# Bachelor of Science in Biology: Concentration in Microbiology - Quantitative Reasoning Category III/IV and Stretch English

120 Total Units Required  
Minimum Number of Units in the 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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 230</td>
<td>Introductory Biology I</td>
<td>5</td>
</tr>
<tr>
<td>ENG 104</td>
<td>Writing the First Year: Finding Your Voice Stretch I (^1)</td>
<td>3</td>
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<tr>
<td>MATH 197</td>
<td>Prelude to Calculus I (Prerequisite for MATH 226) (^2,3)</td>
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<tr>
<td><strong>GE Area A (^4)</strong></td>
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<tr>
<td><strong>Units</strong></td>
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<tr>
<td><strong>Second 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>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division Core)</td>
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<tr>
<td>ENG 105</td>
<td>Writing the First Year: Finding Your Voice Stretch II (A2) (^1)</td>
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<tr>
<td>MATH 198</td>
<td>Prelude to Calculus II (Prerequisite for MATH 226, B4) (^2,3)</td>
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<tr>
<td><strong>Units</strong></td>
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<tr>
<td><strong>Third Semester</strong></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:</td>
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<tr>
<td></td>
<td>(Major Lower-Division Core)</td>
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<tr>
<td>MATH 226</td>
<td>Calculus I (Major Lower-Division Core, B4) (^2,3)</td>
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<tr>
<td>PHYS 111 &amp; PHYS 112</td>
<td>General Physics I and General Physics I Laboratory (Major Lower-Division Core)</td>
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<td><strong>GE Area E</strong></td>
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<td><strong>Fourth Semester</strong></td>
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<tr>
<td>CHEM 130</td>
<td>General Organic Chemistry (Major Lower-Division Core)</td>
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<tr>
<td>CHEM 233</td>
<td>Organic Chemistry I (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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<tr>
<td><strong>GE Area A</strong></td>
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<tr>
<td><strong>GE Area D</strong></td>
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<td><strong>Units</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>Major Lower-Division Requirement – Select One (^5)</td>
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<tr>
<td><strong>GE Area C - Take Two</strong></td>
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<tr>
<td><strong>GE Area D</strong></td>
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<td><strong>Units</strong></td>
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<tr>
<td><strong>Sixth Semester</strong></td>
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<tr>
<td>BIOL 401 &amp; BIOL 402GW</td>
<td>General Microbiology and General Microbiology Laboratory - GWAR (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>GE Area D</strong></td>
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<tr>
<td><strong>Units</strong></td>
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</table>
Bachelor of Science in Biology: Concentration in Microbiology - Quantitative Reasoning Category III/IV and Stretch English

### Seventh Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Description</th>
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<tr>
<td>BIOL 442</td>
<td>3</td>
<td>Microbial Physiology (Major Upper-Division Core)</td>
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<tr>
<td>CHEM 340 or CHEM 349</td>
<td>3</td>
<td>Biochemistry I (Major Upper-Division Core)</td>
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<tr>
<td><strong>Upper-Division Electives (12 Units Total) - Take Two</strong></td>
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<tr>
<td>GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)</td>
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<tr>
<td>SF State Studies or University Elective</td>
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<td><strong>Total Units</strong></td>
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### Eighth Semester

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<tr>
<th>Course</th>
<th>Units</th>
<th>Description</th>
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<tbody>
<tr>
<td>Upper-Division Electives (12 Units Total) - Take Two</td>
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</tr>
<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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<td></td>
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<tr>
<td><strong>Total Units</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Total Units</strong></td>
<td>120</td>
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</table>

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 GE Area 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. QR Category III students with a grade of B or higher in high school pre-calculus in the past year may be able to enroll in MATH 226. Please see a department advisor.
4. To avoid taking additional units, it is recommended that you meet SF State Studies requirements (AERM, GP, ES, SJ) within your GE.
5. **Lower-Division Requirement - Select One**
   - BIOL 358 Forensic Genetics: Math Matters (4 units)
   - BIOL 458 Biometry (4 units)
   - CSC 210 Introduction to Computer Programming (3 units)
   - MATH 124 Elementary Statistics (3 units) (B4)
   - MATH 227 Calculus II (4 units)
   - MATH 228 Calculus III (4 units)

### Electives in Microbiology
Select 12 units from the following courses, including at least three laboratory courses with approval of an advisor. Any course taken as an elective that does not appear on this list will not be counted towards completion of the Microbiology degree requirements unless the course is approved by an advisor prior to enrolling in it.

   - BIOL 351GW Experiments in Cell and Molecular Biology - GWAR (4 units)
   - BIOL 420 General Virology (3 units)
   - BIOL 425 Emerging Diseases (3 units)
   - BIOL 430 Medical Microbiology (3 units)
   - BIOL 431 Medical Microbiology Laboratory (2 units)
   - BIOL 435 Immunology (3 units)
   - BIOL 436 Immunology Laboratory (2 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 490 Ecology of Infectious Diseases (4 units)
   - BIOL 625 Hematology (3 units)
   - BIOL 638 Bioinformatics and Genome Annotation (4 units)
   - BIOL 699 Independent Study in Biology (1-3 units)
   - BIOL 741/CHEM 741/ERTH 741 Electron Microscopy (4 units)
   - CHEM 336 Organic Chemistry II Laboratory (2 units)
   - CHEM 346 Organic Chemistry II Laboratory (3 units)