy in Veterinary Medicine, J. Am. Vet. Assoc., 116 (874) 1950.

APPENDIX B

MISCELLANEOUS OBSERVATIONS ON
THE BIOLOGY CODE AND KEY AND THE CBCC PROCEDURES

Specificity and Adaptability of the Biology Code:

The CBCC Biology Code makes no pretense at being complete in terms of the categories of information nor of the items of any one category. Furthermore, the classification schemes or organization of items within any one information category (e.g., the organization of biological states, qualities, and processes in Field T-2) may not be entirely satisfactory for coding every type of biological data. For example, if there were wanted to be established a file of information about certain plants, not especially for information about their responses to chemicals, but about their geographical origins, their products, their diseases, and their cultivation requirements, the CBCC Biology Code would hardly be expected to be used in its entirety; moreover, entire new categories of information, such as factors of cultivation, would need to be organized and assigned symbols. Similarly, a file of clinical information on pathology would demand a code for describing pathological conditions far in excess of the Pathology Code of the Biology Code's Field E which needs to include only those pathologies apt to be experimentally treated with chemicals. At the same time that the Code is not complete in the sense of the foregoing examples, some of the information categories and items within the categories would not be applicable or necessary for coding certain other types of biological data. For example, a file of information restricted to toxic effects on humans would need but a fraction of the terms now included in the Code's Fields T-1 and T-2, nor would a Taxonomy Code and several others of the CBCC Code's fields be needed.

On the other hand, in meeting the objectives of the Center, the CBCC Biology Code is no longer regarded as an experimental code for chemical-biological information, except that any of the existing individual sections is candidate for additions, deletions, or rearrangements of items, or of being omitted entirely, if further experience indicates these changes are appropriate. Establishing in the CBCC system provisions for coding new categories of biological information is not impossible, though it would require deleting present fields of the Code to provide room on the IBM punched card for any new fields, or expanding into a second IBM punched card for each code line, or converting to another mechanical system, such as electronic tape.

Therefore, the CBCC Biology Code must be examined and evaluated in the light of its specialized intent, the coding of information from tests for effects of chemicals on biological systems. However, at the same time that the Code as a whole has been developed, each of its parts has always been regarded as capable of being used independently and, to that extent, being applicable or adaptable for coding many types of biological information. Thus, beyond the specific use for which the total CBCC Biology Code was developed, it should be regarded as a series of coding patterns which this project has found adequate, any of which might be the basis for elaboration or simplification to fit other coding and indexing needs.

Coding of Physical Properties of Chemicals:

The CBCC had intended to expand its files to include the coding of physical properties of chemicals tested for biological effects, with the objective of making that information on physical properties available for correlation with biological responses. Regrettably, the design of a physical properties code was never accomplished for the CBCC use, though a number of conferences were held to discuss and plan it.

Beyond the significance of physical properties of chemicals as a correlative with biological responses, the CBCC recognized the need for a central reference depository for information on physical properties. The importance of this is reflected in the fact that there has been recently established a center whose objectives are precisely the collection of this information and developing both a code for thermophysical properties of chemicals and a procedure for storing the coded information for mechanical retrieval. In January of 1957, by coincidence the date immediately subsequent to the closing of the CBCC, the Thermophysical Properties Research Center was established at Purdue University, within the University's School of Mechanical Engineering, cooperatively financed by a large number of industrial organizations and governmental research agencies. This center was conceived quite

independently of the activities of the CBCC, its objectives having genesis in needs differing from those which the CBCC was established to satisfy. The TPRC has a vigorous program and has developed a coding system for thirty thermophysical properties of all matter. Information about this coding system and the procedures and objectives of the Thermophysical Properties Research Center should be addressed to the Director of the Center, School of Mechanical Engineering, Purdue University, Lafayette, Indiana.

CBCC Experience in Correlation:

The Introduction explained the objectives of the Center, the ultimate objective being the correlation of chemical structures (and, eventually, physical properties of chemicals) with responses of biological systems.

The CBCC staff earnestly looked forward to seeing correlation studies attempted by investigators, using the information collected by the CBCC. It is a disappointment that, to date, no correlative studies of the scale originally envisioned have been performed with the file of information collected since 1951. The immense task of creating the information file has not permitted the CBCC biologists themselves to use the files for original correlative investigations and, for reasons not all of which are understood, application has not been made to the Center for such studies by other persons and agencies. It has been suggested that, for any intensive correlative study, a special project should be established for coding into the CBCC files all data of the type to be correlated.

Neither did time permit accomplishing another important aspect, the study and compilation of specific patterns of retrieval of CBCC coded information, based on coding and machine handling patterns. Requests to the Center for information from its files mostly require simple machine sorting or even only manual selection, but a certain percentage have involved making associations which required more broad programming of retrieval and collation.

Qualifications of Coders; Residence vs. Non-residence of Coders:

This particular aspect is to be discussed, because it has played an important role in the Center's efficient functioning and because the Center's experience is expected to be of some value in the deliberations for establishing other coding projects.

The Center experimented at one time with employing students of local universities for coding at the Center under supervision. It also tried persons who had had less training and experience than did the coders the Center finally used. These experiments were comparatively short lived. In each case, the quality of coding was such that the arrangement was obviously impractical. All the coders of the Center's last five or six years were professionally trained biologists, most of whom were not residents of the Washington, D. C. area and who found it convenient to spend part or all of their time coding for the Center.

Since 1952, the number of non-resident coders remained fairly constant, somewhere between ten and fifteen, each submitting monthly a Set of coding varying in quantity according to their schedules.

The procedures for acceptance as a coder have been described in the section discussing selection and coding of information (Appendix A, CBCC Procedures). From the CBCC experience, two observations about finding and training of coders are especially worth mentioning. First, persons with qualifications for being good coders and who coincidentally have access to the literature and can discipline themselves to a regular schedule are not legion. The CBCC had the good fortune to have a number of such persons who remained generally consistent in their work for the Center till its close. It is not to be taken for granted, in establishing a coding program demanding special coders, that finding satisfactory coders, training them, and holding them, as non-resident personnel, is always a simple matter. Secondly, the CBCC experience has been that a minimum period of six months to a year is needed for adequate training of a coder to a point of reasonable efficiency and dependability in coding chemical-biological test data.

The problems inherent in non-residence of coders demand some consideration. Many factors must be balanced in deciding which procedure a project can best support--non-resident coders, demanding a full complement of resident clerical staff to maintain records and a professional staff member's time corresponding with them, as opposed to salaried resident coders. It is impossible here to suggest all the determining factors for this for any given program, but some of the difficulties encountered in the CBCC system and described in the following paragraphs might be enlightening.

It must be pointed out that non-resident coding of chemical-biological test information by the CBCC Biology Code can not be strictly compared to the usual non-resident abstracting and indexing which does not involve coding. This is not to say that a simple coding program involving only organisms' identities, or only specific effects, or only specific chemicals might not be comparable to ordinary indexing. However, the extraction and coding of all aspects of a chemical-biological test is another and more complex matter.

Communication between coder, checker, arbitrator, and the Center was without a doubt, one of the more trying aspects of the Center's procedures and if any one factor would influence a decision about the residence of coders, this would probably be the most convincing. Errors in interpretation of literature data, in coding, and in interpretation of the Key to the Code could only be avoided by advising the coder of errors he had already made; an error could only be discovered by the checker and communicated to the Center. Repeated efforts to establish a system of "comment sheets" for this communication was never very successful, partly because of the unavoidable gaps of time between the material leaving the coder's hands and his receipt of comments about his errors. Furthermore, once the coder or checker received the notification of his errors, he never had the coded Sheets on which the errors occurred so that frequently the comments, unless they were extraordinarily thorough explanations, conveyed little. As a result, when it was finally discovered that a coder was consistently making a coding error, a special letter had most frequently to be prepared to point out and discuss the matter.

Remuneration for coders on a regular basis, considering its problems, was organized to a satisfactory level of efficiency, but never was free of flaws, partly because of the complex system which demanded that payment not be made for code lines which the checker or Center had deleted as unjustifiable or erroneous.

A problem to be considered with resident coders is that of efficiency in an unbroken routine of coding. The staff members' own experience has been that it is not possible to restrict professional activity to coding without eventually arriving at a point of ennui and consequent inefficiency.

Thus, although the CBCC never arrived at a totally satisfactory answer to the matter of coding personnel, it would be strongly recommended that, for thorough and complex coding comparable to that done by the CBCC, an arrangement using resident coders whose routine can be varied might be far preferable to attempting establishment of a system for a staff of non-resident coders.

Checking of Abstracting and Coding:

It seems impossible to overemphasize the importance of coding information correctly and according to a standardized procedure. Errors in coding and punching can only mean information that is lost to retrieval or retrieval of unwanted information. It must be recognized that this process of information "in-put" is dependent on human intelligence and subject to human error; the success of the result of retrieval and correlation depends on holding that error to a minimum. To assure that information entering the files was coded (indexed) accurately, the CBCC found no alternative to having the coding checked and arbitrated. (See the descriptions of these procedures in Appendix A.)

In establishing any new project in which information is coded, the question of checking the accuracy of coders' "translations" into code is apt to be weighed carefully. Checking has been viewed variously by persons contemplating such a program; frequently, the attitude is expressed that checking is desirable but impractical, or even that it is superfluous. Others concede checking to be essential. It would be unreasonable to attempt to formulate, for all prospective coding projects, a fixed recommendation about the extent of checking, since so many variables are involved. Nevertheless, the CBCC experience would discourage any idea that checking in some form and for some period of time can be avoided, except perhaps in building coded information collections in which the material coded has very little variation and the coding is extremely brief and all done by the same coder or a continuous coding staff.

In spite of the care exercised in coding and checking, the Center not infrequently discovered major coding errors on Code Sheets, even after the coding had been punched and filed. Nevertheless, the CBCC felt it had arrived at the point of diminishing returns in the process of checking the coded data entering its files. A certain small number of coding errors had to be accepted as unavoidable within its coding system, just as some factor of error must be established for any such system.

Speed of Processing Information into the CBCC Files; Currency and Content of the Files:

Frequently, in an effort to understand the Center and evaluate it as a source of chemical-biological information, the Center was asked how quickly after issuance published data was incorporated into its files, as well as how completely the published literature was represented by the information in the files. This inquiry had the general objective of evaluating the Center's files primarily on the basis of comparison with currency and coverage of published abstracts and indexes, a more obvious criterion perhaps than evaluation on the basis of the other advantages which the Center felt were its multiple indexing and use of machines.

Certainly the factors of currency and completeness of coverage were important ones. To consider the factor of completeness of the literature coverage by the CBCC files first, it should be recognized that the present CBCC information collection only began in late 1951 and 1952, prior to which most of the Center's efforts were spent in developing and testing codes and procedures. Starting from essentially nothing, it took a year or so to establish a steady flow of coded information. From early 1953 to the end of 1956 when the Center was closed, the volume of flow of coded information into the files remained generally at the same level. The fact that the volume rate did not increase to any marked degree can be accounted for in part by the fact that the number of the Center's resident staff and its non-resident coding staff remained at about the same level; it is also evidence that the speed of information flow (discussed in the following paragraph) was perhaps near the speed possible for the system at a given staff level. During those initial years, the coverage of the literature, even considering the limitation to specifically chemical-biological data, could not pretend to be complete and, regarded in strict comparison, the coverage in terms of number of journals reviewed, could hardly compete with the old established abstracting and indexing publications. As was pointed out in another place, the CBCC, realizing its initial limited capacities for covering the literature, concentrated on the forty of fifty journals that proved by a preliminary survey to be most productive of chemical-biological information. Also, it attempted especially to include certain information which it knew was not apt to be covered routinely by published abstracts and indexes.

With regard to currency of the files, the Center estimated the average lapse of one year from the date published information was selected for the files to the date the coded and punched information was actually incorporated into the files and thereby made available by the routine CBCC retrieval processes. The several steps in selecting and processing data are described in Appendix A. Certain of these steps may be seen to take a month (or be separated by a month) or longer; by reviewing all the steps, it will be understood why the speed of processing data was not much less than a year for any given unit.

The preceding time value expresses the speed by which any given information unit progressed from the date of its selection to the date of its entry into the files. It does not indicate actual time which the coders, checkers, arbitrators, chemists, IBM punch operators, and clerical staff spent on a given unit. From records submitted by coders, checkers, and other staff members involved, the Center estimated that each code line entered into the files took a total of one hour for all steps of its preparation and entry into the files. This included the coder's time in studying the information and constructing the code line, the checking and arbitrating time, a proportion of the clerical time spent on an average Set, a proportion of the chemists' time spent on the average Sheet, the IBM operators' punching time, and a proportion of the time for filing Code Sheets and IBM punched cards.

The Center believed that by enlarging the size of its biology staff to perhaps twice the number of members (i.e., to approximately eight or ten resident biologists with a corresponding increase in biology coders), the coverage of the published general chemical-biological literature, in addition to the acquisition of unpublished data, could have been more satisfactorily complete and review of this literature made more promptly after its issuance. If, in addition, the system was altered so that coding might have been done by resident coders, the speed of selecting and processing, as well as the volume, might have been increased to give the files an increased currency of published data.

Though abstracts of the literature may be published relatively quickly, the indexes of chemical-biological literature are at present published only after periods of well over a year after the literature's issuance. Therefore, the Center's ability to have the information coded and incorporated into its files within a year or less, even though it would be desirable to have it entered even more quickly, represents an advantage in currency over most published indexes.

Use of the Center's Coded Chemical-Biological Information:

The CBCC collection of chemical-biological information organized on a mechanical system was offered, as an information source, to any interested scientist or scientific agency. In particular, it was offered as a means for original academic studies in correlations, especially those which have practical scientific and industrial significance.

The Center had perhaps as many requests for the special information of its files as it was capable of handling, carrying on all other activities simultaneously and adequately. This, however, is not equivalent to saying that the Center's files were used sufficiently or that they were used in ways exploiting their greatest potential.

It goes without saying that the CBCC files had first to be known to exist before they could be consulted. But awareness of the Center's existence, without understanding its specific activities and their scope and limitations, could not stimulate the most efficient use of the files. As a repository for chemical-biological test information, the Center might be compared to a young library whose existence and specialization had gradually to be learned by the scientific community. Paradoxically, the failure of scientists to use the Center frequently and to exploit the system of organization fully has occasionally been regarded as evidence that the information collection had not actually been needed and that the system failed to provide correlation of any significance.

During the first years following 1951, the Center was torn between feeling compelled to provide justifying evidence of its scientific and industrial value and the apprehension that its being consulted before its collection had grown to a significant size would result in dissatisfied users. A considerable effort was made to advertise the Center at meetings of appropriate professional societies and through published articles, activities which in themselves impeded progress by occupying appreciable professional time of staff members.

The results of these efforts were gratifying, but inadequate. While the Center received many requests, the response did not represent the greater magnitude of use which the CBCC was certain exists as a potential.

The Center has not been convinced that lack of education to the Center's files and their values is not primarily the reason they were not more frequently consulted and it was equally convinced that the growth of the files, their continued use, and the spread of information about the results of their use would eventually establish the reputation the files deserved as the single center for data of their nature and the most fully adequate means for correlative studies of either a broad or limited scope.

A related aspect to be considered is that of reliability. A scientist does not place his confidence easily on information sources of unproved reliability and the scientifically trained staff of the CBCC were fully appreciative of this. The degree to which the information coded by the CBCC staff could be relied on for accuracy might only have been learned gradually; it was not enough for the CBCC to claim its own virtue of accuracy. The CBCC felt that its procedures for checking its coding provided accuracy to the greatest degree apt to be possible for information of such a complex nature as that in its files. It can not be predicted at what point confidence of the scientific community would have been placed on the accuracy of CBCC coding. Until that confidence had been won, the coded information files of the CBCC would not have been used by every investigator to his greatest advantage.

The response to information received from the CBCC as a result of a search of its files was generally favorable. If, during the first years, the results of an information search in the CBCC files could not have the quality of completeness, the Center felt the retrieved information did have other qualities fully justifying the effort. Especially, if among the data retrieved from the files and applying to a given inquiry, there were some which would not have been included in published abstracts and indexes, it was felt that the Center's files had contributed valuable information to the requester. Secondly, what data was included in the CBCC files that was also indexed by published indexes could be approached in many ways other than by the two or three subject index criteria of published indexes and the possibility therefore existed that chemical-biological test data relevant to the specific information request would be retrieved from the CBCC files which could not have been found in the published index. Like many other possible studies, no comparative studies were made to determine the actual incidence of this.

Aspirations of the Center:

The Center was occasionally inspired to considerations of activities collateral with its principal goals, reflecting its broadest concept of the role such a center might play in its specialized scientific community. Three examples of these might be mentioned before summarizing the major aims.

One idea grew from the encountering of coding difficulties due, for example, to the frequent omission of details of test technique or to the obscurity of details needed for the CBCC code line (including adequate identification of chemicals and organisms used) or to the omission of test measurements leading to an author's evaluation. It seemed possible that the preparation and distribution of a set of recommendations for preparing chemical-biological data for publication might be eventually a logical undertaking of the Center. Possibly merely the general use of the Center would have demonstrated the necessity of including details of tests which might permit subsequent correlation with information from other tests of similar or diverse natures.

The CBCC might have served as a depository and reference center for methods of testing for, and evaluation of, chemical actions on biological systems and, further, might have been influential thereby in standardization of testing methods, for which a need is generally felt today. This activity could conceivably and logically have grown out of the CBCC experience with its own diversified Screening Program and from its general information collection.

It seems likely that an increasing number of specialized biological and chemical information collections will be established in the near future, many needing classification and coding schemes for categories of information not needed for chemical-biological test data. Uses, activities, geographical distributions and origins, diets, and requirements of organisms, as well as physical properties of chemicals and processes and reagents used in chemicals' syntheses are examples of such categories, any one of which might be needed for more than one information collection. The development, assistance in development, or the collection of these classification and coding schemes for information categories accessory to the categories needed specifically by the CBCC might reasonably have been a function of the Center and a function of considerable value, judging from inquiries received by the Center about schemes for these categories.

The major and more concretely defined aspirations of the Center were implicit in its name. It hoped to serve as a coordinator for development of methods for handling chemical-biological information--to be able, as a result of its pioneering efforts, to serve as a consultant to programs anywhere concerned with related information-handling problems. It also hoped to be coordinative of testing programs in the sense of making available chemical-biological information by collecting and exhaustively indexing unpublished as well as published data falling within that definition, the objective being to prevent, to the extent possible, duplication of effort and to suggest new directions of testing. Related to this, it aspired to studies of a correlative nature (chemical structure and biological response), using data from its coded information collection. Its Screening Program's objective was coordinative in that the Program served as a clearing house for untested chemicals and biological testing facilities. Finally, it regarded as possible even coordination for, or assistance in, related activities of which the sponsoring of symposia and the collection of standard testing methods might be named as examples.

While these aspirations were never to be fully or, in some cases, even partially realized, it can now at least be hoped that the Biology Code and Key and the observations made here on the Center's functioning and use of the Codes will be found useful guides for future efforts in coding biological and chemical-biological information. The published Codes, both Chemical and Biology, may perhaps prove the distillate of, and only memorial to, the effort and ambitions of the CBCC.