BACHELOR OF SCIENCE IN CHEMISTRY ROADMAP - QUANTITATIVE REASONING CATEGORY III/IV AND ENG 114

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>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td>ENG 114</td>
<td>Writing the First Year: Finding Your Voice (A2)</td>
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<tr>
<td></td>
<td>MATH 197</td>
<td>Prelude to Calculus I (Prerequisite for MATH 226)</td>
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<tr>
<td></td>
<td>GE Area A</td>
<td></td>
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<td></td>
<td>GE Area C</td>
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<td></td>
<td>GE Area D</td>
<td></td>
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<tr>
<td><strong>First Semester</strong></td>
<td></td>
<td>Units</td>
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<tr>
<td><strong>Second Semester</strong></td>
<td>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division)</td>
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<tr>
<td></td>
<td>MATH 198</td>
<td>Prelude to Calculus II (Prerequisite for MATH 226, B4)</td>
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<td></td>
<td>GE Area C</td>
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<td>GE Area D</td>
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<td></td>
<td>GE Area E</td>
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<tr>
<td><strong>Second Semester</strong></td>
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<td>Units</td>
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<tr>
<td><strong>Third Semester</strong></td>
<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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<td></td>
<td>MATH 226</td>
<td>Calculus I (Major Lower-Division, B4)</td>
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<td>GE Area A</td>
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<td><strong>Third Semester</strong></td>
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<td>Units</td>
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<tr>
<td><strong>Fourth Semester</strong></td>
<td>CHEM 233 &amp; CHEM 234</td>
<td>Organic Chemistry I and Organic Chemistry I Laboratory (Major Lower-Division)</td>
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<td></td>
<td>MATH 227</td>
<td>Calculus II (Major Lower-Division)</td>
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<td></td>
<td>PHYS 220 &amp; PHYS 222</td>
<td>General Physics with Calculus I and General Physics with Calculus I Laboratory (Major Lower-Division, B1, B3)</td>
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<td></td>
<td>GE Area B: Life Science (B2)</td>
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<td><strong>Fourth Semester</strong></td>
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<td>Units</td>
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<tr>
<td><strong>Fifth Semester</strong></td>
<td>CHEM 321 &amp; CHEM 322</td>
<td>Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory (Major Upper-Division)</td>
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<tr>
<td></td>
<td>CHEM 335 &amp; CHEM 336</td>
<td>Organic Chemistry II and Organic Chemistry II Laboratory (Major Upper-Division)</td>
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<tr>
<td></td>
<td>PHYS 230 &amp; PHYS 232</td>
<td>General Physics with Calculus II and General Physics with Calculus II Laboratory (Major Lower-Division)</td>
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<tr>
<td></td>
<td>GE Area C</td>
<td></td>
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<tr>
<td><strong>Fifth Semester</strong></td>
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<td>Units</td>
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<tr>
<td><strong>Sixth Semester</strong></td>
<td>CHEM 251</td>
<td>Mathematics and Physics for Chemistry (Major Lower-Division)</td>
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<td>CHEM 325</td>
<td>Inorganic Chemistry (Major Upper-Division)</td>
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<td>CHEM 351</td>
<td>Physical Chemistry I: Thermodynamics and Kinetics (Major Upper-Division)</td>
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<td></td>
<td>CHEM 390GW</td>
<td>Contemporary Chemistry and Biochemistry Research - GWAR (Major Upper-Division)</td>
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</table>
Bachelor of Science in Chemistry Roadmap - Quantitative Reasoning Category III/IV and ENG 114

<table>
<thead>
<tr>
<th>GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>3</td>
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</tbody>
</table>

**Seventh Semester**

<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 353</td>
<td>Physical Chemistry II: Quantum Chemistry and Spectroscopy (Major Upper-Division)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 426</td>
<td>Advanced Inorganic Chemistry Laboratory (Major Upper-Division)</td>
<td>2</td>
</tr>
</tbody>
</table>

Upper-Division Major Elective (9 Units Total) - Take One 8 3-4

GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course) 3

**Eighth Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CHEM 451</td>
<td>Experimental Physical Chemistry Laboratory (Major Upper-Division)</td>
<td>2</td>
</tr>
</tbody>
</table>

Upper-Division Major Elective (9 Units Total) – Take Two 8 6-8

GE Area UD-B: Upper-Division Physical and/or Life Sciences (Consider SF State Studies Course) 3

**Total Units** 121-122

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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 (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. 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. CHEM 338 may be substituted for CHEM 336.

6. PHYS 240 and MATH 228 may be substituted for CHEM 251.

7. CHEM 343 may be substituted for either CHEM 426 or CHEM 451 with prior approval of an advisor; CHEM 699 (three units of research in one or more of these three disciplinary areas) may also be substituted with advisor approval.

8. **Major Electives**
   - CHEM 327 Practical GC and HPLC (4 units)
   - CHEM 341 Biochemistry II (3 units)
   - CHEM 343 Biochemistry I Laboratory (3 units)
   - CHEM 370 Computer Applications in Chemistry and Biochemistry (3 units)
   - CHEM 420 Environmental Analysis (3 units)
   - CHEM 422 Instrumental Analysis (4 units)
   - CHEM 433 Advanced Organic Chemistry (3 units)
   - CHEM 443 Biophysical Chemistry Laboratory (4 units)
   - CHEM 645 Research Trends in Chemistry and Biochemistry (3 units)
   - CHEM 680 Chemical Oceanography (3 units)
   - CHEM 699 Independent Study (3 units)

* General Education Requirements Met in the Chemistry Major: The requirements below are deemed “met in the major” upon completion of the courses listed (even though the courses and their prerequisites are not approved for GE). This is true whether or not the student completes the major.

Area B1 (Physical Science) is satisfied upon completion of CHEM 233.

Area B3 (Laboratory Science) is satisfied upon completion of CHEM 234.