

## CHEMISTRY

*Louis Sytsma, Ph.D., department chairperson*



**TRINITY'S CHEMISTRY PROGRAM CONTINUES TO surprise me. The laboratory components teach important reactions I will need to know, and the lectures show me how they bind together with a unity that only God could orchestrate."**

Jonathan Borr '11  
Chemistry (Holland, Michigan)

The chemistry major is designed to prepare students for professional careers in chemistry, medicine, and teaching, or for graduate studies. The program includes opportunity for research and independent study for upper-level students. There is opportunity for excellent field experience assignments in area laboratories or other agencies. Instrumentation in the chemistry labs is augmented by instruments available to chemistry students at Argonne National Laboratories.

The **chemistry major** consists of 48-50 hours:  
Chemistry 103, 104, 202, 205, 206, 331, 391, 392, 400;  
One from Chemistry 303, 305, 332, 333, 340;  
Required Cognates:  
Mathematics 111, 112; Physics 211, 212  
Recommended: Mathematics 151 or 351

The **secondary chemistry education major** consists of 53 hours:  
Chemistry 103, 104, 202, 205, 206, 331, 391, one chemistry elective with lab; Science 380;  
Required cognates:  
Biology 100; Geology 101; Mathematics 111, 112; Physics 211, 212.

Students with a teaching major in chemistry education will minor in education and follow the secondary education minor course requirement as listed in the education department section of the catalog.

The **chemistry minor**, 19 hours, consists of the following:  
Chemistry 103, 104, 205, 206; one elective in chemistry (200-level or higher) or physics

## Chemistry Courses (CHEM)

**Note:** Semesters listed are when courses are normally offered. However, course offerings and scheduling are subject to change at the discretion of the department.

### 100 Chemistry in Society (3)

Fall

This course introduces students to the methods of science, basic chemistry, and the role of chemistry in our modern world. The course includes a one-and-one-half hour laboratory period each week. **Note:** Designed to meet the physical science general education requirement for non-science majors, this course does not count toward the completion of a chemistry major or minor.

### 101 General Chemistry (4)

Fall

This introductory course presents the fundamental principles of inorganic chemistry, emphasizing applications relevant to health sciences. Basic treatment of stoichiometry, atomic structure, bonding, states of matter, solutions, and chemical reactions is given. One three-hour laboratory period per week is included. Chemistry 101 does not count toward a chemistry major or minor.

### 102 Principles of Organic and Biochemistry (4)

Spring

An elementary treatment of organic and biochemistry studying the fundamental classes of organic compounds and their syntheses and reactions, followed by a survey of the chemistry involved in living systems. One three-hour laboratory per week is included. The course emphasizes applications relevant to health sciences. Chemistry 102 does not count toward a chemistry major or minor. Prerequisite: Chemistry 101 with a C or better.

### 103 Fundamentals of Chemistry (4)

Fall

An introduction to the basic laws and theories of modern chemistry (including atomic and molecular structure, bonding, solids, liquids, gases, and solutions); stoichiometry, and thermodynamics. The laboratory work stresses quantitative experiments designed to illustrate basic laws. The course includes three lectures and one three-hour laboratory period per week. Prerequisite: minimum ACT composite score of 21 or a grade of C or better in MATH 101 or instructor permission for students with ACT scores 18-20.

### 104 Fundamentals of Chemistry (4)

Spring

A continuation of 103 includes equilibrium, electrochemistry, kinetics, and the descriptive chemistry of the elements. The laboratory work stresses equilibrium and the solution chemistry of the elements as illustrated by the techniques of qualitative inorganic analysis. Prerequisite: Chemistry 103.

### 202 Quantitative Analysis (4)

Spring, Even

This course consists of two hours of lecture and six hours of laboratory per week. Approximately equal emphasis is placed on (1) a study of the theory underlying various analytical methods including equilibrium manipulation, electrochemistry, and optical methods of analysis, and (2) the mastery of the laboratory techniques needed for the routine analyses of unknowns, using classical methods as well as instrumental methods. Prerequisite: Chemistry 104 with a C or better.

**205 Organic Chemistry (4)****Fall**

This concentrated introduction to the chemistry of carbon compounds emphasizes the integration of descriptive chemistry with basic principles: bonding theory, reaction mechanisms, stereochemistry, acid-base relationships, and others. For the most part, aliphatic compounds are treated. The laboratory work, consisting of one four-hour laboratory period per week, introduces the student to various techniques and stresses preparative procedures of typical organic compounds. Prerequisite: Chemistry 104.

**206 Organic Chemistry (4)****Spring**

This continuation of 205 increases emphasis on the chemistry of aromatics, heterocycles, and "natural" products. The laboratory work is more quantitative and introduces the use and theory of various spectral methods. Prerequisite: Chemistry 205.

**303 Biochemistry (4)****Spring, Odd**

This study combines the intermediary metabolic pathways and corresponding chemical structure with an overview of enzyme mechanism and kinetics, bioenergetics, and macromolecular biosynthetic pathways. Students participate in a four-hour lab period each week. Prerequisites: Chemistry 206, Biology 306, or approval of instructor.

**305 Advanced Organic Chemistry (4)****Varies**

These lectures consist of a study of selected topics in advanced organic chemistry with considerable time spent on the use of spectral methods of analysis (infrared, ultraviolet, mass spectroscopy, nuclear magnetic resonance spectroscopy) in the qualitative identification of organic compounds. Laboratory work consists of classical separations, qualitative organic analysis, and use of spectral techniques to identify organic unknowns. Use of the chemical literature, including complete literature searches to aid in syntheses and subsequent reports, is emphasized. Prerequisite: Chemistry 206.

**324 Individual Research (2-4)****Fall, Spring**

Must be arranged with a member of the chemistry department prior to registration.

**331 Physical Chemistry I (4)****Fall, Odd**

A study of gas laws, chemical and physical equilibria, thermodynamics, and kinetic molecular theory. Students participate in a four-hour lab period each week. Prerequisites: Chemistry 104 and Physics 212 or concurrent registration; Mathematics 112 or permission of instructor.

**332 Physical Chemistry II (4)****Varies**

This continuation of Chemistry I covers studies in kinetics with increased focus on mechanisms. It also discusses quantum theory with application to atomic and molecular structure, statistical mechanics/kinetic theory, and electronic, rotation/vibration, and magnetic resonance spectroscopies. Students participate in a four-hour lab period each week. Prerequisite: Chemistry 331 I.

**333 Environmental Chemistry (4)****Summer**

Principles and analysis of chemical movement and distribution in natural environments. Sampling and analytical methods are included for water, soil, and air. Students work in natural habitats and in the laboratory. Prerequisites: one year of General Chemistry and one semester of Organic Chemistry. This course is offered through Trinity's affiliation with AuSable Institute of Environmental Studies at Mancelona, Michigan. See description of the program under the Biology listings.

**340 Instrumental Methods of Analysis (4)****Varies**

This course introduces the principles of spectroscopic, electrometric, and chromatographic methods of analysis and the types of instruments currently available. Several Argonne staff members describe the instruments they use, including strengths and weaknesses, and guide the student through basic uses of the instruments. Prerequisite: Chemistry 202.

**391 Science Majors Seminar (1)****Spring**

A seminar for all junior majors in biology and chemistry. Meets one hour per week to discuss the nature of scientific research, the relationship between faith and science, and ethical issues. Students begin developing a major paper on the ethics of a scientific topic. Prerequisite: junior standing.

**392 Science Majors Seminar (1)****Spring**

A seminar for all senior majors in biology and chemistry. Similar to Chemistry 391 but includes the completion and oral presentation of the major paper begun in CHEM 391. Prerequisite: senior standing.

**395 Special Topics in Chemistry (2)****Fall**

Each fall, the chemistry division of the Associated Colleges of the Chicago Area (ACCA) offers a special course given in a seminar format by experts in that field. The class meets one evening per week off site. The topic for fall 2009: Spectroscopy.

**399 Independent Study (2-4)****Fall, Spring**

Topics selected from student's major interests. Prerequisite: permission of the department.

**400 Field Education (2-4)****Fall, Spring**

Must be approved by a member of the department prior to registration.

Through our membership in the **Associated Colleges of the Chicago Area (ACCA)**, students have opportunity to hear outside lecturers or participate in special group programs in chemistry (see Chemistry 395). Students also may present the results of laboratory or literature investigations at the annual ACCA student symposium. Students anticipating graduate study especially are encouraged to make such a presentation.