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 for experiments, discuss current research, study specialized topics, and attend 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

Graduates 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 65–70 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 must also complete the College of Liberal Arts and Sciences GE CLAS Core.

Students who wish to apply transfer credit toward the biology major should consult a biology advisor. Students who earn a degree in biology may not earn a degree in biomedical sciences or neuroscience.

In planning coursework, students should be guided by the College of Liberal Arts and Sciences maximum hours rule: students earning a BA may apply a maximum of 56 s.h. earned in one department to the minimum 120 s.h. required for graduation, whether or not the coursework is accepted toward requirements for the major; students who earn more than 56 s.h. from one department may use the additional semester hours to satisfy requirements for the major (if the department accepts them), and the grades they earn become part of their grade-point average, but they cannot apply the additional semester hours to the minimum 120 s.h. required for graduation.

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.

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

Requirements	Hours
Chemistry/Mathematics Foundation Courses	15
Biology Core Courses	19
Breadth Menus	9–11
Course With a Laboratory	4-6
Electives	18–19

Chemistry/Mathematics Foundation

Course #	Title	Hours
This sequence:		
CHEM:1110 & CHEM:1120	Principles of Chemistry I and Principles of Chemistry II	8
One of these:		
MATH:1460	Calculus for the Biological Sciences	4
MATH:1850	Calculus I	4
One of these:		
STAT:2010	Statistical Methods and Computing	3
STAT:3510	Biostatistics	3

Biology Core

Course #	Title	Hours
All of these:		
BIOL:1411 & BIOL:1412	Foundations of Biology and Diversity of Form and Function	8
BIOL:2512	Fundamental Genetics	4
BIOL:2723	Cell Biology	3
BIOL:3172	Evolution	4

Breadth Menus

Genes and Genomes

Course #	Title	Hours
One of these:		
BIOL:3212	Bioinformatics for Beginners	3
BIOL:3314	Genomics	3
BIOL:3373	Human Population Genetics and Variation	3
BIOL:3713	Molecular Genetics	4
BIOL:4333	Genes and Development (if not taken for a biological systems course)	3
BIOL:4373	Molecular Evolution: Genes, Genomes, and Organisms	3
BIOL:4386	Introduction to Scientific Computing for Biologists	3

Biological Systems

Course #	Title	Hours
Two of these:		
BIOL:2254	Endocrinology	3
BIOL:2673	Ecology	3
BIOL:2753	Introduction to Neurobiology	3
BIOL:3233	Introduction to Developmental Biology	3
BIOL:3244	Animal Behavior	3
BIOL:3253	Neurobiology I	4
BIOL:3343	Animal Physiology	3
BIOL:3363	Plant Developmental Biology	3
BIOL:4333	Genes and Development (if not taken as a genes and genomes course)	3
May include one of these:		
BIOL:2663	Plant Response to the Environment	3
BIOL:3663	Plant Response to the Environment	3

Course With a Laboratory

Course #	Title	Hours
One of these (must not have been used as a breadth menu course):		
BIOL:2246	Entomology Lab	4
BIOL:3245	Animal Behavior Laboratory	4
BIOL:3626	Cell Biology Laboratory	4
BIOL:3655	Neurogenetics Laboratory	4
BIOL:3656	Neurobiology Laboratory	4
BIOL:3676	Evolution Lab	4
BIOL:3716	Genetics and Biotechnology Lab	4
BIOL:3736	Developmental Biology Lab	4
BIOL:4999	Honors Research in Biology	6
MICR:2157 & MICR:2158	General Microbiology and General Microbiology Laboratory	5
Iowa Lakeside Laboratory courses (consult advisor)		4-5

Electives

Students complete at least one biology elective course (prefix BIOL) for 3–4 s.h. plus 15 s.h. of coursework outside the Department of Biology from the list below.

Biology courses may include courses chosen from the "Breadth Menus" list or the "Course With a Laboratory" list that have not been used to satisfy those requirements; other 3–4 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

advanced biology courses taught at Iowa Lakeside Laboratory with approval from the advisor.

Course #	Title	Hours
Four to five courses from these (15 s.h.):		
ANTH:2320	Origins of Human Infectious Disease	3
ANTH:3307	Modern Human Origins	3
ANTH:3328	Molecular Genetics of Human Disease	3
BMB:3110	Biochemistry	3
BMB:3120	Biochemistry and Molecular Biology I	3
BMB:3130	Biochemistry and Molecular Biology II	3
CBE:2040	Environment, Energy, and Climate Change	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:3400	Health, Work, and the Environment	3
CPH:4200	Agriculture, Food Systems, and Sustainability	3
CS:1110	Introduction to Computer Science	3
CS:2110	Programming for Informatics	4
GHS:2415	Bioethics	3
GHS:3110	Colonialism and Indigenous Health Equity	3
GHS:3325	Global Epidemics	3
GHS:3500	Global Public Health	3
HIST:2133	Science, Technology, and Society in the Modern World	3
HHP:2100	Human Anatomy	3
HHP:2110	Human Anatomy Laboratory	1
HHP:3115	Anatomy for Human Physiology With Lab	5
MATH:4750	Introduction to Mathematical Biology	3
MICR:2157	General Microbiology	3
MICR:2158	General Microbiology Laboratory	2
MICR:3147	Immunology and Human Disease	3
MICR:3168	Viruses and Human Disease	3
PHIL:3604	Introduction to Philosophy of Science	3
SEES:2374	Biogeography	3
SEES:2950	Environmental Conservation	4
SEES:3070	Marine Ecosystems and Conservation	3
SEES:3095	Field Ecology	4
SEES:3096	Winter Ecology	2
SEES:3097	Introduction to Bird Study	2
SEES:3110	Geography of Health	3
SEES:3210	Principles of Paleontology	3
SEES:3220	Evolution of the Vertebrates	3
SEES:3350	Urban Ecology	3
SEES:4470	Ecological Climatology	3
SEES:4600	Biogeography, Ecology, and Conservation of Mammals	4
From the physics courses, students may choose from the following (maximum of two courses); if they select PHYS:1511, they could take PHYS:1512; if they select PHYS:1611, they could take PHYS:1612:		
PHYS:1400	Basic Physics	3-4
or		
PHYS:1511	College Physics I	4
or PHYS:1611	Introductory Physics I	
PHYS:1512	College Physics II	4
or PHYS:1612	Introductory Physics II	

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. Visit 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, visit 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 the 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 may also enroll in courses with honors sections offered by the Department of Biology and other departments and programs.

To graduate with honors in the biology 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:4898 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:4898 Communicating Research 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; visit "University of Iowa Honors Program" in the following section.

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.

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 third semester begins: MATH:1460 Calculus for the Biological Sciences or MATH:1850 Calculus I, CHEM:1110 Principles of Chemistry I, CHEM:1120 Principles of Chemistry II, and BIOL:1411 Foundations of Biology.

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, visit MyUI.

Biology, BA

Course	Title	Hours
Academic Career		
Any Semester		
GE CLAS Core: Sustainability [a]		
Research: Iowa Lakeside Laboratory summer field courses [b]		
	Hours	**0**
First Year		
Fall		
CHEM:1110	Principles of Chemistry I [c]	4
MATH:1460	Calculus for the Biological Sciences [d]	4
RHET:1030 or ENGL:1200	Rhetoric: Writing and Communication or Interpreting Literature	3 - 4
GE CLAS Core: Social Sciences [e]		3
CSI:1600	Success at Iowa	1
	Hours	**15-16**
Spring		
BIOL:1411	Foundations of Biology	4
CHEM:1120	Principles of Chemistry II	4
ENGL:1200 or RHET:1030	Interpreting Literature or Rhetoric: Writing and Communication	3 - 4

GE CLAS Core: Understanding Cultural Perspectives [e]		3
	Hours	**14-15**
Second Year		
Fall		
BIOL:1412	Diversity of Form and Function	4
STAT:2010 or STAT:3510	Statistical Methods and Computing or Biostatistics	3
Major Elective: elective outside biology [f]		3
GE CLAS Core: World Languages First Level Proficiency or elective course [g]		4 - 5
	Hours	**14-15**
Spring		
BIOL:2723	Cell Biology	3
Major Elective: elective outside biology [f]		3
GE CLAS Core: Historical Perspectives [e]		3
GE CLAS Core: World Languages Second Level Proficiency or elective course [g]		4 - 5
Elective course [h]		3
	Hours	**16-17**
Third Year		
Fall		
BIOL:2512	Fundamental Genetics	4
Major Elective: elective outside biology [f]		3
Major Elective: elective outside biology [f]		3
GE CLAS Core: World Languages Third Level Proficiency or elective course [g]		4 - 5
Elective course [h]		3
	Hours	**17-18**
Spring		
BIOL:3172	Evolution	4
Major Elective: biological systems requirement I [i]		3
Major Elective: elective outside biology [f]		3
GE CLAS Core: World Languages Fourth Level Proficiency or elective course [g]		4 - 5
	Hours	**14-15**
Fourth Year		
Fall		
Major Elective: biological systems requirement II [i]		3
Major Elective: biology elective		3
GE CLAS Core: Literary, Visual, and Performing Arts [e]		3
GE CLAS Core: International and Global Issues [e]		3
Elective course [h]		3
	Hours	**15**
Spring		
Major Elective: course with a laboratory requirement [i]		4 - 6
Major Elective: genes and genomes requirement [i]		3
GE CLAS Core: Values and Society [e]		3
Elective course [h]		3
Elective course [h]		3
Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) [j]		
	Hours	**16-18**
	Total Hours	**121-129**

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 or Formal Reasoning; Social Sciences; Historical Perspectives; International and Global Issues; Literary, Visual, and Performing Arts; or Values and Society.

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 complete 15 s.h. of coursework outside the Department of Biology by choosing courses from an approved list.

g Students who have completed four levels of a single language or two levels of two different languages in high school or college have satisfied the GE CLAS Core World Languages requirement. Students who have completed three levels of a single language may complete a fourth-level course in the same language or may choose an approved World Language and Cultural Exploration course. Enrollment in world languages courses requires a placement exam, unless enrolling in a first-semester-level course. Contact your academic advisor or CLAS Undergraduate Programs Office with questions concerning the World Languages requirement.

h Students may use elective courses to earn credit toward the total s.h. required for graduation or to complete a double major, minors, or certificates.

i See General Catalog for list of approved courses.

j Please see Academic Calendar, on 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 Degree Services.