

CHEMISTRY

Contact Information

Division

Sciences and Mathematics

Dean

Randy Lehr

Associate Dean

Karen Warburton

Division Office

V 211, Rocklin Campus

Overview

The Chemistry program at Sierra College is designed to meet the needs of the diverse community of interests served by the community college. A full program of chemistry for the professional scientist is offered through analytical chemistry and a two-semester course in organic chemistry. A separate track is offered for nursing students that presents general inorganic, organic and biochemistry in a one-year sequence. The Chemistry Department also has a strong commitment to the student with no prior chemistry, or to those whose background is weak.

The entire program is taught with a strong emphasis on the laboratory. In the more advanced classes, students receive hands-on experience with a wide variety of instruments.

TRANSFER MAJOR REQUIREMENTS in Chemistry are available in the Counseling Center. In all cases, students should consult with a counselor for specific transfer requirements. Four-year graduates in Chemistry are qualified for positions in research, industry, education, engineering and the allied medical fields.

Faculty

Michael C. Brelle

Professor, Chemistry

B.S., California State University, Chico

Ph.D., University of California, Santa Cruz

Keri Clemens

Professor, Chemistry

B.S., University of California, Davis

Ph.D., University of California, Davis

Pamela H. Gamel

Professor, Chemistry

B.S., University of California, Davis

M.S., University of California, San Francisco

Jason R. Giuliani

Professor, Chemistry

B.S., California State University, Chico

Ph.D., University of California, Davis

Stuart D. Hay

Professor, Chemistry

B.S., California Polytechnic State University, San Luis Obispo

M.S., California State University, Sacramento

Susan L. Kurnett

Professor, Chemistry

B.A., University of California, Irvine

M.S., California State University, Sacramento

Rhiannon Porter

Professor, Chemistry

B.S., California Polytechnic State University, San Luis Obispo

Ph.D., University of California, Davis

Trevor Roberti

Assistant Professor, Chemistry

B.S., California State University, Long Beach

Ph.D., University of California, Santa Cruz

Mark F. Springsteel

Professor, Chemistry

B.S., California State University, Fullerton

Ph.D., University of California, Davis

Degrees/Certificates

Associate Degree for Transfer

- Chemistry for Transfer (p. 1)

Associate Degree

- Chemistry (p. 2)

Chemistry for Transfer

AS-T Degree

This program provides students with a strong foundation in chemistry, covering the composition, structure, properties, and reactions of substances. Courses in general chemistry, organic chemistry, physics, and calculus are required. Upon completion of this degree, students will demonstrate proficiency in chemistry concepts and scientific communication, and apply critical thinking skills to problem solving.

The Associate in Science in Chemistry for Transfer degree (AS-T) prepares students to transfer into the CSU system to complete a bachelor's degree in chemistry, or a major deemed similar by a CSU campus. Students earning an associate degree for transfer and meeting the CSU minimum transfer admission requirements are guaranteed admission with junior standing within the CSU system. Students are also given priority admission consideration to their local CSU campus but not to a particular campus or major. Upon transfer, students will be required to complete no more than 60 additional prescribed units to earn a bachelor's degree.

To earn the Associate in Science in Chemistry for Transfer degree, students must complete 60 CSU-transferable semester units with a minimum grade point average of 2.0, including both of the following:

- completion of all courses required for the major with grades of "C" or better; and
- completion of the Intersegmental General Education Transfer Curriculum for Science, Technology, Engineering or Mathematics (IGETC for STEM) (<http://catalog.sierracollege.edu/archive/2019-2020/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc>) pattern.¹ (Students transferring to a CSU campus must complete Area 1C Oral Communication to be eligible for admission.)

NOTE: The California State University General Education Breadth pattern (CSU GE) is NOT an option for this degree.

The exact wording of the law pertaining to associate degrees for transfer may be found in Education Code Section 66746.

It is highly recommended that, prior to transferring, students complete courses that satisfy the CSU United States History, Constitution and American Ideals graduation requirement. In all cases, students should consult with a counselor for more information on university admission and transfer requirements.

RESTRICTION: International coursework from non-United States regionally accredited institutions cannot be applied to associate degrees for transfer.

Required Courses

Code	Title	Units
CHEM 0001A	General Chemistry I (OR)	5-6
or CHEM 0003A & CHEM 0003B	General Chemistry I - Part 1 and General Chemistry I - Part 2	
CHEM 0001B	General Chemistry II	5
CHEM 0012A	Organic Chemistry I	5
CHEM 0012B	Organic Chemistry II	5
PHYS 0205	Principles of Physics: Mechanics	4
PHYS 0205L	Principles of Physics Laboratory: Mechanics	1
PHYS 0210	Principles of Physics: Electricity and Magnetism	3
PHYS 0210L	Principles of Physics Laboratory: Electricity and Magnetism	1
MATH 0030	Analytical Geometry and Calculus I	4
MATH 0031	Analytical Geometry and Calculus II	4
Total Units		37-38

¹ IGETC for STEM is only an option for students earning AS-T degrees in Biology for Transfer and/or Chemistry for Transfer. IGETC for STEM certification requires the following courses *before* transfer:

- All courses in Areas 1 (except 1C for UC-bound students), 2, and 5 of the traditional IGETC;
- Two courses in Area 3 - one course in Area 3A and one course in Area 3B; and
- Two courses in Area 4 from two different disciplines.

The following deferred courses must be completed *after* transfer:

- One remaining lower-division general education course in Area 3;
- One remaining lower-division general education course in Area 4; and
- One course in Area 6 for UC-bound students who have not satisfied the requirement through proficiency.

(The deferred lower-division courses must be replaced with calculus and/or science courses that are required to be taken before transfer to the university.)

Chemistry

AS Degree

The Chemistry major recognizes a concentration in the field of Chemistry. Successful completion of the curriculum in Chemistry and the associated electives prepare Chemistry students for transfer to four-year colleges or universities. In all cases, students should consult with a counselor for more information on university admission and transfer requirements. Students must fulfill the following major requirements with grades of "C"

or better, complete a minimum of 60 degree-applicable semester units (12 of which must be completed at Sierra College) with a grade point average of at least 2.0 and complete one of the following three general education patterns:

- Sierra College Associate Degree Requirements (<http://catalog.sierracollege.edu/archive/2019-2020/student-resources/general-education/associate-degree-requirements>);
- California State University General Education Breadth (CSU GE) (<http://catalog.sierracollege.edu/archive/2019-2020/student-resources/general-education/california-state-university-general-education-breadth-requirements>) pattern;
- Intersegmental General Education Transfer Curriculum (IGETC) (<http://catalog.sierracollege.edu/archive/2019-2020/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc>).

Required Courses

Code	Title	Units
CHEM 0001A	General Chemistry I (OR)	5-6
or CHEM 0003A & CHEM 0003B	General Chemistry I - Part 1 and General Chemistry I - Part 2	
CHEM 0001B	General Chemistry II	5
CHEM 0005	Chemistry - Quantitative Analysis	4
CHEM 0012A	Organic Chemistry I	5
CHEM 0012B	Organic Chemistry II	5
Total Units		24-25

Recommended Electives

Code	Title	Units
MATH 0030	Analytical Geometry and Calculus I	4
MATH 0031	Analytical Geometry and Calculus II	4
MATH 0032	Analytical Geometry and Calculus III	4
PHYS 0205 & 0205L	Principles of Physics: Mechanics and Principles of Physics Laboratory: Mechanics	5
PHYS 0210 & 0210L	Principles of Physics: Electricity and Magnetism and Principles of Physics Laboratory: Electricity and Magnetism	4
PHYS 0215 & 0215L	Principles of Physics: Heat, Waves and Modern Physics and Principles of Physics Laboratory: Heat, Waves and Modern Physics	4

Courses

Understanding course descriptions (<http://catalog.sierracollege.edu/archive/2019-2020/student-resources/course-information/understanding-course-descriptions>)

CHEM 0000A. Preparation for College Chemistry*Units: 4*

Prerequisite: Completion of first year high school algebra or MATH A with grade(s) of "C" or better; eligibility for ENGL N

Advisory: Eligibility for ENGL 1A

Hours: 108 (54 lecture, 54 laboratory)

A nontransferable course primarily intended to prepare students for college general chemistry. Includes a brief review of math operations important in chemistry, metric system, formulas, equations, gas laws, and solutions through related lecture and laboratory exercises. (not transferable)

CHEM 0001A. General Chemistry I*Units: 5*

Prerequisite: Completion of CHEM A or equivalent with grade of "C" or better; and completion of MATH D with grade of "C" or better, or placement by matriculation assessment process, or equivalent; and satisfactory score on the Chemistry Placement Examination

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 162 (54 lecture, 108 laboratory)

Introduction to the general principles of chemistry with emphasis upon quantitative relationships. Properties of matter related whenever possible to present concepts of atomic structure and to the periodic table.

Includes atomic structure, the mole concept, gas laws, stoichiometry, redox, states of matter, solutions, and an introduction to modern theories of chemical bonding through related lecture and laboratory exercises.

Students enrolling in CHEM 1A after having completed CHEM 3A will lose credit for CHEM 3A. Note: Not open to students who have completed CHEM 3B. CHEM 1A/1B sequence may be started any semester. (C-ID CHEM 110) (combined with CHEM 1B, C-ID CHEM 120S) (CSU, UC-with unit limitation)

CHEM 0001B. General Chemistry II*Units: 5*

Prerequisite: Completion of CHEM 1A or 3B with grade of "C" or better

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 162 (54 lecture, 108 laboratory)

A continuation of CHEM 1A. Includes modern theories of bonding, acid-base theory, equilibrium, thermodynamics, electro-chemistry, nuclear chemistry, chemical kinetics, and a brief introduction to organic and biochemistry through related lecture and laboratory exercises. Note: CHEM 1A/1B sequence may be started any semester. (combined with CHEM 1A or CHEM 3A/3B, C-ID CHEM 120S) (CSU, UC-with unit limitation)

CHEM 0001X. Problem Solving for Chemistry 1A*Unit: 1*

Prerequisite: Completion of CHEM A or equivalent with grade of "C" or better; and completion of MATH D with grade of "C" or better, or placement by matriculation assessment process, or equivalent; and satisfactory score on the Chemistry Placement Examination

Corequisite: Concurrent enrollment in CHEM 1A

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 18 lecture

Optional problem solving course to accompany CHEM 1A. Students use critical thinking and problem solving strategies to solve general chemistry problems in topics that include atomic structure, the mole concept, gas laws, stoichiometry, redox, intermolecular forces, solid state chemistry, solution chemistry, and chemical bonding. (CSU)

CHEM 0001Y. Problem Solving for Chemistry 1B*Unit: 1*

Prerequisite: Completion of CHEM 1A or 3B with grade of "C" or better

Corequisite: Concurrent enrollment in CHEM 1B

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 18 lecture

Optional problem solving course to accompany CHEM 1B. Students use critical thinking and problem solving strategies to solve general chemistry problems in topics that include equilibrium, chemical kinetics, acid-base theory, thermodynamics, electro-chemistry, nuclear chemistry, and brief introductions to organic and biochemistry. (CSU)

CHEM 0002A. Introduction to Chemistry I*Units: 5*

Prerequisite: Completion of MATH A with grade of "C" or better, or placement by matriculation assessment process, or equivalent

Advisory: Eligibility for ENGL 1A; completion of CHEM A with grade of "C" or better or equivalent; completion of MATH D with grade of "C" or better or equivalent

Hours: 162 (54 lecture, 108 laboratory)

Designed to meet the requirements for certain nursing, dental hygiene, physical therapy, agriculture, and forestry programs (Inorganic Chemistry). An introduction to the fundamental principles of general inorganic chemistry through related lecture and laboratory exercises. (C-ID CHEM 101) (CSU, UC-with unit limitation)

CHEM 0002B. Introduction to Chemistry II*Units: 5*

Prerequisite: Completion of CHEM 2A with grade of "C" or better

Advisory: Eligibility for ENGL 1A

Hours: 162 (54 lecture, 108 laboratory)

Designed to meet the requirements for certain nursing, dental hygiene, physical therapy, agriculture, and forestry programs (Organic and Biochemistry). A study of the major classes of organic compounds, including nomenclature structure, properties, and isomerism. Emphasizes the chemistry and metabolism of carbohydrates, lipids, and proteins, including nucleo-protein and enzymes through related lecture and laboratory exercises. (C-ID CHEM 102) (CSU, UC-with unit limitation)

CHEM 0002X. Problem Solving for Chemistry 2A*Unit: 1*

Prerequisite: Completion of one year high school algebra or MATH A with grade of "C" or better

Corequisite: Concurrent enrollment in CHEM 2A

Advisory: Eligibility for ENGL 1A; completion of high school chemistry or CHEM A with grade of "C" or better; completion of two years of high school algebra or MATH D with grade(s) of "C" or better

Hours: 18 lecture

Optional problem solving course to accompany CHEM 2A. Students use critical thinking and problem solving strategies to solve chemistry problems in topics that include atomic structure, the mole concept, gas laws, stoichiometry, redox, acid-base theory, equilibrium, nuclear chemistry, and chemical bonding. (CSU)

CHEM 0002Y. Problem Solving for Chemistry 2B*Unit: 1*

Prerequisite: Completion of CHEM 2A with grade of "C" or better

Corequisite: Concurrent enrollment in CHEM 2B

Advisory: Eligibility for ENGL 1A

Hours: 18 lecture

Optional problem solving course to accompany CHEM 2B. Students use critical thinking and problem solving strategies to solve organic and biochemistry problems. Both lecture and discussion groups utilized. (CSU)

CHEM 0003A. General Chemistry I - Part 1*Units: 3*

Prerequisite: Completion of MATH D with grade of "C" or better, or placement by matriculation assessment process, or equivalent

Corequisite: Concurrent enrollment in CHEM 3X

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 90 (36 lecture, 54 laboratory)

The first semester of a two-semester course in general chemistry consisting of that material normally included in one semester of CHEM 1A. Topics covered include the mole concept, chemical nomenclature, gas laws, and stoichiometry. This sequence fulfills the prerequisite for CHEM 1B. Students enrolling in CHEM 1A after having taken CHEM 3A will lose credit for CHEM 3A. (combined with CHEM 3B, C-ID CHEM 110) (combined with CHEM 3B and 1B, C-ID CHEM 120S) (CSU, UC-with unit limitation)

CHEM 0003B. General Chemistry I - Part 2*Units: 3*

Prerequisite: Completion of CHEM 3A with grade of "C" or better

Corequisite: Concurrent enrollment in CHEM 3Y

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 90 (36 lecture, 54 laboratory)

The second semester of a two-semester course in general chemistry consisting of that material normally included in one semester of CHEM 1A. Topics include atomic structure, states of matter, solutions, and chemical bonding. This sequence fulfills the prerequisite for CHEM 1B. (combined with CHEM 3A, C-ID CHEM 110) (combined with CHEM 3A and 1B, C-ID CHEM 120S) (CSU, UC-with unit limitation)

CHEM 0003X. Problem Solving for Chemistry 3A*Units: 2*

Prerequisite: Completion of MATH D with grade of "C" or better, or placement by matriculation assessment process, or equivalent

Corequisite: Concurrent enrollment in CHEM 3A

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 36 lecture

Problem solving course to accompany CHEM 3A. Students use critical thinking and problem solving strategies to solve general chemistry problems in topics that include the mole concept, chemical nomenclature, gas laws, and stoichiometry. (pass/no pass grading) (not transferable)

CHEM 0003Y. Problem Solving for Chemistry 3B*Units: 2*

Prerequisite: Completion of CHEM 3A with grade of "C" or better

Corequisite: Concurrent enrollment in CHEM 3B

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 36 lecture

Problem solving course to accompany CHEM 3B. Students use critical thinking and problem solving strategies to solve general chemistry problems in topics that include atomic structure, chemical bonding, states of matter, and solutions. (pass/no pass grading) (not transferable)

CHEM 0005. Chemistry - Quantitative Analysis*Units: 4*

Prerequisite: Completion of CHEM 1B with grade of "C" or better

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 144 (36 lecture, 108 laboratory)

Theory and techniques of quantitative chemical measurement, including gravimetric, volumetric, and introductory instrumental analysis. Required for all chemistry, chemical engineering, medicine, dentistry, veterinary medicine, and related majors. (CSU, UC)

CHEM 0012A. Organic Chemistry I*Units: 5*

Prerequisite: Completion of CHEM 1B with grade of "C" or better

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 162 (54 lecture, 108 laboratory)

An extensive course in the chemistry of the compounds of carbon, which emphasizes structure, kinetics, thermodynamics, spectroscopy, and synthesis. The laboratory provides direct experience with the reaction, synthesis, purification, identification, and characterization (IR, GC, TLC, bp, mp, chemical tests) of organic compounds. Discussions about the emerging field of "Green Chemistry" and performance of Green Chemistry experiments in the laboratory. Required for majors in chemistry as well as many other related fields. (C-ID CHEM 150; and, combined with CHEM 12B, C-ID CHEM 160S) (CSU, UC)

CHEM 0012B. Organic Chemistry II*Units: 5*

Prerequisite: Completion of CHEM 12A with grade of "C" or better

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 162 (54 lecture, 108 laboratory)

Focuses on carbon based molecules and emphasizes structure, kinetics, thermodynamics, spectroscopy, and synthesis. Includes the emerging field of "Green Chemistry." Required for majors in Chemistry as well as many other related fields. (combined with CHEM 12A, C-ID CHEM 160S) (CSU, UC)

CHEM 0028. Independent Study*Units: 1-3*

Designed for students interested in furthering their knowledge at an independent study level in an area where no specific curriculum offering is currently available. Independent study might include, but is not limited to, research papers, special subject area projects, and research projects. See Independent Study page in catalog. (CSU, UC-with unit limitation)

CHEM 0095. Internship in Chemistry*Units: 0.5-4*

Designed for advanced students to work in an area related to their educational or occupational goal. Provides new on-the-job technical training under the direction of a worksite supervisor, allowing students to expand knowledge and skills in the chosen field. Mandatory orientation session and faculty approval to determine eligibility. Students may earn up to a total of 16 units in internship courses (any course numbered 95 and PDEV 94). (CSU-with unit limitation)

CHEM 0140. Survey of Chemistry and Physics*Units: 4*

Also known as PHYS 140

Prerequisite: Completion of MATH D with grade of "C" or better, or placement by matriculation assessment process

Hours: 108 (54 lecture, 54 laboratory)

A conceptual introduction to the basic principles of physics and chemistry including matter, physical and chemical properties, forces and motion, energy, electromagnetism, electromagnetic waves, atomic structure, bonding, solutions and chemical reactions. The interdependence of chemistry and physics will be emphasized. This course is intended for non-science majors. (C-ID CHEM 140) (CSU, UC)

Program Student Learning Outcomes (PSLOs)

- Demonstrate proficiency in chemistry concepts by scoring above the national median in the subject matter ACS (American Chemical Society) exams.

- Demonstrate proficiency in scientific communication.
- Apply critical thinking skills to problem solving.