

BS BIOCHEMISTRY

Program Learning Objectives

1. Understand and apply the fundamental concepts of chemistry in the following areas: calculation and estimation, structure, and properties of atoms, ions and molecules, chemical bonding and chemical reactivity.
2. Use techniques and modern tools to conduct, design, analyze, and interpret experiments in chemistry and biochemistry.
3. Communicate effectively with the scientific community.
4. Apply concepts of math, physical and biological sciences to chemical problems.
5. Integrate the concepts, skills and attitudes from a general education with his/her major program to understand and explain the impact of chemistry, science and technology on issues in global, economic, environmental, and societal contexts.

Degree Requirements and Curriculum

In addition to the program requirements on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation section of this catalog, including:

- 60 units of upper-division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No Major, Support or Concentration courses may be selected as credit/no credit.

MAJOR COURSES

CHEM 124	General Chemistry for Physical Science and Engineering I (B1 & B3) ¹	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
CHEM 126	General Chemistry for Physical Science and Engineering III	4
CHEM 203	Undergraduate Seminar I	1
CHEM 216	Organic Chemistry I	5
CHEM 217	Organic Chemistry II	3
CHEM 218	Organic Chemistry III	3
CHEM 221	Organic Chemistry Laboratory II	2
CHEM 303	Undergraduate Seminar II	1
CHEM 324	Organic Chemistry Laboratory III	2
CHEM 331	Quantitative Analysis ²	5
CHEM 351	Physical Chemistry I	3
CHEM 352	Physical Chemistry II	3
CHEM 353	Physical Chemistry III	3
CHEM 356	Physical Chemistry Laboratory (GWR)	2
CHEM 369	Biochemical Principles (Upper-Division B) ¹	5
CHEM 372	Metabolism	4
CHEM 373	Molecular Biology	3
CHEM 403	Undergraduate Seminar III: Senior Project	1

CHEM/BIO 475	Molecular Biology Laboratory	3
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Select from the following:		3
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BIO 476	Gene Expression Laboratory	
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CHEM 474	Protein Techniques Laboratory	
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Select from the following:		12/18
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Polymers and Coatings Concentration (18 units)

Approved Advanced Biochemistry Electives (12 units) ³

One course must be a lecture, and at least two courses must be from List A.

List A:

CHEM 302	Marine Chemistry	
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CHEM 341	Environmental Chemistry: Water Pollution	
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CHEM 357	Physical Chemistry III Lab	
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CHEM 377	Chemistry of Drugs and Poisons	
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CHEM 401	Advanced Undergraduate Research ⁴	
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CHEM 405	Advanced Physical Chemistry	
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CHEM 414	Advanced Organic Chemistry - Mechanisms	
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CHEM 420	Advanced Organic Chemistry - Synthesis	
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CHEM 428	Nutritional Biochemistry	
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CHEM 432	Physical Biochemistry	
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CHEM 439	Instrumental Analysis	
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CHEM 441	Bioinformatics Applications	
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CHEM 444	Polymers & Coatings I	
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CHEM 445	Polymers & Coatings II	
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CHEM/MATE 446	Surface Chemistry of Materials	
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CHEM 447	Polymers and Coatings Laboratory I	
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CHEM 448	Polymers and Coatings Laboratory II	
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CHEM 449	Polymers and Coatings Internship	
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CHEM 450	Polymers and Coatings III	
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CHEM 451	Polymers and Coatings Laboratory III	
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CHEM 454	Functional Polymeric Materials	
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CHEM 458	Advanced Organic Chemistry: Spectroscopy	
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CHEM 463	Honors Research	
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CHEM 465	College Teaching Practicum	
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CHEM 466	Learning Assistant Seminar	
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CHEM 470	Selected Advanced Topics	
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CHEM 474	Protein Techniques Laboratory	
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CHEM 477	Biochemical Pharmacology	
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CHEM 481	Inorganic Chemistry	
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CHEM 484	Inorganic Chemistry Laboratory	
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CHEM 485	Cooperative Education Experience ⁵	
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CHEM 495	Cooperative Education Experience ⁵	
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SCM 302/ ENGR 322	The Learn By Doing Lab Teaching Practicum	
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List B

BIO/CHEM 308	Genetic Engineering Technology	
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or CHEM 349	Chemical and Biological Warfare	
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or ENVE 324	Introduction to Air Pollution	
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or SCM 360	Selected Environmental Issues of California's Central Coast
BIO 351	Principles of Genetics
BIO 361	Principles of Animal Physiology
BIO 405	Developmental Biology
BIO 406	Advanced Anatomy and Physiology: Neuroscience
BIO 407	Advanced Anatomy and Physiology: Endocrinology
BIO 408	Advanced Anatomy and Physiology: Cardiorespiratory and Renal
BIO 409	Advanced Anatomy and Physiology: Muscle and Locomotion
BIO 410	Functional Histology
BIO 426	Immunology
BIO 452	Cell Biology
MCRO 402	General Virology
MCRO 423	Medical Microbiology
MCRO 424	Microbial Physiology
STAT 312	Statistical Methods for Engineers

SUPPORT COURSES

BIO 161	Introduction to Cell and Molecular Biology (B2 & B3) ¹	4
BIO 452	Cell Biology	3-5
or CHEM 432	Physical Biochemistry	
or MCRO 224	General Microbiology I	
MATH 141	Calculus I (B4) ¹	4
MATH 142	Calculus II (GE Electives) ¹	4
MATH 143	Calculus III	4
PHYS 141	General Physics I	4
PHYS 142	General Physics II	4
PHYS 143	General Physics III	4

GENERAL EDUCATION (GE)

(See GE program requirements below.)

52

FREE ELECTIVESFree Electives⁶

13-21

Total units **180**

- ¹ Required in Major or Support; also satisfies General Education (GE) requirement.
- ² Students should take CHEM 331 as soon as possible after completing CHEM 126.
- ³ Consultation with advisor is recommended prior to selecting Approved Advanced Biochemistry Electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ⁴ No more than 6 units may apply to Approved Advanced Biochemistry Electives.
- ⁵ No more than 2 units may apply toward Approved Advanced Biochemistry Electives.
- ⁶ If a General Education (GE) course is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.

Concentration

Students may select the following concentration instead of Approved Advanced Biochemistry Electives in Major Courses:

- Polymers and Coatings (<http://catalog.calpoly.edu/collegesandprograms/collegeofsciencemathematics/chemistrybiochemistry/bsbiochemistry/polymersandcoatingsconcentration/>)

General Education (GE) Requirements

- 72 units required, 20 of which are specified in Major and/or Support.
- If any of the remaining 52 units is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.
- See the complete GE course listing (<http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext>).
- A grade of C- or better is required in one course in each of the following GE Areas: A1 (Oral Communication), A2 (Written Communication), A3 (Critical Thinking), and B4 (Mathematics/Quantitative Reasoning).

Area A	English Language Communication and Critical Thinking	
A1	Oral Communication	4
A2	Written Communication	4
A3	Critical Thinking	4
Area B	Scientific Inquiry and Quantitative Reasoning	
B1	Physical Science (4 units in Major) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	One lab taken with either a B1 or B2 course	
B4	Mathematics/Quantitative Reasoning (4 units in Support) ¹	0
	Upper-Division B (4 units in Major) ¹	0
Area C	Arts and Humanities	
	Lower-division courses in Area C must come from three different subject prefixes.	
C1	Arts: Arts, Cinema, Dance, Music, Theater	4
C2	Humanities: Literature, Philosophy, Languages other than English	4
	Lower-Division C Elective - Select a course from either C1 or C2	4
	Upper-Division C	4
Area D	Social Sciences - Select courses in Area D from at least two different prefixes	
D1	American Institutions (Title 5, Section 40404 Requirement)	4
D2	Lower-Division D	4
	Upper-Division D	4
Area E	Lifelong Learning and Self-Development	
	Lower-Division E	4
Area F	Ethnic Studies	

F	Ethnic Studies	4
GE Electives in Areas B, C, and D		
Select courses from two different areas; may be lower-division or upper-division courses.		
GE Electives (4 units in Support plus 4 units in GE) ¹		4
Total units		52

¹ Required in Major or Support; also satisfies General Education (GE) requirement.