THE UNIVERSITY OF MINNESOTA

School of Technical and Applied Chemistry.

ANNOUNCEMENT

1897-1898.

MINNEAPOLIS, MINN.

1897.

Requirements for admission to the School of Chemistry are as follows:

English Grammar.
English Composition and Essay.
Reading of English Classics.
Elementary Algebra.
Higher Algebra.
Plane Geometry.
Solid Geometry.
History of the United States.
History of Greece and Rome, or equivalents.
Physiology or Zoology.
Physics.

} For more extended statement of the work covered by these subjects, see statement of the requirements for admission to the classical course.

Catalogue sent free upon application.

Drawing—Freehand sketching of simple objects and geometric forms, instrumental drawing, ornament, and the elements of perspective. The National Drawing Books, up to book seven, represent the work required. If other books are used, selections can be made which will be equivalent.

Chemistry—The non-metallic elements, as presented in the elementary text books, such as Remsen's, Williams', etc.

Botany—Phanerogamic, Gray's Lessons and Manual.

Latin—As in classical course OR

**English*—(*a*) The Latin element in English.
(*b*) History of English literature. Applicants will be required to show an acquaintance with the chief writers and events, from Shakspere to the present time.
Substitute for (*a*)—Applicants will be allowed to substitute a second year's work in English literature for the requirements in the Latin element in English. The examination on the second year's work will require an acquaintance with the chief authors and events from Chaucer to Shakspere, and a thorough study of the following English classics:
For the year 1897-'98—Chaucer, "Prologue" and "Knightes Tale;" Spenser, "Faerie Queene," book i, cantos i to iv; Marlow, "Dr. Faustus;" Bacon, "Essays;" Shakspere, "The Tempest; Milton, "L'Allegro" and "Il Penseroso."
For the year 1898-'99—Chaucer's, "Prologue" and "The Nonne Priestes' Tale;" Spenser, "Faerie Queene," book i, cantos i to iv; Shakspere, "As You Like It" and "Julius Cæsar;" Bacon, "Essays;" Moore, "Utopia;" Milton, "Lycidas" and Comus;" Johnson, "Rasselas."
Either of the following named works will be found useful as an outline of the course and as a basis of work; S. A. Brooke's Primer of English Literature, or Pancoast's Introduction to English Literature.

**German*—(*a*) Joynes-Meissner. (*b*) Whitney's German Reader or Boisen's German Prose, and Bucheim's German Poetry. (*c*) Niebuhr's Heroen Geschichten. (*d*) Goethe's Sesenheim. Reference grammar, Whitney's or Brandt's. Equivalents will be accepted in lieu of the above texts.

OR

**French*—(*a*) Chardenal's Course first two books of Telemaque. (*b*) Whitney's French Grammar; Historiettes Modernes, by C. Fontaine; Le Francais Pratique, by Paul Bercey; translation, English to French from Blouet's Primer of French Composition.

School of Technical and Applied Chemistry.

GENERAL STATEMENT.

The regular four years' course in the School of Chemistry, leading to the degree of bachelor of science, is designed for those who wish to become teachers of chemistry, analysts, investigators, manufacturing and applied chemists. The course here presented includes general, organic, analytical, theoretical and applied chemistry. The course includes, besides these various chemical subjects, extended work in physics, metallurgy, mineralogy, crystallography, geology, botany, bacteriology, drawing, language and mathematics. Electives are offered in the senior year which will enable the student to extend the range of work if desired. It is therefore intended that, besides the special design, the student will find the work of sufficient range to give him a broad, liberal scientific education.

UNCLASSED STUDENTS.

Unclassed students are subject to the same rules and regulations as other unclassed students in the college of science, literature and the arts.

GRADUATE WORK.

The degree of master of science or doctor of philosophy will be conferred upon graduates of any reputable college or university upon fulfillment of the regular requirements of the University. (See Graduate Department,)

ELECTIVES.

These are offered in order to give the students an opportunity of selecting subjects important to them, but which are not at present included in the regular course. The chief object is to enable them to take up animal biology and its allied subjects preparatory to special physiological chemistry. The course is also arranged so that history of philosophy, economics and history may be conveniently taken.

EQUIPMENT.

Laboratories. The chemical laboratories consist of twenty-four rooms fitted for general, analytical and a wide range of technical and research work. On the third floor of the building devoted to chemistry and physics are the general laboratories, general lecture and preparation rooms and the industrial museum. On the second floor are the analytical laboratories, li-

brary and balance room, organic lecture room, water analysis room, professors' private laboratories and office of the director of the laboratories. On the first floor are the organic and research laboratories, gas analysis rooms, technical laboratories and store rooms.

The general laboratories are arranged with ventilating hoods and with modern laboratory tables, supplied with cupboards and drawers, and with water and gas. The technical laboratories are arranged with laboratory tables especially adapted to the work for which they were designed. The store rooms are supplied with apparatus and chemicals necessary for general and analytical work. The laboratories are especially well supplied with lecture apparatus, balances, microscopes, spectroscopes, polariscopes, charts and models, glass and platinum ware; with technical apparatus for general commercial analysis, soil analysis, for water and gas analysis, for iron and steel analysis and for the analysis of sugar, milk, butter and other products.

Library. The chemical library contains complete sets of many of the more important journals. It contains besides these special sets, a well represented list of analytical and technical works, as well as many rare old works of great historical value. Most of the important journals are taken, thus enabling the student to keep abreast of the times. All books are easily accessible, with only the necessary restrictions to guard against injury and loss.

INDUSTRIAL MUSEUM.

Considerable space is given to a collection in industrial, technical and applied chemistry. There is a large collection of chemicals with specimens of each in the various stages of preparation and purification. A collection of nearly all the elements with most of their important salts; a large number of mining and metallurgical specimens, including most of the important ores, together with many rare specimens in crystallography. The collections of coals and petroleums are especially valuable for lecture and technical work. There is a large collection of dyes, mordants, textile, and other materials used in dyeing and bleaching, with a rapidly increasing collection of clays and materials used in the making of glass, earthenware, porcelain and brick. A collection of furnace products, models and series of charts, blue prints and photographs illustrating a wide range of technical and chemical processes is being added.

COURSE OF STUDY.

FRESHMAN YEAR.

FIRST TERM.	SECOND TERM.	THIRD TERM.
Algebra (3)	Algebra (3)	Descriptive geometry (4)
Trigonometry (2)	Trigonometry (2)	Analytical geometry (2)
German or French or	German or French or	German or French or
Latin or English (5)	Latin or English (5)	Latin or English (5)
Chemistry (4)	Qualitative Analysis (4)	Qualitative Analysis (4)
Freehand drawing (5)	Constructive geometry (4)	Elementary mechanics (4)
Military drill (2)	Military drill (2)	Military drill (2)
Rhetorical work (2)	Rhetorical work (1)	Rhetorical work (1)

SOPHOMORE YEAR.

Analytical geometry (5)	Botany (4)	Botany (4)
German or French (4)	German or French (4)	German or French (4)
Physics (4)	Physics (4)	Physics (4)
Mineralogy (4)	Mineralogy (4)	Organic chemistry (4)
Quantitative Analysis (4)	Quantitative Analysis (4)	Quantitative Analysis (4)
Bacteriology (2)		Assaying (3) lab. Monday
Military drill (2)	Military drill (2)	Military drill (2)
Rhetorical work (1)	Rhetorical work (1)	Rhetorical Work (1)

JUNIOR YEAR.

Organic Chem. (4)	Theoretical chemistry (3)	History of chem. (3)
Geology (4)	Geology (4)	Applied geology (4)
Physics (4)	Physics (3)	Metallurgy (3)
Water Analysis (4)	Iron & Steel Analysis (4)	Micro-chemistry (3)
Metallurgy (3)	Wine & Beer Analysis (2)	Colloquium (2)
Inorganic Preparations (3)	Gas Analysis (2)	Industrial chemistry (4)
	Metallurgy (3)	Crystallography (3)

SENIOR YEAR.

Chemistry of Carbohydrates (3)	Electro-chemistry (3)	Food adulterations (2)
Metallurgy (4)		Photographic chemistry (2)
Geology (4)	Metallurgy (4)	Electro-metallurgy (4)
Colloquium (2)	Mineral analysis (3)	Applied chemistry (2)
Elective [4]	Special problems (3)	Metallurgy (4)
Elective [4]	Elective [4]	Elective [4]
Thesis	Elective [4]	Elective [4]
	Thesis	Thesis

COURSES IN CHEMISTRY.

Course I. The metallic elements. Lectures and laboratory work. The course includes a study of the more common metals, their compounds and characteristic reactions. *Freshman i*, 96 hours.

Course II. Qualitative analysis. Lectures and laboratory work. The course includes the qualitative separation and the characteristic tests for the more common metals. *Freshman ii*, 96 hours. Open to those who have completed course I.

Course III. Qualitative analysis. Lectures and laboratory work. The course includes a study of the acids, their detection and separation. *Freshman iii*, 96 hours. Open to those who have completed course II.

Course IV. Quantitative analysis. Lectures and laboratory work. The course includes an introduction to quantitative and a beginning of gravimetric analysis. *Sophomore i*, 96 hours. Open to those who have completed course III.

Course V. Quantatitive analysis. Lectures and laboratory work. A continuation of course IV. *Sophomore ii*, 96 hours. Open to those who have completed course IV.

Course VI. Volumetric analysis. Lectures and laboratory work. The course includes an introduction to volumetric determinations with a discussion of standard solutions and the necessary stœchiometric calculations. *Sophomore iii*, 96 hours. Open to those who have completed course V.

Course VII. Theoretical chemistry Lectures and readings. The course includes a study of Lothar Meyer's Modernen Theorien der Chemie, Oswald's Grundriss der Allgemeinen Chemie and Remsen's Theoretical Chemistry. *Junior i*, 48 hours. Open to those who have completed course III.

Course VIII. History of chemistry. Lectures and reading. The course includes a full historical discussion of alchemy and chemistry. *Junior ii*, 48 hours. Open to those who have completed course III.

Course IX. Organic chemistry. Lectures and laboratory work. The course includes the aliphatic series with a preparation of the more important compounds, supplemented by Levy's Anleitung für Darstellung Organischer Präparate. *Junior iii*, 96 hours. Open to those who have completed course V.

Course X. Organic chemistry. Lectures and laboratory work. A continuation of course IX. The course includes the aromatic series with a preparation of some of the more important compounds supplemented by Fischer's Organische Präparate. *Junior i*, 96 hours. Open to those who have completed course IX.

Course XI. Water analysis. Lectures and laboratory work. The course includes an exhaustive discussion of the chemical and sanitary properties of water. *Junior i*, 48 hours, Open to those who have completed course VI.

Course XII. Gas analysis. Lectures and laboratory work. The work includes an exhaustive chemical examination of the common gases, with a determination of light and heat efficiency of combustible gases. *Junior ii*, 48 hours. Open to those who have completed course XI.

Course XIII. The chemistry of sugar. Lectures and laboratory work. The course includes a discussion of the carbohydrate group with the important methods of analysis. *Senior i*, 48 hours. Open to those who have completed course VI.

Course XIV. Industrial chemistry. Laboratory work and reading. The course includes the analysis of various commercial products. *Junior iii*, 48 hours. Open to those who have completed course VI.

Course XV. Wine and beer analysis. Lectures and laboratory work. The course includes the determination of alcohol and other constituents in wine and beer, with a special study of fermentation. *Senior ii*, 48 hours. Open to those who have completed course X.

Course XVI. Special problems. Laboratory work. The course includes the working out of various mineralogical, technological and metallurgical problems. *Senior i*, 48 hours or more. Open to those who have completed course VI.

Course XVII. Photographic chemistry. Lectures and laboratory work. The course includes a study of the compounds affected by the chemical rays of light, and a discussion of developers and fixers. *Senior iii*, 24 hours. Open to those who have completed course VI.

*This course will be extended in 1898 so as to embrace, besides the present work, a thorough course in photo-engraving, photo-reliefs and color photography.

Course XVIII. Domestic chemistry. Lectures and laboratory work. The course includes a study of the common household products, as sugar, starch, bread, soap, soda, vinegar, coffee, tea; the various ethereal oils; spices; milk and meat. *Senior iii*, 96 hours. Open to those who have completed course V.

Course XIX. Electro-chemical analysis. Lectures and laboratory work. The course includes the qualitative and quantitative separation of the metals by electrolysis. *Senior ii*. 48 hours. Open to those who have completed course VI.

Course XX. Micro-chemical analysis. Lectures and laboratory work. The course includes the methods for the determination of minute quantities of substances by means of the microscope. *Junior iii*, 48 hours. Open to those who have completed course VI.

Course XXI. Applied chemistry. Some of the subjects discussed in this course are: Pigments, paints, oils, varnishes, gun powder, nitro-glycerine, gun cotton and the chemical manufacture of acids, bases and salts. *Senior iii*, 48 hours. Open to those who have completed course VI.

Course XXII. Food Adulterations. An examination of common food products for adulterants. *Senior iii*, 48 hours. Open to those who have completed course VI.

Course XXIII. Iron and steel analysis. Lectures and laboratory work. The course includes the rapid determination of iron by the various methods as well as the determination of associated elements, sulphur, phosphorus, silicon, manganese, carbon and others. Open to those who have completed course VII.

Course XXIV. Mineral analysis. The course includes the analysis of building stones and some of the most important minerals.

Course XXV. Inorganic Preparations. The preparation of inorganic salts, supplemented by Bender's Anorganische Präparatkunde.

Course XXVI. Colloquium. A thorough quiz in general inorganic chemistry.

Course XXVII. Colloquium. A thorough quiz in general organic chemistry.

Course XXVIII. Special problems. This course includes work on ores of base metals, limestones, slags, etc. 48 hours or more.

COURSES FOR GRADUATE STUDENTS.

1. *Special inorganic chemistry.*
2. *Electro-chemistry.*
3. *Organic chemistry.*
4. *The alkaloids.*
5. *Analytical chemistry.*

For other courses see announcement under the respective departments of the other colleges in general catalogue.