

CHEMISTRY AND BIOCHEMISTRY

Department of Chemistry and Biochemistry
School of Natural Sciences, Mathematics, and Engineering

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Program Description

Modern chemistry occupies a central position among the sciences. The goal of chemical science is to discover the fundamental regularities by which matter in its multitude of aggregations interacts with energy in its many forms. Mathematical models and physical principles are utilized in the interpretation of chemical concepts. The organization of chemical knowledge leads to an understanding of natural phenomena in the real world of earth and life sciences.

Biochemistry is a continuously advancing field, vitally important to modern life sciences such as agriculture, biology, microbiology, medicine, pharmacy, and veterinary science. This field studies life in all biological systems, i.e., human, animal, plant, microorganisms, and viruses at the molecular level. Biochemistry is the discipline that explains the structures and the activities of living things at a sub-microscopic level combining principles of biology, chemistry, and physics. Biochemical understanding has served as the basis for major developments in health sciences related research, and significantly contributed to the formation of the biotechnology industry. The emerging knowledge has resulted in a revolution of our understanding of life forces and will have a continuously increasing impact on society.

The departmental academic program is designed to provide essential preparation for students to pursue professional careers and/or advanced studies in chemistry or related disciplines, such as Agricultural Chemistry, Biochemistry, Clinical Chemistry, Environmental Chemistry, and Forensics Chemistry. The department offers course work for chemistry majors to meet the requirements of medical and other professional schools in the health sciences, including dentistry, pharmacy, and veterinary medicine. It also cooperates with other departments and the School of Social Sciences and Education in developing a balanced program of academic and professional preparation for chemistry majors who seek teaching credentials.

The Department of Chemistry is on the approved list of the American Chemical Society. A program leading to the chemistry major can be designed to meet the standards prescribed for the certificate of the American Chemical Society by its Committee on Professional Training.

The Department of Chemistry offers four tracks leading to a B.S. in Chemistry and two tracks leading to a B.S. in Biochemistry:

- Major in Chemistry
- Major in Chemistry with a Concentration in Management and Marketing
- Major in Chemistry with a Concentration in Occupational Safety and Health Management.
- Major in Chemistry Certified by the American Chemical Society
- Major in Biochemistry
- Major in Biochemistry with a Concentration in Food Science

Requirements for the Bachelor of Science Degree in Biochemistry

Total Units Required to Graduate	120 units
Major Requirements	72 units
Chemistry Courses	48 [#]
Cognates	24
Minor Requirement	0 units
General Education Requirements	39 units
First-Year Seminar	2
LD Area A Foundational Skills	9*
LD Area B Natural Sciences	0**
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	6
American Institutions	6
SELF	0***
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	6
Capstone	1
GWAR (Exam) or Class	0***
Additional Units	9 units

[#]6 upper division units may be in Biology

*Area A4 satisfied in cognate

**satisfied in major or cognate

***The SELF requirement is met by completing a LD Area B, C, or D course with a SELF component. The GWAR may be satisfied by exam.

Requirements for the Major in Biochemistry (73 units)

1. **Lower Division** (17 units)*
 - a. CHEM 1000, 1001, 1100, 1600, 2200, 2300, 2400, 2940 [Satisfies Areas B1]
2. **Upper Division** (32 units)*
 - a. CHEM 3300, 3301, 3310, 3311, 3400, 3401, 3650, 3940, 4400, 4401, 4948 (26 units)
 - b. 6 additional units of upper division coursework in Chemistry selected from the following list: CHEM 3100, 3500, 3610, 4010, 4020, 4100, 4101, 4110, 4120, 4121, 4410, 4420, 4500, 4510, 4700, 4800, 4830, 4900. This course work can be substituted with upper division course work in Biology with prior approval of the advisor.

3. **Cognates** (24 units)*
 - a. BIOL 2010, 2110 or 2120 (8 units) [Satisfies Area B2]
 - b. MATH 2010, 2020 or 2310, 2320 or 2510, 2520 (8 units) [Satisfies Area A4]
 - c. PHYS 2110, 2120 or 2210, 2220 (8 units)
- *The minimum GPA for these 72 units is 2.0*

Requirements for the Bachelor of Science Degree in Biochemistry with a Concentration in Food Science

Total Units Required to Graduate	120 units
Major Requirements	75 units
Chemistry Courses	47
Cognates	28
Minor Requirement	0 units
General Education Requirements	39 units
First-Year Seminar	2
LD Area A Foundational Skills	9*
LD Area B Natural Sciences	0**
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	6
American Institutions	6
SELF	0***
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	6
Capstone	1
GWAR (Exam) or Class	0***
Additional Units	6 units
*Area A4 satisfied in cognate	
**satisfied in major or cognate	
***The SELF requirement is met by completing a LD Area B, C, or D course with a SELF component. The GWAR may be satisfied by exam.	

Requirements for the Major in Biochemistry with a Concentration in Food Science (76 units)

1. **Lower Division** (18 units)*
 - a. CHEM 1000, 1001, 1100, 1600, 2200, 2300, 2400, 2500, and 2940 [Satisfies Areas B1]
 2. **Upper Division** (34 units)*
 - a. CHEM 3100 or 3500, 3300, 3301, 3400, 3401, 3650, 3940, 4400, 4500, 4510, 4850, and 4948 (30 units)
 - b. BIOL 3420 (4 units)
 3. **Cognates** (24 units)*
 - a. BIOL 2010, 2110 or 2120 (8 units) [Satisfies Area B2]
 - b. MATH 2010, 2020 or 2310, 2320 or 2510, 2520 (8 units) [Satisfies Area A4]
 - c. PHYS 2110, 2120 or 2210, 2220 (8 units)
- *The minimum GPA for these 75 units is 2.0*

Requirements for the Bachelor of Science Degree in Chemistry

Total Units Required to Graduate	120 units
Major Requirements	66 units
Chemistry Courses	50
Cognates	16

Minor Requirement	0 units
General Education Requirements	42 units
First-Year Seminar	2
LD Area A Foundational Skills	9*
LD Area B Natural Sciences	3**
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	6
American Institutions	6
SELF	0***
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	6
Capstone	1
GWAR (Exam) or Class	0***
Additional Units	12 units
*Area A4 satisfied in cognate	
**satisfied in major or cognate	
***The SELF requirement is met by completing a LD Area B, C, or D course with a SELF component. The GWAR may be satisfied by exam.	

Requirements for the Major in Chemistry (67 units)

1. **Lower Division** (17 units)*
 - a. CHEM 1000, 1001, 1100, 1600, 2200, 2300, 2400, 2900 [Satisfies Areas B1]
 2. **Upper Division** (34 units)*
 - a. CHEM 3100, 3300, 3301, 3310, 3311, 3600, 3610, 3900, 4200, 4908 (27 units)
 - b. CHEM 4100, 4110, 4101 (3 units)
 - c. A minimum of four additional units of upper division course work in Chemistry with pre-approval of academic advisor. (4 units)
 3. **Cognates** (16 units)*
 - a. MATH 2010, 2020 or 2310, 2320 or 2510, 2520 (8 units) [Satisfies Area A4]
 - b. PHYS 2110, 2120 or 2210, 2220 (8 units)
- *The minimum GPA for these 72 units is 2.0*

Requirements for the Bachelor of Science Degree in Chemistry with a Concentration in Management and Marketing

Total Units Required to Graduate	120 units
Major Requirements	72 units
Chemistry Courses	41*
Cognates	16
Concentration	15
Minor Requirement	0 units
General Education Requirements	42 units
First-Year Seminar	2
LD Area A Foundational Skills	9*
LD Area B Natural Sciences	3**
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	6
American Institutions	6
SELF	0***
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	6

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Capstone	1
GWAR (Exam) or Class	0***
Additional Units	6 units
*Area A4 satisfied in cognate	
**Area B1/B3 is satisfied in major or cognate	
***The SELF requirement is met by completing a LD Area B, C, or D course with a SELF component. The GWAR may be satisfied by exam.	

Requirements for the Major in Chemistry with a Concentration in Management and Marketing (72 units)

- Lower Division** (17 units)*
 - CHEM 1000, 1001, 1100, 1600, 2200, 2300, 2400, 2900 [Satisfies Areas B1]
- Upper Division** (39 units)*
 - CHEM 3100, 3300, 3301, 3600, 3610, 3900, 4100, 4101, 4200, 4908 (24 units)
- Cognates** (16 units)*
 - MATH 2010, 2020 or 2310, 2320 or 2510, 2520 (8 units) [Satisfies Area A4]**
 - PHYS 2110, 2120 or 2210, 2220 (8 units)
- Concentration in Management and Marketing** (15 units)*
 - Required Classes (9 units):
MGMT 3000, 3100, MKTG 3000
 - Elective Courses (minimum of two, patterns below just suggestions) (6 units)
 - *Management Focus:*
MGMT 3090, 4300
 - *Logistics/Operations Focus:*
MGMT 3020, MKTG 4060
 - *Marketing/Sales Focus:*
MKTG 3010, 3020

*The minimum GPA for these 72 units is 2.0

Requirements for the Bachelor of Science Degree in Chemistry with a Concentration in Occupational Safety and Health Management

Total Units Required to Graduate	120 units
Major Requirements	72 units
Chemistry Courses	41
Cognates	16
Concentration	15
Minor Requirement	0 units
General Education Requirements	42 units
First-Year Seminar	2
LD Area A Foundational Skills	9*
LD Area B Natural Sciences	3**
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	6
American Institutions	6
SELF	0**
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	6
Capstone	1
GWAR (Exam) or Class	0***

Additional Units	6 units
*Area A4 satisfied in cognate	
**Area B1/B3 is satisfied in major or cognate	
***The SELF requirement is met by completing a LD Area B, C, or D course with a SELF component. The GWAR may be satisfied by exam.	

Requirements for the Major in Chemistry with a Concentration in Occupational Safety and Health Management (105 units)

- Lower Division** (17 units)*
 - CHEM 1000, 1001, 1100, 1600, 2200, 2300, 2400, 2900 [Satisfies Areas B1]
- Upper Division** (24 units)*
 - CHEM 3100, 3300, 3301, 3600, 3610, 3900, 4100, 4101, 4200, and 4908 (24 units)
- Cognates** (16 units)*
 - MATH 2010, 2020 or 2310, 2320 or 2510, 2520 (8 units) [Satisfies Area A4]
 - PHYS 2110, 2120 or 2210, 2220 (8 units)
- Concentration in Occupational Safety and Health Management** (15 units)*

Required Classes:

 - ERM 3010, 3020, 3100, and 3200 (12 units)
 - PPA 4620 (3 units)

*The minimum GPA for these 72 units is 2.0

Requirements for the Bachelor of Science Degree in Chemistry Certified by the American Chemical Society

Total Units Required to Graduate	120 units
Major Requirements	72 units
Chemistry Courses	56
Cognates	16
Minor Requirement	0 units
General Education Requirements	42 units
First-Year Seminar	2
LD Area A Foundational Skills	9*
LD Area B Natural Sciences	3**
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	6
American Institutions	6
SELF	0**
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	6
Capstone	1
GWAR (Exam) or Class	0***
Additional Units	6 units

*Area A4 satisfied in cognate
 **Area B1/B3 is satisfied in major or cognate
 ***The SELF requirement is met by completing a LD Area B, C, or D course with a SELF component. The GWAR may be satisfied by exam.

Requirements for the Major in Chemistry Certified by the American Chemical Society (57 units)

1. **Lower Division** (17 units)*
 - a. CHEM 1000, 1001, 1100, 1600, 2200, 2300, 2400, 2900 [Satisfies Areas B1]
2. **Upper Division** (40 units)*
 - a. CHEM 3100, 3300, 3301, 3310, 3311, 3400, 3600, 3610, 3900, 4100, 4101, 4110, 4120, 4121, 4200, 4800, 4908 (37 units)
 - b. Three additional units of upper division course work in Chemistry selected with pre-approval of academic advisor. (3 units)
3. **Cognates** (16 units)*
 - a. MATH 2010, 2020 or 2310, 2320 or 2510, 2520 (8 units) [Satisfies Area A4]
 - b. PHYS 2110, 2120 or 2210, 2220 (8 units)

**The minimum GPA for these 72 units is 2.0*

Program Student Learning Objectives and Assessment

The student learning objectives for all chemistry degree options and the program assessment plan as well as assessment results are found at www.csub.edu/chemistry/assessment.

Requirements for the Minor in Chemistry

Although no minor is required for the BS degree, a minor in chemistry is available, consisting of 16 units, 8 of which must be in upper division courses taken at CSUB.

Teaching Credential: Science Teacher Preparation Program Leading to a Degree in Natural Sciences, Primary Concentration in Chemistry

The California Commission on Teacher Credentialing (CCTC) has authorized CSUB to offer a single subject matter preparation program in Natural Sciences leading to a Bachelor of Arts degree. This course work satisfies the subject matter requirements for a "Secondary Teaching Credential in Science." The program consists of three components: I. Primary Concentration (major); II. Secondary Concentration (minor); and III. Breadth (cognates). Program completion leads to a BA degree in Natural Sciences with a major in the area of primary concentration and a minor in the secondary concentration. Additional information may be obtained from the Chemistry Department office (661-654-2030).

For a detailed description of the course requirements, please turn to the Natural Sciences section in this catalog.

Academic Regulations

A grade of "C" in chemistry, cognate, and all other major courses is the minimal grade acceptable for progression into subsequent chemistry courses and for graduation. Students who fail to achieve at least a "C" may repeat the course. If a course is satisfactorily completed, the prior unsatisfactory grade will no longer bar a student from continuing in the Chemistry program. Credit, no-credit courses are not acceptable for the major or minor.