Biochemistry, B.S.

To maximize student flexibility, the curriculum for the B.S. with a major in biochemistry is identical to the B.A. degree in the first two years of study.

Requirements

The Bachelor of Science with a major in biochemistry requires a minimum of 120 s.h., including 70 s.h. of work for the major. Students must maintain a g.p.a. of at least 2.00 in all courses for the major and in all UI courses for the major. They also must complete the College of Liberal Arts and Sciences GE CLAS Core.

All students majoring in biochemistry are initially placed in the Bachelor of Arts degree program. Students in good academic standing can switch to the Bachelor of Science degree program after completing one semester of organic chemistry (CHEM:2230 Organic Chemistry I for Majors or CHEM:2210 Organic Chemistry I). Students who wish to change their degree program to the Bachelor of Science should do so by filling out a change of degree form at the College of Liberal Arts and Sciences Office of Academic Programs and Student Development.

The biochemistry major for the Bachelor of Science degree is intended primarily for students planning careers in research. The B.S. program prepares students to pursue graduate degrees, such as an M.S., Ph.D., or a combined M.D./Ph.D. program, or to work as research technicians. The B.S. program requires 12-14 s.h. more credit in science and laboratory electives than the B.A. program does.

Qualified students may graduate with honors in the biochemistry major; see “Honors in the Major” under Honors [p. 2] in this section of the Catalog.

The B.S. with a major in biochemistry requires the following coursework.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Common Requirements</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Additional Requirements</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>

Common Requirements

Students complete the following during their first three years.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC:3120 &amp; BIOC:3130</td>
<td>Biochemistry and Molecular Biology I-II</td>
<td>6</td>
</tr>
<tr>
<td>BIOC:3140</td>
<td>Experimental Biochemistry</td>
<td>2</td>
</tr>
<tr>
<td>BIOL:1411- BIOL:1412</td>
<td>Foundations of Biology - Diversity of Form and Function</td>
<td>8</td>
</tr>
<tr>
<td>CHEM:1110 &amp; CHEM:1120</td>
<td>Principles of Chemistry I-II</td>
<td>8</td>
</tr>
<tr>
<td>CHEM:2210 or CHEM:2230</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:2220 or CHEM:2240</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:2410</td>
<td>Organic Chemistry Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM:2420</td>
<td>Organic Chemistry Laboratory for Majors</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH:1850 &amp; MATH:1860</td>
<td>Calculus I-II</td>
<td>8</td>
</tr>
<tr>
<td>PHYS:1511 or PHYS:1611</td>
<td>College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS:1512 or PHYS:1612</td>
<td>College Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

If students take PHYS:1612 Introductory Physics II, they must take the course with the lab component.

Additional Requirements

In addition to the common requirements listed above, students must complete the following.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Two of these:</td>
<td></td>
</tr>
<tr>
<td>BIOC:4241</td>
<td>Biophysical Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>BIOC:4242</td>
<td>Biophysical Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:4430</td>
<td>Principles of Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:4431</td>
<td>Physical Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:4432</td>
<td>Physical Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>One of these options:</td>
<td></td>
</tr>
<tr>
<td>BIOC:4999</td>
<td>Advanced Undergraduate Biochemistry Research</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Advanced laboratory courses</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>And:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advanced science electives, approved by</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>biochemistry and molecular biology advisor</td>
<td></td>
</tr>
</tbody>
</table>

Students are encouraged to begin research by taking BIOC:3993 Undergraduate Biochemistry Research, which has no prerequisites. The course involves experience in an active biochemistry research lab, which must be arranged ahead of time with a supervising faculty member. Students may make arrangements directly with the faculty member, or they may request assistance from an undergraduate advisor. Credit earned in BIOC:3993 does not count toward the major, but it does count toward the minimum of 120 s.h. required to graduate.

Before students register for BIOC:4999 Advanced Undergraduate Biochemistry Research, they must have completed BIOC:3120 Biochemistry and Molecular Biology I, BIOC:3130 Biochemistry and Molecular Biology II, BIOC:3140 Experimental Biochemistry, and BIOC:3150 Development of Senior Research Project, with a grade of B-minus or higher in each course. Students also are required to have prior research experience, such as in BIOC:3993 Undergraduate Biochemistry Research, URES:3994 Undergraduate Research and Creative Projects, or HONR:3994 Honors Research Practicum, and permission of the instructor. Students can only count 6 s.h. in BIOC:4999 toward their requirements for the degree.

Teacher Licensure

Students interested in teaching in elementary and/or secondary schools should seek admission to the Teacher Education Program (TEP) in the College of Education.

To qualify for licensure in secondary teaching, students in the TEP complete a degree in education as well as a related College of Liberal Arts and Sciences degree. See Apply on the College of Education website for details on requirements and
Advanced study in medicine, dentistry, or other areas. About one-third of biochemistry majors go on to study medicine; others enter graduate programs or professional degree programs.

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.

### Combined Programs

#### B.S./Ph.D. in Biochemistry

The combined Bachelor of Science/Doctor of Philosophy in biochemistry program permits students to transition into the Ph.D. program during their senior year and to count 12 s.h. of credit toward both the B.S. and Ph.D. requirements. The combined program provides a research-intensive experience and shortens the training time for students interested in pursuing independent biochemistry research careers. Students in the program receive financial support during the second half of their senior year and throughout their Ph.D. study.

Students must be pursuing a Bachelor of Science with a major in biochemistry, and by the beginning of their senior year they must:

- have 108 s.h. of undergraduate credit;
- have a minimum g.p.a. of 3.50;
- have completed four semesters of research experience (summer research counts as one semester); and
- have completed BIOC:3120 Biochemistry and Molecular Biology I, BIOC:3130 Biochemistry and Molecular Biology II, and BIOC:3140 Experimental Biochemistry.

Students interested in the combined program should speak with their academic advisor and the biochemistry and molecular biology honors advisor during their first year or at the beginning of their sophomore year. Separate application to each degree program is required. Applicants must be admitted to both programs before they may be admitted to the combined degree program. For more information, contact the Department of Biochemistry and Molecular Biology.

### Honors

#### Honors in the Major

Students have the opportunity to graduate with honors in the major. They must maintain a cumulative University of Iowa g.p.a. of at least 3.33 and a g.p.a. of at least 3.33 in work for the major. They must earn 6 s.h. in BIOC:4999 Advanced Undergraduate Biochemistry Research and present their research results in a honors thesis written in the form of a journal article and in an oral report given at a special open departmental seminar.

#### University of Iowa Honors Program

In addition to honors in the major, students have opportunities for honors study and activities through membership in the University of Iowa Honors Program. Visit Honors at Iowa to learn about the University’s honors program.

Membership in the UI Honors Program is not required to earn honors in the biochemistry major.

### Career Advancement

Biochemistry graduates with bachelor’s degrees often work as research assistants in industry, government, education, or health services; teach in secondary schools; or go on to advanced study in medicine, dentistry, or other areas. The program offers solid preparation for careers in medicine, biology, chemistry, dentistry, research, or related sciences.

### Academic Plans

#### Four-Year Graduation Plan

The following checkpoints list the minimum requirements students must complete by certain semesters in order to stay on the University’s Four-Year Graduation Plan. Courses in the major are those required to complete the major; they may be offered by departments other than the major department.

**Before the third semester begins:** CHEM:1110 Principles of Chemistry I, CHEM:1120 Principles of Chemistry II, MATH:1850 Calculus I, and MATH:1860 Calculus II.

**Before the fifth semester begins:** BIOL:1411 Diversity of Form and Function, CHEM:2210 Organic Chemistry I or CHEM:2230 Organic Chemistry I for Majors, CHEM:2220 Organic Chemistry II or CHEM:2240 Organic Chemistry II for Majors, and CHEM:2410 Organic Chemistry Laboratory or CHEM:2420 Organic Chemistry Laboratory for Majors.

**Before the seventh semester begins:** PHYS:1511 College Physics I or PHYS:1512 College Physics II, BIOL:3150 Development of Senior Research Project, one semester of BIOC:3993 Undergraduate Biochemistry Research for students planning to take BIOC:4999 Advanced Undergraduate Biochemistry Research, BIOC:3120 Biochemistry and Molecular Biology I, BIOC:3130 Biochemistry and Molecular Biology II, BIOC:3140 Experimental Biochemistry, two science electives, and at least 90 s.h. earned toward the degree.

**Before the eighth semester begins:** CHEM:4431 Physical Chemistry I or CHEM:4432 Physical Chemistry II or BIOC:4241 Biophysical Chemistry I or BIOC:4242 Biophysical Chemistry II, a science elective, and at least 3 s.h. of BIOC:4999 Advanced Undergraduate Biochemistry Research.

**During the eighth semester:** enrollment in all remaining coursework in the major, all remaining GE CLAS Core courses, and a sufficient number of semester hours to graduate.

### Sample Plan of Study

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

#### Biochemistry, B.S.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic Career</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Any Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students in good academic standing can switch from the B.A. to the B.S. degree program after completing one semester of organic chemistry (CHEM:2210 Organic Chemistry I or CHEM:2230 Organic Chemistry I for Majors).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
First Year

Fall
CHEM:1110 Principles of Chemistry I \(^{a,b}\) 4
MATH:1850 Calculus I \(^{a,c}\) 4
RHET:1030 or ENGL:1200 Rhetoric or The Interpretation of Literature 3 - 4
Elective course \(^d\) 1
CSI:1600 Success at Iowa 2

Hours 14-15

Spring
CHEM:1120 Principles of Chemistry II \(^a\) 4
ENGL:1200 or RHET:1030 The Interpretation of Literature or Rhetoric 3 - 4
MATH:1860 Calculus II 4
GE CLAS Core: Diversity and Inclusion \(^e\) 3
Elective course \(^d\) 1

Hours 15-16

Second Year

Fall
BIOI:1411 Foundations of Biology \(^a\) 4
CHEM:2230 or CHEM:2210 Organic Chemistry I for Majors or Organic Chemistry I 3
GE CLAS Core: Historical Perspectives \(^e\) 3
GE CLAS Core: World Languages First Level Proficiency or elective course \(^y\) 4 - 5
Elective course \(^d\) 1

Hours 16-17

Spring
BIOI:1412 Diversity of Form and Function \(^a\) 4
CHEM:2220 or CHEM:2240 Organic Chemistry II or Organic Chemistry II for Majors 3
CHEM:2410 or CHEM:2420 Organic Chemistry Laboratory or Organic Chemistry Laboratory for Majors 3
Major: science elective (consult with advisor) \(^g\) 3
GE CLAS Core: World Languages Second Level Proficiency or elective course \(^y\) 4 - 5

Hours 17-18

Third Year

Fall
BIOC:3120 Biochemistry and Molecular Biology I 3
BIOC:3993 Undergraduate Biochemistry Research 3
PHYS:1611 or PHYS:1511 Introductory Physics I \(^a\) or College Physics I 4
GE CLAS Core: Values and Culture \(^e\) 3
GE CLAS Core: World Languages Second Level Proficiency or elective course \(^y\) 4 - 5

Hours 17-18

Spring
BIOC:3130 Biochemistry and Molecular Biology II 3
BIOC:3140 Experimental Biochemistry 2
BIOC:3150 Development of Senior Research Project 2

Fourth Year

Fall
BIOC:4999 Advanced Undergraduate Biochemistry Research 3
CHEM:4430 or BIOC:4241 or CHEM:4431 Principles of Physical Chemistry or Biophysical Chemistry I or Physical Chemistry I 3
Major: science elective (consult with advisor) \(^g\) 3
GE CLAS Core: International and Global Issues \(^e\) 3
GE CLAS Core: Literary, Visual, and Performing Arts \(^e\) 3

Hours 15

Spring
BIOC:4999 Advanced Undergraduate Biochemistry Research 3
CHEM:4432 or BIOC:4242 Physical Chemistry II or Biophysical Chemistry II 3
Major: science elective (consult with advisor) \(^g\) 3
Major: science elective (consult with advisor) \(^g\) 3
GE CLAS Core: Social Sciences \(^e\) 3

Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall)

Hours 15

Total Hours 125-131

a Fulfills a major requirement and may fulfill a GE requirement.
b Enrollment in chemistry courses requires completion of a placement exam.
c Enrollment in math courses requires completion of a placement exam.
d Students may use elective courses to earn credit towards the total s.h. required for graduation or to complete a double major, minors, or certificates.
e GE CLAS Core courses may be completed in any order unless used as a prerequisite for another course. Students should consult with an advisor about the best sequencing of courses.
f Students who have completed four years of a single language in high school have satisfied the GE CLAS Core World Languages requirement. Enrollment in world languages courses requires a placement exam, unless enrolling in a first-semester-level course.
g Students are required to complete 9 s.h. in advanced science electives approved by biochemistry advisor.
h Please see Academic Calendar, Office of the Registrar website for current degree application deadlines. Students should apply for a degree for the session in which all requirements will be met. For any questions on appropriate timing, contact your academic advisor or Graduation Services.