BACHELOR OF SCIENCE IN BIOLOGY: CONCENTRATION IN CELL AND MOLECULAR BIOLOGY - QUANTITATIVE REASONING CATEGORY I/II AND ENG 114

120 Total Units Required
Minimum Number of Units in Major: 68

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td></td>
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<tr>
<td>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division Core)</td>
<td>5</td>
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<tr>
<td><strong>ENG 114</strong></td>
<td>Writing the First Year: Finding Your Voice (A2)</td>
<td>3</td>
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<tr>
<td><strong>MATH 226</strong></td>
<td>Calculus I (Major Lower-Division Core, B4)</td>
<td>4</td>
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<tr>
<td><strong>GE Area A</strong></td>
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<td>Units</td>
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<tr>
<td><strong>Second Semester</strong></td>
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<tr>
<td>BIOL 230</td>
<td>Introductory Biology I (Major Lower-Division Core)</td>
<td>5</td>
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<tr>
<td>CHEM 215 &amp; CHEM 216</td>
<td>General Chemistry II: Quantitative Applications of Chemistry Concepts and General Chemistry II Laboratory: Quantitative Applications of Chemistry Concepts (Major Lower-Division Core)</td>
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<tr>
<td><strong>PHYS 111 &amp; PHYS 112</strong></td>
<td>General Physics I and General Physics I Laboratory (Major Lower-Division Core, B1, B3)</td>
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<td><strong>GE Area E</strong></td>
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<td><strong>Third Semester</strong></td>
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<tr>
<td>CHEM 130</td>
<td>General Organic Chemistry (Hidden Prerequisite for BIOL 355 and CHEM 349)</td>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CHEM 233</td>
<td>Organic Chemistry I (Major Lower-Division Core)</td>
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<tr>
<td>Select One (Major Lower-Division Core):</td>
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<tr>
<td>BIOL 358</td>
<td>Forensic Genetics: Math Matters</td>
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<tr>
<td>BIOL 458</td>
<td>Biometry</td>
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<tr>
<td>CSC 210</td>
<td>Introduction to Computer Programming</td>
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<tr>
<td><strong>MATH 227</strong></td>
<td>Calculus II</td>
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<tr>
<td><strong>GE Area A</strong></td>
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<tr>
<td><strong>GE Area C</strong></td>
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<td>Units</td>
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<tr>
<td><strong>Fourth Semester</strong></td>
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<tr>
<td>BIOL 240</td>
<td>Introductory Biology II (Major Lower-Division Core)</td>
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<tr>
<td>PHYS 121 &amp; PHYS 122</td>
<td>General Physics II and General Physics II Laboratory (Major Lower-Division Core)</td>
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<td><strong>GE Area C</strong></td>
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<tr>
<td><strong>GE Area D - Take Two</strong></td>
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<td><strong>Fifth Semester</strong></td>
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<tr>
<td>BIOL 355</td>
<td>Genetics (Major Upper-Division Core)</td>
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<tr>
<td>CHEM 335</td>
<td>Organic Chemistry II (Major Upper-Division Core)</td>
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<tr>
<td><strong>GE Area C</strong></td>
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<td><strong>Sixth Semester</strong></td>
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<tr>
<td>BIOL 350</td>
<td>Cell Biology (Major Upper-Division Core)</td>
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<td>BIOL 357</td>
<td>Molecular Genetics (Major Upper-Division Core)</td>
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<tr>
<td>CHEM 349</td>
<td>General Biochemistry (Major Upper-Division Core)</td>
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<tr>
<td><strong>GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)</strong></td>
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<tr>
<td><strong>SF State Studies or University Elective</strong></td>
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<td><strong>Seventh Semester</strong></td>
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<tr>
<td>BIOL 351GW</td>
<td>Experiments in Cell and Molecular Biology - GWAR (Major Upper-Division Core)</td>
<td>4</td>
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<tr>
<td>Select Major Electives Requirement (11 Units Total) - Take Two</td>
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<td>6-7</td>
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<td></td>
<td>Units</td>
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</table>
GE Area UD-C: Upper-Division Arts and/or Humanities (Consider 3
SF State Studies or University Elective 2

Eighteenth Semester
Select Major Electives Requirement (11 Units Total) - Take Two 8 4-6
SF State Studies or University Elective – Take Three 9

Total Units 13-15
120-124

1 ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you choose ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.

2 Depending on courses completed through Early Start, students in Pathway/Category III or IV may be required to enroll in a support course to complement their Quantitative Reasoning/B4 requirement. There are multiple course options for this pathway. Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center. Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website.

3 To avoid taking additional units, it is recommended that you meet SF State Studies requirements (AERM, GP, ES, SJ) within your GE.

4 Students who plan to pursue a Ph.D. should complete at least two semesters of calculus and one semester of physical chemistry.

5 GE Areas B2 (Life Science) and B3 (Laboratory Science) are satisfied upon completion of BIOL 240.

6 Upper-Division General Education, Physical, and Life Sciences (UD-B) is satisfied upon completion of BIOL 355.

7 Students may take CHEM 340 and CHEM 341 in lieu of CHEM 349 upon advisement. In this case, CHEM 341 counts towards the upper-division elective unit requirement.

8 Major Electives (11 units)
Select 11 units upon advisement. At least one elective course must have an upper-division laboratory component. Graduate level courses may be used upon advisement.

- BIOL 332 Health Disparities in Cancer (3 units) (AERM, GP, SJ)
- BIOL 337 Evolution (3 units)
- BIOL 344GW Research Skills - GWAR (3 units)
- BIOL 349 Bioethics (3 units) (UD-B, SJ)
- BIOL 356 Honors Genetics (2 units)
- BIOL 358 Forensic Genetics: Math Matters (4 units)
- BIOL 380 Evolutionary Developmental Biology (3 units)
- BIOL 382 Developmental Biology (3 units)
- BIOL 401 General Microbiology (3 units)
- BIOL 402GW General Microbiology Laboratory - GWAR (3 units)*
- BIOL 411 Environmental Microbiology (3 units)
- BIOL 420 General Virology (3 units)
- BIOL 425 Emerging Diseases (3 units)
- BIOL 435 Immunology (3 units)
- BIOL 436 Immunology Laboratory (2 units)*
- BIOL 442 Microbial Physiology (3 units)
- BIOL 443 Microbial Physiology Laboratory (2 units)*
- BIOL 446 Microbial Genomics (4 units)
- BIOL 453 General Parasitology (3 units)
- BIOL 454 Parasitology Laboratory (1 units)*
- BIOL 458 Biometry (4 units)
- BIOL 490 Ecology of Infectious Diseases (4 units)
- BIOL 525 Plant Physiology (3 units)
- BIOL 526 Plant Molecular Physiology Laboratory (2 units)*
- BIOL 615 Molecular Pathophysiology (3 units)
- BIOL 618 Biology of Aging (3 units)
- BIOL 623 Pharmacology (3 units)
- BIOL 630 Animal Physiology (3 units)
- BIOL 631GW Animal Physiology Laboratory - GWAR (4 units)*
- BIOL 638 Bioinformatics and Genome Annotation (4 units)*
- BIOL 640 Cellular Neurosciences (3 units)
- BIOL 652 Science Education Partners in Biology (4 units)
- BIOL 699 Independent Study in Biology (1-3 units)*
- CHEM 343 Biochemistry I Laboratory (3 units)*

* Course fulfills the upper-division laboratory elective requirement.