## Bachelor of Science in Chemistry Roadmap

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

<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>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>MATH 226</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Oral Communication (A1) or Critical Thinking (A3)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE Area A: Written English Communication (A2)</td>
<td>3</td>
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<tr>
<td><strong>Units</strong></td>
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<td>15</td>
</tr>
<tr>
<td><strong>Second Semester</strong></td>
<td></td>
<td></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>
<td>5</td>
</tr>
<tr>
<td>MATH 227</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 220 &amp; PHYS 222</td>
<td>General Physics with Calculus I and General Physics with Calculus I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Written English Communication II (A4)</td>
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</tr>
<tr>
<td>or Written English Communication (A2) Stretch II</td>
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<tr>
<td><strong>Units</strong></td>
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<td>16</td>
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<tr>
<td><strong>Third Semester</strong></td>
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<td></td>
</tr>
<tr>
<td>CHEM 233 &amp; CHEM 234</td>
<td>Organic Chemistry I and Organic Chemistry I Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>PHYS 230 &amp; PHYS 232</td>
<td>General Physics with Calculus II and General Physics with Calculus II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Written English Communication II (A4) if not already satisfied</td>
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<td></td>
</tr>
<tr>
<td>or SF State Studies or University Elective</td>
<td></td>
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<tr>
<td>GE Area D: U.S. History (D2) or U.S. and California Government (D3)</td>
<td>3</td>
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<tr>
<td><strong>Units</strong></td>
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<td>15</td>
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<tr>
<td><strong>Fourth Semester</strong></td>
<td></td>
<td></td>
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<tr>
<td>CHEM 321 &amp; CHEM 322</td>
<td>Quantitative Chemical Analysis and Quantitative Chemical Analysis Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 335 &amp; CHEM 336</td>
<td>Organic Chemistry II and Organic Chemistry II Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>GE Area A: Oral Communication (A1) or Critical Thinking (A3)</td>
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<tr>
<td>GE Area B: Life Science (B2)</td>
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<td><strong>Units</strong></td>
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<tr>
<td><strong>Fifth Semester</strong></td>
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<tr>
<td>CHEM 251</td>
<td>Mathematics and Physics for Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 325</td>
<td>Inorganic Chemistry</td>
<td>3</td>
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<tr>
<td>CHEM 351</td>
<td>Physical Chemistry I: Thermodynamics and Kinetics</td>
<td>3</td>
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<tr>
<td>GE Area C: Arts (C1) or Humanities (C2)</td>
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<tr>
<td>GE Area D: Social Sciences (D1)</td>
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<tr>
<td><strong>Units</strong></td>
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<tr>
<td><strong>Sixth Semester</strong></td>
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<tr>
<td>CHEM 353</td>
<td>Physical Chemistry II: Quantum Chemistry and Spectroscopy</td>
<td>3</td>
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<tr>
<td>CHEM 390GW</td>
<td>Contemporary Chemistry and Biochemistry Research - GWAR</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 426</td>
<td>Advanced Inorganic Chemistry Laboratory</td>
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<tr>
<td>GE Area C: Arts (C1)</td>
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<tr>
<td>GE Area C: Humanities: Literature (C3)</td>
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<tr>
<td><strong>Units</strong></td>
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<td><strong>Seventh Semester</strong></td>
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<tr>
<td>CHEM 340</td>
<td>Biochemistry I</td>
<td>3</td>
</tr>
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<td>CHEM 451</td>
<td>Experimental Physical Chemistry Laboratory</td>
<td>2</td>
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<tr>
<td>Upper Division Major Elective (9 Units Total)</td>
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<tr>
<td>GE Area D: U.S. History (D2) or U.S. and California Government (D3)</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><strong>Units</strong></td>
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<td>14</td>
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<tr>
<td><strong>Eighth Semester</strong></td>
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<tr>
<td>Upper Division Major Elective (9 Units Total) – Take Two</td>
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<tr>
<td>GE Area UD–B: Upper Division Physical and/or Life Sciences (Consider SF State Studies Course)</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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</table>
SF State Studies or University Elective 3

<table>
<thead>
<tr>
<th>Units</th>
<th>15-17</th>
</tr>
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<tbody>
<tr>
<td>Total Units</td>
<td>120-122</td>
</tr>
</tbody>
</table>

1. Depending on courses completed through Early Start and in high school, students in Pathway/Category 3 or 4 may be required to enroll in additional courses before they can take MATH 199 or MATH 226. Most students in Pathway/Category 3 or 4 will need to take a stretch format for MATH 199 (MATH 197 in Fall 2018 and MATH 198 in Spring 2019). 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).

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

3. 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.

4. CHEM 338 may be substituted for CHEM 336.

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

6. CHEM 342 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.

7. **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)
   - Independent Study (CHEM 699) (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.