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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 124</td>
<td>General Chemistry for Physical Science and Engineering I (B3 &amp; B4)</td>
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<tr>
<td>CHEM 125</td>
<td>General Chemistry for Physical Science and Engineering II</td>
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<tr>
<td>CHEM 126</td>
<td>General Chemistry for Physical Science and Engineering III</td>
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<tr>
<td>CHEM 203</td>
<td>Undergraduate Seminar I</td>
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<tr>
<td>CHEM 216</td>
<td>Organic Chemistry I</td>
<td>5</td>
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<tr>
<td>CHEM 217</td>
<td>Organic Chemistry II</td>
<td>3</td>
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<tr>
<td>CHEM 218</td>
<td>Organic Chemistry III</td>
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<td>CHEM 221</td>
<td>Organic Chemistry Laboratory II</td>
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<tr>
<td>CHEM 303</td>
<td>Undergraduate Seminar II</td>
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<tr>
<td>CHEM 324</td>
<td>Organic Chemistry Laboratory III</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 331</td>
<td>Quantitative Analysis</td>
<td>5</td>
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<tr>
<td>CHEM 351</td>
<td>Physical Chemistry I</td>
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<tr>
<td>CHEM 352</td>
<td>Physical Chemistry II</td>
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<tr>
<td>CHEM 353</td>
<td>Physical Chemistry III</td>
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<tr>
<td>CHEM 354</td>
<td>Physical Chemistry Laboratory</td>
<td>2</td>
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<tr>
<td>CHEM 371</td>
<td>Biochemical Principles</td>
<td>5</td>
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<td>CHEM 372</td>
<td>Metabolism</td>
<td>4</td>
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<tr>
<td>CHEM 373</td>
<td>Molecular Biology</td>
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<tr>
<td>CHEM 403</td>
<td>Undergraduate Seminar III: Senior Project</td>
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<tr>
<td>CHEM/BIO 475</td>
<td>Molecular Biology Laboratory</td>
<td>3</td>
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</tbody>
</table>

Select from the following:

- BIO 476 Gene Expression Laboratory
- CHEM 474 Protein Techniques Laboratory

Select from the following:

- Polymers and Coatings Concentration (18 units)
- Approved Advanced Biochemistry Electives (12 units)

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

List A:

- BIO/CHEM 308 Genetic Engineering Technology (Area F)
- CHEM 349 Chemical and Biological Warfare
- CHEM 401 Special Problems for Advanced Undergraduates
- CHEM 405 Advanced Physical Chemistry
- CHEM 414 Advanced Organic Chemistry - Mechanisms
- CHEM 419 Bioorganic Chemistry
- CHEM 420 Advanced Organic Chemistry - Synthesis
- CHEM 439 Instrumental Analysis
- CHEM 441 Bioinformatics Applications
- CHEM 444 Polymers & Coatings I
- CHEM 445 Polymers & Coatings II
- CHEM 446/447 Surface Chemistry of Materials
- CHEM 447 Polymers and Coatings Laboratory I
- CHEM 448 Polymers and Coatings Laboratory II
- CHEM 449 Polymers and Coatings Internship
- CHEM 450 Polymers and Coatings III
- CHEM 451 Polymers and Coatings Laboratory III
- CHEM 454 Functional Polymeric Materials
- CHEM 458 Instrumental Organic Qualitative Analysis
- CHEM 463 Honors Research
- CHEM 465 College Teaching Practicum
- CHEM 466 Learning Assistant Seminar
- CHEM 470 Selected Advanced Topics
- CHEM 474 Protein Techniques Laboratory
- CHEM 477 Biochemical Pharmacology
- CHEM 481 Inorganic Chemistry
- CHEM 484 Inorganic Chemistry Laboratory
- CHEM 485 Cooperative Education Experience
CHEM 495  Cooperative Education Experience ⁵
CHEM 528  Nutritional Biochemistry
SCM 302/ENGR 322 The Learn By Doing Lab Teaching
SCM 451  Ethics in the Sciences

List B
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

SUPPORT COURSES
BIO 161  Introduction to Cell and Molecular Biology (B2 & B4) ¹
BIO 452  Cell Biology ⁴
or MCRO 224  General Microbiology I
MATH 141  Calculus I (B1) ¹ ⁴
MATH 142  Calculus II (B1) ¹ ⁴
MATH 143  Calculus III ⁴
PHYS 141  General Physics IA ⁴
PHYS 132  General Physics II ⁴
PHYS 133  General Physics III ⁴

GENERAL EDUCATION (GE)
(See GE program requirements below.) ⁵⁶

FREE ELECTIVES
Free Electives ⁹-¹⁶
Total units ¹⁸⁰

1. Required in Major/Support; also satisfies GE.
2. Students should take CHEM 331 as soon as possible after completing CHEM 126.
3. Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
4. These courses also satisfy Area F requirements.
5. No more than 2 units may apply toward Approved Advanced Biochemistry Electives.
6. No more than 4 units may apply to Approved Advanced Biochemistry Electives.

Concentration
Students may select the following concentration instead of advanced approved biochemistry electives in Major Courses:
- Polymers and Coatings (http://catalog.calpoly.edu/collegesandprograms/collegeofsciencemathematics/chemistrybiochemistry/bsbiochemistry/polymersandcoatingsconcentration)

General Education (GE) Requirements
- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext).
- Minimum of 12 units required at the 300 level.

Area A Communication
A1  Expository Writing ⁴
A2  Oral Communication ⁴
A3  Reasoning, Argumentation and Writing ⁴

Area B Science and Mathematics
B1  Mathematics/Statistics (8 units in Support) ¹ ⁰
B2  Life Science (4 units in Support) ¹ ⁰
B3  Physical Science (4 units in Major) ¹ ⁰
B4  One lab taken with either a B2 or B3 course

Area C Arts and Humanities
C1  Literature ⁴
C2  Philosophy ⁴
C3  Fine/Performing Arts ⁴
C4  Upper-division elective ⁴
Area C elective (Choose one course from C1-C5) ⁴

Area D/E Society and the Individual
D1  The American Experience (Title 5, Section 40404 requirement) ⁴
D2  Political Economy ⁴
D3  Comparative Social Institutions ⁴
D4  Self Development (CSU Area E) ⁴
D5  Upper-division elective ⁴

Area F Technology
F  Upper-division elective ⁴
Total units ⁵⁶

¹ Required in Major/Support.