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
Physics

Major in Biology

I. Major Program Requirements

BI 161-162 Introductory Biology I and II
BI 496 Senior seminar
Twenty-four (24) additional credits in biology from the following courses:
BI 206 Plant Biology
BI 211 Ecology
BI 222 Comparative Anatomy
BI 302 Genetics
BI 305 Microbiology
BI 307 Animal Physiology
BI 321 Cell Biology
BI 350 Developmental Biology
CH 353 Biochemistry
BI 370 Evolutionary Analysis

Students must have at least one (1) course from each of the following categories. Some courses are listed twice, but can only satisfy the requirement in one category.

A. Cell/Molecular
Cell Biology
Biochemistry
Genetics
Developmental Biology
Microbiology

B. Organismal
Developmental Biology
Animal Physiology
Plant Biology
Comparative Anatomy
Microbiology

C. Ecology/Evolution
Ecology
Evolutionary Analysis
Comparative Anatomy
Genetics

II. Other Program Requirements

CH 101-102 General Chemistry
CH 301-302 Organic Chemistry
MA 131 Accelerated Calculus
or MA 121-122 Calculus I and II
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.

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

III. Acceptance Into The Department

Students must be accepted by the Biology Program at the end of the sophomore year to continue in the major. Acceptance is generally based on the minimum grade point average of 2.5 in required science and mathematics courses taken at Carroll, as well as an indication that the student will continue to perform at the same or at a higher level in advanced courses. Transfer students will be similarly reviewed after they have completed at least ten (10) credits of major level courses in the Department.

Major In Biology For Secondary Education

I. Major Program Requirements

BI 161-162 Introductory Biology I and II
Sixteen (16) additional credits in biology from the following courses
BI 211 Ecology
BI 206 Plant Biology
BI 307 Animal Physiology
BI 222 Comparative Anatomy
BI 302 Genetics

II. Other Program Requirements

CH 101-102 General Chemistry
CH 301-302 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 Biology program, Teacher Education Program, and Student Teaching Program

A. Biology Program: Students must be accepted by the Biology program at the end of the sophomore year to continue in the major. Acceptance is generally based on a minimum grade point average of 2.5 in required science and mathematics courses taken at Carroll, as well as an indication that the student will perform at the same or a higher level in advanced courses. Transfer students will be similarly reviewed after they have completed at least ten (10) credits of major level courses in the Department.

B. 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.

C. 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

Two of the following three choices:

CH 353	Biochemistry
CH 405	Advanced Inorganic Chemistry
CH 406	Advanced Organic Chemistry

II. Other Program Requirements

MA 131	Accelerated Calculus

or MA 121-122 Calculus I and II

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 additional upper division Chemistry courses

II. Other Program Requirements

MA 121	Calculus I
MA 207	Elementary Statistics
PHIL 252	Philosophy and History of Science

And one of the following 2 semester courses

BI 161-162	Introductory Biology
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 161-162 Introductory Biology I and II

Twelve (12) additional credits in biology from the following courses

BI 206 Plant Biology
BI 211 Ecology
BI 222 Comparative Anatomy
BI 302 Genetics
BI 305 Microbiology
BI 307 Animal Physiology
BI 321 Cell Biology
BI 350 Developmental Biology
CH 353 Biochemistry
BI 370 Evolutionary Analysis

Minor in Biology for Secondary Education

I. Minor Program Requirements

BI 161-162 Introductory Biology I and II
BI 211 Ecology
BI 222 Comparative Anatomy

II. Other Program Requirements

ED 346 Teaching Science in the Secondary School
MA 207 Elementary Statistics
MA xxx One additional course in mathematics
PHIL 252 Philosophy and History of Science

Plus one additional four-credit course in chemistry or physics

Minor in Chemistry

I. Minor Program Requirements

Twenty-four (24) semester hours of chemistry, including:

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

Plus one additional chemistry course number 300 or higher

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 Calculus I
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 321 Optics and Electromagnetic Radiation)
PHYS 322 Modern Physics)
PHYS 322L Mathematical Methods of Modern Physics)
PHYS/ENGR 305 Electronics and Circuit Analysis I

And one of the following:

ENGR 302 Engineering Mechanics I: Statics
or PHYS/ENGR 306 Electronics and Circuit Analysis II
or PHYS/ENGR 308 Thermodynamics

II. Math Prerequisites

MA 131 Single-Variable Calculus
MA 233 Multivariable Calculus

III. Recommended Course

MA 232 Differential Equations and Linear Algebra I

Minor in Physics for Secondary Education

I. Minor Program Requirements

PHYS 201 Physics I: Mechanics, Wave Motion, and Sound
PHYS 202 Physics II: Thermodynamics, Electricity and Magnetism, Optics,and Modern Physics
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 courses chosen from Astronomy, Chemistry (4-cr courses only), or Earth Science

III. Math Prerequisites

MA 121 Calculus I
MA 122 Calculus II

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
Physics