

# BA IN CHEMISTRY (BIOCHEMISTRY)

Units required for Major: 64-77  
Total units required for BA: 120

## Program Description

Three BA programs are available: One without a concentration (general) and two with concentrations (Biochemistry or Forensic Chemistry). The common requirements of the three programs are shown below under "Core Requirements."

### 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.

## Program Requirements

Code	Title	Units
<b>Core Requirements (39-43 Units)</b>		
CHEM 1A	General Chemistry I <sup>1,2</sup>	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
CHEM 124	Organic Chemistry Lecture II	3
MATH 30	Calculus I <sup>1</sup>	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	
<b>Total Units</b>		<b>39-43</b>

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

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

## Concentration in Biochemistry (32-34 units)

Code	Title	Units
BIO 1	Biodiversity, Evolution and Ecology <sup>1</sup>	5
BIO 2	Cells, Molecules and Genes	5
Select one of the following:		4 -
		6
CHEM 140A & CHEM 140B	Physical Chemistry Lecture I Physical Chemistry Lecture II	
CHEM 142	Introduction to Physical Chemistry	
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
Select 6 units of Electives in Biological Sciences (must be from the following courses):		6
BIO 121	Molecular Cell Biology	
BIO 131	Systemic Physiology	
BIO 139	General Microbiology	
BIO 180	Molecular Biology Research Experience	
BIO 184	General Genetics	
<b>Total Units</b>		<b>32-34</b>

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

**Note:** Students may also complete a BA with a concentration in Biochemistry by taking the general BA curriculum and completing the following additional courses:

Code	Title	Units
BIO 1	Biodiversity, Evolution and Ecology	5
BIO 2	Cells, Molecules and Genes	5
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
Select 6 units of upper division Biology courses from the approved list		6
<b>Total Units</b>		<b>28</b>

## General Education Requirements <sup>1</sup>

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

<sup>1</sup> 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](mailto:advising@csus.edu)).

<sup>2</sup> Required in Major; also satisfies GE.

## Graduation Requirements <sup>1</sup>

Code	Title	Units
<b>Graduation Requirements (required by CSU) (9 Units)</b>		
American Institutions: U.S. History		3
American Institutions: U.S. Constitution & CA Government		3
Writing Intensive (WI)		3
<b>Graduation Requirements (required by Sacramento State) (12 Units)</b>		
English Composition II		3
Race and Ethnicity in American Society (RE)		3
Foreign Language Proficiency Requirement <sup>2</sup>		6

<sup>1</sup> 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/>).

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<sup>2</sup> 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> (<https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html>)

*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.*

## Chemistry (Biochemistry), BA: 4-Year Roadmap

Course	Title	Units
<b>Year 1</b>		
<b>First Semester</b>		
MATH 30	Calculus I	4
GE Area 1A - English Composition <sup>2</sup>		3
GE Area 1C - Oral Communication <sup>2</sup>		3
GE Area 3B - Humanities <sup>2</sup>		3
GR American Institutions (GOVT) <sup>2</sup>		3
<b>Units</b>		<b>16</b>
<b>Second Semester</b>		
CHEM 1A	General Chemistry I	5
MATH 31	Calculus II	4
GE Area 1B - Critical Thinking <sup>2</sup>		3
GE Area 6 - Ethnic Studies <sup>2</sup>		3
<b>Units</b>		<b>15</b>
<b>Year 2</b>		
<b>First Semester</b>		
CHEM 1B	General Chemistry II	5
ENGL 20	College Composition II	3
GE Area 3A - Arts <sup>2</sup>		3
GR American Institutions (US History) <sup>2</sup>		3
<b>Units</b>		<b>14</b>
<b>Second Semester</b>		
CHEM 24	Organic Chemistry Lecture I	3
CHEM 31	Quantitative Analysis	4

PHYS 5A or PHYS 11A	General Physics: Mechanics, Heat, Sound <sup>3</sup> or General Physics: Mechanics	4
GE Area 4 - Social & Behavioral Sciences <sup>2</sup>		3
<b>Units</b>		<b>14</b>

**Year 3****First Semester**

BIO 1	Biodiversity, Evolution and Ecology	5
CHEM 124	Organic Chemistry Lecture II	3
PHYS 5B or PHYS 11C or PHYS 11B	General Physics: Light, Electricity and Magnetism, Modern Physics <sup>3</sup> or General Physics: Electricity and Magnetism or General Physics: Heat, Light, Sound, Modern Physics	4
Foreign Language Semester 1 <sup>2</sup>		4
<b>Units</b>		<b>16</b>

**Second Semester**

BIO 2	Cells, Molecules and Genes	5
CHEM 25	Organic Chemistry Laboratory	3
CHEM 142 or CHEM 140A or CHEM 140B	Introduction to Physical Chemistry <sup>3</sup> or Physical Chemistry Lecture I or Physical Chemistry Lecture II	3 - 4
Foreign Language Semester 2 <sup>2</sup>		4
<b>Units</b>		<b>15-16</b>

**Year 4****First Semester**

BIO 121 or BIO 131 or BIO 139 or BIO 180 or BIO 184	Molecular Cell Biology <sup>3</sup> or Systemic Physiology or General Microbiology or Molecular Biology Research Experience or General Genetics	3 - 4
CHEM 125	Advanced Organic Chemistry Laboratory	3
CHEM 160A	Structure and Function of Biological Molecules	3
CHEM 162	General Biochemistry Laboratory	3
Upper Division GE Area 3 - Arts or Humanities <sup>2</sup>		3
<b>Units</b>		<b>15-16</b>

**Second Semester**

BIO 131 or BIO 121 or BIO 139 or BIO 180 or BIO 184	Systemic Physiology <sup>3</sup> or Molecular Cell Biology or General Microbiology or Molecular Biology Research Experience or General Genetics	3 - 4
CHEM 160B	Metabolism and Regulation of Biological Systems	3
CHEM 164	Advanced Biochemistry Laboratory	3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive <sup>2</sup>		3
Elective of Choice		3
<b>Units</b>		<b>15-16</b>
<b>Total Units</b>		<b>120-123</b>

**Chemistry (Biochemistry), BA: 2-Year Roadmap**

Course	Title	Units
<b>Year 1</b>		
<b>First Semester</b>		
BIO 1	Biodiversity, Evolution and Ecology	5
CHEM 124	Organic Chemistry Lecture II	3
Foreign Language Semester 1 <sup>2</sup>		4
GR American Institutions (GOVT) <sup>2</sup>		3
<b>Units</b>		<b>15</b>
<b>Second Semester</b>		
BIO 2	Cells, Molecules and Genes	5
CHEM 25	Organic Chemistry Laboratory	3
CHEM 142 or CHEM 140A or CHEM 140B	Introduction to Physical Chemistry <sup>3</sup> or Physical Chemistry Lecture I or Physical Chemistry Lecture II	3 - 4
Foreign Language Semester 2 <sup>2</sup>		4
<b>Units</b>		<b>15-16</b>
<b>Year 2</b>		
<b>First Semester</b>		
BIO 121 or BIO 131 or BIO 139 or BIO 180 or BIO 184	Molecular Cell Biology <sup>3</sup> or Systemic Physiology or General Microbiology or Molecular Biology Research Experience or General Genetics	3 - 4
CHEM 125	Advanced Organic Chemistry Laboratory	3
CHEM 162	General Biochemistry Laboratory	3
CHEM 160A	Structure and Function of Biological Molecules	3
Upper Division GE Area 3 - Arts or Humanities <sup>2</sup>		3
<b>Units</b>		<b>15-16</b>
<b>Second Semester</b>		
BIO 131 or BIO 121 or BIO 139 or BIO 180 or BIO 184	Systemic Physiology <sup>3</sup> or Molecular Cell Biology or General Microbiology or Molecular Biology Research Experience or General Genetics	3 - 4
CHEM 160B	Metabolism and Regulation of Biological Systems	3
CHEM 164	Advanced Biochemistry Laboratory	3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive <sup>2</sup>		3
GR American Institutions (US History) <sup>2</sup>		3
<b>Units</b>		<b>15-16</b>
<b>Total Units</b>		<b>60-63</b>

- Any course not completed in the first semester should be taken in the second or a later semester.
- Please see General Education/Graduation Requirement **course options** ([https://www.csus.edu/academic-affairs/curriculum-workflow/\\_internal/\\_documents/program-road-maps/als\\_2yr/art\\_transfer-roadmap-2024-25.pdf](https://www.csus.edu/academic-affairs/curriculum-workflow/_internal/_documents/program-road-maps/als_2yr/art_transfer-roadmap-2024-25.pdf)).
- Please see an academic advisor for elective options.