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

<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>ENG 114</td>
<td>Writing the First Year: Finding Your Voice (A2)</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>
</tr>
<tr>
<td>GE Area C</td>
<td></td>
<td>3</td>
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<tr>
<td>GE Area D</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>CHEM 115</td>
<td>General Chemistry I: Essential Concepts of Chemistry (Major Lower-Division)</td>
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<tr>
<td>MATH 198</td>
<td>Prelude to Calculus II (Prerequisite for MATH 226, B4)</td>
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<td>GE Area C</td>
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<td>GE Area D</td>
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<tr>
<td>GE Area E</td>
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<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: 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>
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<tr>
<td>GE Area D</td>
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<tr>
<td><strong>Units</strong></td>
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<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>
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<tr>
<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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<tr>
<td>GE Area B: Life Science (B2)</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>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>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>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>GE Area C</td>
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<tr>
<td><strong>Units</strong></td>
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<td><strong>Sixth Semester</strong></td>
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<tr>
<td>CHEM 251</td>
<td>Mathematics and Physics for Chemistry (Major Lower-Division)</td>
<td>3</td>
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<tr>
<td>CHEM 325</td>
<td>Inorganic Chemistry (Major Upper-Division)</td>
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<tr>
<td>CHEM 351</td>
<td>Physical Chemistry I: Thermodynamics and Kinetics (Major Upper-Division)</td>
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<tr>
<td>CHEM 390GW</td>
<td>Contemporary Chemistry and Biochemistry Research - GWAR (Major Upper-Division)</td>
<td>3</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><strong>Units</strong></td>
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### Seventh Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Units</th>
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<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>
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</tr>
<tr>
<td>CHEM 426</td>
<td>Advanced Inorganic Chemistry Laboratory (Major Upper-Division)</td>
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</table>

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

<table>
<thead>
<tr>
<th>GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course)</th>
<th>Units</th>
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### Eighth Semester

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

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

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

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. 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. **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)