

Department of Natural Sciences

Philosophy and Goals of the Department

The biology and chemistry major programs are designed to provide students with the knowledge and skills needed to enter graduate or professional school or to gain employment in their field. Students completing the major program in biology or chemistry are expected to have

- an understanding of the basic principles and concepts of the major field;
- the critical thinking skills needed for solving problems in the field;
- the abilities to evaluate and interpret data and to analyze and synthesize information from different sources;
- a working knowledge of fundamental laboratory techniques and the ability to use them to perform experiments in the field;
- the writing and speaking skills needed to communicate effectively in the field.

Majors for the Bachelor of Arts Degree

Biology
Biology for Secondary Education
Chemistry
Chemistry for Secondary Education

Minors for the Bachelor of Arts Degree

Biology
Biology for Secondary Education
Chemistry
Chemistry for Secondary Education
Physics
Physics for Secondary Education

Special Course Offerings

Astronomy
Earth Science

Major in Biology

I. Major Program Requirements

BI 171-172 Biological Principles I & II
BI 221 Cell Biology
BI 300 Genetics
BI 420 Topics In Biological Sciences
BI 496 Senior seminar

Three (3) additional upper-division courses from the following list:

BI 305 Microbiology
BI 306 Plant Systematics
BI 308 Animal Physiology
BI 311 Ecology
BI 323 Comparative Anatomy
BI 350 Developmental Biology
BI 370 Evolutionary Biology
CH 353 Biochemistry

II. Other Program Requirements

CH 101-102 General Chemistry
CH 301-302 Organic Chemistry
MA 131 Calculus of Single Variable Functions
or MA 121-122 Differential and Integral Calculus
MA 207 Elementary Statistics
PHYS 201-202 General Physics I and II

Notes: 1. All biology majors must earn a grade of "C" or better in all major courses (sections I and II above) and successfully pass the senior comprehensive examination in biology. Students must pass prerequisites with a "C" or better to advance to subsequent courses.

2. All degree students should review requirements for graduation as described in this catalog.

Major in Biology For Secondary Education

I. Major Program Requirements

BI 171-172 Biological Principles I & II
BI 221 Cell Biology
BI 300 Genetics
BI 420 Topics in Biological Science

One (1) additional upper division course from the following list:

BI 305 Microbiology
BI 306 Plant Systematics
BI 308 Animal Physiology
BI 311 Ecology
BI 323 Comparative Anatomy
BI 350 Developmental Biology
BI 370 Evolutionary Biology
CH 353 Biochemistry

II. Other Program Requirements

CH 101-102 General Chemistry
CH 301 Organic Chemistry
MA 207 Elementary Statistics
MA xxx One additional course in mathematics
PHIL 252 Philosophy and History of Science
PHYS xxx One course in physics is recommended

Note: All biology for secondary education students must earn a grade of "C" or better in all major courses (sections I and II above) and successfully pass the senior comprehensive examination in biology.

III. Professional Education Requirements

AN/SO 218 Introduction to Native American Studies
CS 103 Instructional Media and Technology
ED 102 Foundations of Education
ED/PSY 229 Educational Psychology
ED 245 Diversity Field Experience
ED 327 Content Area Reading/Language Arts
ED 309 Teaching in the Secondary School
ED 346 Teaching Science in the Secondary School
ED 405 Education Seminar
ED 410 Student Teaching
ED 412 Measurement & Assessment in Teaching
HPE 214 The School Health Program
PSY 228 Adolescent Psychology
SPED 300 Introduction to Exceptional Children
United States and contemporary world cultures
course(s)—see index for page number.

IV. Acceptance into the Teacher Education Program and Student Teaching Program

Teacher Education Program: Students pursuing academic programs that lead to teacher licensure must seek admission to the teacher education program by the end of their sophomore year.

Student Teaching Program: In the spring semester of the junior year, all preservice teachers must seek admission to the student teaching program. See index for page numbers for Teacher Education and Student Teaching programs.

Note: In order to be licensed to teach in a secondary school in Montana, a student is required to have a teaching minor in a subject field acceptable for licensure endorsement as well as the teaching major. All degree students should review requirements for graduation as described in this catalog.

Major in Chemistry

I. Major Program Requirements

- CH 101-102 General Chemistry
- CH 205 Quantitative Analysis
- CH 301-302 Organic Chemistry
- CH 306 Instrumental Methods
- CH 391-392 Physical Chemistry
- CH 496 Senior Seminar
- One (1) additional upper-division course from the following list:
 - CH 353 Biochemistry
 - CH 405 Advanced Inorganic Chemistry
 - CH 406 Advanced Organic Chemistry

II. Other Program Requirements

- MA 131 Calculus of Single Variable Functions or MA 121-122 Differential and Integral Calculus
- MA 233 Multivariable Calculus
- PHYS 205-206 Engineering Physics I & II

Note: All chemistry majors must earn a grade of “C” or better in all major courses (Section I and II above). Students must pass prerequisites with a “C” or better to enroll in chemistry courses.

Major in Chemistry for Secondary Education

I. Major Program Requirements

- CH 101-102 General Chemistry
- CH 205 Quantitative Analysis
- CH 301-302 Organic Chemistry
- Two (2) additional upper division Chemistry courses

II. Other Program Requirements

- MA 121 Differential Calculus
- PHIL 252 Philosophy and History of Science
- One (1) additional two-semester course from the following list:
 - BI 171-172 Biological Principles I & II
 - PHYS 201-202 Physics I and II
 - PHYS 205-206 Engineering Physics

III. Professional Education Requirements

- AN/SO 218 Introduction to Native American Studies
- CS 103 Instructional Media and Technology
- ED 102 Foundations of Education
- ED/PSY 229 Educational Psychology
- ED 245 Diversity Field Experience

- ED 309 Teaching in the Secondary School
- ED 327 Content Area Reading/Language Arts
- ED 346 Teaching Science in the Secondary School
- ED 405 Education Seminar
- ED 410 Student Teaching
- ED 412 Measurement & Assessment in Teaching
- HPE 214 The School Health Program
- PSY 228 Adolescent Psychology
- SPED 300 Introduction to Exceptional Children

United States and contemporary world cultures course(s)—see index for page number.

Note: All chemistry for secondary education majors must earn a grade of “C” or better in all major courses (Section I and II above). Students must pass prerequisites with a “C” or better to enroll in chemistry courses.

IV. Acceptance into the Teacher Education Program and Student Teaching Program

A. Teacher Education Program: Individuals pursuing academic programs that lead to teacher licensure must seek admission to the teacher education program by the end of their sophomore year.

B. Student Teaching Program: In the spring semester of the junior year, all preservice teachers must seek admission to the student teaching program. See index for page numbers for these programs.

Note: In order to be licensed to teach in a secondary school in Montana, a student is required to have a teaching minor in a subject field acceptable for licensure endorsement as well as the teaching major. All degree students should review requirements for graduation as described in this catalog.

Minor in Biology

I. Minor Program Requirements

- BI 171-172 Biological Principles I & II
- BI 221 Cell Biology
- BI 300 Genetics
- One (1) additional upper-division course from the following list:
 - BI 305 Microbiology
 - BI 306 Plant Systematics
 - BI 308 Animal Physiology
 - BI 311 Ecology
 - BI 323 Comparative Anatomy
 - BI 350 Developmental Biology
 - BI 370 Evolutionary Biology
 - CH 353 Biochemistry

II. Other Program Requirements

- CH 101-102 General Chemistry
- CH 301 Organic Chemistry

Minor in Biology for Secondary Education

I. Minor Program Requirements

- BI 171-172 Biological Principles I & II
- BI 221 Cell Biology
- BI 300 Genetics

II. Other Program Requirements

- CH 101-102 General Chemistry
- CH 301 Organic Chemistry
- ED 346 Teaching Science in the Secondary School

- MA 207 Elementary Statistics
- PHIL 252 Philosophy and History of Science

Minor in Chemistry

I. Minor Program Requirements

- CH 101-102 General Chemistry
- CH 205 Quantitative Analysis
- CH 301-302 Organic Chemistry
- Plus one (1) additional upper-division chemistry course

Minor in Chemistry for Secondary Education

I. Minor Program Requirements

- CH 101-102 General Chemistry
- CH 205 Quantitative Analysis
- CH 301-302 Organic Chemistry

II. Other Program Requirements

- ED 346 Teaching Science in the Secondary School
- MA 121 Differential Calculus
- MA 207 Elementary Statistics
- PHIL 252 Philosophy and History of Science
- Plus one (1) additional 4-credit course in biology or physics.

Minor in Physics

I. Minor Program Requirements

- PHYS 205 Engineering Physics I: Mechanics
- PHYS 206 Engineering Physics II: Electricity and Magnetism
- PHYS 322 Modern Physics
- PHYS 322L Mathematical Methods of Modern Physics
- PHYS 323 Optics and Electromagnetic Radiation
- PHYS/ENGR 305 Electronics and Circuit Analysis I
- One (1) additional course from the following list:
- ENGR 302 Engineering Mechanics I: Statics
- PHYS/ENGR 306 Electronics and Circuit Analysis II
- PHYS/ENGR 308 Thermodynamics

II. Math Prerequisites

- MA 121 and 122 Differential and Integral Calculus
- or MA 131 Calculus of Single Variable Functions
- MA 233 Multivariable Calculus

III. Recommended Course

- MA 232 Differential Equations and Linear Algebra I

Minor in Physics for Secondary Education

Pending approval of the Montana Board of Public Education

I. Minor Program Requirements

- PHYS 205 Engineering Physics I: Mechanics
- PHYS 206 Engineering Physics II: Electricity and Magnetism, Optics
- PHYS 321 Geometrical Optics
- PHYS 322 Modern Physics
- PHYS/ENGR 305 Electronics and Circuit Analysis I

II. Other Program Requirements

- PHIL 252 Philosophy and History of Science
- ED 346 Teaching Science in the Secondary School
- MA 207 Elementary Statistics
- Two (2) courses chosen from Astronomy, Chemistry, or Earth Science

III. Math Prerequisites

- MA 121 and 122 Differential and Integral Calculus

IV. Recommended Course

- ENGR 302 Engineering Mechanics I: Statics

Special Course Offerings

The Department of Natural Sciences offers courses in astronomy, earth science, and physics for interdisciplinary studies, degree enhancement, preparation for graduate studies, fulfillment of major/minor program requirements, and completion of the Carroll College Core Curriculum common to all degree programs at Carroll College. Please refer to the course descriptions for full course listings:

- Astronomy
- Earth Science