

BIOCHEMISTRY and MOLECULAR BIOLOGY

Biochemistry is concerned with the chemistry of the materials fundamental to life and contributes toward the understanding of the structure and functioning of all organisms. Because of the rapid advances in the areas of biotechnology, molecular biology and genetic engineering, biochemistry is an exciting area for study and research.

Background Information

The undergraduate program in biochemistry at North Dakota State University is planned for students who are seeking careers in the life sciences, agriculture, medicine or health related fields. The program is also suited for students who are contemplating advanced graduate degrees in biochemistry, botany, zoology and microbiology, or professional degrees in dentistry and medicine.

The biochemistry program is offered by the Department of Chemistry and Biochemistry.

The Program

Students with an interest in biochemistry earn the Bachelor of Science degree in biochemistry and molecular biology. This provides flexibility in the selection of courses for those students who plan to seek employment in areas related to biochemistry, enter graduate or medical school, or teach in high schools or higher education institutions. The program provides training in biochemistry, botany, microbiology, zoology or in applied areas according to the student's interest. In addition to the courses in chemistry, physics and mathematics, an additional 16 credits in biological sciences, 18 credits of electives in the humanities and social sciences, nine credits in English, three credits in speech and two credits in wellness are required. The pre-medical student is encouraged to take a year of upper-level zoology.

All undergraduates in biochemistry and molecular biology receive assistance in planning and scheduling classes from faculty advisors. In addition to course work and laboratory courses, students also have the opportunity to learn by conducting research in various areas of biochemistry under faculty guidance.

Faculty And Facilities

The Department of Chemistry and Biochemistry is well staffed with 17 faculty members. All of the faculty have doctorate degrees from well-known universities. Most of them have considerable experience in postdoctoral or industrial research.

The research and teaching facilities for the department are housed in three buildings—Ladd Hall, Dunbar Laboratories, and the Quentin Burdick Building. A chemistry library containing approximately 10,000 volumes and 280 scientific and technical journals is located in Ladd Hall.

Advanced instruments and facilities are readily available. These include ultracentrifuges; gene synthesizer; nuclear magnetic, infrared, ultraviolet and mass spectrometers; gas and liquid chromatographs; computers; recombinant DNA and cell and tissue culture laboratories; and an advanced electron microscope facility.

Career Opportunities

Employment opportunities for biochemists are found at higher education institutions within the chemistry, biochemistry and biological sciences departments; in medical schools, hospitals, research institutes and government research laboratories; and in other health, energy, environment and agricultural research programs. Biochemists are employed at all levels in industries concerned with food processing, manufacturing, genetic engineering and marketing of drugs, cosmetics and pesticides, as well as in the petroleum and allied industrial complexes.

Earnings of persons trained in biochemistry vary, and the salary level depends largely upon the amount of formal training a person has received. Entry-level salaries for biochemists average \$48,000 per year, based on 2015 data from www.payscale.com. For biochemists who have an advanced degree, salaries and opportunities are much greater.

High School Preparation

A strong high school background in English, mathematics (through trigonometry, if possible), biology, chemistry and physics is recommended.

Sample Curriculum

General Education Requirements Credits

First Year Experience	
UNIV 189 - Skills for Academic Success.....	1
Communication	
COMM 110 - Fundamentals of Public Speaking.....	3
ENGL 110, 120 - College Composition I, II.....	3, 3
ENGL 321 - Writing in the Technical Professions <i>or</i>	
ENGL 324 - Writing in the Sciences.....	3
Quantitative Reasoning	
MATH 165 - Calculus I.....	4
Science & Technology	
PHYS 251, 251L - University Physics I and Lab.....	5
PHYS 252, 252L - University Physics II and Lab.....	5
Humanities & Fine Arts.....	6
Social & Behavioral Sciences.....	6
Wellness.....	2
Cultural Diversity.....	-
Global Perspective.....	-
Total	40

College and Department Requirements Credits

Hum/Soc. Science Electives (B.S. Degree).....	6
Hum/Soc. Science Electives (B.A. Degree).....	12
Second Year Language Proficiency.....	-
Total	6-12

Major Requirements Credits

BIOC 460, 460L - Foundations of Biochemistry and	
Molecular Biology I and Lab.....	4
BIOC 461 - Foundations of Biochemistry and Molecular	
Biology II.....	3
BIOC 465 - Principles of Physical Chemistry and	
Biophysics.....	4
BIOC 473 - Methods of Biochemical Research.....	3
BIOC 474 - Methods of Recombinant DNA Technology.....	3
BIOC 483 - Cellular Signal Transduction Processes	
and Metabolic Regulations.....	3
BIOC 487 - Molecular Biology of Gene Expression.....	3
BIOL 150, 150L - General Biology I and Lab.....	4
CHEM 121, 121L - General Chemistry I and Lab <i>or</i>	
CHEM 150, 160 - Principles of Chemistry I and Lab.....	4
CHEM 122, 122L - General Chemistry II and Lab <i>or</i>	
CHEM 151, 161 - Principles of Chemistry II and Lab.....	4
CHEM 341 - Organic Chemistry I.....	3
CHEM 342 - Organic Chemistry II.....	3
CHEM 353 - Majors Organic Chemistry Lab I.....	1
CHEM 354 - Majors Organic Chemistry Lab II.....	2
CHEM 380 - Chemistry Junior Seminar.....	1
CHEM 431 - Analytical Chemistry I.....	3
CHEM 491 - Seminar.....	2
MATH 166 - Calculus II.....	4
MICR 350, 350L - General Microbiology and Lab.....	5
STAT 330 - Introductory Statistics.....	3
ZOO 315 - Genetics.....	3
Science 300-400 Level Electives.....	9
Electives.....	1
Total	74-76

CURRICULUM TOTAL.....122-128

This sample curriculum is not intended to serve as a curriculum guide for current students, but rather an example of course offerings for prospective students. For the curriculum requirements in effect at the time of entrance into a program, consult with an academic advisor or with the Office of Registration and Records.

For Further Information

Department of Chemistry and Biochemistry
 North Dakota State University
 Dept. #2735
 PO Box 6050
 Fargo, ND 58108-6050
 Tel. (701) 231-8694
 Fax: (701) 231-8831
 Email: John.Hershberger@ndsu.edu
 Web: www.ndsu.edu/chemistry/