

# Chemistry

## Degree

Associate in Arts: Chemistry

## Program Description

From its obscure beginnings in alchemy and philosophy, chemistry has emerged as the central science in the modern world. 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.

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.

## 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

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

Chemistry Stockroom: Jill Bailard (PS-207, ext. 2254)

Tracy Reynolds (PS-207, ext. 3054)

## Faculty and Offices

Dr. Eric Bullock (PS-212, ext. 3639)

Dr. Sally Ghizzoni (PS-210, ext. 2799)

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

Dr. Raeanne Napoleon (PS-206, ext. 4056)

## Requirements for A.A. Degree: Chemistry

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

### Department Requirements (28.8 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

### 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](http://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.

## Department Resources

### Honors and Awards

#### *Outstanding Chemistry Students*

Each year the faculty of the Chemistry Department select a student from each of the chemistry courses who has clearly demonstrated academic excellence 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.

### 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, and a nuclear magnetic resonance spectrometer.

## Advising

In addition to the services provided by the college counselor 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) 965-0581, ext. 4319, or Oscar Zavala, Counselor, ext. 2403.

## Course Descriptions

### **CHEM 101 — Introductory Chemistry (4) — CSU, UC\***

*Skills Advisories: MATH 100 and Eligibility for ENG 100 and 103*

*Hours: 108 (54 lecture, 54 lab)*

Introduction to chemistry, with emphasis on modern concepts of atomic structure. Topics include properties and reactions, behavior of gases, electrochemistry and nuclear chemistry. Recommended for non-science majors and as a preparatory course for CHEM 155 (for those who have not had a previous chemistry course). Students must also enroll in a CHEM 101 lab.

*(\*UC Transfer Limit: CHEM 101 and 104 combined: maximum credit, one course; no credit for CHEM 101 or 104 if taken after CHEM 155)*

### **CHEM 104 — Fundamentals of General, Organic and Biological Chemistry (4) — CSU, UC\***

*Skills Advisories: MATH 100 and Eligibility for ENG 100 and 103*

*Hours: 108 (54 lecture, 54 lab)*

Introduction to chemistry, with special emphasis on chemical principles and their application to biological systems and processes. Topics include the composition and behavior of matter, atomic theory and chemical bonding, molecules and reactions of biological importance and radiochemistry. Includes approximately one-half of a semester on inorganic chemistry and the balance on organic and biochemistry. Recommended for non-science majors, especially those in the fields of physical education, home economics, nursing (ADN) and others that require a one-semester course in chemistry.

*(\*UC Transfer Limit: CHEM 101 and 104 combined: maximum credit, one course; no credit for CHEM 101 or 104 if taken after CHEM 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)

Structure of atoms and molecules, valence-bond and molecular orbital theory, stoichiometry, ionic and covalent bonding, VSEPR theory, states of matter, solutions. Emphasis on calculations. Laboratory emphasis on collection and interpretation of data and quantitative techniques: gravimetric, volumetric, colorimetric analysis. Required of science, engineering and pre-medical majors.

### **CHEM 156 — General Chemistry II**

**(5) — CSU, UC**

*Prerequisites:* CHEM 155, with a “C” or better

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

*Hours:* 126 (72 lecture, 54 lab)

Study of the nature of chemical reactions, kinetics, equilibrium, thermodynamics, electrochemistry, quantitative analysis, qualitative analysis and spectroscopy. Laboratory emphasis expanded to include use of spectrophotometers and pH meters. Required of science, engineering, pre-dental and pre-medical majors.

### **CHEM 201 — Preparation for Organic Chemistry**

**(2) — CSU**

*Prerequisites:* CHEM 155

*Hours:* 36 lecture

Designed for students planning to enroll in a one-year organic chemistry course. Limited in scope and intended to provide an introduction to some of the fundamental topics encountered in a college-level one-year organic chemistry course. Nomenclature, spectroscopy and reaction mechanisms. Not transferable to a four-year institution as an organic chemistry course nor does it fulfill any requirement at any school as an organic chemistry course.

### **CHEM 211 — Organic Chemistry I**

**(3) — CSU, UC\***

*Prerequisites:* CHEM 156, with a “C” or better

*Skills Advisories:* Eligibility for ENG 110 or 110H

*Hours:* 54 lecture

Study of fundamental principles of organic chemistry: structure, functional groups, stereochemistry,

nomenclature, reactions, synthesis and mechanisms. Introduction to spectroscopic methods. Intended for students in chemistry, chemical engineering, biology, pharmacy, chiropractic studies, agriculture, sanitation and pre-professional programs. Concurrent enrollment in CHEM 221 is recommended.

(\*UC Transfer Limit: CHEM 211 and 221 combined: maximum credit, 5 units)

### **CHEM 212 — Organic Chemistry II**

**(3) — CSU, UC\***

*Prerequisites:* CHEM 211 with a “C” or better

*Skills Advisories:* Eligibility for ENG 110 or 110H

*Hours:* 54 lecture

Further study of fundamental principles of organic chemistry. Emphasis on bonding, reactivity and mechanisms. Intended for students in chemistry, chemical engineering, biology, pharmacy, chiropractic studies, agriculture, sanitation and pre-professional programs. Concurrent enrollment in CHEM 222 is 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)

Techniques of separation, purification and identification of organic compounds. Emphasis on modern techniques and theoretical reasons behind these techniques. Introduction to IR 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

Techniques in synthesis and analysis of organic compounds. Interpretation of infrared and nuclear magnetic resonance data. Use of the literature of organic chemistry.

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