Individuals interested in teaching in K-12 schools must complete a degree in the content area they want to teach plus the teacher preparation program through the Department of Teaching and Learning. Individuals must complete the teaching major/teaching track within that degree program, which may contain different course requirements than the academic major since the sequence of courses is designed to meet state standards. Upon completion of the degree program with the teaching track and the secondary licensure program, one will be eligible for a standard Montana teaching license in this content area.

- Secondary Education Licensure Program (http://www.coehs.umt.edu/departments/currinst/undergradprograms/seced/default.php)
- Licensure Degree Requirements (http://catalog.umt.edu/colleges-schools-programs/education-human-sciences/teaching-learning/lic-secondary-licensure)

### Bachelor of Arts - Biology; Biological Education Concentration

**College Humanities & Sciences**

**Degree Specific Credits:** 62

**Required Cumulative GPA:** 2.75

**Catalog Year:** 2017-2018

**Note:** This option provides students with coursework in biology and related science and mathematics needed to be certified by the State of Montana to teach secondary biology (in middle and high school). This concentration is appropriate for students interested in teaching biology in a larger, more urban school. In order to be licensed to teach secondary biology, students must be admitted to the Teacher Education Program through the Phyllis J. Washington College of Education and Human Sciences.

### General Education Requirements

Information regarding these requirements can be found in the General Education Section (http://catalog.umt.edu/academics/general-education-requirements) of the catalog.

### Summary

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology/Microbiology Lower Division Core</td>
<td>17</td>
</tr>
<tr>
<td>Upper Division Core Courses Required by the Biological Education Concentration</td>
<td>14</td>
</tr>
<tr>
<td>Animal-Based Organismal Requirement</td>
<td>3</td>
</tr>
<tr>
<td>Required Content Courses Outside of the Major</td>
<td>28</td>
</tr>
<tr>
<td>- Mathematics - Calculus</td>
<td></td>
</tr>
<tr>
<td>- Mathematics - Statistics</td>
<td></td>
</tr>
<tr>
<td>- Chemistry</td>
<td></td>
</tr>
<tr>
<td>- Physics</td>
<td></td>
</tr>
</tbody>
</table>

### Biology/Microbiology Lower Division Core

**Rule:** All of the following courses are required.

**Note:** The lower division core should be completed before attempting most upper division major courses.

- **AP Biology credit may be substituted for either BIOB 160N/BIOB 161N or BIOB 170N/BIOB 171N.**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 160N</td>
<td>Principles of Living Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 161N</td>
<td>Prncpls of Living Systems Lab</td>
<td>1</td>
</tr>
<tr>
<td>BIOB 170N</td>
<td>Princpls Biological Diversity</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 171N</td>
<td>Prncipls Biological Dvrsty Lab</td>
<td>2</td>
</tr>
<tr>
<td>BIOB 260</td>
<td>Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 272</td>
<td>Genetics and Evolution</td>
<td>4</td>
</tr>
</tbody>
</table>

| Total Hours | 65 |

### Upper Division Core Courses Required by the Biological Education Concentration

**Rule:** All of the following courses are required.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 370</td>
<td>General Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 371</td>
<td>Gen Ecology Lab (equiv to 271)</td>
<td>2</td>
</tr>
<tr>
<td>BIOM 360</td>
<td>General Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 361</td>
<td>General Microbiology Lab</td>
<td>2</td>
</tr>
<tr>
<td>BIOO 433</td>
<td>Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 434</td>
<td>Plant Physiology Lab</td>
<td>1</td>
</tr>
</tbody>
</table>

| Total Hours | 14 |

**Minimum Required Grade:** C-

### Animal-Based Organismal Requirement

**Rule:** Complete one of the following courses

- **BIOB 301** Developmental Biology 3
- or **BIOL 435** Comparative Animal Physiology

| Total Hours | 3 |

**Minimum Required Grade:** C-

### Required Content Courses Outside of the Major

**Minimum Required Grade:** C-

### Mathematics - Calculus

**Rule:** Complete one of the following calculus courses

---

### Environmental Geosciences

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Upper Division Writing Expectation for the Major</td>
<td>3</td>
</tr>
<tr>
<td>Secondary Teaching Licensure</td>
<td></td>
</tr>
</tbody>
</table>

| Total Hours | 65 |

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Biological Education (Teacher Preparation Biology)
**Note:** Choose M 171, if you plan to take additional calculus courses, or if you plan a double major or minor in a field that requires more calculus (e.g. math, physics, biochemistry, computer science).

M 162  Applied Calculus  4
or M 171  Calculus I

Total Hours  4

Minimum Required Grade: C-

**Mathematics - Statistics**

**Rule:** The following course is required

STAT 216  Introduction to Statistics  4

Total Hours  4

Minimum Required Grade: C-

**Chemistry**

**Rule:** All of the following courses are required

CHMY 123  Introduction to Organic and Biochemistry  5
& CHMY 124  and Introduction to Organic and Biochemistry Lab

Choose one of the Chemistry sequences:

CHMY 121N  Introduction to General Chemistry  4-10
CHMY 485  Laboratory Safety
Or (Required for the broadfield teaching concentration)

CHMY 141N  College Chemistry I
CHMY 142N  College Chemistry I Lab
CHMY 143N  College Chemistry II
& CHMY 144N  and College Chemistry II Lab

Total Hours  9-15

Minimum Required Grade: C-

**Physics**

Select one of the following Physics sequences:  10

Algebra- and Trigonometry-based:

PHSX 205N  College Physics I
& PHSX 206N  and College Physics I Laboratory

PHSX 207N  College Physics II
& PHSX 208N  and College Physics II Laboratory

Calculus-based:

PHSX 217N  Fund of Physics w/Calc I
& PHSX 218N  and Physics Laboratory I w/Calc (requires M 171)

PHSX 215N  Fund of Physics w/Calc II
& PHSX 216N  and Physics Laboratory II w/Calc

Total Hours  10

Minimum Required Grade: C-

**Environmental Geosciences**

**Rule:** Complete one of the following courses

GEO 105N  Oceanography  3
or GEO 103N  Introduction to Environmental Geology

Total Hours  3

Minimum Required Grade: C-

**Education**

**Rule:** The following course is required

Note: The course number EDU 497 covers many different teaching method courses. The section of EDU 497 entitled "Methods: 5 - 12 Science" for 3 credits is required for the Biological Education option.

EDU 497  Teaching and Assessing  4

Total Hours  4

Minimum Required Grade: C-

**Advanced College Writing Requirement**

**Rule:** Complete the equivalent of a full writing course (either three 1/3 writing courses or one 2/3 writing course + one 1/3 writing course or one complete writing course)

Note: To meet the Advanced College Writing Requirement, Biology students take 2 or 3 partial writing courses (either three 1/3 writing courses or one 1/3 writing course and one 2/3 writing course) or one complete writing course. The Biological Education concentration requires one 2/3 writing course (BIOE 371) and one 1/3 writing course (BIOO 434). No additional courses are needed to meet this requirement.

Minimum Required Grade: C-

**1/3 Advanced Writing Courses**

BCH 482  Advanced Biochemistry II  3
BIOB 410  Immunology  3
BIOB 425  Adv Cell & Molecular Biology  3
BIOB 483  Phylogenics and Evolution  3
BIOE 403  Vert Design & Evolution  5
BIOE 409  Behavior & Evolution Discussion  1
BIOE 428  Freshwater Ecology  5
BIOL 484  Plant Evolution  3
BIOM 402  Medical Bacteriology& Mycology  3
BIOO 320  General Botany  5
BIOO 434  Plant Physiology Lab  1
BIOO 470  Ornithology  4
BIOO 475  Mammalogy  4

Minimum Required Grade: C-

**2/3 Advanced Writing Courses**

BCH 486  Biochemistry Research Lab  3
BCH 499  Senior Thesis/Capstone  3-6
BIOB 411  Immunology Laboratory  2
BIOB 499  Undergraduate Thesis  3-6
BIOE 342  Field Ecology  5
BIOE 371  Gen Ecology Lab (equiv to 271)  2
BIOE 411  Exprmntl Microbial Genetcs Lab  1
BIOE 499  Undergraduate Thesis  3-6

Minimum Required Grade: C-
Complete Advanced Writing Course
BIOH 462 Principles Medical Physiology 3

Secondary Teaching Licensure
Note: For endorsement to teach biology, a student also must gain admission to the Teacher Education Program and meet all the requirements for secondary teaching licensure (see the College of Education & Human Sciences (http://catalog.umt.edu/colleges-schools-programs/education-human-sciences))

Exception to the Modern/Classical Languages Requirement
Rule: Choose one of the following Math courses

Note: The Division of Biological Sciences has been granted an exception to the Modern/Classical Language Requirement. Either of these Calculus courses (required by the major) will satisfy this requirement.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 162</td>
<td>Applied Calculus</td>
<td>4</td>
</tr>
<tr>
<td>or M 171</td>
<td>Calculus I</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 4

Minimum Required Grade: C-