CHEMISTRY, BACHELOR OF SCIENCE

Chemistry Major Requirements
(Also see Requirements for a Bachelor's Degree. (https://e-catalogue.jhu.edu/ksas-wse/undergraduate-policies/academic-policies/requirements-bachelors-degree/))

Lecture and laboratory courses should be taken in sequence. In particular, AS.030.228 Intermediate Organic Chemistry Laboratory must be taken before AS.030.356 Advanced Inorganic Lab. Courses taken at another institution that are not directly equivalent to a JHU course may not apply towards these requirements without permission of the Director of Undergraduate Studies.

To allow maximum flexibility in choosing electives, students should complete both physics and organic chemistry by the end of the sophomore year. A biochemistry course AS.020.305 (https://e-catalogue.jhu.edu/search/?P=AS.020.305) Biochemistry or AS.250.315 (https://e-catalogue.jhu.edu/search/?P=AS.250.315) Biochemistry I and Quantitative Analysis Laboratory AS.030.245 (https://e-catalogue.jhu.edu/search/?P=AS.030.245) are required for an American Chemical Society accredited degree. The in-depth courses that are required for the ACS degree are Organic Chemistry II AS.030.206 (https://e-catalogue.jhu.edu/search/?P=AS.030.206), Quantitative Analysis AS.030.245 (https://e-catalogue.jhu.edu/search/?P=AS.030.245), Physical Chemistry II AS.030.301 (https://e-catalogue.jhu.edu/search/?P=AS.030.301). Both AS.030.206 and AS.030.301 are required for the major.

Majors must complete all courses required for the major for a letter grade and receive a grade of C- or higher.

Writing in the Major

Students must complete at least 6 credits of Writing and Communication Foundational Ability coursework in one major. For this major, students would be able to fulfill this requirement by completing AS.030.356 Advanced Inorganic Lab, a required 3 credit course of the major, and by selecting one of their electives (at least 3 credits) for the major that is designated as a Writing and Communications course.

Requirements of the chemistry major are:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS.030.101</td>
<td>Introductory Chemistry I &amp; AS.030.105 and Introductory Chemistry Laboratory I</td>
<td>4</td>
</tr>
<tr>
<td>AS.030.102</td>
<td>Introductory Chemistry II &amp; AS.030.106 and Introductory Chemistry Laboratory II</td>
<td>4</td>
</tr>
<tr>
<td>or AS.030.103</td>
<td>Applied Chemical Equilibrium and Reactivity w/lab</td>
<td></td>
</tr>
<tr>
<td>AS.030.205</td>
<td>Introductory Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>AS.030.206</td>
<td>Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>or AS.030.212</td>
<td>Honors Organic Chemistry II</td>
<td></td>
</tr>
<tr>
<td>AS.030.227</td>
<td>Chemical Chirality: An Introduction in Organic Chem. Lab, Techniques</td>
<td>3</td>
</tr>
<tr>
<td>or AS.030.225</td>
<td>Introductory Organic Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>AS.030.228</td>
<td>Intermediate Organic Chemistry Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>AS.030.301</td>
<td>Physical Chemistry I</td>
<td>3</td>
</tr>
</tbody>
</table>

Select two Lab Courses from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS.030.245</td>
<td>Quantitative Analytical Laboratory</td>
<td>6</td>
</tr>
<tr>
<td>AS.030.305</td>
<td>Physical Chemistry Instrumentation Laboratory I</td>
<td></td>
</tr>
<tr>
<td>AS.030.306</td>
<td>Physical Chemistry Instrumentation Laboratory II</td>
<td></td>
</tr>
</tbody>
</table>

Courses Outside the Department

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS.171.101</td>
<td>General Physics: Physical Science Major I</td>
<td>4</td>
</tr>
<tr>
<td>or AS.171.103</td>
<td>General Physics I for Biological Science Majors</td>
<td></td>
</tr>
<tr>
<td>or AS.171.105</td>
<td>Classical Mechanics I</td>
<td>4</td>
</tr>
<tr>
<td>or AS.171.107</td>
<td>General Physics for Physical Sciences Majors (AL)</td>
<td></td>
</tr>
<tr>
<td>AS.173.111</td>
<td>General Physics Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>or AS.173.115</td>
<td>Classical Mechanics Laboratory</td>
<td></td>
</tr>
<tr>
<td>AS.171.102</td>
<td>General Physics: Physical Science Major II</td>
<td>4</td>
</tr>
<tr>
<td>or AS.171.104</td>
<td>General Physics/Biology Majors II</td>
<td></td>
</tr>
<tr>
<td>or AS.171.106</td>
<td>Electricity and Magnetism I</td>
<td>4</td>
</tr>
<tr>
<td>or AS.171.108</td>
<td>General Physics for Physical Science Majors (AL)</td>
<td></td>
</tr>
<tr>
<td>AS.173.112</td>
<td>General Physics Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>or AS.173.116</td>
<td>Electricity and Magnetism Laboratory</td>
<td></td>
</tr>
<tr>
<td>AS.110.108</td>
<td>Calculus I (Physical Sciences &amp; Engineering)</td>
<td>4</td>
</tr>
<tr>
<td>or AS.110.106</td>
<td>Calculus I (Biology and Social Sciences)</td>
<td></td>
</tr>
<tr>
<td>AS.110.109</td>
<td>Calculus II (For Physical Sciences and Engineering)</td>
<td>4</td>
</tr>
<tr>
<td>or AS.110.107</td>
<td>Calculus II (For Biological and Social Science)</td>
<td></td>
</tr>
<tr>
<td>or AS.110.113</td>
<td>Honors Single Variable Calculus</td>
<td></td>
</tr>
</tbody>
</table>

Advanced Elective Courses

Three credits of advanced chemistry courses beyond AS.030.305-AS.030.306 | 3

Nine credits of advanced chemistry courses, or science electives at the 300-level or higher approved by a Department of Chemistry advisor, and/or mathematics beyond Calculus II | 9

Total Credits | 70

1 Fall semester of AS.030.227 Chemical Chirality: An Introduction in Organic Chem. Lab, Techniques restricted to Chemistry majors.
2 Course must be completed before AS.030.356 Advanced Inorganic Lab.
3 None of the advanced course requirements may be fulfilled with research. Courses numbered between AS.030.307 and AS.030.499 apply here, along with biochemistry course offerings AS.020.305 and AS.250.315.
4 Any graded course worth 3 credits or more at the 300- or 400-level in the following departments will fulfill this requirement: Biology (020), Biophysics (250), Chemistry (030), Earth and Planetary Sciences (270), Neuroscience (080), and Physics (171). It also includes AS.280.3xx-4xx courses with area designators N or Q and Math (AS.110) or Applied Math and Statistics (EN.553) courses at the 200- through 400-level.

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Credits 1
Credits 2
Credits 3
Credits 4
Credits 70
Lecture and laboratory courses should be taken in sequence. In particular, AS.030.228 Intermediate Organic Chemistry Laboratory must be taken before AS.030.356 Advanced Inorganic Lab. Courses taken at another institution that are not directly equivalent to a JHU course may not apply towards these requirements without permission of the Director of Undergraduate Studies.

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Sample Program of Study
A typical program might include the following sequence of courses:

<table>
<thead>
<tr>
<th>First Year</th>
<th>Credits</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS.030.101</td>
<td>3</td>
<td>AS.030.102</td>
</tr>
<tr>
<td>AS.030.105</td>
<td>1</td>
<td>AS.030.106</td>
</tr>
<tr>
<td>AS.110.106</td>
<td>4</td>
<td>AS.110.107</td>
</tr>
<tr>
<td><strong>Second Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS.030.205</td>
<td>4</td>
<td>AS.030.206</td>
</tr>
<tr>
<td>AS.030.225 or 227</td>
<td>3</td>
<td>AS.030.228</td>
</tr>
<tr>
<td>AS.171.101, 103, or 107</td>
<td>4</td>
<td>AS.171.102, 104, or 108</td>
</tr>
<tr>
<td>AS.173.111</td>
<td>1</td>
<td>AS.173.112</td>
</tr>
<tr>
<td><strong>Third Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS.030.301</td>
<td>3</td>
<td>AS.030.302</td>
</tr>
<tr>
<td>Additional Chemistry Lab #1</td>
<td>3</td>
<td>Additional Chemistry Lab #2</td>
</tr>
<tr>
<td>Science or math elective</td>
<td>3</td>
<td>Science or math elective</td>
</tr>
<tr>
<td><strong>Fourth Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS.030.449</td>
<td>3</td>
<td>AS.030.356</td>
</tr>
<tr>
<td>Additional Chemistry Lab #2 (if not taken in the previous year)</td>
<td>3</td>
<td>Science or math elective</td>
</tr>
<tr>
<td>Upper level chemistry elective</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total Credits 72</strong></td>
<td></td>
<td></td>
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</tbody>
</table>