Biochemistry and Molecular Biology, BS

To maximize student flexibility, the curriculum for the BS with a major in biochemistry and molecular biology is identical to the BA degree in the first two years of study.

Requirements

The Bachelor of Science with a major in biochemistry and molecular biology requires a minimum of 120 s.h., including 70 s.h. of work for the major. Students must maintain a grade-point average (GPA) 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 and molecular biology 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 sending an email from their UI email account to clas-undergrad@uiowa.edu.

The biochemistry and molecular biology major for the Bachelor of Science degree is intended primarily for students planning careers in research. The BS program prepares students to pursue graduate degrees, such as an MS, PhD, or a combined MD/PhD program, or to work as research technicians. The BS program requires 12–14 s.h. more credit in science and laboratory electives than the BA program does.

Qualified students may graduate with honors in the biochemistry and molecular biology major; see "Honors in the Major" under Honors [p. 2] in this section of the catalog.

The BS with a major in biochemistry and molecular biology requires the following coursework.

Common Requirements

Students complete the following during their first three years.

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMB:3120 &amp;</td>
<td>Biochemistry and Molecular</td>
<td>6</td>
</tr>
<tr>
<td>BMB:3130</td>
<td>Biology I-II</td>
<td></td>
</tr>
<tr>
<td>BMB:3140</td>
<td>Experimental Biochemistry</td>
<td>2</td>
</tr>
<tr>
<td>BIOL:1411-</td>
<td>Foundations of Biology -</td>
<td>8</td>
</tr>
<tr>
<td>BIOL:1412</td>
<td>Diversity of Form and Function</td>
<td></td>
</tr>
<tr>
<td>CHEM:1110 &amp;</td>
<td>Principles of Chemistry I-II</td>
<td>8</td>
</tr>
<tr>
<td>CHEM:1120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM:2210</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM:2230</td>
<td>Organic Chemistry I for Majors</td>
<td></td>
</tr>
<tr>
<td>CHEM:2220</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM:2240</td>
<td>Organic Chemistry II for Majors</td>
<td></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>
<tr>
<td>MATH:1850</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>or MATH:1550</td>
<td>Engineering Mathematics I: Single Variable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calculus</td>
<td></td>
</tr>
<tr>
<td>or MATH:1860</td>
<td>Calculus II</td>
<td></td>
</tr>
<tr>
<td>or MATH:1560</td>
<td>Engineering Mathematics II: Multivariable</td>
<td></td>
</tr>
<tr>
<td>or STAT:3510</td>
<td>Biostatistics</td>
<td></td>
</tr>
<tr>
<td>or BIOS:4120</td>
<td>Introduction to Biostatistics</td>
<td></td>
</tr>
<tr>
<td>PHYS:1511</td>
<td>College Physics I</td>
<td>4</td>
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<tr>
<td>or PHYS:1611</td>
<td>Introductory Physics I</td>
<td></td>
</tr>
<tr>
<td>PHYS:1512</td>
<td>College Physics II</td>
<td>4</td>
</tr>
<tr>
<td>or PHYS:1612</td>
<td>Introductory Physics II</td>
<td></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>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMB:4240</td>
<td>Biophysics and Advanced Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>And one of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM:4430</td>
<td>Principles of Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:4431</td>
<td>Chemical Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:4432</td>
<td>Quantum Mechanics and Chemical Kinetics</td>
<td>3</td>
</tr>
<tr>
<td>One of these options:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMB:4999</td>
<td>Advanced Undergraduate Biochemistry Research</td>
<td>6</td>
</tr>
<tr>
<td>Advanced laboratory courses</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>And: Advanced science electives, approved by biochemistry and molecular biology advisor</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

Students are encouraged to begin research by taking BMB:3993 Undergraduate Biochemistry Research, which has no prerequisites. The course involves experience in an active biochemistry and molecular biology 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 BMB: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 BMB:4999 Advanced Undergraduate Biochemistry Research, they must have completed BMB:3120 Biochemistry and Molecular Biology I, BMB:3130 Biochemistry and Molecular Biology II, BMB:3140 Experimental Biochemistry, and BMB: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 BMB: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 BMB: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 must complete a degree in education as well as a related College of Liberal Arts or College of Liberal Arts and Sciences degree in the first two years of study.
Arts and Sciences degree. See Apply on the College of Education website for details on requirements and deadlines for applying to the College of Education and about TEP choices of majors leading to licensure.

**Combined Programs**

**BS/PhD in Biochemistry and Molecular Biology**

The combined Bachelor of Science/Doctor of Philosophy in the biochemistry and molecular biology program permits students to transition into the PhD program during their senior year and to count 12 s.h. of credit toward both the BS and PhD 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 PhD study.

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

- have 108 s.h. of undergraduate credit;
- have a minimum grade-point average of 3.50;
- have completed four semesters of research experience (summer research counts as one semester); and
- have completed BMB:3120 Biochemistry and Molecular Biology I, BMB:3130 Biochemistry and Molecular Biology II, and BMB: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 grade-point average (GPA) of at least 3.33 and a GPA of at least 3.33 in work for the major. They must earn 6 s.h. in BMB: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 and molecular biology major.

**Career Advancement**

Biochemistry and molecular biology 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 biochemistry, medicine, biology, chemistry, dentistry, research, or related sciences. About one-third of biochemistry and molecular biology 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.

**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 fifth semester begins:** PHYS:1611 Introductory Physics I or PHYS:1511 College Physics I, PHYS:1612 Introductory Physics II or PHYS:1512 College Physics II, BMB:3150 Development of Senior Research Project, one semester of BMB:3993 Undergraduate Biochemistry Research for students planning to take BMB:4999 Advanced Undergraduate Biochemistry Research, BMB:3120 Biochemistry and Molecular Biology I, BMB:3130 Biochemistry and Molecular Biology II, BMB:3140 Experimental Biochemistry, two science electives, and at least 90 s.h. earned toward the degree.

**Before the seventh semester begins:** BMB:4240 Biophysics and Advanced Biochemistry or CHEM:4430 Principles of Physical Chemistry or CHEM:4431 Chemical Thermodynamics or CHEM:4432 Quantum Mechanics and Chemical Kinetics, a science elective, and at least 3 s.h. of BMB: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 and Molecular Biology, BS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Career</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Semester</td>
<td>Students in good academic standing can switch from the BA to the BS 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>
</tr>
<tr>
<td>GE CLAS Core: Sustainability</td>
<td>a</td>
<td>0</td>
</tr>
</tbody>
</table>
**First Year**

**Fall**
- CHEM:1110 Principles of Chemistry I \(^{b,c}\) 4
- MATH:1850 Calculus I \(^{b,d}\) 4
- RHE:1030 Rhetoric 3 - 4
- ENGL:1200 The Interpretation of Literature 3 - 4
- STAT:3510 Biostatistics 3 - 4
- GE CLAS Core: Diversity and Inclusion \(^{f}\) 3
- Elective course \(^{g}\) 1

**Hours** 14-15

**Spring**
- CHEM:1120 Principles of Chemistry II \(^{b}\) 4
- ENGL:1200 The Interpretation of Literature 3 - 4
- GE CLAS Core: Historical Perspectives \(^{f}\) 3
- GE CLAS Core: World Languages First Level Proficiency or elective course \(^{g}\) 4 - 5
- Elective course \(^{g}\) 2

**Hours** 16-17

**Second Year**

**Fall**
- BIOL:1411 Foundations of Biology \(^{b}\) 4
- CHEM:2230 Organic Chemistry I for Majors 3
- GE CLAS Core: Historical Perspectives \(^{f}\) 3
- GE CLAS Core: World Languages Second Level Proficiency or elective course \(^{g}\) 4 - 5
- Elective course \(^{g}\) 2

**Hours** 17-18

**Spring**
- BIOL:1412 Diversity of Form and Function \(^{b}\) 4
- CHEM:2240 Organic Chemistry II for Majors 3
- CHEM:2420 Organic Chemistry Laboratory for Majors 3
- GE CLAS Core: World Languages Third Level Proficiency or elective course \(^{g}\) 4 - 5

**Hours** 17-18

**Third Year**

**Fall**
- BMB:3120 Biochemistry and Molecular Biology I 3
- BMB:3993 Undergraduate Biochemistry Research 3
- PHYS:1611 Introductory Physics I \(^{b}\) 4
- GE CLAS Core: Values and Culture \(^{f}\) 3
- GE CLAS Core: World Languages Fourth Level Proficiency or elective course \(^{g}\) 4 - 5

**Hours** 17-18

**Spring**
- BMB:3130 Biochemistry and Molecular Biology II 3
- BMB:3140 Experimental Biochemistry 2
- BMB:3150 Development of Senior Research Project 2
- PHYS:1612 Introductory Physics II \(^{b}\) 4
- GE CLAS Core: World Languages Fourth Level Proficiency or elective course \(^{g}\) 4 - 5

**Fourth Year**

**Fall**
- BMB:4999 Advanced Undergraduate Biochemistry Research 3
- BMB:4240 Biophysics and Advanced Biochemistry \(^{j}\) 3
- GE CLAS Core: International and Global Issues \(^{f}\) 3
- GE CLAS Core: Literary, Visual, and Performing Arts \(^{f}\) 3

**Hours** 15

**Spring**
- BMB:4999 Advanced Undergraduate Biochemistry Research 3
- BMB:4240 Biophysics and Advanced Biochemistry \(^{j}\) 3
- GE CLAS Core: Social Sciences \(^{f}\) 3
- Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) \(^{j}\)

**Hours** 15

**Total Hours** 124-131

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a. Sustainability must be completed by choosing a course that has been approved for Sustainability AND for one of these General Education areas: Natural Sciences; Quantitative and Formal Reasoning; Social Sciences; Historical Perspectives; International and Global Issues; Literary, Visual, and Performing Arts; or Values and Culture.

b. Fulfills a major requirement and may fulfill a GE requirement.

c. Enrollment in chemistry courses requires completion of a placement exam.

d. Enrollment in math courses requires completion of a placement exam.

e. 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.

f. 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.

g. 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.

h. Students are required to complete 9 s.h. in advanced science electives approved by biochemistry advisor.

i. Students must complete BMB:4240 and one course from CHEM:4430, CHEM:4431, CHEM:4432.

j. 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.