

BS IN BIOCHEMISTRY

Units required for Major: 81-85

Total units required for BS: 120

Program Description

The Bachelor of Science degrees are recommended for students intending to pursue graduate work in Chemistry or Biochemistry or those desiring a strong technical background for work in the chemical or biotechnology industry or other highly technical areas.

Safety

Due to the potential hazards some chemicals may present, safety is an essential element of all Chemistry laboratory classes, including independent research. All students must adhere to the Department of Chemistry Laboratory Safety Policies (<https://www.csus.edu/college/natural-sciences-mathematics/internal/safety/>). Failure to adhere to the Safety Policies may constitute grounds for withdrawal from a course and/or dismissal from the program.

Advising

The Department believes advising of students is an important function. Members of the Chemistry Department who have a strong interest in advising have been selected to serve as advisors for students wishing to major in chemistry. Each represents a particular area of chemistry: analytical, inorganic, biochemistry, organic, and physical. Each Chemistry major will be assigned to one of these advisors when entering the Chemistry Department, coordinated to the area of each student's expressed interest.

Prerequisite Requirements

When enrolling in a course, it is required that the student will have met the specific prerequisites listed. A course listed as a prerequisite may have its own set of prerequisites. All must be met prior to enrolling in a chemistry course. Students not meeting the prerequisite requirements for a course will be administratively removed from the class.

Minimum Grade Requirements


In all courses required for the Chemistry major and minor, a minimum grade of "C-" must be earned with the exception of CHEM 1A which requires a grade of C or better. A minimum grade of "C-" is required in all prerequisite courses with the exception of CHEM 1A which requires a grade of C or better to meet the prerequisite requirement for CHEM 1B if a student has not achieved a "C-" in all prerequisite courses for a particular chemistry course, the instructor of the course will administratively remove the student from class.

Transfer Majors and Minors

Transfer students majoring in Chemistry must complete at least three of the required courses in chemistry while fulfilling the residence requirements of California State University, Sacramento. Transfer students seeking a minor in Chemistry must complete at least one upper division chemistry course at the University.

Note: Students graduating with a Bachelor of Science Degree in Biochemistry will not be subject to the University's Foreign Language Graduation Requirement. Students who change major may be subject to the University's Foreign Language Graduation Requirement.

Program Requirements

Code	Title	Units
Required Lower Division Courses (46-50 Units)		
BIO 1	Biodiversity, Evolution and Ecology ¹	5
BIO 2	Cells, Molecules and Genes	5
CHEM 1A	General Chemistry I ^{1,2}	5
CHEM 1B	General Chemistry II	5
CHEM 24	Organic Chemistry Lecture I	3
CHEM 25	Organic Chemistry Laboratory	3
CHEM 31	Quantitative Analysis	4
MATH 30	Calculus I ¹	4
MATH 31	Calculus II	4
Select one of the following sequences:		8 -
		12
PHYS 5A & PHYS 5B	General Physics: Mechanics, Heat, Sound General Physics: Light, Electricity and Magnetism, Modern Physics	
PHYS 11A & PHYS 11B & PHYS 11C	General Physics: Mechanics General Physics: Heat, Light, Sound, Modern Physics General Physics: Electricity and Magnetism	
Required Upper Division Courses (29 Units)		
BIO 184	General Genetics	4
CHEM 124	Organic Chemistry Lecture II	3
CHEM 125	Advanced Organic Chemistry Laboratory	3
CHEM 141	Physical Chemistry Laboratory	3
CHEM 142	Introduction to Physical Chemistry	4
CHEM 160A	Structure and Function of Biological Molecules	3
CHEM 160B	Metabolism and Regulation of Biological Systems	3
CHEM 162	General Biochemistry Laboratory	3
CHEM 164	Advanced Biochemistry Laboratory	3
Upper Division Elective Courses (6 Units)		
Select 3 units of Chemistry from approved list:		3
CHEM 110	Inorganic Chemistry Lecture	
CHEM 126	Physical Organic Chemistry	
CHEM 128	Organic Synthesis	
CHEM 133	Chemical Instrumentation	
CHEM 145	Applications of Computational Chemistry	
CHEM 198	Senior Research	
CHEM 250	Selected Topics in Chemistry	
CHEM 260	Protein Biochemistry	
CHEM 261	Nucleic Acid Chemistry	
Select 3 units of Biological Sciences from approved list:		3
BIO 121	Molecular Cell Biology	
BIO 139	General Microbiology	
BIO 144	Pathogenic Bacteriology	
BIO 149A	Immunology	
BIO 149B	Immunology and Serology Laboratory	
BIO 180	Molecular Biology Research Experience	
BIO 220	Introduction to Scientific Inquiry 	
BIO 222	Molecular Biology	
Total Units		81-85

¹ Course also satisfies General Education (GE)/Graduation Requirement.

² Passing a placement exam or obtaining a passing grade of "C" or better in CHEM 4 is required to enroll in CHEM 1A.

General Education Requirements ¹

Code	Title	Units
Area A: Basic Subjects (9 Units)		
A1	Oral Communication	3
A2	Written Communication	3
A3	Critical Thinking	3
Area B: Physical Universe and Its Life Forms (3 Units)		
B1	Physical Science ²	0
B2	Life Forms ²	0
B3	Lab (Note: Lab experience to be taken with one of the following: B1, B2 or B5) ²	0
B4	Math Concepts ²	0
B5	Additional Course (Any B to reach 12 units) - Take upper-division course to complete Area & upper division requirements.	3
Area C: Arts and Humanities (12 Units)		
C1	Arts	3
C2	Humanities	3
C1/C2	Area C Course	3
C1/C2	Area C Course - Take upper-division course to complete Area & upper division requirements.	3
Area D: The Individual and Society (9 Units)		
Area D Course		3
Area D Course		3
Area D Course	- Take upper-division course to complete Area & upper division requirements.	3
Area E: Understanding Personal Development (3 Units)		
Area E Course		3
Area F: Ethnic Studies (3 Units)		
Area F Course		3
Total Units		39

¹ To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (<https://catalog.csus.edu/colleges/academic-affairs/general-education/>).

Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (<http://www.csus.edu/acad/>), by phone (916) 278-1000, or email (advising@csus.edu).

² Required in Major; also satisfies GE.

Graduation Requirements ¹

Code	Title	Units
Graduation Requirements (required by CSU) (9 Units)		
American Institutions: U.S. History		3
American Institutions: U.S. Constitution & CA Government		3
Writing Intensive (WI)		3
Graduation Requirements (required by Sacramento State) (6 Units)		

English Composition II	3
Race and Ethnicity in American Society (RE)	3
Foreign Language Proficiency Requirement ²	0

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Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (<http://www.csus.edu/acad/>), by phone (916) 278-1000, or email (advising@csus.edu).

² If not satisfied before entering Sacramento State, it may be satisfied in General Education Area C2 (Humanities). "C- or better required." The alternative methods for satisfying the Foreign Language Proficiency Requirement are described here: <https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html>
Note: Students with a declared major of BS in Biochemistry are exempt from the Foreign Language Graduation Requirement.

The following roadmaps are sample planning resources. Please consult your academic advisor and Academic Catalog for graduation requirements as you develop your individualized academic plan.

Biochemistry, BS: 4-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 30	Calculus I	4
GE Area 1A - English Composition ²		3
GE Area 1C - Oral Communication ²		3
GE Area 6 - Ethnic Studies ²		3
GE Area 3B - Humanities ²		3
Units		16
Second Semester		
CHEM 1A	General Chemistry I	5
MATH 31	Calculus II	4
GE Area 1B - Critical Thinking ²		3
GE Area 4 - Social & Behavioral Sciences ²		3
Units		15
Year 2		
First Semester		
BIO 1	Biodiversity, Evolution and Ecology	5
CHEM 1B	General Chemistry II	5
GE Area 3A - Arts ²		3
Foreign Language Semester 1 ²		4
Units		17
Second Semester		
BIO 2	Cells, Molecules and Genes	5
CHEM 24	Organic Chemistry Lecture I	3
ENGL 20	College Composition II	3
Foreign Language Semester 2 ²		4
Units		15
Year 3		
First Semester		
CHEM 25	Organic Chemistry Laboratory	3
CHEM 31	Quantitative Analysis	4
CHEM 124	Organic Chemistry Lecture II	3

PHYS 5A	General Physics: Mechanics, Heat, Sound	4
GR American Institutions (US History) ²		3

Units	17
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Second Semester

BIO 184	General Genetics	4
CHEM 125	Advanced Organic Chemistry Laboratory	3
PHYS 5B	General Physics: Light, Electricity and Magnetism, Modern Physics	4
GR American Institutions (GOVT) ²		3

Units	14
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Year 4**First Semester**

CHEM 142	Introduction to Physical Chemistry	4
CHEM 160A	Structure and Function of Biological Molecules	3
CHEM 162	General Biochemistry Laboratory	3
BIO Elective ³		3
Upper Division GE Area 4 - Social & Behavioral Sciences ²		3

Units	16
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Second Semester

CHEM 141	Physical Chemistry Laboratory	3
CHEM 160B	Metabolism and Regulation of Biological Systems	3
CHEM 164	Advanced Biochemistry Laboratory	3
CHEM Elective ³		3
Upper Division GE Area 3 - Arts or Humanities + Writing Intensive ²		3

Units	15
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Total Units	125
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Biochemistry, BS: 2-Year Roadmap

Course	Title	Units
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Year 1**First Semester**

CHEM 25	Organic Chemistry Laboratory	3
CHEM 124	Organic Chemistry Lecture II	3
Foreign Language Semester 1 ²		4
GR American Institutions (US History) ²		3
Elective of Choice		3

Units	16
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Second Semester

BIO 184	General Genetics	4
CHEM 125	Advanced Organic Chemistry Laboratory	3
Foreign Language Semester 2 ²		4
GR American Institutions (GOVT) ²		3

Units	14
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Year 2**First Semester**

CHEM 142	Introduction to Physical Chemistry	4
CHEM 160A	Structure and Function of Biological Molecules	3
CHEM 162	General Biochemistry Laboratory	3
BIO Elective ³		3
Upper Division GE Area 4 - Social & Behavioral Sciences ²		3

Units	16
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Second Semester

CHEM 141	Physical Chemistry Laboratory	3
CHEM 160B	Metabolism and Regulation of Biological Systems	3
CHEM 164	Advanced Biochemistry Laboratory	3

CHEM Elective ²		3
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Upper Division GE Area 3 - Arts or Humanities + Writing Intensive ²		3
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Units	15
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Total Units	61
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1. Any course not completed in the first semester should be taken in the second or a later semester.

2. Please see General Education/Graduation Requirement **course options** (https://www.csus.edu/academic-affairs/curriculum-%20workflow/_internal/_documents/program-road-maps/als_2yr/art_transfer-%20roadmap-2024-25.pdf).

3. Please see an academic advisor for elective options.