

# CHEMISTRY

**Program Website:** Chemistry – Hiram College (<https://www.hiram.edu/academics/undergraduate-studies/undergraduate-programs/chemistry/>)

## Introduction

The chemistry program at Hiram College is designed to provide students with detailed knowledge of the subject matter through extensive laboratory and research experiences. Coursework cultivates expertise in the areas of analytical, biological, inorganic, organic, and physical chemistry. Because Hiram College is an undergraduate teaching institution, students receive close instruction and mentoring from Hiram's full-time chemistry faculty. Hiram students also have unlimited access to the program's array of research equipment and laboratory space.

## Faculty

**Carol Kercher, (2007) Associate Professor of Chemistry**

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Ph.D., The University of Akron

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**James Kercher, (2009) Associate Professor of Chemistry**

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**Brian Kettle, (2012) Associate Professor of Chemistry; Chair**

B.S., M.S., University of Toledo;

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**Steven P Romberger, (2014) Associate Professor of Chemistry;**

**Biochemistry Program Director; Director of Undergraduate Research**

B.S., Susquehanna University;

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## Course Descriptions

**CHEM 10100: CHEM IN CONTEXT-W/LAB:SM: 4 Hour(s)**

CHEMISTRY IN CONTEXT-AN ENVIRONMENTAL PERSPECTIVE-W/LAB:SM ~ A basic chemistry course, organized to develop knowledge and an understanding of the chemical factors affecting the environment and society's interaction with the environment. This course is designed for students with no previous experience in chemistry. This course satisfies the laboratory course requirement. Student must also register for a CHEM 10100 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as four credit hours.

Core: Experimental Scientific Method

**CHEM 10500: PHYSIOLOGIC CHEM W/LAB:SM: 4 Hour(s)**

PHYSIOLOGICAL CHEMISTRY W/LAB:SM ~ This course is an introduction to inorganic chemistry, basic organic chemistry and biological chemistry. Topics will include atomic structure, chemical bonding, intermolecular forces, acids and bases, solutions, thermodynamics, kinetics, the structure and reactivity of simple organic compounds, carbohydrates, enzymes, lipids, nucleic acids, proteins, and metabolism. Activities in this course will involve analytical thinking and problem-solving skills, with an emphasis on the application of chemical principles to human health, medicine and physiology. Students must earn a "C" or better in this course to satisfy requirements of the nursing program at Hiram College. Students must also register for a CHEM 10500 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as 4 credit hours.

Core: Experimental Scientific Method

**CHEM 10600: PHYSIOLOGIC CHEM I-W/LAB:SM: 4 Hour(s)**

PHYSIOLOGICAL CHEMISTRY I-W/LAB:SM ~ This course is intended for non-science majors, and is particularly aimed at those entering various healthcare fields, environmental studies, neuroscience, and those wishing to teach elementary school or middle school. This course will provide an introduction to the principles of inorganic and organic chemistry. Topics include: atomic theory and nuclear chemistry, the periodic table, chemical bonds, states of matter, chemical reactivity, principles of equilibrium and reaction rates, acids and bases, and the structure and reactivity of organic compounds including alkyl, aryl, alcohol, carbonyl, and amino compounds. Activities in this course will emphasize analytical thinking and problem-solving particularly in the area of quantitative calculations. Students must also register for a CHEM 10600 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as 4 credit hours.

Core: Experimental Scientific Method

**CHEM 10800: PHYSIOLOGIC CHEM II-W/LAB:SM: 4 Hour(s)**

PHYSIOLOGICAL CHEMISTRY II-W/LAB:SM ~ This is the second semester of a two course sequence intended for non-science majors, and is particularly aimed at those entering various healthcare fields, environmental studies, neuroscience, and those wishing to teach elementary school or middle school. This course will build upon the inorganic and organic chemistry topics introduced in the previous course, and explore how they apply to biological systems. Topics include: the structure and properties of the various food groups (carbohydrates, lipids, proteins), biological reactions including enzyme kinetics, metabolic pathways and bioenergetics, genetic expression including DNA and RNA structure. Activities will continue to involve analytical thinking and problem-solving skills, and will be geared towards the application of chemical principles to the structure and function of biological systems. Students must also register for a CHEM 10800 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as four credit hours.

Prerequisite: CHEM 16100 or CHEM 10600

Core: Experimental Scientific Method

**CHEM 12000: GEN I:STRUCTURE/BOND-W/LAB:SM: 4 Hour(s)**

GENERAL I-STRUCTURE AND BONDING-W/LAB:SM ~ An introduction to atoms and molecules. Topics include atomic orbitals, periodicity, intermolecular forces, bonding models, bond energies and orbital hybridization. Student must also register for CHEM 12000 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as 4 credit hours.

Core: Experimental Scientific Method

**CHEM 12100: GEN II:INTR CHEM ANLS-W/LAB:SM: 4 Hour(s)**  
GENERAL II-INTRODUCTION TO CHEMICAL ANALYSIS-W/LAB:SM ~ An introduction to solution chemistry. Topics include gas laws, redox reactions, thermodynamics, electrochemistry, kinetics, colligative properties, equilibrium and pH. Student must also register for a CHEM 12100 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as four credit hours.

Prerequisite: CHEM 12000

Core: Experimental Scientific Method

**CHEM 18000: WKSP: 1 Hour(s)**  
WORKSHOP. ~ Workshops may be taken Pass/No Credit only. Students may take no more than nine workshops for credit toward graduation. Workshops can be used as elective credit only.

**CHEM 20400: PHYSICAL SCIENCE-W/LAB:SM: 4 Hour(s)**  
PHYSICAL SCIENCE-W/LAB:SM ~ A non-majors course. This is a comprehensive but not highly technical presentation of the essential concepts of physical science. While the subject matter is derived from the major branches of physical science (astronomy, chemistry, geology, meteorology and physics), it is studied as an integrated interpretation of the physical world. The laboratory is designed to be of special application for the prospective elementary teacher through the establishment of demonstrations and experiments illustrating salient concepts. Student must also register for a CHEM 20400 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as 4 credit hours.

Core: Experimental Scientific Method

**CHEM 22000: INTRO TO ORGANIC CHEM-W/LAB: 4 Hour(s)**  
INTRODUCTION TO ORGANIC CHEMISTRY-W/LAB ~ Introduction to Organic Chemistry. A survey of the principles of organic chemistry with emphasis on functional groups. Nomenclature, structure, synthetic methods, and reactions are the primary focuses. An introduction to isomerism, stereo-chemistry, and conformational analysis is included. Reaction energetics and implications for a selected series of reaction mechanisms are also examined. The laboratory introduces basic techniques of isolation, characterization, and synthesis of organic compounds. Student must also register for a CHEM 22000 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as 4 credit hours.

**CHEM 22500: INTRO ELECTRONICS-W/LAB: 4 Hour(s)**  
INTRODUCTORY ELECTRONICS-W/LAB ~ An introduction to the principles of electronics and the uses of electronic components. The laboratory will investigate the fundamentals of linear and digital circuits while using basic laboratory instruments such as oscilloscopes, waveform generators, and digital multimeters. Topics will include basic circuit theory, passive devices, junction and field effect transistors, operational amplifiers, digital logic, integrated circuit chips and optical solid-state devices. This course is designed for physics and chemistry majors and entails a considerable amount of problem solving. While not required, a familiarity with calculus would be helpful. Student must also register for a CHEM 22500 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as 4 credit hours. Also listed as PHYS 22500.

Prerequisite: PHYS 11400 or PHYS 21400

**CHEM 23000: INTRO TO INORGANIC CHEM-W/LAB: 4 Hour(s)**  
INTRODUCTION TO INORGANIC CHEMISTRY-W/LAB ~ The concepts of inorganic chemistry in light of modern theory. Atomic structure, chemical periodicity, bonding, group theory, coordination chemistry with crystal field theory, and reaction mechanisms of complex formation are considered. Descriptive chemistry and the often neglected chemistry of the lanthanide and actinide elements are also examined. The laboratory introduces basic inorganic laboratory techniques for the synthesis and characterization of inorganic compounds. Students must also register for a CHEM 23000 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as 4 credit hours.

Prerequisite: CHEM 12100 and CHEM 22000

**CHEM 24000: QUANTITATIVE ANALYSIS-W/LAB: 4 Hour(s)**  
QUANTITATIVE ANALYSIS-W/LAB ~ An in-depth study of theory and practice of analytical methods including gravimetric, volumetric, redox, electrochemical, compleximetric and spectrophotometric, and an introduction to modern instrumentation. Intended for students of biological, chemical, medical, and physical sciences. Student must also register for a CHEM 24000 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as four credit hours.

Prerequisite: CHEM 12100

**CHEM 25000: HUMAN NUTRITION: 3 Hour(s)**  
HUMAN NUTRITION ~ The requirements of nutrition for individuals and families as related to health and well-being are examined in this course as well as the functions, sources and interactions of essential nutrients. Food groups are studied and methods of nutrition education are explored. Prerequisite: CHEM 16200 or CHEM 10800 (may be taken concurrently)

**CHEM 28000: SEM: 4 Hour(s)**  
SEMINAR ~

**CHEM 28100: INDEPENDENT STUDY: 1-4 Hour(s)**  
INDEPENDENT STUDY ~

**CHEM 29800: FIELD EXPERIENCE: 1-4 Hour(s)**  
FIELD EXPERIENCE ~

**CHEM 32000: INTERMED ORGANIC CHEM-W/LAB: 4 Hour(s)**  
INTERMEDIATE ORGANIC CHEMISTRY-W/LAB ~ A continuation of CHEM 22000. Includes a survey of bifunctional and polyfunctional molecules and bio-organic chemistry. Student must also register for a CHEM 32000 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as 4 credit hours.

Prerequisite: CHEM 22000

**CHEM 35000: PHYSICAL CHEMISTRY I-W/LAB: 4 Hour(s)**  
PHYSICAL CHEMISTRY I-W/LAB ~ This course provides an introduction to physical chemistry, with an emphasis on energetics. Topics include: the physical properties of gases, liquids, solids, and solutions; thermodynamics and thermochemistry; phase equilibria; electrochemistry; and the kinetic theory of gases and fluids. Students must also register for a CHEM 35000 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as 4 credit hours.

Prerequisite: CHEM 22000 and PHYS 21400 and MATH 19900

**CHEM 35100: PHYSICAL CHEMISTRY II-W/LAB: 4 Hour(s)**

PHYSICAL CHEMISTRY II-W/LAB ~ This course is a continuation of CHEM 35000. The emphasis in this course is on structure and change. Topics include: atomic and molecular structure; quantum mechanics; molecular structure determination; thermodynamics; and chemical kinetics. Students must also register for a CHEM 35100 lab. The breakdown between lecture and lab hours is for administrative office use only. This course may only be taken as four credit hours.  
Prerequisite: CHEM 35000

**CHEM 38000: SEM:: 4 Hour(s)**

SEMINAR ~

**CHEM 38100: SPC TPC:: 1-4 Hour(s)**

SPECIAL TOPICS IN CHEMISTRY ~ Various advanced courses. This course may be taken more than once for credit.

**CHEM 48000: SENIOR SEMINAR: 1 Hour(s)**

SENIOR SEMINAR ~ Students prepare and present to faculty and students, papers on chemical topics based on literature search or laboratory research.

**CHEM 48100: INDEPENDENT RESEARCH: 1-4 Hour(s)**

INDEPENDENT RESEARCH ~

**CHEM 48200: RESEARCH TECHNIQUES: CHEM: 4 Hour(s)**

RESEARCH TECHNIQUES CHEMISTRY ~ This course provides an opportunity for collaborative research among students and faculty. While the faculty member will guide the research project, all members of the team will work together to delineate the role(s) each will play in carrying out the project. Students may use this research as the background for their student seminar. This course may be taken more than once for credit.

Prerequisite: CHEM 22000

**CHEM 49800: INTERNSHIP: 4 Hour(s)**

INTERNSHIP ~

## Academic Offerings

- Chemistry Major (<https://catalog.hiram.edu/undergraduate/academic-programs/chemistry/chemistry-major/>)
- Chemistry Minor (<https://catalog.hiram.edu/undergraduate/academic-programs/chemistry/chemistry-minor/>)
- Entrepreneurship Minor - Chemistry (<https://catalog.hiram.edu/undergraduate/academic-programs/chemistry/entrepreneurship-minor/>)