BACHELOR OF SCIENCE IN BIOCHEMISTRY - QUANTITATIVE REASONING CATEGORY III/IV AND STRETCH ENGLISH

120 Total Units Required
Minimum Number of Units in the Major: 72

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>
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</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td></td>
<td></td>
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<tr>
<td>ENG 104</td>
<td>Writing the First Year: Finding Your Voice Stretch I</td>
<td>3</td>
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<tr>
<td>MATH 197</td>
<td>Prelude to Calculus I (Prerequisite for MATH 226)</td>
<td>3</td>
</tr>
<tr>
<td>GE Area A</td>
<td></td>
<td>3</td>
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<tr>
<td>GE Area C</td>
<td></td>
<td>3</td>
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<tr>
<td>GE Area D</td>
<td></td>
<td>3</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)</td>
<td>5</td>
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<tr>
<td>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division)</td>
<td>5</td>
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<tr>
<td>ENG 105</td>
<td>Writing the First Year: Finding Your Voice Stretch II (A2)</td>
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<tr>
<td>MATH 198</td>
<td>Prelude to Calculus II (Prerequisite for MATH 226)</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: Quantitative Applications of Chemistry Concepts (Major Lower-Division)</td>
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<tr>
<td>MATH 226</td>
<td>Calculus I (Major Lower-Division, B4)</td>
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<tr>
<td>GE Area A</td>
<td></td>
<td>3</td>
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<tr>
<td>GE Area E</td>
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<tr>
<td><strong>Fourth Semester</strong></td>
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<tr>
<td>CHEM 233 &amp; CHEM 234</td>
<td>Organic Chemistry I and Organic Chemistry I Laboratory (Major Lower-Division)</td>
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<tr>
<td>MATH 227</td>
<td>Calculus II (Major Lower-Division)</td>
<td>4</td>
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<tr>
<td><strong>Fifth Semester</strong></td>
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<tr>
<td>Select One Set of Courses (Major Lower-Division):</td>
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<td>5</td>
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<tr>
<td>PHYS 111 &amp; PHYS 112</td>
<td>General Physics I and General Physics I Laboratory (B1, B3)</td>
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<tr>
<td>PHYS 220 &amp; PHYS 222</td>
<td>General Physics with Calculus I and General Physics with Calculus II Laboratory</td>
<td>4</td>
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<tr>
<td>GE Area C</td>
<td></td>
<td>3</td>
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<tr>
<td><strong>Sixth Semester</strong></td>
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<tr>
<td>CHEM 321</td>
<td>Quantitative Chemical Analysis (Major Upper-Division)</td>
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<tr>
<td>CHEM 335</td>
<td>Organic Chemistry II (Major Upper-Division)</td>
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<tr>
<td><strong>Seventh Semester</strong></td>
<td></td>
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<tr>
<td>CHEM 300</td>
<td>General Physical Chemistry I (Major Upper-Division)</td>
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</tbody>
</table>

Units

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Bachelor of Science in Biochemistry - Quantitative Reasoning Category III/IV and Stretch English
Bachelor of Science in Biochemistry - Quantitative Reasoning Category III/IV and Stretch English

**Major Electives (15 Units Total) - Take One**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CHEM 340</td>
<td>Biochemistry I (Major Upper-Division)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 343</td>
<td>Biochemistry I Laboratory (Major Upper-Division)</td>
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</tbody>
</table>

**Eighth Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CHEM 301</td>
<td>General Physical Chemistry II (Major Upper-Division)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 341</td>
<td>Biochemistry II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Major Electives (15 Units Total) - Take Two**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE Area UD-B: Upper-Division Physical and/or Life Sciences (Consider SF State Studies Course)</td>
<td>3</td>
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</tbody>
</table>

**Upper-Division Electives (15 units)**

- Students must complete at least 15 units of upper-division Chemistry and Biology electives selected from the lists below. Courses from community colleges cannot be substituted for the courses on the list below.
- Electives must include at least:
  - one course with a CHEM prefix,
  - one GWAR (GW) course (See Footnote 7), and
  - three laboratory courses.
- Note that many Biology electives have a BIOL 240 prerequisite.
- Students wishing to enroll in BIOL 350, BIOL 355, and BIOL 612 without completing the BIOL 240 prerequisite should contact an advisor before registration.
- Students should consult an advisor regarding selection of elective courses and check course co- and pre-requisites before enrolling.
- Graduate level courses in chemistry or appropriate courses in biology, physics, geosciences, and computer science may be substituted upon prior approval of advisor.

**Upper-Division Electives in Chemistry**

- CHEM 322 Quantitative Chemical Analysis Laboratory (2 units)
- CHEM 325 Inorganic Chemistry (3 units)
- CHEM 327 Practical GC and HPLC (4 units)
- CHEM 336 Organic Chemistry II Laboratory (2 units)
- CHEM 370 Computer Applications in Chemistry and Biochemistry (3 units)
- CHEM 420 Environmental Analysis (3 units)
- CHEM 422 Instrumental Analysis (4 units)
- CHEM 424 Advanced Inorganic Chemistry Laboratory (2 units)
- CHEM 443 Advanced Organic Chemistry (3 units)
- CHEM 445 Biophysical Chemistry Laboratory (4 units)
- CHEM 451 Experimental Physical Chemistry Laboratory (2 units)
- CHEM 645 Research Trends in Chemistry and Biochemistry (3 units)
- CHEM 680 Chemical Oceanography (3 units)
- CHEM 699 Independent Study (1-6 units)

**Upper-Division Electives in Biology**

- BIOL 350 Cell Biology (3 units)
- BIOL 351GW Experiments in Cell and Molecular Biology - GWAR (4 units)
- BIOL 355 Genetics (3 units)
- BIOL 357 Molecular Genetics (3 units)
- BIOL 401 General Microbiology (3 units)
- BIOL 402GW General Microbiology Laboratory - GWAR (3 units)
- BIOL 420 General Virology (3 units)
- BIOL 435 Immunology (3 units)
- BIOL 436 Immunology Laboratory (2 units)
- BIOL 612 Human Physiology (3 units)
- BIOL 613GW Human Physiology Laboratory - GWAR (3 units)
- BIOL 638 Bioinformatics and Genome Annotation (4 units)
- BIOL 640 Cellular Neurosciences (3 units)

**GWAR Elective (3-4 units)**

- BIOL 351GW Experiments in Cell and Molecular Biology - GWAR (4 units)
- BIOL 402GW General Microbiology Laboratory - GWAR (3 units)
- BIOL 613GW Human Physiology Laboratory - GWAR (3 units)
- CHEM 390GW Contemporary Chemistry and Biochemistry Research - GWAR (3 units)

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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. 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 or major.

5. PHYS 111 and PHYS 112 are prerequisites for PHYS 121 and PHYS 122. PHYS 220 and PHYS 222 are prerequisites for PHYS 240 and PHYS 242.