# 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 |
| Select from the following: | | 3 |
| BIO 476 | Gene Expression Laboratory | |
| CHEM 474 | Protein Techniques Laboratory | |
| Select from the following: | | 12/18 |
| **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 | |
| CHEM 341 | Environmental Chemistry: Water Pollution | |
| CHEM 357 | Physical Chemistry III Lab | |
| CHEM 377 | Chemistry of Drugs and Poisons | |
| CHEM 401 | Advanced Undergraduate Research [4] | |
| CHEM 405 | Advanced Physical Chemistry | |
| CHEM 414 | Advanced Organic Chemistry - Mechanisms | |
| CHEM 418 | Neurochemistry | |
| CHEM 420 | Advanced Organic Chemistry - Synthesis | |
| CHEM 428 | Nutritional Biochemistry | |
| CHEM 432 | Physical Biochemistry | |
| CHEM 439 | Instrumental Analysis | |
| CHEM 441 | Bioinformatics Applications | |
| CHEM 444 | Polymers & Coatings I | |
| CHEM 445 | Polymers & Coatings II | |
| CHEM/MATE 446 | 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 | Advanced Organic Chemistry: Spectroscopy | |
| 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 [5] | |
| CHEM 495 | Cooperative Education Experience [5] | |
| SCM 302/ ENGR 322 | The Learn By Doing Lab Teaching Practicum | |
| **List B** | | |
| BIO/CHEM 308 | Genetic Engineering Technology | |
| or CHEM 349 | Chemical and Biological Warfare | |
| 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 ELECTIVES** | | |
| Free Electives [6] | | 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 (https://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 (https://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.