Biomedical Sciences, BS

Learning Outcomes

Graduates of the biomedical sciences program will achieve the following.

Foundational Knowledge

Comprehension of fundamental principles and concepts in the natural and social sciences.

Graduates will be able to:

- integrate across the natural and social sciences;
- apply foundational knowledge and conceptual frameworks to biomedicine;
- recognize the consequences of evolutionary history in the understanding of human biology and disease; and
- evaluate new information reported in the news and/or in scientific publications against prior knowledge.

New Discovery

Scientific reasoning and experimental process in biomedicine.

Graduates will be able to:

- perform basic laboratory procedures, including correct operation of devices;
- formulate questions about natural 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 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 biomedicine.

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 biomedical 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 biomedical 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
- present findings or results from the literature orally with appropriate media.

Requirements

The Bachelor of Science with a major in biomedical sciences requires a minimum of 120 s.h., including at least 79–81 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 interdisciplinary major provides an excellent foundation for medical training and research and/or practice in the chemical, genetic, cellular, and physiological bases of human disease. The curriculum includes required and elective coursework in biochemistry and molecular biology, biology, chemistry, health, sport, and human physiology, mathematics, microbiology and immunology, physics, psychology, sociology, and statistics. Students who wish to apply transfer credit toward the major should consult their departmental advisor.

Students who earn a major in biomedical sciences may not earn a major in biology (BA or BS).

The BS with a major in biomedical sciences requires the following coursework.

Requirements	Hours
Required Courses	66-67
Elective Courses	13-14

Required Courses

Students complete the following coursework (66–67 s.h.).

Chemistry

Course #	Title	Hours
All of these:		
BMB:3120	Biochemistry and Molecular Biology I	3
BMB:3130	Biochemistry and Molecular Biology II	3
CHEM:1110	Principles of Chemistry I	4
CHEM:1120	Principles of Chemistry II	4
CHEM:2210	Organic Chemistry I	3
CHEM:2220	Organic Chemistry II	3
CHEM:2410	Organic Chemistry Laboratory	3

Life Sciences

Course #	Title	Hours
All of these:		
BIOL:1411	Foundations of Biology	4
BIOL:2512	Fundamental Genetics	4
BIOL:3373	Human Population Genetics and Variation	3
HHP:2400	Fundamentals of Human Physiology	3
MICR:2157 & MICR:2158	General Microbiology and General Microbiology Laboratory (both courses should be taken in the same semester)	5

Mathematics

Course #	Title	Hours
One of these:		
MATH:1460	Calculus for the Biological Sciences	4
MATH:1550	Engineering Calculus I	4
MATH:1850	Calculus I	4

Statistics

Course #	Title	Hours
This course:		
STAT:3510	Biostatistics	3

Physics

Course #	Title	Hours
One of these sequences:		
PHYS:1511 & PHYS:1512	College Physics I and College Physics II	8
PHYS:1611 & PHYS:1612	Introductory Physics I and Introductory Physics II	8

Social Sciences

Course #	Title	Hours
Both of these:		
PSY:1001	Elementary Psychology	3
SOC:1010	Introduction to Sociology	3-4
One of these:		
CPH:1800	Social and Psychological Determinants of Health: Changing Behavior, Improving Health	3
PSY:2130	Advanced Psychology for Pre-Medical Track	3
PSY:2930	Abnormal Psychology: Health Professions	3

Elective Courses

Students complete a total of 13–14 s.h. of elective coursework chosen from the following lists.

Lecture Courses

Course #	Title	Hours
Two of these:		
BIOL:2254	Endocrinology	3
BIOL:2723	Cell Biology	3
BIOL:2753	Introduction to Neurobiology	3
BIOL:3212	Bioinformatics for Beginners	3
BIOL:3233	Introduction to Developmental Biology	3
BIOL:3244	Animal Behavior	3
BIOL:3314	Genomics	3
BIOL:3343	Animal Physiology	3
MICR:3147	Immunology and Human Disease	3
MICR:3159	Bacteria and Human Disease	3
MICR:3168	Viruses and Human Disease	3

Investigative Lab

Course #	Title	Hours
One of these:		
BIOL:3245	Animal Behavior Laboratory	4
BIOL:3626	Cell Biology 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
MICR:3165	Genetics of Bacterial Pathogens Lab and Discussion	3

Experiential Learning

The objective of this requirement is to enrich the curriculum through efforts on a research project or other academic experience where a student pursues activities in the biomedical sciences.

Course #	Title	Hours
Choose from the following:		
BIOL:3994	Introduction to Research (taken twice for 2 s.h. each)	4
BIOL:4999	Honors Research in Biology (taken twice for 2 s.h. each)	4
An approved research course equivalent, such as HONR:4990.		4
Approved internships, paid hourly research work, or similar experiences conducted over at least two semesters		0-4

Approved internships, paid hourly research work, and similar experiences may be used to satisfy the experiential learning requirement. They may also be used to fulfill the experiential learning requirement for the University of Iowa Honors Program. Students should discuss potential activities with academic advisors and, if necessary, obtain approval from the program director for a personalized plan to satisfy the requirement. A final summary of completed and in-progress experiential learning activities, including courses taken, fellowships received, appointments, presentations, and publications, among others, is required to evaluate completion.

Honors

Honors in the Major

Students majoring in biomedical sciences are encouraged to graduate with honors in the major.

Honors students in the major may enroll in courses with honors sections offered by the Department of Biology and by other departments and programs. They also are advised to participate in the Office of Undergraduate Research (OUR) and to apply for research scholarships.

Students who earn honors in the major must maintain a cumulative University of Iowa grade-point average (GPA) of at least 3.33, as required by the College of Liberal Arts and Sciences.

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

- complete the requirements for a major in biomedical sciences with a GPA of at least 3.33 in all University of Iowa coursework in the major;
- complete 2 s.h. in BIOL:4898 Communicating Research;
- complete a minimum of 6 s.h. (taken over two or more semesters) in BIOL:4999 Honors Research in Biology or equivalent research credit approved by the program director;
- 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 an oral presentation of their research findings.

Biomedical sciences majors interested in graduating with honors in the major should contact the biology honors program advisor as early as possible, preferably during their sophomore or junior year, so that they may be matched with an appropriate lab. Contact the Department of Biology to learn more about honors in the major.

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 biomedical sciences major.

Career Advancement

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: CHEM:1110 Principles of Chemistry I, CHEM:1120 Principles of Chemistry II, BIOL:1411 Foundations of Biology, PSY:1001 Elementary Psychology, SOC:1010 Introduction to Sociology, MATH:1460 Calculus for the Biological Sciences or MATH:1550 Engineering Calculus I or MATH:1850 Calculus I, CHEM:2210 Organic Chemistry I, CHEM:2220 Organic Chemistry II, MICR:2157 General Microbiology, MICR:2158 General Microbiology Laboratory, PHYS:1511 College Physics I, PHYS:1512 College Physics II, and HHP:2400 Fundamentals of Human Physiology.

Before the seventh semester begins: BMB:3120 Biochemistry and Molecular Biology I, BMB:3130 Biochemistry and Molecular Biology II, CHEM:2410 Organic Chemistry Laboratory, BIOL:2512 Fundamental Genetics, and STAT:3510 Biostatistics.

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.

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Course	Title	Hours
Academic Career		
Any Semester		
GE CLAS Core: Sustainability [a]		
Students who earn a major in biomedical sciences may not earn a major in Biology (BA or BS).		
	Hours	**0**
First Year		
Any Semester		
Begin volunteering at a hospital or other healthcare facility in the first year or as early as possible.		
	Hours	**0**
Fall		
CHEM:1110	Principles of Chemistry I [b]	4
MATH:1460	Calculus for the Biological Sciences [c]	4
ENGL:1200 or RHET:1030	The Interpretation of Literature or Rhetoric: Writing and Communication	3 - 4
SOC:1010	Introduction to Sociology	3
CSI:1600	Success at Iowa	1
	Hours	**15-16**
Spring		
BIOL:1411	Foundations of Biology	4
CHEM:1120	Principles of Chemistry II	4
RHET:1030 or ENGL:1200	Rhetoric: Writing and Communication or The Interpretation of Literature	3 - 4
PSY:1001	Elementary Psychology	3
	Hours	**14-15**
Second Year		
Any Semester		
Shadow a professional and learn more about the field of medicine in the second or third year.		

Start the search process for a research lab in the second or third year.		
	Hours	**0**
Fall		
BIOL:2512	Fundamental Genetics	4
CHEM:2210	Organic Chemistry I	3
PHYS:1511	College Physics I	4
GE CLAS Core: World Languages First Level Proficiency or elective course [d]		4 - 5
	Hours	**15-16**
Spring		
CHEM:2220	Organic Chemistry II	3
MICR:2157	General Microbiology [e]	3
MICR:2158	General Microbiology Laboratory [e]	2
PHYS:1512	College Physics II	4
GE CLAS Core: World Languages Second Level Proficiency or elective course [d]		4 - 5
	Hours	**16-17**
Third Year		
Any Semester		
Students should start the search process for letters of recommendation in the third or fourth year.		
	Hours	**0**
Fall		
BMB:3120	Biochemistry and Molecular Biology I	3
CHEM:2410	Organic Chemistry Laboratory	3
HHP:2400	Fundamentals of Human Physiology	3
STAT:3510	Biostatistics	3
GE CLAS Core: World Languages Third Level Proficiency or elective course [d]		4 - 5
	Hours	**16-17**
Spring		
BIOL:3373	Human Population Genetics and Variation	3
BMB:3130	Biochemistry and Molecular Biology II	3
PSY:2930 or PSY:2130 or CPH:1800	Abnormal Psychology: Health Professions or Advanced Psychology for Pre-Medical Track or Social and Psychological Determinants of Health: Changing Behavior, Improving Health	3
GE CLAS Core: World Languages Fourth Level Proficiency or elective course [d]		4 - 5
Elective course [f]		3
Exam: Take MCAT in spring or summer		
	Hours	**16-17**
Summer		
Admission Application: Apply to medical school		
	Hours	**0**
Fourth Year		
Fall		
Major: elective lecture I [g]		3
Major: research experience [g]		4
GE CLAS Core: Understanding Cultural Perspectives [h]		3
GE CLAS Core: Historical Perspectives [h]		3
GE CLAS Core: International and Global Issues [h]		3
	Hours	**16**
Spring		
Major: elective lecture II [g]		3 - 4
Major: investigative lab [g]		3 - 4
GE CLAS Core: Literary, Visual, and Performing Arts [h]		3
GE CLAS Core: Values and Society [h]		3
Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) [i]		
	Hours	**12-14**
	Total Hours	**120-128**

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 Enrollment in chemistry courses requires completion of a placement exam.

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

d 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.

e MICR:2157 and MICR:2158 should be taken in the same semester.

f 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.

g Students complete a total of 13-14 s.h. of elective coursework from approved lists of courses; see General Catalog.

h 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.

i 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.