**Department of Chemistry**

**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 180 units**

**Major Requirements 113 units**

 Chemistry Courses 73\*

 Cognates 40

**Minor Requirement 0 units**

**Other University Requirements 67 units**

 CSUB 101 2

 American Institutions 5

 Area A 15

 Area B 0\*\*

 Area C 15

 Area D 15

 Theme 1 0\*\*

 Theme 2 5

 Theme 3 5

 GRE 5

 GWAR (Exam) or Class 0\*\*\*

 A minor is not required 0

\*15 upper division units may be in Biology

\*\*satisfied in major or cognate

\*\*\*GWAR requirement is fulfilled through exam.

**Additional Units 0 units**

**Requirements for the Major in Biochemistry (113 units)**

1. **Lower Division** (15 units)\*

 a. CHEM 211, 211L, 212, 212L, 213, 213L [Satisfies Areas B1 and B3]. *Prerequisite for CHEM 211: CHEM 101 or satisfactory score on Chemistry Placement Test.*

2. **Upper Division** (58 units)\*

 a. CHEM 331, 332, 333, 340, 365, 391, 440, 442, and 491 (40 units)

 b. 18 additional units of upper division course work in Chemistry selected from the following list (18 units): CHEM 300, 341, 350, 410, 421, 441, 451, 452, 453, 479, 471, 480. Up to 15 units of this course work can be substituted with upper division course work in Biology with prior approval of the advisor.

3. **Cognates** (40 units)\*

 a. BIOL 201, 202 and 203 (15 units) [Satisfies Area B2 and B3]

 b. MATH 201, 202 or MATH 211, 212 or MATH 231, 232 (10 units) [Satisfies Area B4]

 c. PHYS 201, 202, 203 (15 units)

*\*The minimum GPA for these 113 units is 2.0*

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

**Total Units Required to Graduate 180 units**

**Major Requirements 111 units**

 Chemistry Courses 68

 Cognates 43

**Minor Requirement 0 units**

**Other University Requirements 67 units**

 CSUB 101 2

 American Institutions 5

 Area A 15

 Area B 0\*

 Area C 15

 Area D 15

 Theme 1 0\*

 Theme 2 5

 Theme 3 5

 GRE 5

 GWAR (Exam) or Class 0\*\*

 A minor is not required 0

\*satisfied in major or cognate

\*\*GWAR requirement is fulfilled through exam

**Additional Units 2 units**

**Requirements for the Major in Biochemistry with a Concentration in Food Science (111 units)**

1. **Lower Division** (17 units)\*

 a. CHEM 211, 211L, 212, 212L, 213, 213L, 270 [Satisfies Areas B1 and B3]. *Prerequisite for CHEM 211: CHEM 101 or satisfactory score on Chemistry Placement Test.*

2. **Upper Division** (51 units)\*

 a. CHEM 331, 332, 340, 356, 365, 391, 440, 442, 470, 471 and 491 (46 units)

 b. BIOL 314 (5 units)

3. **Cognates** (43 units)\*

 a. BIOL 201, 202, 203, and 270 (18 units) [Satisfies Area B2 and B3]

 b. MATH 201, 202 or MATH 211, 212 or MATH 231, 232 (10 units) [Satisfies Area B4]

 c. PHYS 201, 202, 203 (15 units)

*\*The minimum GPA for these 111 units is 2.0*

**Requirements for the Bachelor of Science Degree in Chemistry**

**Total Units Required to Graduate 180 units**

**Major Requirements 93-96 units**

 Chemistry Courses 63

 Cognates 30-33

**Minor Requirement 0 units**

**Other University Requirements 72-77 units**

 CSUB 101 2

 American Institutions 5

 Area A 15

 Area B 5\*

 Area C 15

 Area D 15

 Theme 1 0\*

 Theme 2 5

 Theme 3 5

 GRE 5

 GWAR (Exam) or Class 0-5

 A minor is not required 0

\*everything but Area B2 satisfied in major and cognates

**Additional Units 7-15 units**

**Requirements for the Major in Chemistry (93-96 units)**

1. **Lower Division** (15 units)\*

 a. CHEM 211, 211L, 212, 212L, 213, 213L [Satisfies Areas B1 and B3]. *Prerequisite for CHEM 211: CHEM 101 or satisfactory score on Chemistry Placement Test.*

2. **Upper Division** (48 units)\*

 a. CHEM 331, 332, 350, 361, 362, 363, 390, and 490 (32 units)

 b. One course out of CHEM 421, 422 (4 units)

 c. Two courses out of CHEM 451, 452, 453 (6 units)

 d. A minimum of six additional units of upper division course work with pre-approval of academic advisor. (6 units)

3. **Cognates** (30 units)\*

 a. MATH 201, 202, 203 or MATH 211, 212, 203 or MATH 231, 232, 233 (15 units) [Satisfies Area B4]

 b. PHYS 201, 202, 203 or PHYS 221, 222, 223 (15–18 units)

*\*The minimum GPA for these 93-96 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 180–182 units**

**Major Requirements 105 units**

 Chemistry Courses 55\*

 Cognates 25

 Concentration 25

**Minor Requirement 0 units**

**Other University Requirements 72–77 units**

 CSUB 101 2

 American Institutions 5

 Area A 15

 Area B 5\*

 Area C 15

 Area D 15

 Theme 1 0\*

 Theme 2 5

 Theme 3 5

 GRE 5

 GWAR (Exam) or Class 0**–**5

 A minor is not required 0

\*satisfied in major or cognate

**Additional Units 0-3 units**

**Requirements for the Major in Chemistry with a Concentration in Management and Marketing (105 units)**

1. **Lower Division** (15 units)\*

 a. CHEM 211, 211L, 212, 212L, 213, 213L [Satisfies Areas B1 and B3]. *Prerequisite for CHEM 211: CHEM 101 or satisfactory score on Chemistry Placement Test.*

2. **Upper Division** (40 units)\*

 a. CHEM 331, 332, 340, 350, 361, 362, 390, and 490 (33 units)

 b. One course out of CHEM 421, 422 (4 units)

 c. One course out of CHEM 451, 452, 453 (3 units)

3. **Cognates** (25 units)\*

 a. MATH 211, 212 or MATH 201, 202 or MATH 231, 232 (10 units) [Satisfies Area B4]

 b. PHYS 201, 202, 203

4. **Concentration in Management and Marketing** (25 units)\*

 a. Required Classes:

 MGMT 300, 310, MKTG 300

 b. Elective Courses (minimum of two, patterns below just suggestions):

  *Management Focus:*

 MGMT 309, 430

  *Logistics/Operations Focus:*

 MGMT 302, MKTG 406

  *Marketing/Sales Focus:*

 MKTG 301, 302

*\*The minimum GPA for these 105 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 180 units**

**Major Requirements 103 units**

 Chemistry Courses 55

 Cognates 25

 Concentration 23

**Minor Requirement 0 units**

**Other University Requirements 72–77 units**

 CSUB 101 2

 American Institutions 5

 Area A 15

 Area B 5\*

 Area C 15

 Area D 15

 Theme 1 0\*

 Theme 2 5

 Theme 3 5

 GRE 5

 GWAR (Exam) or Class 0**–**5\*\*

 A minor is not required 0

\*satisfied in major or cognate

\*\*GWAR requirement is fulfilled through exam.

**Additional Units 0-5 units**

**Requirements for the Major in Chemistry with a Concentration in Occupational Safety and Health Management (103 units)**

1. **Lower Division** (15 units)\*

 a. CHEM 211, 211L, 212, 212L, 213, 213L [Satisfies Areas B1 and B3]. *Prerequisite for CHEM 211: CHEM 101 or satisfactory score on Chemistry Placement Test.*

2. **Upper Division** (40 units)\*

 a. CHEM 331, 332, 340, 350, 361, 362, 390, and 490 (33 units)

 b. One course out of CHEM 421, 422 (4 units)

 c. One course out of CHEM 451, 452, 453 (3 units)

3. **Cognates** (25 units)\*

 a. MATH 211, 212 or MATH 201, 202 or MATH 231, 232 (10 units) [Satisfies Area B4]

 b. PHYS 201, 202, 203

4. **Concentration in Area Energy Occupational Safety and Health Management** (23 units)\*

 Required Classes:

 a. ERM 301, 302, 310, and 320 (18 units)

 b. PPA 475

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

**Total Units Required to Graduate 180 units**

**Major Requirements 105–108 units**

 Chemistry Courses 75

 Cognates 30–33

**Minor Requirement 0 units**

**Other University Requirements 72 units**

 CSUB 101 2

 American Institutions 5

 Area A 15

 Area B 5\*

 Area C 15

 Area D 15

 Theme 1 0\*

 Theme 2 5

 Theme 3 5

 GRE 5

 GWAR (Exam) or Class 0\*\*

 A minor is not required 0

\*everything but Area B2 satisfied in major

\*\*GWAR requirement is fulfilled through exam

**Additional Units 0-3 units**

**Requirements for the Major in Chemistry Certified by the American Chemical Society (105-108 units)**

1. **Lower Division** (15 units)\*

 a. CHEM 211, 211L, 212, 212L, 213, 213L [Satisfies Areas B1 and B3]. *Prerequisite for CHEM 211: CHEM 101 or satisfactory score on Chemistry Placement Test*

2. **Upper Division** (60 units)\*

 a. CHEM 331, 332, 333, 340, 350, 361, 362, 363, 390, 451, 452, 453, and 490 (51 units)

 b. One course out of CHEM 421, 422 (4 units)

 c. Five additional units of upper division course work selected with pre-approval of academic advisor (5 units)

3. **Cognates** (30 units)+

 a. MATH 201, 202, 203 or MATH 211, 212, 203 or MATH 231, 232, 233 (15 units) [Satisfies Area B4]

 b. PHYS 201, 202, 203 or PHYS 221, 222, 223 (15–18 units)

*\*The minimum GPA for these 105 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 20 units, 10 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 (661-654-3027).

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 as well as cognate courses is the minimal grade acceptable for progression into subsequent chemistry courses. 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.