

BIOCHEMISTRY (BCHM)

Degrees Offered: Ph.D., M.S.

This program is offered in Durham.

The Department of Molecular, Cellular, and Biomedical Sciences offers a Doctor of Philosophy (Ph.D.) degree, a Master of Science (M.S.), and an accelerated master's program (B.S./M.S.) in Biochemistry. Graduate students (Ph.D. and M.S.) in biochemistry are typically supported by teaching or research assistantships, as well as by competitive internal and external fellowship programs. For more information about the program, including admission and degree requirements, please contact the Department of Molecular, Cellular, and Biomedical Sciences at mcbs.dept@unh.edu.

Distinctive Features of the Program

The Graduate Program in Biochemistry combines a rigorous curriculum in biochemistry with diverse research opportunities at the frontier of chemical, molecular, and cellular biology, as well as biophysics. The program aims to train interdisciplinary researchers, savvy in modern technologies and data science, interested in a mechanistic understanding of biology. Incoming students are given the opportunity for laboratory rotations to explore the various areas of biochemistry in those cases where a thesis advisor has not been identified or where exposure to a variety of experimental approaches is advantageous.

The Graduate Program in Biochemistry offers:

- Outstanding research training in many cutting-edge research areas such as cellular structure and function, genome stability, protein structure and function, lipid metabolism, signal transduction, and structural biology.
- Weekly seminar series that includes both distinguished invited speakers and graduate student research presentations.
- Opportunities to gain teaching and mentoring experiences with undergraduate students in the biological sciences.
- Strong track record for graduates attaining careers in academia, biomedical research institutes, biotechnology and pharmaceutical companies, and state and federal governmental agencies.

Admission Requirements

An applicant is expected to have completed basic courses in chemistry, biological sciences, mathematics, and physics. Otherwise well-qualified applicants will be permitted to correct deficiencies in undergraduate education by enrollment in the appropriate courses or by independent study during the first year. Applicants must submit a personal statement and three letters of recommendation. If possible, the personal statement should specify the applicant's research interests and potential faculty mentors. International applicants living outside the U.S. should initially complete a free online [pre-application](#). Applicants from non-English-speaking countries must also provide TOEFL (Test of English as a Foreign Language) scores.

Accelerated Master's Degree Requirements

This accelerated program, leading to a combined bachelor's and master's degree in biochemistry, is designed for highly motivated and qualified students seeking additional training to further their career goals as a researcher in the life sciences.

Admission to the combined degree program is highly competitive. Students wishing to pursue this option must have a grade point average greater than 3.2 at the time of application. A thesis advisor must be identified during the junior year and the approval of the advisor must be obtained. Prior to the first semester of the senior year, the student must formally apply to the Graduate School and receive early admission to the Biochemistry Graduate Program. The requirement for the Graduate Record Examination is waived for combined degree applicants.

<https://colsa.unh.edu/molecular-cellular-biomedical-sciences>

Programs

- [Biochemistry \(Ph.D.\)](#)
- [Biochemistry \(M.S.\)](#)

Courses

Biochemistry (BCHM)

BCHM 802 - Endocrinology

Credits: 4

Structure and function of vertebrate endocrine systems through the lens of physiology, biochemistry, and cell and molecular biology, with special reference to mammals. Current investigations of the body's major endocrine glands, such as the brain, thyroid, pancreas, adrenals and gonads, as regulators and integrators of biological systems. A previous cell biology course is recommended. Prereq: one semester of biochemistry.

Equivalent(s): ANSC 802

Grade Mode: Letter Grade

BCHM 825 - Cell Phenotyping and Tissue Engineering Laboratory

Credits: 4

Introduction to culture and phenotyping of mammalian cells (cell line models), with applications to bioengineering and biomedical sciences. Skills, techniques, and knowledge covered include sterile technique, cell culture, cell line models, cell proliferation, cell survival, cell migration, cell adhesion, and drug response. Inquiry-based team projects investigate cell proliferation, cell death, transfection, flow cytometry, 3D scaffolds, or cell imaging. Prereq: General Microbiology Class and Lab.

Grade Mode: Letter Grade

BCHM 850 - Physical Biochemistry

Credits: 3

Structure, interactions, and physical-chemical properties of biomolecules. Thermodynamic, kinetic, and spectroscopic methods for the study of proteins and nucleic acids. Prereq: 2 semesters organic chemistry, 1 semester of calculus; or permission.

Grade Mode: Letter Grade

BCHM 851 - Principles of Biochemistry I

Credits: 4

In-depth survey of biochemistry: macromolecule structure; structure and function of proteins, nucleic acids, carbohydrates, and lipids; introduction to metabolic pathways. Prereq: One semester of organic chemistry; or permission.

Grade Mode: Letter Grade

BCHM 852 - Principles of Biochemistry II

Credits: 4

In-depth survey of biochemistry: metabolism of amino acids, nucleotides, carbohydrates and lipids; synthesis and regulation of macromolecules; molecular biology of the eukaryotic cell. Prereq: BCHM 851 or permission.

Grade Mode: Letter Grade

BCHM 853 - Cell Culture

Credits: 5

Principles and Technical Skills fundamental to the culture of animal and plant cells, tissues and organs. Introduction to the techniques of sub-culturing, establishing primary cultures, karyotyping, serum testing, cloning, growth curves, cryopreservation, hybridoma formation and monoclonal antibody production, and organ cultures. Application of cell culture to contemporary research in the biological sciences. Special fee.

Lab. Prereq: general microbiology and lab.

Grade Mode: Letter Grade

BCHM 854 - Molecular Biology Research Methods

Credits: 5

Theory and application of current technologies to manipulate DNA. Hands-on experience that includes DNA isolation and quantitation methods, cloning, PCR, DNA sequencing, and analysis of gene products.

Prereq: introductory genetics. Special fee. Lab.

Equivalent(s): GEN 854, PBI0 854

Grade Mode: Letter Grade

BCHM 860 - Pharmacology

Credits: 4

Introduction to the basic principles and fundamental concepts of pharmacology, with a focus on molecular mechanisms and pathological basis of therapeutics and the curative effects. Foundations of pharmacology including pharmacodynamics and pharmacogenomics; drugs affecting the nervous system (neuropharmacology); drugs affecting other systems; chemotherapeutic drugs. Prereq: one semester of biochemistry or permission.

Grade Mode: Letter Grade

BCHM 863 - Biochemistry of Cancer

Credits: 4

Evaluation of the hallmarks of cancer, including molecular mechanisms of carcinogenesis, roles of oncogenes and dysregulated cell development, function and metabolism, tumor immunology, and the biological basis of cancer therapy. Prereq: one semester of biochemistry or permission.

Grade Mode: Letter Grade

BCHM 894 - Protein Structure and Function

Credits: 4

Analysis of how the three-dimensional architecture of soluble and membrane proteins contributes to their biochemical function; methods for determining the structure of proteins; protein folding; protein targeting; and mechanisms of enzyme catalysis. Computer resources used for protein modeling and structural prediction. Prereq: one semester of biochemistry.

Grade Mode: Letter Grade

Faculty

Please see https://colsa.unh.edu/molecular-cellular-biomedical-sciences/program/phd/biochemistry#collapse_1693 for faculty.