Biomedical Sciences, B.S.

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 enquiry;
  - 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; and
  - 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 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 78-83 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.

The interdisciplinary major provides an excellent foundation for medical training and for research and/or practice in the chemical, genetic, cellular, and physiological bases of human disease. The curriculum includes required and elective course work in biochemistry, biology, chemistry, health 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.

The B.S. with a major in biomedical sciences requires the following course work.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Required Courses</td>
<td>62-63</td>
</tr>
<tr>
<td></td>
<td>Elective Courses</td>
<td>16-20</td>
</tr>
<tr>
<td>Total</td>
<td>Hours</td>
<td>78-83</td>
</tr>
</tbody>
</table>

Required Courses
Students complete the following course work (62-63 s.h.).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All of these</td>
<td></td>
</tr>
<tr>
<td>BIOC:3120</td>
<td>Biochemistry and Molecular Biology I</td>
<td>3</td>
</tr>
<tr>
<td>BIOC:3130</td>
<td>Biochemistry and Molecular Biology II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:1110</td>
<td>Principles of Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM:1120</td>
<td>Principles of Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM:2210</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:2220</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
</tbody>
</table>

Life Sciences
All of these:

- BIOL:1411 Foundations of Biology 4
- BIOL:2211 Genes, Genomes, and the Human Condition 3
- BIOL:3373 Human Population Genetics and Variation 3
- HHP:3500 Human Physiology 3
- MICR:2157- MICR:2158 General Microbiology - General Microbiology Laboratory (both courses must be taken in the same semester) 5

**Mathematics**

One of these:

- MATH:1460 Calculus for the Biological Sciences 4
- MATH:1550 Engineering Mathematics I: Single Variable Calculus 4
- MATH:1850 Calculus I 4

**Statistics**

This course:

- STAT:3510 Biostatistics 3

**Physics**

One of these sequences:

- PHYS:1511- PHYS:1512 College Physics I-II 8
- PHYS:1611- PHYS:1612 Introductory Physics I-II 8

**Social Sciences**

All of these:

- PSY:1001 Elementary Psychology 3
- PSY:2130 Advanced Psychology for Pre-Medical Track 3
- SOC:1010 Introduction to Sociology 3-4

**Elective Courses**

Students complete a total of 16-20 s.h. of elective course work chosen from the following lists.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
</table>
| Lecture Courses
| Two of these:                                    |       |
| BIOC:5241 | Biophysical Chemistry I                          | 3     |
| BIOL:2254 | Endocrinology                                     | 3     |
| BIOL:2723 | Cell Biology                                      | 3     |
| BIOL:2753 | Introduction to Neurobiology                      | 3     |
| BIOL:3233 | Introduction to Developmental Biology             | 3     |
| BIOL:3343 | Animal Physiology                                 | 3     |
| BIOL:4213 | Bioinformatics                                    | 4     |
| MICR:3147 | Immunology and Human Disease                      | 3     |
| MICR:3168 | Viruses and Human Disease                         | 3     |

**Chemistry Lab**

One of these:

- BIOC:3140 Experimental Biochemistry 2
- CHEM:2410 Organic Chemistry Laboratory 3

**Investigative Lab**

One of these:

- 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

**Experiential Learning**

One of these (4-6 s.h.):

- BIOL:4999 Honors Research in Biology arr.
- Another approved honors research course 6
- An additional lab course 4

**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 Iowa Center for Research by Undergraduates (ICRU) and to apply for research scholarships.

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

- complete the requirements for a major in biomedical sciences with a g.p.a. of at least 3.33 in all University of Iowa course work in the major;
- complete 1 s.h. in BIOL:4898 Communicating Research;
- complete 2 s.h. in either BIOL:4998 Honors Seminar in Biology or an advanced biology seminar 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 an oral presentation of their research findings.

Biomedical sciences majors interested in graduating with honors in the major should contact the biomedical sciences honors 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.
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.


During the eighth semester: enrollment in all remaining course work 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.

Biomedical Sciences, B.S.

Course        Title                        Hours
First Year
Any Semester
Begin volunteering at a hospital or other healthcare facility in the first year or as early as possible.

Fall
CHEM:1110    Principles of Chemistry I a, b  4
SOC:1010     Introduction to Sociology a     3
ENGL:1200    The Interpretation of Literature or RHET:1030 or Rhetoric                  3 - 4
MATH:1460    Calculus for the Biological Sciences a, c                   4
CSI:1600     Success at Iowa                      2

Spring
BIOL:1411    Foundations of Biology a            4
CHEM:1120    Principles of Chemistry II a        4
PSY:1001     Elementary Psychology                  3
GE CLAS Core: World Languages First Level Proficiency or elective course d                      4 - 5

Hours 15-16

Second Year
Any Semester
Shadow a doctor and learn more about the field of medicine in the second year.
Start the search process for a research lab in the second year.

Fall
MICR:2157    General Microbiology e                      3
MICR:2158    General Microbiology Laboratory e           2
PHYS:1511    College Physics I                             4
CHEM:2210    Organic Chemistry I                             3
GE CLAS Core: World Languages Second Level Proficiency or elective course e                    4 - 5

Hours 16-17

Spring
HHP:3500     Human Physiology                                3
PHYS:1512    College Physics II                                4
CHEM:2220    Organic Chemistry II                                3
STAT:3510    Biostatistics                                         3
GE CLAS Core: World Languages Second Level Proficiency or elective course e                    4 - 5

Third Year
Any Semester
Students should request letters of reference for medical school applications in the third year.

Fall
BIOL:2211    Genes, Genomes, and the Human Condition                      3
BIOC:3120    Biochemistry and Molecular Biology I                        3
Major: chemistry lab option or elective course f                          2 - 3
GE CLAS Core: Historical Perspectives g                                     3
GE CLAS Core: World Languages Fourth Level Proficiency or elective course e            4 - 5

Hours 17-18

Spring
BIOL:3373    Human Population Genetics and Variation                      3
BIOC:3130    Biochemistry and Molecular Biology II                       3
PSY:2130     Advanced Psychology for Pre-Medical Track                      3
ENGL:1200    The Interpretation of Literature or Rhetoric                  3 - 4
ENGL:1030    The Interpretation of Literature or Rhetoric                  3 - 4
Major: chemistry lab option or elective course f                          2 - 3
Exam: Take MCAT in spring or summer                                       

Hours 14-16

Summer
Admission Application: Apply to medical school

Fourth Year
Fall
Major: elective lecture I course f                                        3
Major: experiential elective or elective course f, h                         3 - 4
GE CLAS Core: International and Global Issues g                                3
GE CLAS Core: Diversity and Inclusion

| Hours | 12-13 |

**Spring**

| Major: elective lecture II course | 3 |
| Major: investigative lab | 3 - 4 |
| Major: experiential elective or elective course | 3 - 4 |
| GE CLAS Core: Literary, Visual, and Performing Arts | 3 |
| GE CLAS Core: Values and Culture | 3 |

| Hours | 15-17 |

**Total Hours**

| 120-131 |

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- 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 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.
- e: MICR:2157 and MICR:2158 must be taken in the same semester.
- f: Students complete a total of 16-20 s.h. of elective course work from approved lists of courses.
- g: 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.
- h: Experiential elective is honors in the major or a second investigative lab course.

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**Career Advancement**

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