

Studying Biology at North Central

As a North Central College biology or biochemistry major, you will gain broad experience in all the principal areas of biology. As you choose upper-level courses, you will also have an opportunity to focus your in-depth studies in the specific areas that interest you the most. Your North Central degree will provide a solid foundation for a wide range of career options, including the health sciences, academic research, education, environmental fields, biotechnology, the pharmaceutical industry and many more.

This section of the handbook is intended to guide you in choosing degree options and selecting courses. It is *not* an official list of degree requirements; the College catalog is your source for official information, and the specific version of the catalog that was in effect in your first year at North Central contains *your* graduation requirements. Your academic advisor can help you work out your individual program of study; if you want to be a biology or biochemistry major but have an academic advisor from another discipline, you may ask any member of the biology faculty to become your advisor.

In addition to the catalog, more information on major requirements and career preparation is available online from the biology Web site: www.noctrl.edu/biology.

What are my degree options?

The Biology department offers two degrees: Bachelor of Arts (BA) and Bachelor of Science (BS). The degrees differ mostly in the number of biology courses taken and in the requirements for support courses. In addition, students with strong interests in cellular and molecular biology may want to consider a BA or BS in Biochemistry, a joint program between the Biology and Chemistry departments.

Which degree should I choose?

Graduate schools, professional schools in most of the health-science areas and many academic and industry employers will expect biology graduates to have a strong background in mathematics, chemistry and physics, so **students preparing for careers in these areas are encouraged to complete the BS degree or to supplement the BA degree with the recommended support courses**. The BA degree provides an alternative primarily for secondary education students, nursing students and others whose academic program does not allow them to complete all of the courses for the BS.

For biochemistry students, the BA degree provides appropriate preparation for graduate and professional schools. A BS in biochemistry is a more rigorous course of study and allows students to gain even more depth of experience and expertise. Some employers, particularly in industry, prefer a BS to a BA degree when looking at qualifications of potential employees.

Biology minors, endorsements and transfers

Transfer students must complete the same requirements as any biology or biochemistry major. A minimum of 11 of their Biology credit hours must be taken at North Central, including at least 7.5 hours at the 200 level or above. It is generally *not* true that a transfer student can “get all of the general education courses out of the way” at another school and then complete a science major at North Central in two years. In order to transfer as a junior and finish in two years, a transfer student would usually have to have taken 100- and 200-level biology and chemistry courses comparable to what is recommended below for North Central freshmen and sophomores.

A biology endorsement for education majors seeking elementary or middle-school certification requires 18 credit hours in biology; information on specific course requirements can be obtained from the Education department. A biology minor requires 22 credit hours in biology, including at least 11 hours at the 200 level or above.

Summary of degree requirements

Biology

At least one course from each area:

- Animal systems
- Plant systems
- Evolution, ecology and diversity
- Cellular and molecular biology

Research experience

Seminar

- two terms as participant
- one term as presenter

Introductory chemistry

Mathematics

Support courses (required for BS degree, recommended for BA):

- Organic chemistry
- Physics
- Calculus or Statistics (both for BS)

Foreign language (College BA requirement)

Biochemistry

Biology and chemistry topic areas:

- Introductory biology
- Introductory chemistry
- Cell biology and genetics
- Molecular biology
- Biochemistry
- Organic chemistry
- Analytical chemistry
- Physical chemistry
- Research and ethics

Research experience

Seminar

- two terms as participant
- one term as presenter

Support courses:

- Physics
- Calculus
- Statistics (for BS)

Foreign language (College BA requirement)

Sample schedules

Here are two possible schedules for your first two years as a North Central College biology major. Although there is some flexibility, it is important that you finish the Bio 101-102 sequence and introductory chemistry by the fall of your second year, in order to meet the prerequisites for more advanced courses.

		Schedule A			Schedule B		
		Fall	Winter	Spring	Fall	Winter	Spring
First Year		CHM 141 MTH 125 or 151 ENG 115	BIO 101 MTH 151 or 152 CHM 142 or IDS 125	BIO 102 MTH 152 or GenEd CHM 142 or IDS 125	MTH 125 or 151 ENG 115 CHM 141 or GenEd	MTH 151 or 152 CHM 141 or 142 IDS 125	BIO 101 MTH 152 or GenEd CHM 142 or IDS 125
Second Year		200-level BIO CHM 220	200-level BIO CHM 221	200-level BIO CHM 222	BIO 102 CHM 220	200-level BIO CHM 221	200-level BIO CHM 222
		BIO/CHM 475 (seminar) at least one term			BIO/CHM 475 (seminar) at least one term		

Or, for a biochemistry major:

		Schedule A			Schedule B		
		Fall	Winter	Spring	Fall	Winter	Spring
First Year		CHM 141 MTH 125 or 151 ENG 115	BIO 101 MTH 151 or 152 CHM 142 or IDS 125	BIO 102 MTH 152 or GenEd CHM 142 or IDS 125	MTH 125 or 151 ENG 115 CHM 141 or GenEd	MTH 151 or 152 CHM 141 or 142 IDS 125	BIO 101 MTH 152 or GenEd CHM 142 or IDS 125
Second Year		CHM 220 BIO 260 PHY 111 or 131	CHM 221 PHY 112 or 132	CHM 222	BIO 102 CHM 220 PHY 111 or 131	BIO 200 CHM 221 PHY 112 or 1132	CHM 222
		BIO/CHM 475 (seminar) at least one term			BIO/CHM 475 (seminar) at least one term		

Research experience

Research is how science is done: it's how the facts got in the textbook! Undergraduate research is nearly an absolute requirement for students who want to go on to graduate school or work as research technicians, and it is also very valuable for students whose careers will involve applying the research results of others (such as in medicine, the pharmaceutical industry, forensics, or many other biological applications).

We believe that research experience is a crucial part of every biology and biochemistry student's education. There are several ways to fulfill the research requirement:

- ▶ **Research courses** (laboratory portion of the course is a short-term, independent project):
 - Animal Behavior (BIO 305)
 - Developmental Biology (BIO 410)
 - Ecology (BIO 415)
 - Advanced Topics in Molecular Biology, Biochemistry, and Microbiology (BIO/CHM 465)
- ▶ **NCC's summer research program** or **independent study** during the academic year: collaborate with a faculty mentor in an ongoing, "real-world" research project.
- ▶ **Off-campus summer-research programs** (check with your advisor to make sure the program you are interested in will meet the research requirement)

For additional information about on-campus research opportunities and application procedures for the summer research program, see the Research section of the Web site (www.noctrl.edu/biology).

What could I do with a Biology or Biochemistry degree?

- ▶ Graduate study in preparation to direct research in an academic or industry lab and/or in the field. Possible areas of specialization include: biochemistry, botany, ecology, entomology, genetics, herpetology, marine biology, microbiology, molecular biology, physiology, virology, zoology, etc. (*Did you know that graduate students get paid to go to school?*)
- ▶ Professional school programs to prepare for careers in medicine, dentistry, physical therapy, veterinary medicine, nursing, medical technology, etc.
- ▶ Work as a technician in a research or biotech lab or in field research
- ▶ Education: teach junior-high or high-school science (with additional education coursework) or work in educational programs at zoos, parks, museums, etc.
- ▶ Scientific writing or illustration
- ▶ Environmental monitoring, advocacy, policy, etc.
- ▶ Bioinformatics: application of computer technology to study of genomes, etc.
- ▶ Pharmaceutical research and development
- ▶ Forestry, fisheries, conservation, etc.
- ▶ Bioengineering
- ▶

Forensic medicine or other forensic careers

- ▶ Law firms specializing in biotechnology patent law
- ▶ Government agencies such as the EPA, FDA, USDA or the Forest or Park Service
- ▶ Horticulture and landscaping
- ▶ Sales of pharmaceuticals or other biology-related products

What courses should I take to prepare for...?

North Central does not offer specialized degrees in individual disciplines within the biological sciences. (Our graduates often find they are *better* prepared for careers or graduate study than peers with specialized degrees from large schools!) However, a variety of upper-level courses are available, so that you can choose those most relevant to your desired career or area of further study. Some good course choices for popular career areas are listed below. Your academic advisor can help you select courses to prepare for a particular career interest.

Molecular biology, Biochemistry, Cancer biology, etc.

- Genetics
- Cell biology
- Molecular biology
- Organic chemistry
- Biochemistry
- Advanced Topics
- Microbiology
- Virology/Immunology

Forensic Science

- Genetics
- Molecular biology
- Organic chemistry
- Analytical chemistry
- Biochemistry
- Instrumental analysis

Ecology & Environmental Science

- Ecology
- Environmental biology
- Statistics
- Desert/estuarine ecology
- Botany and/or Zoology
- Plant physiology

Marine Biology

- Zoology
- Botany
- Ecology
- Animal physiology
- Evolution

Secondary Education

- Cell biology
- Botany
- Zoology
- Genetics
- Animal Physiology
- Microbiology
- Ecology

Development & Evolution

- Genetics
- Cell biology
- Molecular biology
- Zoology and/or Botany
- Development
- Evolution
- Vertebrate biology

Pre-medical curriculum

- ▶ Minimum general science requirements for admission into medical school:
 - 1 year (8 semester hours) of general chemistry
 - 1 year (8 semester hours) of general biology
 - 1 year (8 semester hours) of organic chemistry
 - 1 year (8 semester hours) of general physics
 - Most schools require 1 year of composition
 - Many schools require calculus and social science courses covering behavioral science
 - Many schools require or recommend biochemistry
 - Be sure to check specific requirements for the schools you are interested in!

- ▶ Suggested curriculum to prepare for the MCAT:

Freshman year

CHM 141, 142
BIO 101, 102
MTH 151, 152

Sophomore year

CHM 220, 221, 222
BIO 200, 260
PHY 131, 132, 213

Junior year

CHM 365
BIO 302, 310

- ▶ Additional recommended courses:

- CHM 465
- BIO 340, 410, 430, 440
- PHY 210
- ENG 245, REL 310, PHL 210, PSY 100, PSY 250

Pre-dental, pre-veterinary curricula

- ▶ Requirements for these programs are very similar to pre-medical requirements
- ▶ The suggested curriculum and courses above provide suitable preparation for these programs.
- ▶ In addition, veterinary programs often require a nutrition course (BIO/CHM 140)

Pre-nursing curriculum

North Central College provides the opportunity to earn a Bachelor of Science in nursing by spending either two or three years at North Central followed by two years at a nursing school. The three-year (“3-2”) program is more flexible, permits students to earn both a BA from North Central and a BS from the nursing school, and qualifies them to take the professional licensure examination. Students in the two-year (“2-2”) program obtain a BS from the nursing school but no North Central degree. Note that some nursing schools (including Rush University) now require a four-year undergraduate degree in order to enter their program.

- ▶ Curriculum for the 2-2 nursing program:

<u>First year</u>	<u>Second year</u>
CHM 141, 142, 205	CHM 220, 221, 222
BIO 102, 147, 200	BIO 340 and 302 or 310
ENG 115, 116 (or 125)	PSY 210, 250
MTH 128 or 130	SOA 100
PSY 100	4 Humanities and Social Science courses
1 Humanities or Social Science course	

- ▶ Additional courses for the 3-2 program: BIO 260; SPC 100, 200; PSY 325; REL 310; foreign language

Pre-pharmacy curriculum

A Bachelor of Science or Doctor of Pharmacy degree can be completed by students who meet the pre-pharmacy requirements in two years at North Central College and then spend three to four years in a school of pharmacy. Alternatively, students who spend three years at North Central and complete the general education requirements could also receive a BA from North Central.

- ▶ Curriculum for students wishing to complete pharmacy school requirements in two years:

<u>First year</u>	<u>Second year</u>
CHM 141, 142	CHM 220, 221, 222
BIO 101, 102	PHY 131, 132 (or 111, 112)
ENG 115, 116 (or 125 and 264 or 266)	ECN 250
MTH 151 (152 for some schools)	SCT 100 or 200
PSY 100	1 Humanities course
	1 Psychology or Sociology course

Other health-science careers:

Additional information about the health-science careers listed above can be found on the Health Sciences section of the biology Web page (www.noctrl.edu/biology). In addition, a biology degree from North Central is appropriate preparation for a variety of other health-related careers; details are available on the Web page or from the premedical advisors. Some career possibilities include:

- ▶ Physical or Occupational therapy
- ▶ Nuclear Medicine Technology and Radiation Therapy (cooperative program with Northwestern)
- ▶ Physician’s Assistant (PA) and Nurse Practitioner programs
- ▶ Medical technology
- ▶ Genetic counseling

