

Chemistry

Degree

Associate in Arts: Chemistry

Program Description

The Chemistry Department offers courses for both Chemistry majors and non-Chemistry majors. An Associate in Arts Degree may be earned. In addition, the department offers chemistry courses required by other departments.

There is virtually no area of science that is unaffected by discoveries in the field of chemistry. The exploration of our solar system is made possible by the development of exotic fuels for rockets, special ceramics to dissipate the enormous heat generated by re-entry into the atmosphere, and light-weight, high-strength alloys for the space vehicles themselves. A coalition of chemists and biologists is attempting to correct defects in living organisms through genetic engineering, while other chemists work with doctors to create synthetic body parts and to alleviate suffering through the design of new or more effective drugs. Additionally, chemists are helping to increase the world's food supply, to develop synthetic fuels, and to produce extremely pure chemicals for use in computers and energy-conversion devices.

Because chemistry touches so many areas of human activity, it is essential that each individual have some understanding of basic chemical principles. Only in this way can citizens make intelligent decisions concerning applications of technology.

Program Student Learning Outcomes

1. Demonstrate proficiency in solving chemical mathematical problems.
2. Demonstrate proficiency in describing atomic structure, bonding and periodic trends.
3. Demonstrate proficiency in naming and writing chemical formulas.
4. Demonstrate proficiency in writing balanced chemical equations and performing stoichiometric calculations.
5. Demonstrate proficiency in predicting the outcome of chemical reactions.
6. Demonstrate proficiency in assembling laboratory glassware and performing laboratory techniques.
7. Demonstrate proficiency in making and recording experimental observations and interpreting the results.

Department Offices

Jens-Uwe Kuhn, *Chair* (PS-217, ext. 4319)

Jennifer Evans, *Lab Technician* (PS-207, ext. 2254)

Tracy Reynolds, *Lab Technician* (PS-207, ext. 3054)

Marilynn Spaventa, *Dean*

Faculty and Offices

Jens-Uwe Kuhn, *Chair* (PS-217, ext. 4319)

Eric Bullock (PS-212, ext. 3639)

Juan Carrera-Espinoza (PS-216, ext. 2310)

Sally Ghizzoni (PS-210, ext. 2799)

Raeanne Napoleon (PS-206, ext. 4056)

Requirements for AA Degree: Chemistry

The Associate Degree is awarded upon completion of both department and college requirements.

Department Requirements (28.8-30.8 units)

CHEM 155 — General Chemistry I	5
CHEM 156 — General Chemistry II	5
CHEM 211 — Organic Chemistry I.....	3
CHEM 212 — Organic Chemistry II.....	3
CHEM 221 — Organic Chemistry Lab I.....	2.3
CHEM 222 — Organic Chemistry Lab II.....	2.5

Controlled Electives (8 units) selected from the following:
MATH 117 or 117H, 130, 131, 137, 138, 150, 160, 200, 210, 220; PHYS 105, 106, 121, 122, 123

**MATH 140 (21)/141 (22) and 250/260 may also count toward the Controlled Electives requirement.

College Requirements

For complete information, see "Graduation Requirements" in the *Catalog Index*.

Preparation for Transfer

Course requirements for transfer vary depending upon the college or university a student wishes to attend. Therefore, it is *most important* for a student to consult a counselor before planning an academic program for transfer. Articulation agreements for majors outlining transfer requirements are available on the ASSIST website at www.assist.org.

Planning a Program of Study

Since many Chemistry courses have mathematics classes as prerequisites, it is important for students majoring in Chemistry to complete these courses prior to beginning the program.

General Chemistry (CHEM 155 and 156) is offered every semester, including the summer. The one-year organic sequence begins in the Fall Semester with CHEM 211 and 221, and is completed in the Spring Semester with CHEM 212 and 222. Students must complete CHEM 156 before being able to enroll in CHEM 211 and 221.

Honors and Awards

Outstanding Chemistry Students and Book Awards

Each year the faculty of the Chemistry Department select a student from each of the chemistry courses who has clearly demonstrated academic excellence and outstanding scholarly achievement in Introductory Chemistry (CHEM 101), Fundamentals of General, Organic, and Biological Chemistry (CHEM 104), General Chemistry (CHEM 155 and 156), or Organic Chemistry (CHEM 211, 212, 221, and 222) to be the Outstanding Chemistry Student in the respective area.

In addition, several Book Awards are given to outstanding students, such as the Dr. Preston B. Moore Chemistry Book Award in recognition of a student's commitment to research in a field of chemistry.

Department Resources

Tutorial Opportunities

In most semesters, the Chemistry Department is able to hire student tutors to provide group tutoring sessions to students enrolled in many of the courses in the department. Students who have demonstrated a high level of understanding of chemistry and have expressed an interest in teaching, are encouraged to apply for these positions.

Special Departmental Resources

The Chemistry Department offers laboratories that contain state-of-the-art instruments, including infrared spectrophotometers, UV-vis spectrophotometers, gas chromatography, and a nuclear magnetic resonance spectrometer.

Advising

In addition to the services provided by college counselors for the sciences and by the Career

Center, department members offer advisement regarding Chemistry courses and career opportunities in chemistry. For information about the Chemistry Program at Santa Barbara City College, contact Dr. Jens-Uwe Kuhn, PS-217, (805) 730-4319.

Chemistry Courses

CHEM 101 — Introductory Chemistry

(4) — CSU, UC*

Skills Advisories: MATH 95 and Eligibility for ENG 98 and 103

Hours: 108 (54 lecture, 54 lab)

Introduction to Chemistry, with laboratory. Topics include atomic structure, matter and energy, the Periodic Table, chemical properties and reactions, nomenclature, behavior of gases, liquids and solids, intermolecular forces, acid-base chemistry and nuclear chemistry. Recommended for non-science majors as a science with a laboratory course or as a preparatory course for CHEM 155. (*UC Transfer Limit: CHEM 101 and 104 combined: maximum credit, one course; no credit for CHEM 101 or 104 if taken after 155)

CHEM 104 — Fundamentals of General, Organic and Biological Chemistry

(4) — CSU, UC*

Skills Advisories: MATH 95 and Eligibility for ENG 98 and 103

Hours: 108 (54 lecture, 54 lab)

Introduction to chemistry, with emphasis on chemical principles and their application to biological systems and processes. Approximately half of the semester covers general chemistry topics, with the remainder covering an introduction to organic chemistry topics and biochemistry topics. Recommended for non-science majors, especially those in the fields of allied health, nursing (ADN), and physical education. (*UC Transfer Limit: CHEM 101 and 104 combined: maximum credit, one course; no credit for CHEM 101 or 104 if taken after 155)

CHEM 155 — General Chemistry I

(5) — CSU, UC

Prerequisites: CHEM 101 or 104 or one year of high school chemistry and MATH 107 or 111

Skills Advisories: Eligibility for ENG 110 or 110H

Hours: 126 (72 lecture, 54 lab)

First semester of a two-semester General Chemistry course sequence. Includes laboratory. Topics include the structure of atoms and molecules, stoichiometry,

types of chemical bonding and chemical reactions, gas laws, molecular structure, acid-base chemistry, and thermodynamics. Laboratory focuses on collection and interpretation of data, and includes spectroscopy. Required for science, engineering and pre-dental and pre-medical majors.

**CHEM 156 — General Chemistry II
(5) — CSU, UC**

Skills Advisories: MATH 107 or 111 and Eligibility for ENG 110 or 110H

Hours: 126 (72 lecture, 54 lab)

Second semester of a two-semester General Chemistry course sequence. Includes laboratory. Topics include thermodynamics, chemical equilibrium, chemical kinetics, electrochemistry, and chemical applications. Laboratory focuses on collection and interpretation of data, and includes quantitative analysis and spectroscopy. Required for science, engineering and pre-dental and pre-medical majors.

**CHEM 211 — Organic Chemistry I
(3) — CSU, UC***

Prerequisites: CHEM 156

Skills Advisories: Eligibility for ENG 110 or 110H

Hours: 54 lecture

First semester of a two-semester Organic Chemistry course sequence. Topics cover the study of fundamental principles of organic chemistry and includes structure, functional groups, nomenclature, stereochemistry, organic reactions, syntheses and mechanisms, as well as spectroscopic methods. Intended for students in chemistry, chemical engineering, biology, pre-med, pre-dental and related programs. Concurrent enrollment in CHEM 221 recommended. (*UC Transfer Limit: CHEM 211 and 221 combined: maximum credit, 5 units)

**CHEM 212 — Organic Chemistry II
(3) — CSU, UC***

Prerequisites: CHEM 211

Skills Advisories: Eligibility for ENG 110 or 110H

Hours: 54 lecture

Second semester of a two-semester Organic Chemistry course sequence. Topics further study the fundamental principles of organic chemistry, with emphasis on organic syntheses and reaction mechanisms, as well as spectroscopic methods. Intended for students in chemistry, chemical engineering, biology, pre-med, pre-dental and related programs. Concurrent enrollment in CHEM 222

recommended. (*UC Transfer Limit: CHEM 212 and 222 combined: maximum credit, 5 units)

**CHEM 221 — Organic Chemistry Laboratory I
(2.3) — CSU, UC***

Corequisites: CHEM 211

Skills Advisories: Eligibility for ENG 110 or 110H

Hours: 90 (18 lecture, 72 lab)

First-semester Organic Chemistry laboratory. Focuses on organic chemistry laboratory techniques, including techniques of separation, purification and identification of organic compounds. Includes IR spectroscopy, distillation, crystallization, extraction, determination of physical properties and microscale techniques. (*UC Transfer Limit: CHEM 211 and 221 combined: maximum credit, 5 units)

**CHEM 222 — Organic Chemistry Laboratory II
(2.5) — CSU, UC***

Prerequisites: CHEM 221

Corequisites: CHEM 212

Skills Advisories: Eligibility for ENG 110 or 110H

Hours: 135 lab

Second-semester Organic Chemistry laboratory. Focuses on organic syntheses and corresponding organic chemistry laboratory techniques, including techniques of separation, purification and identification of organic compounds. Includes IR spectroscopy, NMR, distillation, crystallization, extraction, determination of physical properties and microscale techniques. (*UC Transfer Limit: CHEM 212 and 222 combined: maximum credit, 5 units)

**CHEM 299 — Independent Research in Chemistry
(1-4) — CSU**

Limitation on Enrollment: To be eligible for independent study, a student must have completed 12 units at SBCC with a GPA of 2.5 and a minimum of 4 units with a GPA of 3.0 in the Chemistry Department.

Skills Advisories: Eligibility for ENG 110 or 110H

Hours: 48-192 lecture

Independent, systematic research investigation of a problem in Chemistry. A final report on research conducted is required. For Chemistry students who are capable and interested in pursuing studies in Chemistry at a level beyond that covered in regular classes.