

BS IN CHEMISTRY

Units required for Major: 77

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. The BS Chemistry degree is approved by the American Chemical Society.

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 (44 Units)		
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 ²	4
MATH 31	Calculus II	4
MATH 32	Calculus III	4
PHYS 11A	General Physics: Mechanics	4
PHYS 11B	General Physics: Heat, Light, Sound, Modern Physics	4
PHYS 11C	General Physics: Electricity and Magnetism	4
Required Upper Division Courses (33 Units)		
CHEM 110 & 110L	Inorganic Chemistry Lecture Advanced Inorganic Chemistry Laboratory	5
CHEM 124	Organic Chemistry Lecture II	3
CHEM 125	Advanced Organic Chemistry Laboratory	3
CHEM 133	Chemical Instrumentation	4
CHEM 140A	Physical Chemistry Lecture I	3
CHEM 140B	Physical Chemistry Lecture II	3
CHEM 141	Physical Chemistry Laboratory	3
CHEM 161	General Biochemistry	3
OR		
CHEM 160A & CHEM 160B	Structure and Function of Biological Molecules Metabolism and Regulation of Biological Systems ³	6
Select additional courses from the following to a minimum of 33 upper division units in Chemistry. Elective courses should be selected in consultation with an advisor:		6
CHEM 126	Physical Organic Chemistry	
CHEM 128	Organic Synthesis	
CHEM 145	Applications of Computational Chemistry	
CHEM 160B	Metabolism and Regulation of Biological Systems	
CHEM 162	General Biochemistry Laboratory	
CHEM 164	Advanced Biochemistry Laboratory	
CHEM 198	Senior Research	
Total Units		77

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

² Course also satisfies General Education (GE)/Graduation Requirement.

³ Students taking CHEM 160A to fulfill the Biochemistry requirement MUST take BOTH CHEM 160A AND CHEM 160B.

Notes:

- An appropriate upper division mathematics or physics course may be used to fulfill Chemistry elective units (department permission required).

- Graduate courses (excepting CHEM 200, CHEM 299 and CHEM 500) may be used to fulfill Chemistry elective units (department permission required).

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 (6 Units)		
B1	Physical Science ²	0
B2	Life Forms	3
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		42

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 Chemistry 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.

Chemistry, BS: 4-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
CHEM 1A	General Chemistry I	5
MATH 30	Calculus I	4
GE Area 1A - English Composition ²		3
GE Area 4 - Social & Behavioral Sciences ²		3
Units		15
Second Semester		
CHEM 1B	General Chemistry II	5
MATH 31	Calculus II	4
PHYS 11A	General Physics: Mechanics	4
GE Area 1C - Oral Communication ²		3
Units		16
Year 2		
First Semester		
CHEM 24	Organic Chemistry Lecture I	3
MATH 32	Calculus III	4
PHYS 11C	General Physics: Electricity and Magnetism	4
GE Area 1B - Critical Thinking ²		3
Units		14
Second Semester		
CHEM 25	Organic Chemistry Laboratory	3
CHEM 31	Quantitative Analysis	4
CHEM 124	Organic Chemistry Lecture II	3
ENGL 20	College Composition II	3
GE Area 6 - Ethnic Studies ²		3
Units		16
Year 3		
First Semester		
CHEM 125	Advanced Organic Chemistry Laboratory	3
CHEM 140A	Physical Chemistry Lecture I	3
PHYS 11B	General Physics: Heat, Light, Sound, Modern Physics	4

GE Area 3A - Arts ²	3
Elective of Choice	3
Units	16

Second Semester

CHEM 140B	Physical Chemistry Lecture II	3
CHEM 141	Physical Chemistry Laboratory	3
GE Area 3B - Humanities ²		3
GE Area 5B - Biological Science (BIO 10 recommended) ²		3
GR American Institutions (US History) ²		3
Units		15

Year 4**First Semester**

CHEM 110	Inorganic Chemistry Lecture	3
CHEM 110L	Advanced Inorganic Chemistry Laboratory	2
CHEM 161	General Biochemistry	3
CHEM BS Upper Division Elective ³		3
GR American Institutions (GOVT) ²		3
Units		14

Second Semester

CHEM 133	Chemical Instrumentation	4
CHEM BS Upper Division Elective ³		3
Upper Division GE Area 3 - Arts or Humanities ²		3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive ²		3
Elective of Choice		3
Units		16
Total Units		122

Chemistry, 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
GR American Institutions (GOVT) ²		3
Elective of Choice		3
Elective of Choice		3
Units		15

Second Semester

CHEM 125	Advanced Organic Chemistry Laboratory	3
CHEM 140A	Physical Chemistry Lecture I	3
CHEM BS Upper Division Elective ³		3
GR American Institutions (US History) ²		3
Elective of Choice		3
Units		15

Year 2**First Semester**

CHEM 133	Chemical Instrumentation	4
CHEM 140B	Physical Chemistry Lecture II	3
CHEM 141	Physical Chemistry Laboratory	3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive ²		3
Elective of Choice		3
Units		16

Second Semester

CHEM 110	Inorganic Chemistry Lecture	3
CHEM 110L	Advanced Inorganic Chemistry Laboratory	2
CHEM 161	General Biochemistry	3
Upper Division GE Area 3 - Arts or Humanities ²		3

Elective of Choice	3
Units	14
Total Units	60

- 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-%20workflow/_internal/_documents/program-road-maps/als_2yr/art_transfer-%20roadmap-2024-25.pdf).
- Please see an academic advisor for elective options.