## Bachelor of Science in Biology: Concentration in Cell and Molecular Biology - Quantitative Reasoning Category I/II and Stretch English

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

This roadmap is a suggested plan of study and does not replace meeting with an advisor. Please note that students may need to adjust the actual sequence of courses based on course availability. Please consult an advisor in your major program for further guidance.

### Course Title | Units
--- | ---
**First Semester**  
CHEM 115 | General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division Core)  | 5  
ENG 104 | Writing the First Year: Finding Your Voice Stretch I | 3  
MATH 226 | Calculus I (Major Lower-Division Core, B4) | 4  
**GE Area A** | Units | 3  
**Units** | 15-16

**Second Semester**  
BIOL 230 | Introductory Biology I (Major Lower-Division Core) | 5  
CHEM 215 & CHEM 216 | General Chemistry II: Quantitative Applications of Chemistry Concepts and General Chemistry II Laboratory: Quantitative Applications of Chemistry Concepts (Major Lower-Division Core) | 5  
ENG 105 | Writing the First Year: Finding Your Voice Stretch II (A2) | 3  
**GE Area B** | Units | 3

**Third Semester**  
CHEM 233 | Organic Chemistry I (Major Lower-Division Core) | 3  
**Select One (Major Lower-Division Core):**  
BIOL 358 | Forensic Genetics: Math Matters | 3-4  
BIOL 458 | Biometry |  
CSC 210 | Introduction to Computer Programming |  
**MATH 227** | Calculus II | 4

**GE Area A** | 3  
**GE Area D** | 3  
**GE Area E** | 3  
**Units** | 15

**Fourth Semester**  
BIOL 240 | Introductory Biology II (Major Lower-Division Core) | 5  
PHYS 121 & PHYS 122 | General Physics II and General Physics II Laboratory (Major Lower-Division Core) | 4  
**GE Area C** | 3  
**GE Area D** | 3  
**Units** | 15

**Fifth Semester**  
BIOL 355 | Genetics (Major Upper-Division Core) | 3  
CHEM 335 | Organic Chemistry II (Major Upper-Division Core) | 3  
**GE Area C - Take Two** | 6  
**GE Area D** | 3  
**Units** | 15

**Sixth Semester**  
BIOL 350 | Cell Biology (Major Upper-Division Core) | 3  
BIOL 357 | Molecular Genetics (Major Upper-Division Core) | 3  
CHEM 349 | General Biochemistry (Major Upper-Division Core) | 3  
**GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)** | 3  
**SF State Studies or University Elective** | 3  
**Units** | 15
## Bachelor of Science in Biology: Concentration in Cell and Molecular Biology - Quantitative Reasoning Category I/II and Stretch English

### Seventh Semester

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>BIOL 351GW</td>
<td>Experiments in Cell and Molecular Biology - GWAR</td>
<td>4</td>
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<table>
<thead>
<tr>
<th>Requirement</th>
<th>Units</th>
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<tbody>
<tr>
<td>Select Major Electives Requirement (11 Units Total) - Take Two</td>
<td>6-7</td>
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<tr>
<td>GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course)</td>
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<tr>
<td>SF State Studies or University Elective</td>
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**Total Units:** 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 (http://cms.sfsu.edu/content/student-center/). Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website (http://developmentalstudies.sfsu.edu/).

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

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.

### Eighth Semester

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<td>4-6</td>
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<tr>
<td>SF State Studies or University Elective – Take Three</td>
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</table>

**Total Units:** 120-124

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 402 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.