# BIOCHEMISTRY

## Bachelor of Science Degree Requirements

CSULA | NSS Academic Advisement Center | 323.343.5284 | King Hall D1051

Name: Date:

CIN: Catalog (Qtr/Yr): Major (Qtr/Yr):

Phone: Student Signature:

Email: Advisor Signature:

## GENERAL EDUCATION REQUIREMENTS (72 units)

Refer to the *Double Count Handout* for a list of major specific courses that also fulfill GE requirements.

### A: Basic Subjects (16 units)

| | Qtr/Yr | Grade |
|---|---|---|
| A1: Written Communication | | |
| A2: Oral Communication | | |
| A3: Critical Thinking | | |
| A4: Mathematics | | |

*A minimum C grade is required for all courses in Block A*

### AI: American Institutions (8 units)

| | | |
|---|---|---|
| US History | | |
| US Constitution | | |

### B: Natural Sciences (8 units)

| | | |
|---|---|---|
| B1: Biological (with lab) | | |
| B2: Physical (with lab) | | |

### C: Humanities (12 units)

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|---|---|---|
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### D: Social Sciences (12 units)

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### E: Lifelong Understanding (4 units)

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### Upper Division Theme (12 units) _____

| | | |
|---|---|---|
| Natural Sciences and Mathematics | | |
| Social Sciences | | |
| Humanities | | |

*Courses listed or cross-listed with major cannot be taken to satisfy theme requirements.*

## UNIVERSITY REQUIREMENTS (14-16 units)

| | | |
|---|---|---|
| NSS 101 or 301 | | |
| ENGL 102 | | |
| WPE (UNIV 400) | | |
| (d) Diversity | | |
| (d) Diversity | | |

### 2.0 GPA and 188 units required to graduate

| | |
|---|---|
| Academic Standing: | |
| Overall GPA: | Major GPA: |
| CSULA GPA: | Units: |

## MAJOR REQUIREMENTS (122 units)

### Lower Division Core (74 units)

| | Qtr/Yr | Grade |
|---|---|---|
| BIOL 100A: Introductory Biology I (5) | | |
| BIOL 100B: Introductory Biology II (5) | | |
| CHEM 101: General Chemistry I (5) | | |
| CHEM 102: General Chemistry II (5) | | |
| CHEM 103: General Chemistry III (5) | | |
| CHEM 201: Quantitative Analysis (5) | | |
| CHEM 280: Introduction to Biomolecules (3) | | |
| CHEM 291A: Organic Chemistry (3) | | |
| CHEM 291B: Organic Chemistry (3) | | |
| CHEM 292A: Organic Chemistry Laboratory (2) | | |
| CHEM 292B: Organic Chemistry Laboratory (2) | | |
| MATH 206: Calculus I Differentiation (4) | | |
| MATH 207: Calculus II Integration (4) | | |
| MATH 208: Calculus III Sequences, Series ... (4) | | |
| MATH 209: Calculus IV Several Variables (4) | | |
| PHYS 211: Mechanics (5) | | |
| PHYS 212: Waves, Optics and Thermodynamics (5) | | |
| PHYS 213: Electricity and Magnetism (5) | | |

### Upper Division Core (36 units)

| | | |
|---|---|---|
| CHEM 301: Organic Chemistry (3) | | |
| CHEM 318: Introduction to Inorganic Chemistry (3) | | |
| CHEM 360: Writing for Chemists (4) | | |
| CHEM 401: Physical Chemistry I (4) | | |
| CHEM 402: Physical Chemistry II (4) | | |
| CHEM 431A: Biochemistry (3) | | |
| CHEM 431B: Biochemistry (3) | | |
| CHEM 431C: Biochemistry (3) | | |
| CHEM 432A: Biochemistry Laboratory (2) | | |
| CHEM 432B: Biochemistry Laboratory (2) | | |
| MICR 300: General Microbiology (5) | | |

### Upper Division Electives (12 units, select one course from each area)

| | | |
|---|---|---|
| Chemistry: | | |
| Development / Physiology: | | |
| Genetics / Biometrics: | | |

## NOTES

**Department Office: 323.343.2300, BS 336**

- Students must earn a grade of C- or higher in all courses used to meet major requirements.

# BIOCHEMISTRY

Bachelor of Science
List of Courses and Prerequisites

## Lower Division Core (74 units)

| | | |
|---|---|---|
| BIOL 100A | Introductory Biology I (5) | MATH 104A |
| BIOL 100B | Introductory Biology II (5) | BIOL 100A and MATH 104A with grades of C or higher. MATH 105 recommended. |
| CHEM 101 | General Chemistry I (5) | High school chemistry & physics; 2 years of H.S. algebra; satisfactory score on placement examination; See catalog for more details. |
| CHEM 102 | General Chemistry II (5) | CHEM 101 |
| CHEM 103 | General Chemistry III (5) | CHEM 102 |
| CHEM 201 | Quantitative Analysis (5) | CHEM 103 |
| CHEM 280 | Introduction to Biomolecules (3) | BIOL 100B and CHEM 102 or equivalent |
| CHEM 291A | Organic Chemistry (3) | Originally CHEM 301A. CHEM 103 or one year of General Chemistry |
| CHEM 291B | Organic Chemistry (3) | Originally CHEM 301B. CHEM 291A |
| CHEM 292A | Organic Chemistry Laboratory (2) | Originally CHEM 302A. CHEM 291A. Corequisite: CHEM 291B |
| CHEM 292B | Organic Chemistry Laboratory (2) | Originally CHEM 302B. CHEM 292A and CHEM 291B. Corequisite: CHEM 301 |
| MATH 206 | Calculus I Differentiation (4) | MATH 104A and 104B, each with a minimum C grade or satisfactory score on placement examination; students with a grade less than B- in either MATH 104 A or MATH 104B must enroll concurrently in MATH 206P. |
| MATH 207 | Calculus II Integration (4) | MATH 206 with a minimum C grade; students with a grade less than B- in either MATH 206 must enroll concurrently in MATH 207P. |
| MATH 208 | Calculus III Sequences, Series and Coordinate Systems (4) | MATH 207 with a minimum C grade; students with a grade less than B- in either MATH 207 must enroll concurrently in MATH 208P. |
| MATH 209 | Calculus IV Several Variables (4) | MATH 208 with a minimum C grade |
| PHYS 211 | Mechanics (5) | High school physics or equivalent, or permission of the department, MATH 206 or equivalent (may be taken concurrently). |
| PHYS 212 | Waves, Optics and Thermodynamics (5) | PHYS 211. Prerequisite or corequisite: MATH 207. |
| PHYS 213 | Electricity and Magnetism (5) | PHYS 212. Prerequisite or corequisite: MATH 208. |

## Upper Division Core (36 units)

| | | |
|---|---|---|
| CHEM 301 | Organic Chemistry (3) | Originally CHEM 301C. CHEM 291B |
| CHEM 318 | Introduction to Inorganic Chemistry (3) | CHEM 103 or one year of General Chemistry |
| CHEM 360 | Writing for Chemists (4) | Satisfactory completion of the Graduation Writing Assessment Requirement (GWAR); CHEM 291B or Instructor consent |
| CHEM 401 | Physical Chemistry I (4) | CHEM 103 or equivalent; MATH 208; PHYS 213 |
| CHEM 402 | Physical Chemistry II (4) | CHEM 401 |
| CHEM 431A | Biochemistry (3) | CHEM 301 |
| CHEM 431B | Biochemistry (3) | CHEM 431A |
| CHEM 431C | Biochemistry (3) | CHEM 431B |
| CHEM 432A | Biochemistry Laboratory (2) | CHEM 292B and 431A |
| CHEM 432B | Biochemistry Laboratory (2) | CHEM 431A and 432A |
| MICR 300 | General Microbiology (5) | BIOL 100B; CHEM 102 |

## Upper Division Electives (12 units, select one course from each area)

### *Chemistry*

| | | |
|---|---|---|
| CHEM 403 | Physical Chemistry III (4) | MATH 215 or 401; CHEM 103 or one year of General Chemistry; PHYS 214. |
| CHEM 412A | Physical Chemistry Laboratory (2) | CHEM 401 or 403 |
| CHEM 412B | Physical Chemistry Laboratory (2) | CHEM 401 or 403 |
| CHEM 418 | Inorganic Chemistry (3) | CHEM 318 |
| CHEM 420 | Advanced Organic Chemistry I (4) | CHEM 301 |
| CHEM 425 | Polymer Chemistry (4) | CHEM 301 and MATH 209 |
| CHEM/BINF 434 | Bioinformatics and Computational Biology (4) | Grade of C or higher in BIOL 100A and CS 201; upper division or graduate level standing. |
| CHEM 438 | Bioinorganic & Bioorganic Chemistry (4) | CHEM 431A or 435 |
| CHEM/BIOL 444 | Drug Discovery & Development (4) | CHEM 301 and either BIOL 380 or CHEM 435 or CHEM 431A |
| CHEM 462 | Instrumental Analysis (6) | CHEM 201, CHEM 402 |
| CHEM 499 | Undergraduate Directed Study (1-5) | 2.5 G.P.A in chemistry courses or one advanced lab course, consent of an instructor to act as sponsor, ability to assume responsibility for independent work and to prepare written and oral reports. |

### *Development / Physiology*

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|---|---|---|
| BIOL 424 | General Embryology (4) | Grade of C or higher in BIOL 100C; CHEM 301 |
| BIOL 430 | Plant Physiology I (5) | Grade of C or higher in BIOL 100C; CHEM 103 |
| BIOL 431 | Plant Physiology II (5) | BIOL 430 |
| BIOL 432 | Fundamentals of Toxicology (4) | BIOL 380, CHEM 301 and CHEM 292B |
| BIOL 433 | Animal Physiology I (4) | BIOL 380 |
| BIOL 434 | Animal Physiology II (4) | BIOL 380 |
| BIOL 436 | Neurobiology: Neurophysiology (4) | BIOL 380 |
| BIOL 437 | Advanced Cell Physiology (4) | BIOL 380 |
| BIOL 439 | Endocrinology (4) | BIOL 380 |
| BIOL 448 | Molecular Biology of the Brain (4) | BIOL 380 |
| BIOL 449 | Neurobiology of Development (4) | BIOL 380 |
| BIOL 476 | Physiological Animal Ecology (4) | BIOL 380 |
| MICR 301 | General Medical Microbiology (4) | MICR 300 with grade of C or higher |
| MICR 302 | Pathogenic Bacteriology (5) | MICR 301 with grade of C or higher |
| MICR 304 | Immunology & Serology (5) | MICR 302, CHEM 291A, 292A, each with a grade of C or higher |
| MICR 331 | Structure and Function of Bacteria (3) | MICR 300; CHEM 291A; prerequisite or corequisite: CHEM 292A |
| MICR 401 | General Virology (3) | MICR 340 or BIOL 340 *plus* 380 |
| MICR 430 | Bacterial Physiology (3) | MICR 331; CHEM 431A, 432A; corequisite: CHEM 431B, 432B |
| MICR 433 | Bacterial Physiology Laboratory (2) | Corequisite: MICR 430 |

### *Genetics / Biometrics*

| | | |
|---|---|---|
| BIOL 300 | Biometrics (4) | Grade of C or higher in BIOL 100C; MATH 105 for Biology and Microbiology majors and MATH 104B for other majors. |
| BIOL 340 | General Genetics (4) | BIOL 300 |
| BIOL 413 | Molecular Diagnostics (4) | BIOL 380 or MICR 401 or CHEM 431A and CHEM 431 C (may be taken concurrently) |
| BIOL 415 | Population Genetics (4) | BIOL 340 |
| BIOL 416 | Molecular Genetics (4) | BIOL 340, CHEM 291A |
| BIOL 417 | Gene Manipulation (4) | BIOL 340 or MICR 340; BIOL 380 or CHEM 431AB and 432A |
| BIOL 418 | Evolution (4) | BIOL 340 |
| BIOL 473 | Molecular Ecology (4) | BIOL 360 |
| MICR 340 | Microbial Genetics (3) | Grade of C or higher in MICR 300 |
| BINF 401 | Machine Learning Applications in Molecular Life Sciences (2) | BINF 400, BIOL 100B, CS 202, BIOL 300 (or EE 242 or MATH 270 or ECON 309 or MATH 474). |
| BINF 402 | Phylogenomics (2) | BINF 400, BIOL 100B, CS 202, BIOL 300 (or EE 242 or MATH 270 or ECON 309 or MATH 474). |
| BINF 403 | Process Estimation & Detection in Cellular Biology (2) | BINF 400, BIOL 100B, CS 202, BIOL 300 (or EE 242 or MATH 270 or ECON 309 or MATH 474). |
| BINF 450 | Advanced Topics in Bioinformatics & Computational Biology (2) | BINF 402 or BINF 403 |