

BIOCHEMISTRY, BS

Natural Sciences, Mathematics, and Engineering (nsme) (<https://catalog.csub.edu/general-information/csub-information/school-natural-sciences-mathematics-engineering/>)

Department of Chemistry and Biochemistry (<https://catalog.csub.edu/general-information/csub-information/school-natural-sciences-mathematics-engineering/department-chemistry-biochemistry/>)

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www.csub.edu/Chemistry (<http://www.csub.edu/Chemistry/>)

Program Maps for Natural Sciences, Mathematics, and Engineering (<https://programmmap.csub.edu/academics/interest-clusters/4e942a6e-b8e4-4b60-a1ae-334235acc581/>)

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.

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.

General Chemistry and Transfer Students

Students who have taken a full year of general chemistry and then transfer to CSUB will typically receive credit for CHEM 1000, 1001, 1100, and 1600. However, topics in CHEM 1100 and CHEM 1600 are covered in greater depth than in a typical general chemistry course and some students elect to take one or both courses even after completing general chemistry.

Academic Regulations

A grade of "C" in chemistry, cognate, and all other major/minor 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.

Program Requirements

Code	Title	Units
General Education Requirements		
	First-Year Seminar (FYS)	2
	Lower Division Area A: Foundational Skills	9
	Lower Division Area B: Natural Sciences ²	0
	Lower Division Area C: Arts and Humanities	6
	Lower Division Area D: Social and Behavioral Sciences	3
	Lower Division Area E: Student Enrichment and Lifelong Learning (SELF) ⁷	0
	Lower Division Area F: Ethnic Studies	3
	American Institutions: Government and History	6
	Junior Year Diversity & Reflection (JYDR)	3
	Graduation Writing Assessment Requirement (GWAR) ⁸	0
	Upper Division Thematic Area C and D	6
	General Education Capstone ²	0
	<i>General Education Subtotal</i>	38
Major Requirements¹		
	<i>Lower Division²</i>	
CHEM 1000	Foundations of Chemistry	3

CHEM 1001	Foundations of Chemistry Laboratory	2	CHEM 4800	Honors Research	
CHEM 1100	Foundations of Analytical Chemistry	2	CHEM 4830	Instruction in Chemistry	
CHEM 1600	Foundations of Physical Chemistry	2	<i>Cognates</i> ²		
CHEM 2200	Foundations of Inorganic Chemistry	2	Biology ⁴		
or CHEM 2240	Foundations of Bioinorganic Chemistry		BIOL 2010	Introductory Biology - Cells	4
CHEM 2300	Foundations of Organic Chemistry	3	BIOL 2110	Introductory Biology - Animals	4
CHEM 2400	Foundations of Biochemistry	2	or BIOL 2120	Introductory Biology - Plants	
CHEM 2940	Research Methods in Biochemistry ³	2	Mathematics ⁵		
<i>Upper Division</i> ²			Select one of the following:		
CHEM 3300	Intermediate Organic Chemistry	3	MATH 2010	Calculus for the Biological and Chemical Sciences & MATH 2020 I	8
CHEM 3301	Organic Chemistry Laboratory I	2	and Calculus for Biological & Chemical Sciences II		
CHEM 3310	Advanced Organic Chemistry	2	MATH 2310	Single Variable Calculus I for Engineers	
CHEM 3311	Organic Chemistry Laboratory II	2	& MATH 2320	and Single Variable Calculus II for Engineers	
CHEM 3400	Biochemistry of Metabolic Pathways	2	MATH 2510	Single Variable Calculus I	
CHEM 3401	Biochemistry Laboratory I	2	& MATH 2520	and Single Variable Calculus II	
CHEM 3600	Physical Chemistry: Thermodynamics and Kinetics	3	Physics ⁶		
CHEM 3948	Seminar in Biochemical Literature	3	Select one of the following:		
CHEM 4400	Biochemistry of Nucleic Acids	2	PHYS 2110	College Physics I	8
CHEM 4401	Biochemistry Laboratory II	2	& PHYS 2120	and College Physics II	
CHEM 4948	Senior Seminar in Biochemistry	3	PHYS 2210	Physics for Scientists and Engineers I	
Select two of the following:			& PHYS 2220	and Physics for Scientists and Engineers II	
BIOL 3010	General Genetics	6	<i>Major Subtotal</i>		
BIOL 3020	General Physiology		74		
BIOL 3220	Human Pathophysiology		Additional Units Needed Towards Graduation		
BIOL 3410	General Microbiology		7-8		
BIOL 3420	Food Microbiology		Total Units		
BIOL 3530	Immunology		119-120		
BIOL 3540	Hematology				
BIOL 3550	Advanced Human Physiology				
BIOL 4100	Evolution				
BIOL 4200	Medical Microbiology				
BIOL 4440	Molecular Genetics				
BIOL 4450	Genomics and Bioinformatics				
BIOL 4460	Evolutionary Genetics				
CHEM 3110	Advanced Quantitative Chemical Analysis				
CHEM 3500	Concepts of Food Analysis				
CHEM 3510	Food Science				
CHEM 3610	Physical Chemistry: Quantum and Statistical Mechanics				
CHEM 4010	Symmetry and Group Theory				
CHEM 4020	Computational Chemistry				
CHEM 4100	Chemical Separations				
CHEM 4101	Chemical Separations Laboratory				
CHEM 4110	Spectroscopy				
CHEM 4120	Nuclear Magnetic Resonance				
CHEM 4121	Spectroscopy Laboratory				
CHEM 4200	Inorganic Chemistry				
CHEM 4410	Protein Chemistry				
CHEM 4420	Plant Biochemistry				
CHEM 4500	Food Chemistry				
CHEM 4510	Advanced Nutrition and Metabolism				
CHEM 4700	Special Topics in Chemistry				

¹ The minimum GPA for these 74-75 units is 2.0

² Satisfied in major or cognate

³ Satisfies Area B1

⁴ Satisfies Area B2/B3

⁵ Satisfies Area B4

⁶ Satisfies Area B1/B3

⁷ The SELF requirement is met by completing a LD Area C, or D course with a SELF component.

⁸ Can be satisfied by exam.