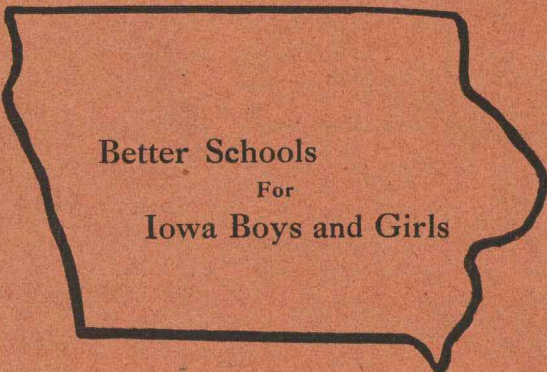


LB
1561
.J8
S7
1916

J. L. Merrick

Approved Graded and High Schools

Standards
and
Equipment



Better Schools
For
Iowa Boys and Girls

Issued by the
Department of Public Instruction
Des Moines, Iowa
1916

Summary of Standards and
Equipment for

Approved Graded and High Schools

Better Schools for Iowa Boys and Girls

Issued by the
Department of Public Instruction

Albert M. Deyoe
Superintendent of Public Instruction

1916

Revised by
Melvin R. Fayram, and John L. Cherny
Inspectors State Graded and High Schools

FOREWARD

The movement for Better Schools in Iowa is going forward with steady development. People are concerning themselves with school matters as never before. The forward movement is contagious. There is a state wide manifestation of zeal for all that promotes school efficiency. This ardor for splendid things is shown in rural, graded and high schools. Through closer supervision, better teachers, buildings and equipment, the one-room rural schools are giving a richer service. By combining with adjacent villages into consolidated districts many rural communities are supplanting the one-room school of long cherished traditions with a full graded organization, and modern methods and equipment; thereby securing advantages that have long been enjoyed only by urban centers. This movement is gaining ground daily.

The grade schools in villages and towns as well as the graded departments in larger schools are being given more consideration. The grade school work is doubly important since it is here that the large mass of children get their only schooling, and also for the fact that grade school work is inevitably foundation work. The general acceptance of these facts should bring to the grades better organization, better trained teachers, fewer classes daily and a smaller number of pupils per teacher, better buildings and class rooms, and more equipment.

Every community desires a full four-year high school. This well intentioned anxiety has in the past produced many top-heavy schools. A few remnants of this tendency persist even yet. Between eight hundred fifty and nine hundred communities have a school with more than a single teacher. A few more than eight hundred schools have three or more teachers.

Over half of the schools failing to qualify were attempting too many grades of work for the number of teachers employed, frequently at the expense of the grades I to VIII. The other schools failing to qualify lacked essential equipment.

Adequate equipment and wholesome conditions should be provided for the pupils in the grade schools first. Then as much standard high school work should be given as the possibilities of the community will reasonably permit. If the upper structure stands firm the base must be sound. No high school can be permanently strong unless the grades below are strong.

Over 180,000 children are in grades I to VIII of the eight hundred fifty schools referred to above; 70,000 are in the high schools. One-third of these high school pupils come from outside the district.

A significant factor in bringing a high school worthy of the name within reach of every boy and girl must be the development of the school in the smaller places. This bulletin is issued to suggest an organization, courses of study and equipment for the Approved schools.

The present edition of the Bulletin of Approved Graded and High Schools is, to a certain extent, a restatement of the main regulations contained in the two previous editions prepared by Inspectors J. C. McGlade and A. C. Fuller, Jr., and issued by the Department in 1913 and 1915 respectively. It contains, however, a number of additional features. The pamphlet entitled Agriculture, Domestic Science and Manual Training has been substantially incorporated into the present bulletin, together with a number of suggestive minimum lists of equipment for standard schools. It is hoped that the bulletin will be of increased value to school officers in their endeavor to make the schools of greater service to their supporting communities.

September, 1916.

ALBERT M. DEYOE,
Superintendent of Public Instruction.

APPROVED SCHOOLS

Schools to be classified and approved by the Department of Public Instruction must meet reasonable requirements in the following lines:

- I. Material Equipment.
- II. Organization.
- III. Curriculum.
- IV. Instruction.
- V. Spirit.

MATERIAL EQUIPMENT.

I. Material equipment includes grounds, and buildings with appurtenances, and fixtures. The grounds should supply ample room for the playground activities, and also for the field experiment work in connection with agriculture and practical botany. Buildings should be well lighted, heated and ventilated, and provided with water supply, toilet facilities, janitor service and other appointments in keeping with present day standards. The lighting space should never be less than one-fifth of the floor space. Modern ventilation changes the air completely every six or eight minutes. When new buildings are constructed they must comply with the regulations and suggestions designated in the bulletin, Iowa School-houses and Grounds, issued by the Department of Public Instruction. Old buildings should be so handled as to safely approach this standard as closely as possible. Whatever the age of the building, good janitor service will keep it clean and presentable at all times. Floors should be scrubbed at least once each month. The general appearance and attractiveness of the school building and premises should equal that of any business house in the community.

The rooms should be sufficient in number so that no more than forty grade school children need be assigned to a teacher. The high school department requires an assembly room, class recitation rooms, laboratory and shops fitted with cases to hold apparatus, and suitable tables for class use. Special lists of laboratory and shop equipment for each subject may be secured on application.

Primary Supplies.—Primary supplies should be provided for the children in grades one and two. The teachers should not be expected to buy this material with their own money. The school board should devote at least fifty cents per pupil per year to such

use. Primary supplies include materials for sense training, weaving, paper cutting, drawing and color work, seat work with letters, words and numbers, modeling clay, paste, scissors, rulers and blocks.

There should be a sand table in every Primary room. The Primary teacher should be equipped with sight-word and phonic cards. If the teacher is using a primary system for which a chart is provided she should have that chart. A general primary reading chart is not of much value. If no special chart accompanies the system of reading used, then the teacher should make her own chart to fit the work as taken up in the first book the child uses. Supplies should be provided for such work.

Supplementary Reading.—Supplementary readers are necessary. Sets of standard readers should be purchased by the board so that, including the books purchased by the pupils, each child will read appropriately graded books as follows:

Supplementary Readers: Four sets, Grades 1, 2, 3; three sets, grades 4, 5, 6; two sets, grades 7 and 8.

By "set" is meant that enough copies of one kind will be secured to furnish one book to each child in the class.

The school board should purchase one-half of these readers and keep them as property of the district.

Maps, Globe, Physiology Chart.—In each room where Geography is studied there should be an adequate supply of wall maps to cover the regions of Geography studied therein. There should be a globe and a Physiology Chart for the school.

Grade Reference Books.—The classes in grades VI, VII and VIII in Physiology, History and Geography will need appropriate reference books. A Webster's New International or a New Standard Dictionary should be provided for grades V, VI, VII and VIII. A small encyclopedia is recommended for grades VII and VIII.

Miscellaneous Material.—Miscellaneous illustrative material such as blocks, units of weights and measures, etc., should be provided.

Writing and Music.—The elementary school should be equipped with some sort of writing manuals and materials in the hands of the children. There should also be music books provided so that there is one copy for every child.

The Field Plot.—To give the class opportunity to see actual conditions, observation trips to fields and farm yards should be ar-

ranged whenever practicable. Where conditions will permit, a school plot for experimental purposes is highly desirable. The size of the plot is not important. That there be a plot, however small, and that it be rightly used, is essential to the best results. A large garden will serve. An entire city lot may be used. A large high school class can utilize two or three acres in the year course. On the other hand, some surprising results have been obtained from a strip only three feet wide along one side of the school yard.

High School Library.—The high school library should meet the conditions given in the bulletin "High School Reference Books." Under each subject is stated the minimum number of books required therein. Schools are advised to count the number of good standard high school reference books they have and then supply themselves with the additional number to meet the following requirements:

English, 25 reference books for each year; Science, 8 books for each subject; Ancient History, 15 books; Mediaeval and Modern History, 15; General History, 15; American History, 30; Civics, 10; Economics, 10; Commercial Geography, 8; Home Economics, 16; Agriculture, 15; Foreign Language, 8. Schools are required to buy no books for subjects not taught.

High School Wall Maps.—In Physical Geography there should be at least eight regions covered by the physical maps as follows:

North America	*Atlantic Ocean	South America
Europe	*Pacific Ocean	Africa
United States	Asia	

In Ancient History not less than five regions should be shown by wall maps or charts on tripod stand. Choice is permissible and more regions will be found desirable. Those usually chosen, when only five, are Asia Minor in Early Times, Beginnings in Greece, Early Times in Roman History, The Roman World at Its Greatest, Campaigns of Caesar in Gaul (Useful also in Second Year Latin).

In Mediaeval and Modern History not less than three regions should be shown either by wall maps or charts on tripod stands. Choice is allowable. These are suggested, more will be found helpful:

*The two-starred regions may be combined in one large map of the world, Mercator's Projection preferred.

Europe near Close of Twelfth Century.
Europe at the Beginning of the Eighteenth Century.
The World in the Period of Discoveries.
Map of the British Isles.

If General History is undertaken, not less than eight regions should be selected.

The above equipment in maps is meager. Where they can reasonably be provided much profit will arise from the use of a large number of regions well selected to depict important historical movements and events.

In English History at least four regions should be selected to show important phases in the growth of the Empire.

In United States History preference is for a tripod frame and chart consisting of several maps. These range in number from 20 to 45 pages and from 30 by 40 inches in size, upwards. Charts smaller than this are not so desirable. This material will be valuable in United History work both in the grades and high school departments.

Science Laboratory Equipment.—Science cannot be taught adequately without a properly equipped laboratory. Lists of minimum equipment for physics, general science, physiology, botany and physical geography are included in this bulletin.

Vocational Equipment.—Lists of standard minimum equipment in Agriculture, Domestic Science and Manual Training will be found in the back of this bulletin. Equipment used in any other science need not be duplicated.

Suggested Equipment.—Illustrative material such as stereographs, lantern slides, moving pictures and victrolas should be bought as freely as possible to assist in explaining the subject matter taught in the school.

ORGANIZATION.

II. The Organization in an Approved School rests upon a school year of thirty-six weeks, divided into semesters.

Ordinarily the greatest economy of time results in a program which provides four recitation periods, each half day.

The regular recitation period for all high school subjects should be, at least, 40 minutes, in the clear. Double periods, 80 minutes, in the clear.

The double period subjects are Manual Training, Agriculture, Physics, and other vocational and laboratory subjects. If there is time at the disposal of the school, Bookkeeping may be more profitably taught in a double period.

Classification of Schools.—The following plan indicates the minimum number of teachers required in approved schools of different classes:

9 grade school, at least three teachers.

10 grade school, at least four teachers.

11 grade school, at least five teachers.

12-C grade school, six teachers, provided that the high school enrollment does not exceed thirty, and not more than two of the high school subjects, requiring double periods, are taught.

12-B grade school, at least, seven teachers.

12-A grade school, at least seven teachers, all in the high school department have training equivalent to college graduation.

Distribution of High School Classes.—The arrangement of the program should be such that both pupils and teachers may do the the most efficient work. Regular work for high school students shall consist of four subjects daily. No class should contain more than thirty students. The maximum number of daily classes conducted by an instructor should not exceed seven. Many of the best schools limit the number of students in high school classes to twenty-five, and the number of classes for each teacher to five.

Distribution of Graded School Classes.—In the larger schools, and wherever possible in the smaller systems, better work will result if not more than two grades are assigned to a teacher. In small schools where the attendance is light three grades may be handled by a teacher with fair results. The number of pupils assigned to any grade school teacher should never be more than forty and better results will be secured if the number does not exceed thirty.

Supervision.—Supervision, or daily business management, is necessary in any school. The superintendent, or principal, should have time to observe one full class recitation with each teacher once each week. One important duty of supervision is to see that the daily amount of time devoted to each study in the grades is in proportion to its importance in the course of study, and adapted to the age and ability of the children. The time schedules of various school systems may be secured on application to the office

of the Department. Small schools lose the benefit of expert management by requiring the superintendent or principal to give class instruction throughout the entire day. Undoubtedly much money and time is wasted in schools because of lack of management.

Supervision means more than keeping order, checking over reports of attendance, or progress of classes. It is concerned with more important matters than appearance of the room, or the estimates gathered from a momentary glimpse of teacher and pupil.

Supervision of any school is concerned with what should be taught, and when it should be taught, how and to what purpose. It aims to establish and to maintain for the individual teacher standards of worth and attainment.

In all business relating to the organization, management, equipment and supervision of the school, especially in the election of teachers, the expert advice of the city or town superintendent should be sought by the Board of Education. He should be present at all Board meetings and be given freedom of discussion on all school questions.

Plans for Vocational Subjects.—Chapter 248, Thirty-fifth General Assembly, states that:

“The teaching of elementary agriculture, domestic science, and manual training, shall, after the first day of July, nineteen hundred and fifteen (1915), be required in the public schools of the state; and the state superintendent of public instruction shall prescribe the extent of such instruction in the public schools.”

I. *Plan for Work in the Grade Schools.* The grade school plan outlines in detail thirty-six lessons in each subject. Each lesson is expected to be from sixty to seventy-five minutes in length. These lessons may be given in grade VII or grade VIII at the option of the school. The thirty-six lessons will be the minimum requirements for grade school work. The character of the work will not require expert ability in the teacher.

II. *Minimum Plan for High Schools.* This provides one semester of eighteen weeks with daily work for the high school. Agriculture and home economics will each ordinarily require three regular recitation periods of 40 minutes each, and two double, or laboratory periods each week. Manual training will require double periods of 80 minutes each daily. This is the minimum amount of high school work accepted.

III. *Recommended Plan for High Schools.* One year of high school work is being outlined for those schools that desire courses of this length and that have the requisite teaching force and equipments to handle it. Larger schools will find the year courses much more satisfactory. Such schools may profitably install plan I in the grades and plan III in the high school, making the high school work elective.

Schools may, however, satisfy the law by adopting plan I for the grades or either of the plans for high school work.

Schools may make any combinations desired with plans I and II. Agriculture may be given in the High School and Domestic Science and Manual Training in grade VII or VIII, or otherwise, according to local needs and conditions. It is not necessary to offer any subject in more than one place or grade in the school.

CURRICULUM.

III. A well planned Curriculum is essential in every school. Work suited to the needs and interests of the pupils should be provided for each grade. Thorough and careful performance should mark the school activities throughout.

The amount of time devoted to each subject in recitation and study time is important, since it is through the recitation and the study periods connected therewith that the whole effort of the school is directed.

Tables of time distribution appropriate to schools of various sizes will be issued on request.

Schools organized under the Junior High School, or Six-Six plan should submit their courses of study to the Department of Public Instruction for approval.

The following outline shows the order and extent of topics generally given:

Brief Outline of Work for Graded Schools.

Detailed suggestions are found in the "Course of Study and Manual of Methods for the Elementary Schools of Iowa." Copies may be secured from the County Superintendent.

GRADE ONE.

Reading—

Blackboard and chart work, 6 weeks.

Primers, 2 to 4 books read.

First Readers, 2 to 4 books read.

Phonics—

This work should begin simultaneously with the book work in reading.

Spelling—

Work based on reading. Spelling by letter is not given till last of year.

Numbers—

Counting. Read and write numbers to 100. Combinations in addition and subtraction to ten. Lessons in sense training and number relations.

General Lessons—

Language, nature study, hand work, oral history and oral hygiene.

GRADE TWO.

Reading—

Second Readers, at least four books.

Phonics—

Continue and stress.

Spelling—

From reading and other school activities. Two to five new words daily.

Numbers—

Special emphasis on the 45 combinations. Combinations in four fundamentals to 20. Simple work with fractional units within this range.

General Lessons—

Language, nature study, hand work, oral hygiene, and oral history.

GRADE THREE.

Reading—

Third Readers, at least four books.

Phonics—

Continued.

Spelling—

One-half the spelling from a standard text and one-half from other subjects and activities. Three to six new words daily.

Numbers—

Suitable books in hands of children used with care.
Stress four fundamentals to 30. Multiplication tables through five's. Emphasize work outside of book within this range.

Language—

Suitable book in hands of children.

General Lessons—

As suggested in previous grades, including home geography.

GRADE FOUR.

Reading—

Fourth Readers, at least three books.

Spelling—

Select work as in Grade Three. Four to seven new words daily.

Arithmetic—

Suitable book used. Emphasize four fundamentals. Teach common units of weights and measures. Complete multiplication tables. Preliminary work in easy fractions. Speed and accuracy drills.

Language—

Suitable book. Oral expression. Simple letter writing. Teach correct language forms rather than technical grammar.

General Lessons—

Geography—

Suitable text. Home geography, if not previously taught, first semester. Continue in text to South America, second semester. Aim—intelligent map interpretations. Teach pupils how to study Geography.

GRADE FIVE.

Reading—

Fifth Readers, at least three books.

Spelling—

Select work as before.

Arithmetic—

Suitable text. Major portion of year on common fractions. Elementary study of decimal fractions. Work with tables in common use. Speed and accuracy drills.

Language—

Continue plans of Grade Four.

Geography—

Elementary text completed.

Hygiene—

Suitable text, two days a week.

GRADE SIX.

Reading—

Sixth Readers, at least three books.

Spelling—

Select work as before.

Arithmetic—

Emphasis on four fundamentals, common and decimal fractions, common tables, bills and accounts.

Language—

Suitable text. Supplement liberally with *oral* and written composition.

Geography—

Advanced text, western hemisphere. Geography should be a study of the earth as the home of man. Use geographical readers supplementary to geography, not in reading period.

U. S. History—

Elementary text completed. Story and biography emphasized. The beginnings of American history in Europe should be used as supplementary material.

GRADE SEVEN.

Reading—

Seventh Readers, at least two books.

Spelling—

Select work as before.

Arithmetic—

Continue text to simple interest.

Grammar—

Sentences and their structure. Give due attention to oral and written composition.

Geography—

Complete advanced text. Stress industrial and commercial features. Give one month to study of Iowa and your county. Review.

U. S. History—

Grammar school text to Civil War. Supplement with biography and story.

GRADE EIGHT.

Reading—

Eighth Readers, at least two books.

Spelling—

Select work as before.

Arithmetic—

Review from percentage to simple interest. Emphasize practical operations throughout remainder of book. Review.

Grammar—

Parts of speech. Due attention to oral and written composition.

U. S. History—

Text completed, first semester.

Civics—

Suitable text, second semester.

Physiology—

Suitable text completed. Health and sanitation uppermost.

General Remarks.

Writing—

Pen work in grades three to eight, inclusive. Books of systematic drills and exercises in hands of pupils in these grades. Grades one and two follow system of higher grades. Penmanship heeded in all written exercises.

Music—

Grades One and Two, rote singing. Texts, giving fundamentals of vocal music and good song material, should be in hands of children in grades three to eight, inclusive. Additional song materials should be provided. Alternate with drawing.

Drawing—

One or two lessons per week may be given from systematic books in hands of children. Alternate with music.

General Lessons—

These may include hygiene, nature study, current events, morals and manners, and hand work for grades one to four.

High School.

The high school course of study should be in vital contact with the environment and life interests of boys and girls. Human interest studies should replace antiquated courses of study. The high school curriculum, especially in the early years, should be so interesting and attractive that pupils will gain inspiration to complete at least a full four year standard high school course.

Alternations. Alternations are a make shift and are to be resorted to in any school only as necessity demands.

In the one-year program, all subjects will be offered annually.

In the two year program, subjects may be so chosen that two of the eight yearly courses will alternate. One of these two will be given in odd years and another in even years. The two grades will be combined in these subjects. Thus, only seven recitations will be required of the teacher daily in any semester.

In the three-year program one combination may be made in ninth and tenth grades and another in tenth and eleventh grades. Such subjects will be offered biennially. Thereby, the number of recitations may be reduced to ten.

In the four-year program one combination may be planned in the first half and two in the latter half of the course. This will leave thirteen daily recitations, six for the principal and seven for the assistant.

*Foreign Languages—*Not less than two years of any foreign language will be approved. Prose composition from an approved text should occupy one-fifth of the time devoted to foreign language work beyond the first year. Such work of the first year will be determined by the adopted text.

SUGGESTIVE ONE-YEAR PROGRAM OF HIGH SCHOOL WORK.

For Schools Having a Minimum of Three Teachers for Nine Grades.

IX GRADE.

*English—*One year of work embracing the following topics:

Composition and rhetoric, three-fifths of the time, approved English classics, two-fifths of the time. Spelling and word study are a part of the regular work.

Mathematics—Select one year of work in the following studies:

Commercial arithmetic, including farm arithmetic, one-half year. Bookkeeping with farm accounts, one-half year. Algebra to quadratics, one year.

Elementary Science—Select one year of work in the following topics:

General science, one-half year, Physical geography, Commercial geography, one-half year, Agriculture, one-half year or one full year. Botany, one-half year.

Elective—Select one year of work in the following topics:

Manual Training, one-half year, Home Economics one-half year. General or Ancient history, one full year. Bookkeeping, one-half year, and commercial geography, one-half year.

NOTES.—Only four studies are to be chosen each semester. So far as possible these should be the same year after year. Frequent changes in the course of study are unnecessary and lead to confusion. If a large number of pupils go on to further schooling the work offered may profitably follow that of the nearby school.

Foreign language should not be given in a one-year course.

SUGGESTIVE TWO-YEAR PROGRAM OF HIGH SCHOOL WORK FOR SCHOOLS HAVING AT LEAST FOUR TEACHERS.

The full time of one teacher is needed for the High School work.

IX GRADE.

English—One year of work embracing the following topics:

Composition and rhetoric, three-fifths of the time, approved English classics, two-fifths of the time. Spelling and word study are a part of the regular work.

Mathematics—Select one year of work in the following studies:

Algebra to quadratics, one year. Commercial arithmetic, including farm arithmetic, one-half year. Bookkeeping with farm accounts, one-half year.

Elementary Science—Select one year of work in the following topics:

General science, one year. Physical geography, one-half year. Commercial geography, one-half year. Agriculture, one year or one-half year. Botany, one-half year.

Elective—Select one year of work in the following topics:
Manual training, one-half year, home economics, one-half year. Ancient history, one full year. Bookkeeping, one-half year, and commercial geography, one-half year.

X GRADE.

English—One year of work embracing the following topics:
Composition and rhetoric, two-fifths of the time, approved English classics, three-fifths of the time. Spelling and word study are a part of the regular work. One-half year of business English may be substituted for composition and rhetoric if desired.

Mathematics—Select one year of work in the following studies:
Algebra, one year, if not taken in IX. Plane geometry, one year. (Taken only after algebra.) Commercial arithmetic, one-half year, and bookkeeping one-half year, if not given in Grade IX.

History—Select one of the following studies:
Ancient history, one year, if not taken in IX. American history, with civics, one year. (Taken only after ancient history.)

Elective—Select one year of work in keeping with the elective offered in the Ninth Grade. This may be:
Additional science. Agriculture, one-half year or one year.
Bookkeeping, one-half year. Physiology, one-half year.
Manual training, home economics, one year or one-half year.

NOTES—Most two-year high schools give Algebra in Grade IX and follow it with Geometry in Grade X. This is the plan for the first two years of mathematics used in four-year high schools.

SUGGESTIVE THREE-YEAR PROGRAM OF HIGH SCHOOL
WORK FOR SCHOOLS HAVING AT LEAST
FIVE TEACHERS.

The full time of two teachers is required by this program.

IX GRADE.

English—One year of work embracing the following topics:
Composition and rhetoric, three-fifths of the time. Approved English classics, two-fifths of the time. Spelling and word study are a part of the regular work.

Mathematics—Select one year in the following topics, algebra preferred:

Algebra to quadratics, one year. Commercial arithmetic, including farm arithmetic, one-half year. Bookkeeping with farm accounts, one-half year.

Elementary Science—Select one year of work.

General science, one year. Physical geography, one-half year. Commercial geography, one-half year. Agriculture, one-half year or one full year. Laboratory and field work included. Botany, one-half year.

Elective—Select one year of work:

Manual training; home economics, one-half year or one year. Latin, German or Spanish, if a two-year course may be given. Ancient history, one full year. Bookkeeping, one-half year and commercial geography, one-half year.

X GRADE.

English—One year of work embracing the following topics:

Composition and rhetoric, two-fifths of the time. Approved English classics, three-fifths of the time. Spelling and word study are a part of the regular work.

Mathematics—Select one year of work:

Algebra, if not given in Grade IX. Plane geometry, one year. (The customary mathematics here.) Commercial arithmetic, including farm accounts, one-half year. Bookkeeping, one-half year. (Commercial arithmetic and bookkeeping should not be given in both IX and X.)

History—Select one year of work.

Ancient history, one year, if not taken in IX. Medieval and modern history, if ancient history is taken in IX.

Elective—Select one year of work in keeping with the elective offered in Grade IX, this may be:

Science, one year. Agriculture, with laboratory and field plot work, one-half year or one year. Bookkeeping, one-half year. Physiology, one-half year, manual training, home economics, one-half year or one full year. Latin, German, or Spanish, one year. (If part of a two-year course.) Prose composition from an approved text should occupy one-fifth of time.

XI GRADE.

English—Select one year of work in the following topics:

1. History of literature in connection with study of Approved English classics. Grammar may be reviewed in place of classics last one-half year; or,
2. Business English, one-half year. Review English Grammar, one-half year.

Mathematics—One year of work.

Algebra, complete text from quadratics, one-half year. Advanced arithmetic, one-half year, if not taken previously. Plane geometry, one year, if not taken in X Grade.

History—One year of work.

Medieval and modern history, one year, if not taken in Grade X. American history and civics, one year. (Following ancient history.)

Elective—One year of work.

Any elective listed and not previously taken. Economics, one-half year or one year. Physiology, one-half year. Physics with laboratory work one year. Latin, German or Spanish.

NOTES—A number of three-year high school programs contain two-year courses in Latin or German. Most schools do not attempt more than this amount. In History the custom favors one year of Ancient History in Grade X and one year of American History and Civics in Grade XI.

SUGGESTIVE FOUR-YEAR PROGRAM OF HIGH SCHOOL
WORK FOR SCHOOLS HAVING AT LEAST
SEVEN TEACHERS.

The full time of two teachers, and all that of the principal save what is required in supervision will be needed to carry out this program effectively. In class 12-C schools, two teachers may conduct this program. It will be necessary for such schools to arrange systematic alternations year after year.

IX GRADE.

English—One year of work embracing the following topics:

Composition and rhetoric, three-fifths of the time. Approved English classics, two-fifths of the time. Spelling and word study are a part of regular work.

Mathematics—Select one year of work.

Algebra to quadratics, one year. Commercial arithmetic, including farm arithmetic, one-half year. Bookkeeping, one-half year or one year.

Elementary Science—Select one year of work.

General science, one year. Commercial geography, one-half year. Physical geography, one-half year. Agriculture, one-half year, or one full year. Field work included.

Elective—Select one year of work.

Manual training, home economics, one-half year or one full year. Latin, German or Spanish. Ancient history, one full year. Bookkeeping, one-half year, and commercial geography, one-half year. Botany, one-half year.

X GRADE.

English—One year of work embracing the following topics:

Composition and rhetoric, two-fifths of the time. Approved English classics, three-fifths of the time. Spelling and word study are a part of the regular work.

Mathematics—Select one year of work.

Algebra, one year. (If not taken in Grade IX.) Plane geometry, one year. (The customary mathematics here.)

History—Select one year of work.

Ancient history, one year, if not taken in IX. Medieval and modern history, if ancient history is taken in IX.

Elective—Select one year of work. This should follow, not repeat the work offered in Grade IX.

Additional science. Agriculture, with laboratory and field work, one-half year or one year. Bookkeeping, one-half year or one year. Physiology, one-half year. Manual training, home economics, one-half year or one year. Latin, German or Spanish, one year.

XI GRADE.

English—Select one year of work.

1. History of American literature, two-fifths of the time. Approved English classics, three-fifths of the time (one year); or,
2. Review of English grammar, one-half year. Business English, one-half year.

Mathematics—Select one year of work.

Algebra, third semester work, one-half year. Advanced arithmetic, one-half year. (Not if arithmetic occurs elsewhere in the high School course.) Solid geometry, one-half year. Plane geometry, one year. (If not taken in Grade X.)

Elective—Select two years of work.

One year of any science or combination of sciences not taken previously. Agriculture (second year). Manual training and home economics (second year). Medieval and modern history, or English history, one year. Latin, German or Spanish, one year.

XII GRADE.

English—Select one year of work.

1. History of English literature, two-fifths of the time. Approved English classics, three-fifths of the time (one year);
or,
2. Review of English grammar, one-half year. (Not if taken in Grade XI.) Business English, one-half year.

Science—One year in physics with laboratory work.

History—One year of advanced work.

American history, three-fifths of the time. United States civics, two-fifths of the time.

Elective—Select one year of work.

One year of mathematics not taken previously. Latin, German or Spanish, one year. Political economy, one-half year or one year. Sociology, one-half year or one year. Commercial law, one-half year. Industrial History, one-half year. Agriculture (second year). Manual training and home economics (second year).

INSTRUCTION.

IV. *Instruction*: Although good buildings, sanitary conditions, sufficient equipment, efficient organization, and a practical course of study should be diligently sought after by ever school officer and every other citizen; yet these things do not make a school. Two other items at least are lacking: (1) the teacher, (2) co-operation of all individuals concerned.

With the items above a good teacher will teach a better school and a poor teacher will keep one not quite so poor. A school cannot be a good school without a good teacher. The most important duty of any school board is the election of the teacher. In the teacher lies the most evident source of strength or weakness of the school system. No teacher is more costly than the low-salaried, inefficient one.

“The late Professor Payne of the University of Michigan is responsible for the statement that eighty-five per cent of the value of a school lies in the teacher. The buildings, laboratories, libraries, and all other physical equipment count but fifteen per cent. It is the teacher that makes all these worth while.”

Primary Teachers. The primary teacher in any school should have had special primary training in a recognized institution where experts are employed as instructors. It is not simply training that this teacher should have but training of the proper sort, primary training. The young years are the great years for the pupils.

Grade Teachers. The scholastic training of all grade teachers should not be less than that given in a full four-year high school course. In addition to this scholastic preparation, they should have special normal training fitting them for teaching in the grades.

High School Teachers. The minimum requirements for any high school teacher should be two years of scholastic preparation in a reputable institution above a four-year high school course. The minimum scholastic preparation without experience is not adequate. In every high school employing two or more teachers the majority should be graduates of a full college course.

Vocational Teachers. The teachers who are to give instruction in agriculture, domestic science or manual training in Grades VII and VIII should have not less than six weeks of special training in these subjects—more is highly desirable.

Teachers who are to give high school instruction in these subjects should have as much preparation along these special lines as is required for preparation to teach the other high school subjects.

Unless the work in the high school may be satisfactorily provided for with respect to the teacher, equipment, room, and time on the daily program, Plan No. 1 is recommended.

Special Teachers. Teachers with special certificates based upon graduation from a reputable institution, may teach, in addition to the major subject pursued, such minor subjects as were correlated with it.

While all teachers must begin without experience, in the election of new teachers, school officers should carefully weigh the worth of experience and employ as many teachers as possible who have added proof of teaching power. Due care should also be taken to provide teachers who are especially prepared for the particular grade, department or subjects they are to teach. Certificates are rated in the following order:

1. First Grade State Certificate.
2. Second Grade State Certificate.
3. Third Grade State Certificate.
4. Certificate for Special Subjects Issued on College Graduation.
5. High School Normal Training Certificate.
6. First Grade Uniform County Certificate.
7. Second Grade Uniform County Certificate.
8. Third Grade Uniform County Certificates.

Certainly a teacher of energy and ambition will not be long satisfied with an inferior certificate. The fact that any of the above certificates is validated for life does not change its rating in the scale.

SPIRIT.

V. *Spirit.* In the promotion of a good school there is still another dynamic quantity involved. "As the teacher so the school" is both true and false. A poor teacher may wholly set at naught all the efforts of the other factors, but a good teacher cannot wholly make a good school. Co-operation is the motive force required to propel the machinery of school organization. Unless the students feel that the success of the school is their success and its defeat their defeat, unless they realize that the only way to become educated is through work, unless the members of the Board of Education feel that their position is a public trust, unless the teacher sees in her position faithfulness and justice to all, unless the patrons add work and loyalty to faith, unless the tax payers meet their obligations cheerfully, unless the strong arm of the law is upheld by every citizen, unless all catch the vision of a better citizenship because of the school, this institution must fall short of

the ideals that democracy has determined. If any one of these factors fail, to that degree is the whole weakened; if a majority of the factors fail to function as they should, a poor school is the only hope of the boys and girls of that community. The school is a sentinel proclaiming the degree to which the community is alive to the welfare of the youth therein. Good buildings, standard equipment and trained teachers are objective proofs of this interest.

Tuition in High School.

The Thirty-fourth General Assembly recognized the right of every boy and girl in Iowa to a high school education. Therefore a law was enacted granting the rural youth of Iowa the privilege of attending any Iowa high school that would receive him with his tuition paid by his home district.

In order that the rural district may be reasonably certain that the high school is maintaining proper standards to justify the payment of the tuition, such schools must be approved by the State Department of Public Instruction before this tuition can be legally collected or paid.

Four general conditions must be met if this tuition is legally claimed by the officials of said high school or paid by officials of rural districts:

1. The pupil must have completed the course in his school corporation as approved by the Department of Public Instruction. If there is an unapproved high school in his district, he may attend an approved high school in another district and claim from his district the legal tuition, provided he meets other conditions.

2. The pupil shall present the officials of said high school a certificate signed by the county superintendent showing proficiency in the common school branches.

3. The pupil shall present the officials of said high school the affidavit of his or her father, mother or guardian that such applicant is of school age and a resident of a school district of this state, specifying the district.

4. The school corporation claiming the tuition must maintain an approved school.

Certificates of Approval.

Six classes of schools will be approved for high school tuition purpose by the Department: Four-Year-A, Four-Year-B, Four-Year-C, Three Year, Two Year, and One Year. Two kinds of certificates of approval are issued. All of the smaller schools in which changes in teaching force are numerous, and any other schools whose condition in any of the five lines mentioned may warrant, will receive the annual certificate of approval. Such certificate will expire at the close of the school year, June 30, and must be renewed from year to year. The other form of certificate of approval is issued to larger schools and those upon a more permanent basis. This certificate continues in force indefinitely, or until conditions arise which would have prevented its issue at the first, when it will be withdrawn and canceled. All certificates of approval granted upon written reports are subject to the findings of the inspectors upon a personal visit, or other investigations arranged by the Department.

Patrons who desire to send their children to Approved Schools must know in advance what schools are approved for a given semester. Accordingly it will be the policy of the Department hereafter to issue a list of approved schools twice each year, in August and December. Each list will give the full number of approved schools for the next succeeding semester (4½ months) of school. Schools may by report or inspection qualify for approval at any time intervening, but the approval of the Department for tuition purposes will not take effect until the first of September or the middle of January, as the case may be, thereafter. Lists of approved schools may be obtained from the county superintendent.

LISTS OF LABORATORY EQUIPMENT APPROVED BY
THE DEPARTMENT OF PUBLIC INSTRUCTION.

I. SUGGESTIONS AND EQUIPMENT FOR AGRICULTURE.

Nature of the Work. Success with the work in agriculture will be measured by the spirit in which the work is entered into by the community and the school and the degree to which the work is really made practical. Real work and the actual objects should be the subjects for class activity, study and observation. Agriculture is not a book study in the sense that many school studies are. Mere text-book study will not secure satisfactory results nor will it satisfy the requirements for the teaching of agriculture. Topics, experiments and projects should be assigned. Wherever possible these are first to be studied and observed under actual field conditions. Farmers' bulletins from state and national sources, year books of agriculture, and other excellent reference books should be used in checking results and also for further investigation and study. Each pupil should keep a complete and accurate note book record of his experiments, observations and references.

It should be remembered that the school experiment plot is of doubtful value unless the teacher may be responsible for the work for more than the nine months of the school year. Many experiments of the greatest interest and highest value to the class will continue through the growing season. Work of this character may well be encouraged. School boards will be justified in providing for vacation direction and care of field plot experiments and problems. The class teacher may arrange with individual pupils who desire to carry on home projects on their farms or in their gardens. When proper reports are made covering these vacation and home projects full school credit should be allowed.

Minimum Grade List.

Many valuable experiments should be conducted in the class rooms using material collected from various sources. Much of the material can be secured without cost, or made by pupils or teachers. For the work designed for Grades VII and VIII a special bulletin is issued. Definite page references are given in the bulletin to twenty-five books on agriculture well suited to the

needs and ability of pupils in these grades. These books should be provided. In addition to the material that can be furnished from the homes the following apparatus will be required for work in the grades:

1	Harvard trip scale	\$ 6.65
1	Set iron weights, ½ oz. to 2 lbs.	1.40
1	Spring balance, 25 lbs. in ½ lb. divisions.....	.16
1	Babcock milk tester, 8 bottles complete	10.00
	Extra equipment for same—	
	4 milk bottles, 2 cream bottles (50%), 2 skim milk bottles (1-100), 4 acid measures, 4 pipettes (combined), 4 brushes	4.00
5	Tripod magnifiers (preferable each student should own one)	2.25
24	Small vials, 3 inches long for teacher's collection (students should buy their own), with corks .....	.46
1	Insect mounting case, 4x5 .....	.15
5	Rulers, maple, English and metric .....	.20
1	Yard stick .....	.20
10	Student lamp chimneys (or have pupil bring one from home)	.60
1	Sheet of cardboard 16x20 .....	.10
1	oz. Iodine .....	.15
1	qt. Denatured alcohol .....	.45
1	Alcohol lamp, 8 oz. ....	.40
1	qt. Formalin, 40% .....	.60
1	oz. Chloroform .....	.10
1	lb. Hydrochloric acid .....	.25
1	lb. Nitric acid C. F. ....	.35
2	Vials litmus paper, red and blue .....	.16
1	Glass graduate, graduated in drahms, 4 oz.....	.50
	Samples of fertilizers may be secured free from the leading meat packing houses of the country.	

Minimum High School List.

In the high school the actual field and laboratory work will be the basis of the course. Recitation work will involve the use of adequate reference books. There will be the customary division of time between laboratory and recitation—two double periods of laboratory for three in recitation. The high school work embraces farm crops, soils, animal husbandry, farm management and rural economics, dairying, and horticulture. Outlines covering experiments and recitation in detail and giving exact references upon all topics considered are provided in separate bulletins both for grade and high school work.

The bulletin "Outlines for High School Agriculture" assigns definite references to twenty-five or more known reference books suited to the needs of such pupils. These books should be provided as part of the regular equipment.

The important part of the work in agriculture is to be carried on out of doors, in the fields or on the experimental plot.

The recitation and indoor laboratory work may be conducted in the ordinary class room if a specially fitted room is not available. Space can be found to store materials and to care for experiments that may be several days in duration.

High school classes will do vastly more work. They will naturally require more apparatus. Many of their experiments will call for careful work. For satisfactory instruction in agriculture as in any other science, good equipment is necessary.

Schools having well equipped physics laboratory may secure the necessary additional equipment for \$50.00 to \$75.00.

The following apparatus will serve a class of 10 pupils. It will need to be ordered in advance. A liberal discount should be secured from the *list* prices quoted:

1	Laboratory table for class room, 6'x3' or larger	
1	Case to store apparatus (may be built specially or secured locally).	
1	Harvard trip scale	6.65
1	Set brass weights, in block, 1 gm. to 500 gm.....	1.77
1	Set iron weights, ½ oz. to 2 lbs.	1.40
1	Set fractional weights, German silver, 1 mgm. to 500 mgm...	.22
1	Spring balance, 25 lbs., ½-lb. divisions.....	.16
1	Set soil sieves (5), wood frame, 20-40-60-80-100.....	2.40
2	Thermometers, chemical, -10° to 110°, C. and F. engraved. stem	2.80
1	Babcock milk tester, 8 bottles complete	10.00
	Extra equipment for same—	
	4 milk bottles, 2 cream bottles (50%), 2 skim milk bottles (1-100), 4 acid measures, 4 pipettes (combined), 4 brushes	4.00
1	Lactometer (Quevenne's combined with thermometer)....	1.60
1	Hydrometer jar, 15"x2" .....	.50
1	Soil auger, 40"x1½"	3.00
5	Universal soil tubes, 12", brass, interchangeable bottom.....	8.75
1	Pruning saw, flat steel back, 18½"	1.25
2	Hand pruners, 45c each .....	.90
10	Grafting knives, non-folding, 6¾"	3.00
5	Alcohol lamps, 8 oz.	2.00
5	Tripod magnifiers	2.25
2	Glass tubes, 2" diameter, 36" or more long	2.20
½	Lb. Soft glass tubing, ¼" .....	.22
½	Lb. glass rods, ¼" .....	.22
6	Ft. rubber tubing ¼" .....	.60
12	Rubber stoppers, 2-hole, 2 No. 8, 3 No. 7, 3 No. 6, 2 No. 4, 2 No. 2	1.10
12	Wide mouth bottles, 8 oz. ....	.60
12	Wide mouth bottles, 2, 4 and 6 oz. assorted .....	.45
48	Vials, straight walls, 3" long, with corks and labels.....	.92
1	Gross assorted corks .....	.50
2	Graduates, 100 cc each	1.12
72	Test tubes, 6x¾"	1.25
5	Test tube brushes .....	.20
1	Test tube rack, 16 tubes, 8 drying pins .....	.50
10	Evaporating dishes, 3" diameter	1.30
1	Package filter paper, 15 cm. diameter .....	.20

2	Vials litmus paper, 100 strips in each, blue .....	.16
2	Vials litmus paper, 100 strips in each, red .....	.16
1	Set of liquid measures, ½ pint to 1 gallon, tin	1.00
1	Set of dry measures, 1 quart to ½ bushel, wood	1.50
2	Ringstands, rectangular base, 18" rods, 3 rings each	1.20
10	Student lamp chimneys .....	.60
1	Tape measure, 50 ft.	1.20
5	Tape measures, 5 ft., plain linen without case .....	.25
12	Flower pots, 4", with saucers, 6" .....	.60
1	Insect mount, 4x5 .....	.15
20	Earthen saucers .....	.55
10	Garden trowels	1.70
1	Qt. Formalin Preservative, 40% .....	.60
1	Lb. grafting wax .....	.35
1	Lb. hydrochloric acid .....	.25
1	Lb. nitric acid .....	.35

Fertilizers, insecticides, fungicides and other chemicals should be provided to fit the needs of the work as planned by the instructor.

Soil samples—Department of Soils, Ames.

Samples of seeds of Iowa grasses.

Type samples of grains of Iowa.

Heads or sheaf of each grain.

Collection of economic seeds, free from the U. S. Department of Agriculture, by sending \$1.50 to pay for packing and case.

1	Compound microscope, 2 eyepieces, 2 objectives, double nose-pieces (Spencer 66D, Bausch and Lomb BH4, or equivalent)	33.00
12	Microscopic slides, blank, 75mmx25mm.....	.10
½	Oz. cover glasses, No. 2 round, 18mm diameter.....	.44

(Where schools can possibly afford it, it is strongly recommended that a Torsion Balance, at \$15.00, for testing cream and determining the amount of moisture in butter be added to the above.)

II. SUGGESTIONS AND EQUIPMENT FOR DOMESTIC SCIENCE.

Laboratory. This room should be provided with suitable cupboards, a sink, and work benches sufficient to give each individual pupil in the largest class a working space as follows:

Width 26 to 30 inches.

Depth 20 to 24 inches.

The height of the benches should not be less than 30 inches nor more than 32 to 34. The work benches should be built absolutely mouse proof and provide each pupil with a drawer and cupboard space for the individual equipment. Benches built with shelves instead of drawers are very unsatisfactory.

Each pupil should be provided with a bread board and a meat board of suitable size. A stool or seat of some kind should also be provided. It is very convenient, especially where the laboratory room is somewhat small, to have the benches built with a recess in which the stool or seat can be made to disappear. The windows and the door in the laboratory room should be screened. This is especially important. Suitable blackboards should also be provided.

Fuel. The fuel that is to be used in the home economics laboratory will be governed by circumstances. Where city gas is available it makes the most satisfactory, convenient and economical fuel for laboratory use, but where city gas is not available many small towns are fortunate in having a good dependable day current of electricity. Where a day current of electricity is available at a reasonable rate it is very satisfactory. It is clean, has no odors, and has many other decided advantages. The objection that few homes represented by the members of the class use electricity for cooking purposes, need not be given much consideration. It is probable that no more difficulties are involved for a girl to go from an electric stove to a gas, wood or coal range, than for her to go from one make of coal range to another.

But where city gas or day current electricity is not available it will be necessary for the board to provide some other fuel. On account of the danger involved, the Department of Public Instruction is of the opinion that under no circumstances should the gasoline stove be used. Denatured alcohol stoves or kerosene burners (Blue Flame) are sometimes used. Denatured alcohol ordinarily retails at 50 cents a gallon. It is smokeless, odorless, and the difference in expense, if any, per heat unit, is slight. Where the kerosene stoves do not leak and where exceptional care is taken to keep the wick clean and properly trimmed, and to avoid spilling kerosene when filling the stoves, there is not much difficulty from smoke, soot and odors.

The high kerosene stove that cannot be placed on the back of the pupil's table between herself and the teacher has disadvantages that are serious.

The amount of fuel used in the home economics laboratory is so small that even though the most expensive fuel is used the cost is not a burdensome expense; so safety, convenience and freedom from smoke, soot and objectionable odors should have chief consideration in deciding the fuel to be used. Where city gas or day current electricity is not available many boards install private gas plants. Of the systems that we have had opportunity to examine the F. P. Gas Plant, Des Moines, the Blaugas system, Capitol Blaugas Co., Des Moines, and the St. Louis Aero-Gas Machine, are entirely satisfactory and the cost of installation and upkeep is very reasonable. Many schools are now using one or the other of these systems.

Without doubt the best arrangement for the work benches in the home economics laboratory or kitchen is the rectangular or hollow

square formation with at least two openings. This arrangement with the pupils and their individual equipment on the outside and the teacher with a small supply table on the inside not only brings the hot plates between the teacher and the pupils but it also enables the teacher to observe the entire class easily and to pass readily from one pupil's work to another.

INDIVIDUAL EQUIPMENT.

Multiply by Number in Class.

(Where sizes are indicated be careful not to get larger sizes.)

1 gas or other burner.	1 kitchen fork.
1 14x18 kneading board.	1 egg whisk.
1 meat board.	1 Dover beater or 1 for 2 pupils.
1 7½ inch rolling pin.	1 wire sieve.
1 7 inch mixing bowl, white lined.	1 small spatula.
1 3x5 individual bread pan.	1 individual steel skillet.
1 custard cup, white lined.	1 saucepan, with handle and cover.
1 ¾ qt. granite mixing bowl.	1 standard measuring cup.
1 6 inch granite plate.	1 wooden spoon.
1 paring knife.	1 soap dish.
1 double boiler (1 pint).	1 vegetable brush.
1 biscuit cutter.	1 salt shaker.
1 tablespoon—standard.	1 pepper shaker.
1 teaspoon—standard.	
1 kitchen knife.	

GENERAL OR CLASS EQUIPMENT.

1 refrigerator, if ice is available.	1 lemon squeezer.
1 granite tea kettle.	5 square cake tins.
3 muffin pans (9 hole).	1 deep round cake tin.
3 8x10 inch drip pans.	2 oblong cake or biscuit tins.
1 No. 2 Universal food chopper.	12 cups and saucers.
1 kettle strainer.	1 6 inch butcher knife.
1 granite kettle (2 to 3 qt.).	12 plates.
1 No. 8 steel skillet.	1 granite coffee pot.
2 granite sauce pans with covers.	1 granite tea pot.
2 granite mixing bowls (2 qt.)	1 nutmeg grater.
1 combination can opener and cork screw.	1 bread knife.
2 covered garbage cans.	1 funnel.
2 granite water buckets.	2 toasters (4 slice).
1 sink strainer.	1 coarse grater.
2 1 quart double boilers.	2 2 quart pitchers.
2 flour sieves.	2 10 inch platters.
5 dish pans.	2 7 inch bakers.
5 rinsing pans.	3 supply cans.
1 12 inch serving tray.	1 scale (dial 24 lb.)
	1 wire basket—8 inch.

SUGGESTED ADDITIONAL EQUIPMENT.

1 fireless cooker.	½ dozen forks.
1 good range.	½ dozen knives.
1 plain oak dining table.	4 tablespoons.
6 dining chairs to match table.	1 carving knife and fork.
1 buffet or china cupboard.	6 glasses.
1 small serving table.	2 table cloths.
1 dozen teaspoons.	1 dozen napkins.
½ dozen dessert spoons.	

Set of plain white German china or a Syracuse china in simple design.

SEWING ROOM EQUIPMENT.

Sewing tables and one or more sewing machines.

Adequate drawers, lockers or cupboards.

III. SUGGESTIONS AND EQUIPMENT FOR MANUAL TRAINING.

The bulletin, "Outlines in Manual Training Course in Wood-work," issued by the Department of Public Instruction, contains definite plans and suggestions for daily manual training work, in both the grammar grades and the high school.

Room. The size of the room will depend on the number to be accommodated. About forty square feet of floor space should be provided for each pupil. The room should be dry, well heated, ventilated and lighted, neatly finished, orderly and attractive. There should be provided racks for lumber, cases for stains, varnish, glue, nails, the unfinished work of the pupils, etc. A wall rack for general tools, hooks for work aprons, coats and hats, and a blackboard should be installed. Everything should be kept in shipshape manner.

Wood-working Bench. Each member of the class needs a special wood-working bench. The single bench is usually 32 inches high with a top 22x52 inches. Double benches are not desirable. Good single benches cost from \$7.50 to \$12.00.

Quality of Tools. The State Department does not insist on the particular brand of tools suggested below. Names are given merely to indicate quality. Equivalent grades of equipment will be entirely satisfactory. The one essential is that the tools be of standard make and grade.

TOOLS FOR EACH MEMBER OF THE CLASS.

Back Saw, 10", Disston, No. 4.....	\$ 1.00
Chisel, $\frac{3}{8}$ ", Tang Firmer, D. R. Barton, No. 107.....	.30
Chisel, $\frac{3}{4}$ ", Tang Firmer, D. R. Barton, No. 107.....	.35
No. 576, Eagle Compass.....	.10
No. 64, Stanley Gage.....	.15
No. 3, Bailey Plane.....	1.50
2 ft., No. 18, Stanley Rule.....	.20
No. 12, 6", Stanley Try Square.....	.20
Wisk Broom, 8".....	.15

ONE OF THE FOLLOWING TOOLS FOR EVERY TWO MEMBERS.

No. 8, Stanley Mallet, 3"x5".....	.20
No. 20, 4", Stanley Screw Driver.....	.25

NECESSARY GENERAL EQUIPMENT.

1 Bevel "T" Square, 10". No. 25 Stanley.....	\$.25
13 Bits, Auger, No. 4 to 16 inclusive, Jackson (Set).....	3.50
1 Bit, Auger, No. 4, Jackson.....	.20
1 Bit, Auger, No. 6, Jackson.....	.20
1 Bit, Auger, No. 8, Jackson.....	.25
2 Bits, Drill, No. 4, Syracuse, @10c.....	.20
2 Bits Drill, No. 5, Syracuse @15c.....	.30
2 Bits, Drill, No. 6, Syracuse @15c.....	.30
2 Bits, Screw Driver, 5-16", Stanley @15c.....	.30
2 Braces, 8", No. 918, Stanley @1.15.....	2.30
2 Chisels, 1/4", Tang Firmer, D. R. Barton, No. 107 @30c.....	.60
1 Oiler, 1 pt., Eagle.....	.40
6 Clamps, Cabinet 4 ft., Sheldon, No. 1 @85c.....	5.10
2 Countersinks, Buck Bros., 3/4" @25c.....	.50
1 Divider, Wing, 8", P. S. and W.....	.25
2 Files, 10", Mill Smooth, Disston @20c.....	.40
1 File, Auger Bit, Moore Bros.....	.15
2 Gouges, 1/2", Tang Firmer, D. R. Barton, No. 113 @40c.....	.80
4 Hammers, Stanley, No. 12 @50.....	2.00
2 Planes, 14", Jack, Bailey, No. 5 @\$2.00.....	4.00
1 Plier Combination, 6", Crescent.....	.35
4 Saws, Coping, 6", No. 100, Jennings @25c.....	1.00
1 Gross extra coping saw blades, 6".....	1.50
2 Saws, Cross-cut, 24", 10 Pt., Disston, D. 8 @\$1.50.....	3.00
2 Saws, Rip-cut, 24" 10 Pt., Disston, D. 8 @\$1.25.....	2.50
2 Saws, Turning, 14"x3-16", Disston @60c.....	1.20
2 Scrapers, Cabinet, 3"x6" @10c.....	.20
12 Screws, Hand, No. 810, G. R. H. S. Co., @45c.....	5.40
12 Nail Sets, Stanley @10c.....	1.20
1 Square, 2 ft., Framing, Nichols, No. 3.....	.90
1 Oil Stone, 8"x2"x1", India Combination.....	1.00
1 Slip Stone, No. 13, Fine India.....	.25
6 Spokeshaves, Stanley, No. 64 @15c.....	.90
1 1 qt. Glue Pot and Kerosene Heater.....	1.50

RECOMMENDED GENERAL EQUIPMENT.

1 Brace, Ratchet, 8", No. 919, Stanley.....	1.35
1 Waste Can on Legs.....	2.25
1 Clamp, Saw, Disston, No. 2.....	.60
2 Gouges, 1", Tang Firmer, No. 113, D. R. Barton @50c.....	1.00
1 Draw Knife, 8", Barton.....	1.25
1 Plane, Jointer, Bailey, No. 7.....	2.75
1 Saw Set, Tainter's, Positive No. 7.....	.75
2 Spokeshaves, Stanley, No. X63 @20c.....	.40
1 Combination Plane, No. 46, Stanley.....	3.50
1 Fillister Plane, No. 289, Stanley.....	1.35
1 Grind Stone, Double Treadle and Bicycle Seat, Ball Bearing, Diameter 20".....	4.75

IV. SUGGESTIONS AND EQUIPMENT FOR PHYSICS.

The prices quoted below are approximate.

Items marked with an asterisk (*) are duplicated in whole or in part in lists of apparatus for other sciences. Small schools will be asked to buy only one lot of such items, supplying the maximum quantity given in any single list.

The pupils should be provided with a standard laboratory manual. In buying apparatus strict attention should be given to the manual and text used by the class. Wherein the apparatus for those books differs from the following, buy to fit texts used.

*At least one laboratory table 3x8'-30" high.

(May be home made.)

*Case for caring for apparatus.

The following items, together with miscellaneous, minor supplies, will need to be supplied locally:

Chemicals for cells.

Wire.

Copper, zinc, and lead for batteries.

Six dry cells.

Corks.

A few common tools.

Alcohol for lamps, etc.

MECHANICS.

*3 Meter and yard sticks combined.....	\$.75
3 Spring balances, 8 oz. and 250 gm., flat back.....	2.50
3 Spring balances, 2000 gm.....	1.65
*Brass weights in block, 1 gm. to 500 gm.....	1.60
Vernier caliper, Eng. and Metric units.....	2.25
*Harvard Agate Bearing Trip Scale.....	6.65
2 Single pulleys, light.....	.36
1 Double pulley .....	.30
1 Triple pulley .....	.40
Board for inclined plane with pulley and graduate arc.....	3.95
Hall's carriage	1.00
Composition of force board.....	1.65
Set "Universal Weights" iron.....	2.00
Pascal's vases and apparatus.....	6.65
Archimedes' principle apparatus.....	1.25
Class model of hydraulic press.....	2.00
Brass cylinder for Archimedes' Exp. 3.5 cm. long, 1.9 cm. diameter	.30
Specific gravity bottle, 50 cc.....	.50
Air pump, plate and jar (if a better pump is not available).....	9.00
(We strongly recommend a pump with mechanical valves, \$30.00).	
Seven-in-One Apparatus	7.75
Hydrometer for light and heavy liquids.....	1.00
*Hydrometer jar, 15 in.....	.50
*1 lb. mercury.....	1.00
*½ Gross test tubes ¼x6".....	1.50
*Barometer tube, complete with glass cup and pipette for filling..	.40
* 2 Iron supports with rings at 60c.....	1.20
1 Clamp holder with swivel, iron.....	.45
1 Glass model of lift pump.....	1.35
1 Glass model of force pump.....	1.50
1 Aluminum wheel and axle.....	2.00

1 Aneroid barometer	3.00
1 Protractor, brass, 5 1/8 in.....	.50
1 Graduate, 100 cc.....	.56
*2 lbs. soft glass tubing, assorted at 44c.....	.88
*6 Beakers, 200 cc. at 22c.....	1.32
*3 Thistle tubes at 17c.....	.51
*2 Porcelain evaporating dishes, 3 in., at 13c.....	.26
*12 ft. rubber tubing, 1/4 in.....	1.20
*1 Glass funnel, 4 in.....	.16
*3 Florence flasks, flat bottom, 16 oz., at 18c.....	.54
*3 Rubber corks to fit, two holes.....	.30
*4 Alcohol lamps, 8 oz., glass at 40c.....	1.60

SOUND.

Bell in vacuo.....	2.75
Adjustable tuning fork.....	1.10
Sonometer and wires.....	5.25
Violin bow, heavy.....	1.00
Organ pipe with rod and light membrane.....	3.35
Chladni's plates and clamp.....	1.45

LIGHT.

Optical disc with diverging ray attachment and refraction tank..	25.00
Photometer, student's or similar.....	2.75
Standard candle .....	.30
Color top with color discs.....	.90
1 Set demonstration lenses, 6, 2 in. in diameter.....	2.50
*1 Triangular prism, 1 1/2 x 6".....	.40
1 Optical bench .....	.75
Newton's rings. A pair of lenses 1 1/2 in. in diameter in brass frame	1.50
1 Mirror, concave and convex, 12 cm. in diameter, mounted in one frame, focus 25 to 30 cm.....	1.55

HEAT.

*4 Centigrade thermometers, 10 degrees to 110 degrees C.....	4.00
2 Calorimeters, 3x5 in., nickel plated brass.....	1.00
Linear expansion apparatus.....	4.50
Hypsometer (steam generator).....	2.25
*1 Ball and Ring, illustrating expansion.....	1.00

MAGNETISM AND ELECTRICITY.

*2 Bar magnets, 6".....	.50
Horseshoe magnet, 6".....	.25
Electro magnet, 4 in.....	1.50
*Compass, good	1.45
Galvanometer frame, 3 windings.....	1.25
U-shaped magnet, 5 in.....	.28
2 Glass friction rods.....	.75
2 Vulcanite rods .....	.80
Electrophorus	1.50
Electroscope	1.25
Daniell cell, complete.....	1.50
Electrolysis of water apparatus.....	2.50
Induction coil, dissectible.....	5.00
St. Louis motor with electro-magnet attachment.....	5.00
Telegraph key and sounder.....	2.00
Electric bell .....	.40
1 Magnetic needle, 6 in.....	.60
2 Miniature incandescent lamps, 1 C. P., at 28c.....	.56

RECOMMENDED APPARATUS.

Boyle's law ap.....	4.50
*Influence Electrical Machine, Toepler-Holtz.....	19.00
Resistance box	7.50
Wheatstone's bridge	3.50
D'Arsonval galvanometer	5.55
1 Set Geissler's tubes, six, assorted.....	2.50
Hand power dynamo for direct and alternating currents.....	33.00
*Barometer, mercurial	15.00
Kundt's apparatus	3.65
Resonance tube, with tank, support and scale.....	10.00
1 Laboratory balance, capacity 2 kgm. 6K, sensibility to .05 gm., open construction beam, with rider, damping device, leveling screw, plumb bob	12.00
Leyden jar, quart, movable coatings (if static machine is available)	2.90
Discharger, rubber handle (to accompany Leyden jar).....	.66
Dipping needle, 3 in., brass stand.....	2.25
1 D'Arsonval laboratory ammeter, jewel bearings, aluminum case, hand calibrated. Range 0-25. amperes, and 0-5 amperes.....	9.40
1 D'Arsonval laboratory voltmeter, jewel bearing, aluminum case, hand calibrated. Range 0-120 volts in 2-volt divisions, 0-12 volts in 1-5 volt divisions.....	9.40
Universal rotator (strongly recommended).....	6.00
The following accessories should be provided with the rotator:	
Color discs, 2 sets of 8 discs each.....	1.00
*Centrifugal brass hoop.....	1.25
Siren disc, metal, 10 in.....	1.10

V. SUGGESTIONS AND EQUIPMENT FOR GENERAL SCIENCE.

The prices quoted below are approximate.

Items marked with an asterisk (*) are duplicated in whole or in part in lists of apparatus for other sciences. Small schools are asked to buy only one lot of such items, supplying the maximum quantity given in any single list.

*At least one laboratory table 3x8'-30" high.

(May be home made.)

*Case for caring for apparatus.

The following items, together with miscellaneous minor supplies, will need to be provided locally:

Chemicals for cells, etc.

Wire.

Copper, zinc, and lead for batteries. *

Four dry cells.

Corks.

A few common tools.

Alcohol for lamps, etc.

MECHANICS.

*2 Meter and yard sticks combined.....	\$.50
3 Spring balances, 2000 gm.....	1.65
*Brass weights in block, 1 gm. to 500 gm.....	1.60
*Harvard agate bearing trip scale.....	6.65
2 Single pulleys, light.....	.36
1 Double pulley .....	.30
1 Triple pulley .....	.40

Hall's carriage	1.00
Set "Universal weights" iron.....	2.00
4 Test tubes, 1x8".....	.15
Hydrometer for light and heavy liquids.....	1.00
*Hydrometer jar, 15 in.....	.50
*1 lb. mercury	1.00
*1 doz. test tubes $\frac{3}{4}$ x6".....	.15
*Barometer tube, complete with glass cup and pipette for filling...	.40
*2 Iron supports with rings at 60c.....	1.20
1 Clamp holder with swivel, iron.....	.45
1 Glass model of lift pump.....	1.35
1 Glass model of force pump.....	1.50
1 Aluminum wheel and axle.....	2.00
1 Aneroid barometer	6.50
1 Graduate, 100 cc.....	.56
*1 lb. soft glass tubing, assorted.....	.44
*6 Beakers, 200 cc. at 22c.....	1.32
*1 Thistle tube .....	.17
*6 ft. rubber tubing, $\frac{1}{4}$ in.....	.60
*1 Glass funnel, 4 in.....	.16
*3 Florence flasks, flat bottom, 16 oz. at 18c.....	.54
*3 Rubber corks to fit, two holes.....	.30
*2 Alcohol lamps, 8 oz., glass at 40c.....	.80

SOUND.

Adjustable tuning fork.....	1.10
Sonometer and wires.....	5.25
Violin bow, heavy.....	1.00
Organ pipe with rod and light membrane.....	3.35

LIGHT.

Standard candle .....	.30
Color top with color discs.....	.90
1 Set demonstration lenses, 6, 2 in. in diameter.....	2.50
*2 Triangular prisms, 1 $\frac{1}{2}$ x6" at 40c.....	.80
1 Optical bench .....	.75
1 Mirror, concave and convex, 12 cm. in diameter, mounted in one frame, focus 25 to 30 cm.....	1.55
*1 Centigrade thermometer, 10 degrees to 110 degrees C.....	2.00
1 Calorimeter, 3x5 in., nickel plated brass.....	.50
Hypsometer (steam generator).....	2.25
*1 Ball and ring, illustrating expansion.....	1.00

MAGNETISM AND ELECTRICITY.

*2 Bar magnets, 6".....	.50
Electro magnet, 4 in.....	1.50
*Compass, good	1.45
Galvanometer frame, 3 windings.....	1.25
U-shaped magnet, 5 in.....	.28
Daniell cell, complete	1.50
Electrolysis of water apparatus.....	2.50
St. Louis motor with electro-magnet attachment.....	5.00
Telegraph key and sounder.....	2.00
Electric bell .....	.40
1 Magnetic needle, 6 in.....	.60
2 Miniature incandescent lamps, 1 C. P. at 28c.....	.56

VI. SUGGESTIONS AND EQUIPMENT FOR PHYSICAL GEOGRAPHY.

The prices quoted below are approximate.

Items marked with an asterisk (*) are duplicated in other lists. Small schools will need only one lot of such items.

* Laboratory table 3x8'-30" with drawers.....	
* 2 lbs, soft glass tubing, assorted at 44c.....	.88
* 2 Thermometers, 10 to 110 C., also with Fahrenheit scale at \$1.40	2.80
* 12 ft. rubber tubing, ¼ in. inside at 10c.....	1.20
* 1 Glass funnel, 4 in.....	.16
* 4 Doz. test tubes, ¾x6" at 28c	1.12
* 3 Florence flasks, flat bottom, 16 oz. at 18c.....	.54
* 3 Rubber corks to fit, 2 holes.....	.30
* Alcohol lamp, 8 oz., glass.....	.40
* 6 Large mouthed bottles, 16 oz.....	.45
* 3 Rubber corks to fit, 2 holes .....	.45
* 1 Iron stand and rings, 3, 4 and 5 in.....	.60
* 1 Barometer tube, complete with glass cup and pipette for filling	.40
* 1 Pound Mercury	1.10
1 Centrifugal hoop with clamp	3.75
* 2 Bar magnets, 6 in.....	.50
* 1 Good compass	1.45
1 Glass prism, 1½x6" .....	.40
Ball and ring to show expansion and contraction.....	1.00
Collection of common rocks and minerals, 20 of each labeled....	2.25
Self registering maximum and minimum thermometer.....	3.25
Daily and monthly weather maps. (The daily maps may be secured from the Weather Bureau Station, Des Moines; the monthly from the Weather Bureau, Washington, D. C. These maps are free.)	
1 Pound of hydro-chloric acid	1.10
* 1 Meter stick .....	.28
1 Globe, 12"	5.75

INDIVIDUAL EQUIPMENT.

1 Magnifier, tripod, 1 in. focus .....	.45
1 Pipette with rubber bulb.....	.03

RECOMMENDED APPARATUS.

* Barometer	15.00
* Air Pump, plate and jar, with mechanical valves.....	30.00
* Electric Machine, Toepler Holtz	19.00
Tellurian	16.00
Spherical Blackboard, 12"	4.00
Rain Gauge	2.50
Physical Maps of the Continents, World and the United States in Spring Roller Cases, 8 maps	35.00
Hygrometer, Mason's	5.00
Blank Weather Maps. Per hundred	1.00
Sun dial	4.50
* Harvard Agate Bearing Trip Scale with beam, weighing 10 gm. in 1-10 gm. divisions	6.55
* Weights, brass in block, 500 gm. to 1 gm.	1.77

TOPOGRAPHICAL MAPS FOR PHYSICAL GEOGRAPHY.

These maps may be secured from the United States Geological Survey, Washington, D. C., for \$3.21. Each school should have a full set.

- Send draft or money order in advance.
- Simple plain or plateau, Fargo, N. Dak.
- Simple mountain ridge: Delaware Water Gap, New Jersey-Pennsylvania.
- Plain with young valleys: Wilson, N. Y.
- Mountains with shallow valleys: Shasta, Calif.
- Plains with well-defined valleys: Palmyra, Mo.
- Dissected mountains: Mt. Marcey, N. Y.
- Dissected plains: Lancaster, Wis.
- Fast mature plains: Clinton, Mo.
- Plains with hills and valleys: Warrenton, Va.
- Plains with hills: Eagle, Wis.
- Plains with mountain ridges and valleys: Harrisburg, Pa.
- Maps of valleys:
- Niagara Falls, N. Y.
 - Map of the U. S. showing the Mississippi, Potomac, Delaware and other river basins.
- Ponded rivers: Perch Lake, Mich.
- Drowned valleys: New York City, N. Y.
- River deposits (flood plains): Marshall, Mo.
- Wind deposits: Kingsley, Kans.
- Glacial deposits:
- Drumlins: Oswego, N. Y.
 - Sand and gravel plains: Jonesville, Wis.
- U-shaped valleys: Leadville, Colo.
- Fjords: Juneau, Alaska.
- Lakes: Minneapolis, Minn.
- Shore cliffs: San Francisco, Calif.
- Volcanic deposits: Mt. Shasta, Calif.
- Lava plains and plateaus: Modoc Lava Beds, Calif.
- Laccolite mountains: San Rafael, Utah.
- Entrenched meanders, etc.; Antietam, Md.-Va.-W. Va.
- Barrier beach: Atlantic City, N. J.
- Bays, glacial lakes: Boston and vicinity.
- Canyon in stratified plateau: Bright Angel, Ariz.
- Crater Lake of Mt. Mazama: Crater Lake, National Park, Oregon.
- Flood plain: Des Moines, Iowa.
- Alpine glaciers: Glacier Peak, Wash.
- Beheaded stream: Kaaterskill, N. Y.
- Recently elevated coast: La Jolla, Calif.
- Glaciated canyons: Lake, Yellowstone National Park.
- Folded mountains: Monterey, Va.-W. Va.
- Mature topography: Natural Bridge, special, Va.
- Sand dunes: Norfolk, Va.-N. Car.
- Contrast between glaciated and unglaciated areas: Oelwein, Iowa.
- Sand bars: St. Louis and vicinity, Mo.-Ills.
- Hooks, sand bars: Sandy Hook, N. J.-N. Y.
- Driftless area of the upper Mississippi Valley: Waukon, Iowa-Wis.
- Hanging valleys, etc.: Yosemite Valley, Calif.

VII. SUGGESTIONS AND EQUIPMENT FOR BOTANY.

The prices quoted below are approximate.

Items marked with an asterisk (*) are duplicated in other lists. Small schools will need only one lot of such items.

*Laboratory table 3x8'-30"high, with drawers.

(Home made.)

* 2 lbs. soft glass tubing; assorted, at 44c.....	.88
* 3 Thistle tubes at 17c.....	.51
* 6 Beakers, 200 cc., at 22c.....	1.32
* 2 Porcelain evaporating dishes at 13c.....	.26
* 1 Cylinder graduate, 500 cc.....	1.05
* 2 Thermometers, 10 to 110 C, also with Fahrenheit scale, at \$1.40	2.80
*12 ft. rubber tubing, ¼ in. inside, at 10c.....	1.20
* 1 Glass funnel, 4 in.....	.16
* 4 doz. test tubes, ¾x6", at 28c.....	1.12
* 3 Florence flasks, flat bottom, 16 oz., at 18c.....	.54
* 3 Rubber corks to fit, 2 holes.....	.30
*Alcohol lamp, 8 oz., glass.....	.40
*Blue and red Litmus paper.....	.20
* 6 Large mouthed bottles, 16 oz.....	.45
* 3 Rubber corks to fit, 2 holes.....	.45
* 1 Iron stand and rings, 3, 4 and 5".....	.60
* 1 3 gal. earthen jar.....	.50
* 1 doz. Syracuse watch glasses.....	.90
* 1 Section razor	1.00
1 doz. Economy fruit jars, qt.....	.85
* 1 Large bell jar, 7".....	1.65
1 doz. flower pots and trays.....	1.20
Sawdust for germination.	

A few chemicals will be needed. These may be secured from or through the local druggist.

INDIVIDUAL EQUIPMENT.

Scalpel, dissecting needles, forceps, scissors, per set in strong leatherette case	1.00
1 Pipette with rubber bulb.....	.03
1 Magnifier, tripod, 1 in. focus.....	.45

RECOMMENDED APPARATUS FOR BOTANY.

* 1 Compound microscope, B H 4, 2 eye pieces, 2 objectives, double nose piece, magnification 50, 100, 215, 430 diameters. Net....	29.70
* 1 Harvard agate bearing trip scale with beam weighing 10 gm. in 1-10 gm. divisions	6.65
* Weights, brass in block, 500 gm. to 1 gm.....	1.77
* 3 doz. glass slides 1x3".....	.30
* 1 oz. cover glasses, medium thickness.....	.75

VIII. SUGGESTIONS AND EQUIPMENT FOR PHYSIOLOGY.

The prices quoted below are approximate.

Items marked with an asterisk (*) are duplicated. Small schools will need only one lot of such items.

Each teacher should have a laboratory manual in Physiology and follow it as a guide.

*Laboratory table 3x8'-30" high, with drawers.

(Home made).

A minimum amount of dissecting should include work with heart, lungs, eye, general work with rabbit and frog.

1 Dissecting board, 1x12x18", for every two pupils, at 10c.	
1 Bread pan for each board at 15c.	
* 2 lbs. soft glass tubing, assorted, at 44c.....	\$.88
* 3 Thistle tubes at 17c.....	.51
* 6 Beakers, 200 cc., at 22c.....	1.32
* 2 Porcelain evaporating dishes, diameter 3 in., at 13c.....	.26
* 1 Graduate, 500 cc., cylindrical.....	1.05
* 2 Thermometers, 10 to 110 C, also with Fahrenheit scale, at \$1.40	2.80
* 12 ft. rubber tubing, 1/4 in. inside.....	1.20
* 1 Glass funnel, diameter 4 in.....	.16
* 4 doz. test tubes, 3/4x6", at 28c.....	1.12
* 3 Florence flasks, flat bottom, 16 oz., at 18c.....	.54
* 3 Rubber corks to fit, 2 holes.....	.30
* Alcohol lamp, 8 oz., glass.....	.40
* Blue and red litmus paper.....	.20
* 6 Large mouthed bottles, 16 oz.....	.45
* 3 Rubber corks to fit, two holes.....	.45
* 1 Iron stand and rings, 3, 4 and 5".....	.60
* 1 3-gal. earthen jar.....	.50
* 1 doz. Syracuse watch glasses.....	.90
* 1 Section razor.....	1.00

A few chemicals will be needed. These may be secured from or through the local druggist.

INDIVIDUAL EQUIPMENT.

Scalpel, dissecting needles, forceps, scissors, per set in strong leatherette case.....	1.00
1 Pipette with rubber bulb.....	.03
1 Magnifier, tripod, 1 in. in focus.....	.45

RECOMMENDED APPARATUS FOR PHYSIOLOGY.

* 1 Compound microscope, B H 4, 2 eye pieces, 2 objectives, double nose piece, magnification about 50, 100, 215, 430 diameters. Net	29.70
* 1 Harvard agate bearing trip scale with beam weighing 10 gm. in 1-10 gm. divisions.....	6.65
* Weights, brass in block, 500 gm. to 1 gm.....	1.77
* Air pump, plate and jar, with mechanical valves.....	30.00
Electrolysis of water apparatus with platinum electrodes.....	2.50
* 4 Dry cells for same.....	1.00
Prepared slides (may be borrowed from Dr.)	
* 3 doz. glass slides, 1x3".....	.30
* 1 oz. cover glasses, medium thickness.....	.75
1 Anatomical chart.	
Skeleton papier-mache anatomical models of heart, arm, brain, etc., \$3.00 to \$6.00 each.	



3 1723 02106 6477