Biology, BA

All biology majors complete a chemistry/mathematics foundation and the biology core. In addition, BA students choose courses from several breadth menus and have a wide selection of elective courses, while BS students complete physics foundation courses and choose one of four tracks. The department acquaints undergraduate students with the nature of practicing scientists’ work by offering BIOL:3994 Introduction to Research (requires a Department of Biology faculty sponsor), BIOL:4898 Communicating Research (a course supporting students involved in research), and BIOL:4999 Honors Research in Biology (requires membership in the Biology Honors Program). Students associate with one of the department’s research groups in experiments, discussion of current research, the study of specialized topics, and attendance at research seminars.

Students interested in field biology, zoology, or botany may take varied courses in those subjects offered during the summer at Iowa Lakeside Laboratory.

Learning Outcomes
The graduate with a bachelor’s degree in biology will be able to demonstrate the following.

Foundational Knowledge
Comprehension of fundamental principles and concepts of biology.

Graduates will be able to:
• explain fundamental biological principles within and across levels of organization, from molecules to ecosystem;
• apply foundational knowledge and conceptual frameworks to new situations;
• recognize the consequences of evolutionary history in contrasts between living organisms;
• appreciate the historical sequence and diversity of people who have contributed to the achievements of biological discovery; and
• evaluate new information reported in the news and/or in scientific publications against prior knowledge.

New Discovery
Scientific reasoning and experimental process in biology.

Graduates will be able to:
• perform basic laboratory procedures, including correct operation of devices;
• formulate questions about biological processes based on current knowledge;
• construct a hypothesis to guide experimental inquiry;
• design experiments, identifying variables of analysis and controls for error;
• consider appropriate strategies or technologies applicable to investigate a novel problem;
• collect, organize, summarize, and interpret biological data;
• analyze and evaluate experimental results to inform a hypothesis; and
• distinguish between necessary and sufficient causes.

Quantitative Skills
Mathematical reasoning and basic numeracy applied to biology.

Graduates will be able to:
• perform essential mathematical operations such as unit conversions, dilutions, and molarity calculations;
• apply mathematical concepts and rules of probability to make predictions;
• select and apply appropriate statistical tests to determine the significance of experimental results; and
• use mathematical and/or statistical expressions to evaluate hypotheses with experimental data.

Information Literacy
Acquisition, analysis, and summary of published biological information.

Graduates will be able to:
• locate and evaluate the relevance and credibility of information from electronic and print sources;
• navigate and obtain relevant information from public databases;
• recognize and appropriately cite sources of information;
• identify questions addressed and methodologies used; and
• assess findings reported and conclusions drawn in published scientific articles.

Communication Proficiency
Written and oral presentation of biological information.

Graduates will be able to:
• write concise scientific reports based on findings or literature searches;
• construct visual presentations of results or findings from the scientific literature; and
• orally present findings or results from the literature with appropriate media.

Requirements
The Bachelor of Arts with a major in biology requires a minimum of 120 s.h., including at least 68–75 s.h. of work for the major. Students must maintain a grade-point average 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.

The major for the Bachelor of Arts prepares students for graduate study in the biological sciences and is especially appropriate for those interested in careers in biological science education at all levels. It also provides suitable preparation for professional positions in industry, laboratory, field research, or for professional study in medicine and other health-related fields.

The BA program is broadly based. It introduces students to key concepts in important areas of biology and, compared to the BS program, provides more flexibility in choosing elective courses. Students working toward a Bachelor of Arts degree must complete the chemistry/math foundation; the biology core; three courses from the breadth menus; one course with a laboratory; and five or six elective courses, which may include one course in the history or philosophy of science.
Students who wish to apply transfer credit toward the biology major should consult their biology advisor.

The BA with a major in biology requires the following coursework.

### Requirements

<table>
<thead>
<tr>
<th>Course Category</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry/Mathematics Foundation Courses</td>
<td>18</td>
</tr>
<tr>
<td>Biology Core Courses</td>
<td>19</td>
</tr>
<tr>
<td>Breadth Menus</td>
<td>9-11</td>
</tr>
<tr>
<td>Course with a Laboratory</td>
<td>4-6</td>
</tr>
<tr>
<td>Electives</td>
<td>18-21</td>
</tr>
</tbody>
</table>

### Chemistry/Mathematics Foundation

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>CHEM:1110 &amp; CHEM:1120</td>
<td>Principles of Chemistry I-II</td>
<td>8</td>
</tr>
<tr>
<td>BMB:3110</td>
<td>Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>One of these:</td>
<td></td>
<td></td>
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<tr>
<td>MATH:1460</td>
<td>Calculus for the Biological Sciences</td>
<td>4</td>
</tr>
<tr>
<td>MATH:1850</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>One of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT:2010</td>
<td>Statistical Methods and Computing</td>
<td>3</td>
</tr>
<tr>
<td>STAT:3510</td>
<td>Biostatistics</td>
<td>3</td>
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</tbody>
</table>

### Biology Core

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<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>BIOL:2512</td>
<td>Fundamental Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:2723</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3172</td>
<td>Evolution</td>
<td>4</td>
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</tbody>
</table>

### Breadth Menus

#### Genes and Genomes

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL:3212</td>
<td>Bioinformatics for Beginners</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3314</td>
<td>Genomics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3373</td>
<td>Human Population Genetics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>and Variation</td>
<td></td>
</tr>
<tr>
<td>BIOL:3713</td>
<td>Molecular Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:4373</td>
<td>Molecular Evolution: Genes, Genomes, and Organisms</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:4386</td>
<td>Introduction to Scientific Computing for Biologists</td>
<td>3</td>
</tr>
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</table>

#### Biological Systems

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL:2254</td>
<td>Endocrinology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:2673</td>
<td>Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:2753</td>
<td>Introduction to Neurobiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3233</td>
<td>Introduction to Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3244</td>
<td>Animal Behavior</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3253</td>
<td>Neurobiology I</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3343</td>
<td>Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3363</td>
<td>Plant Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:4333</td>
<td>Genes and Development</td>
<td>3</td>
</tr>
<tr>
<td>May include one of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL:2663</td>
<td>Plant Response to the Environment</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3663</td>
<td>Plant Response to the Environment</td>
<td>3</td>
</tr>
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</table>

### Course with a Laboratory

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL:2246</td>
<td>Entomology Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3245</td>
<td>Animal Behavior Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3626</td>
<td>Cell Biology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3655</td>
<td>Neurogenetics Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3656</td>
<td>Neurobiology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3676</td>
<td>Evolution Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3716</td>
<td>Genetics and Biotechnology Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3736</td>
<td>Developmental Biology Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:4314</td>
<td>Introduction to Synthetic Biology in the Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:4999</td>
<td>Honors Research in Biology</td>
<td>6</td>
</tr>
<tr>
<td>MICR:2157-</td>
<td>General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>MICR:2158</td>
<td>- General Microbiology Lab</td>
<td></td>
</tr>
<tr>
<td>Iowa Lakeside Laboratory courses (consult advisor)</td>
<td>4-5</td>
<td></td>
</tr>
</tbody>
</table>

### Electives

Students complete at least two biology elective courses (prefix BIOL) for 6 s.h. plus 12 s.h. of coursework outside the Department of Biology from the list below.

Biological courses may include courses chosen from the "Breadth Menus" list or the "Course with a Laboratory" list above that have not been used to satisfy those requirements; other 2-4 s.h. courses numbered 2000 or above offered by the Department of Biology except for BIOL:2120 Good Genes Gone Bad: Genetic Disorders of Notable Celebrities and BIOL:2211 Genes, Genomes, and the Human Condition; and approved advanced biology courses taught at Iowa Lakeside Laboratory with approval from the advisor.

Students may count BIOL:3994 Introduction to Research and BIOL:4897 Teaching Internship in Biology only once toward the elective requirement.

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH:2320</td>
<td>Origins of Human Infectious Disease</td>
<td>3</td>
</tr>
<tr>
<td>ANTH:3307</td>
<td>Modern Human Origins</td>
<td>3</td>
</tr>
<tr>
<td>ANTH:3325</td>
<td>Human Evolutionary Genetics</td>
<td>3</td>
</tr>
<tr>
<td>ANTH:3328</td>
<td>Molecular Genetics of Human Disease</td>
<td>3</td>
</tr>
</tbody>
</table>
HIST:3133  Biology of Aging  3
CHEM:2210  Organic Chemistry I  3
CHEM:2220  Organic Chemistry II  3
CPH:2230  Finding Patient Zero: The Exploration of Infectious Disease Transmission and Pandemic Threats  3
CPH:3230  Human Genetics and Public Health  3
CS:1110  Introduction to Computer Science  3
CS:2110  Programming for Informatics  4
EES:3070  Marine Ecosystems and Conservation  3
EES:3210  Principles of Paleontology  3
EES:3220  Evolution of the Vertebrates  4
ENVS:3095  Field Ecology  4
ENVS:3096  Winter Ecology  2
ENVS:3097  Introduction to Bird Study  2
GEOG:2374  Urban Ecology  3
GEOG:2950  Ecological Climatology  3
GHS:2415  Introduction to Philosophy of Science  3
GHS:3110  Colonialism and Indigenous Health Equity  3
GHS:3110  Global Public Health  3
HIST:3133  Science, Technology, and Society in the Modern World  3
PHIL:3604  Introduction to Philosophy of Science  3

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 deadlines for applying to the College of Education and about TEP choices of majors leading to licensure.

Combined Programs

BA/MAT (Science Education Subprogram)

Students interested in pursuing a graduate degree in teaching may apply to the combined Bachelor of Arts/Master of Arts in Teaching with a science education subprogram offered by the College of Liberal Arts and Sciences and the College of Education. The combined program enables students to earn a BA in biology and an MAT in five years by beginning to earn graduate credit during their fourth year of undergraduate study and by counting up to 19 s.h. of qualifying credit toward both degrees. For more information, see Science Education in the Master of Arts in Teaching (College of Education) section of the catalog. Interested students should consult an advisor.

Honors

Honors in the Major

Students majoring in biology have the opportunity to graduate with honors in the major. The Biology Honors Program introduces students to the pursuits of practicing scientists. Honors students associate with one of the department's research groups and participate in an independent research project guided by a faculty member (the research supervisor).

Biology honors students write a thesis based on an interesting biological problem, which is usually identified by the research supervisor. The thesis should clearly document that a student has acquired the necessary experimental skills to address specific questions and test specific hypotheses related to the research problem. Throughout undergraduate residence, departmental honors students also may enroll in courses with honors sections offered by the Department of Biology and by other departments and programs.

To graduate with honors in the major, students must fulfill the following requirements:

- complete the requirements for a major in biology with a grade-point average (GPA) of at least 3.33 in all coursework in the major taken at the University of Iowa (including all biology courses and cognates in chemistry, biochemistry, mathematics, and statistics) and a cumulative University of Iowa GPA of at least 3.33;
- complete 2 s.h. in either BIOL:4998 Communicating Research or a related approved course;
- complete a minimum of 6 s.h. (taken over two or more semesters) of BIOL:4999 Honors Research in Biology;
• write a brief research proposal summarizing the background and goals of their proposed honors research;
• upon completion of their research, submit an acceptable honors thesis; and
• give a brief oral presentation of their research findings to other biology honors students.

Students may apply 6 s.h. of BIOL:4999 Honors Research in Biology toward the required course with a laboratory and count the 2 s.h. earned in BIOL:4998 Honors Seminar in Biology toward the elective requirement.

Biology majors interested in graduating with honors in the major should contact the biology advisor as early as possible, preferably during their sophomore or junior year, so that they may be matched with an appropriate lab. Visit Biology Honors Program to learn more about honors study in the department.

Students who are interested in the University of Iowa Honors Program satisfy the level two requirements when they satisfy the biology honors requirements; see “University of Iowa Honors Program” below.

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 programs.

Students who satisfy the requirements for honors in the biology major also satisfy the experiential learning requirement of the university honors curriculum.

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

Career Advancement

The major in biology prepares students to enter research or service careers associated with private industry or government programs and for primary and secondary school teaching. It also prepares them to enter advanced degree programs leading to careers in higher education and to independent research in a variety of biological fields, or for practice in health professions such as medicine, dentistry, pharmacy, nursing, veterinary medicine, medical technology, and physical therapy.

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: BIOL:1412 Diversity of Form and Function, STAT:2010 Statistical Methods and Computing or STAT:3510 Biostatistics, and four other courses in the major.

Before the seventh semester begins: BIOL:2512 Fundamental Genetics, BIOL:2723 Cell Biology, BIOL:3172 Evolution, five or six more courses in the major, and at least 90 s.h. earned toward the degree.

Before the eighth semester begins: two or three more courses in the major.

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.

Biology, BA

Course Title Hours
Academic Career

Any Semester

Research: Iowa Lakeside Laboratory summer field courses

First Year

Fall
CHEM:1110 Principles of Chemistry I 4
RHET:1030 or ENGL:1200 Rhetoric or The Interpretation of Literature 3 - 4
MATH:1460 Calculus for the Biological Sciences 4
GE CLAS Core: Social Sciences 3
CSI:1600 Success at Iowa 2

Hours 16-17

Spring
BIOL:1411 Foundations of Biology 4
CHEM:1120 Principles of Chemistry II 4
RHET:1030 or ENGL:1200 Rhetoric or The Interpretation of Literature 3 - 4
GE CLAS Core: Diversity and Inclusion 3

Hours 14-15

Second Year

Fall
BIOL:1412 Diversity of Form and Function 4
STAT:3510 or STAT:2010 Biostatistics or Statistical Methods and Computing 3
GE CLAS Core: Literary, Visual, and Performing Arts 3
GE CLAS Core: World Languages First Level Proficiency or elective course 4 - 5

Hours 14-15

Spring
BIOL:2723 Cell Biology 3
Major: elective outside biology 3
Biology, BA

GE CLAS Core: Historical Perspectives 3
GE CLAS Core: World Languages Second Level 4 - 5
Proficiency or elective course

**Hours** 13-14

**Third Year**

**Fall**

BIOL:2512 Fundamental Genetics 4
BMB:3110 Biochemistry 3
Major: elective outside biology 3
GE CLAS Core: World Languages Third Level 4 - 5
Proficiency or elective course

**Hours** 14-15

**Spring**

BIOL:3172 Evolution 4
Major: biological systems requirement I 3
Major: elective outside biology 3
GE CLAS Core: World Languages Fourth Level 4 - 5
Proficiency or elective course

**Hours** 14-15

**Fourth Year**

**Fall**

Major: biological systems requirement II 3
Major: biology elective I 3
Major: elective outside biology 3
GE CLAS Core: International and Global Issues 3
GE CLAS Core: Values and Culture 3

**Hours** 15

**Spring**

Major: course with a laboratory requirement 4 - 6
Major: genes and genomes requirement 3
Major: biology elective II 3
Elective course 3
Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall)

**Hours** 13-15

**Total Hours** 113-121

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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) After completing BIOL:1412 Diversity of Form & Function, students are eligible to enroll in Lakeside Laboratory summer field courses. Registration for these courses is in winter of each year.
c) Enrollment in chemistry courses requires completion of a placement exam.
d) Enrollment in math courses requires completion of a placement exam.
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 complete 12 s.h. of coursework outside the Department of Biology by choosing courses from an approved list.
h) See General Catalog for list of approved courses.
i) 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.
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.