BIOCHEMISTRY (BIOC)

About Biochemistry

What is Biochemistry?

Biochemistry is the application of chemistry to the study of biological processes at the cellular and molecular level. It emerged as a distinct discipline around the beginning of the 20th century when scientists combined chemistry, physiology, and biology to investigate the chemistry of living systems.

- *The study of life in its chemical processes:* Biochemistry is both a life science and a chemical science—it explores the chemistry of living organisms and the molecular basis for the changes occurring in living cells. It uses the methods of chemistry, physics, molecular biology, and immunology to study the structure and behaviour of the complex molecules found in biological material and the ways these molecules interact to form cells, tissues, and whole organisms. Biochemistry graduates are interested, for example, in mechanisms of brain function, cellular multiplication and differentiation, communication within and between cells and organs, and the chemical bases of inheritance and disease. The biochemistry student seeks to determine how specific molecules such as proteins, nucleic acids, lipids, vitamins, and hormones function in such processes. Particular emphasis is placed on regulation of chemical reactions in living cells.
- *An essential science:* Biochemistry has become the foundation for understanding all biological processes. It has provided explanations for the causes of many diseases in humans, animals, and plants. It can frequently suggest ways by which such diseases may be treated or cured.
- *A practical science:* Because biochemistry seeks to unravel the complex chemical reactions that occur in a wide variety of life forms, it provides the basis for practical advances in medicine, veterinary medicine, agriculture, and biotechnology. It underlies and includes such exciting new fields as molecular genetics and bioengineering. The knowledge and methods developed by biochemistry scientists are applied in all fields of medicine, in agriculture, and in many chemical- and health-related industries. Biochemistry is also unique in providing teaching and research opportunities in both protein structure/function and genetic engineering, the two basic components of the rapidly expanding field of biotechnology.
- *A varied science:* As the broadest of the basic sciences, biochemistry includes many subspecialties such as neurochemistry, bioorganic chemistry, clinical biochemistry, physical biochemistry, molecular genetics, biochemical pharmacology, and immunochemistry. Recent advances in these areas have created links among technology, chemical engineering, and biochemistry.

The Department of Biochemistry offers three undergraduate programs:

- **Liberal Program**
  This is the most flexible of the departmental programs offered, providing students with a useful concentration in biochemistry while allowing them to pursue a minor in another speciality or to broaden their education in the sciences.
- **Major**
  The Major program becomes more specialized in biochemistry during the final two years. This program requires skills and insight from all areas of chemistry, and from other areas such as biology, physiology, microbiology and immunology, statistics, and pharmacology. For students aiming for a professional career in the biological sciences or in medicine, these programs can lead to postgraduate studies and research careers in hospital, university, or industrial laboratories.
- **Honours**
  The Honours program in Biochemistry combines the substantial background given by the Major program with a challenging opportunity to carry out laboratory research projects in the U3 year. These courses provide students with research experience under the supervision of a professor in the Department. Honours students intending to pursue an M.Sc. in Biochemistry may be interested in the B.Sc./M.Sc. track, which offers a streamlined path to a graduate degree.

Our Major and Honours programs provide a sound background for students aiming for a professional career in biochemistry. The less specialized Liberal program allows students to select courses in other fields of interest. The Liberal program provides students with the opportunity to study the core of one science discipline along with a breadth component from another area of science or from many other disciplines; for more information, see Liberal, Major, and Honours Programs.

During the first year, each program provides introductory lecture and laboratory courses in biochemistry, as well as basic courses in cell and molecular biology and organic and physical chemistry. In the second and third years, the programs offer an expanded focus in biochemistry through lecture courses, a second laboratory course in biochemistry, and opportunities to carry out research projects in faculty members' laboratories through our BIOC 396 Undergraduate Research Project., BIOC 462 Research Laboratory in Biochemistry., and BIOC 491 Independent Research. courses. Students can also take a variety of complementary courses in other biological, biomedical, and chemical disciplines in their second and third years.

Increasingly complex technology requires training in both chemistry and biology. As well, the combination of chemistry, molecular biology, enzymology, and genetic engineering in our programs provides the essential background and training in biotechnology. With this, our graduates can work in a variety of positions in industry and health. These range from R&D in the chemical and pharmaceutical industries, to testing and research in government and hospital laboratories, to management. Many graduates pursue higher degrees in research and attain academic positions in universities and colleges.

Additional information is available on the Department of Biochemistry website.

Available Programs

- Biochemistry Honours (B.Sc.) (73 credits)
- Biochemistry Liberal Program - Core Science Component (B.Sc.) (47 credits)
- Biochemistry Major (B.Sc.) (64 credits)

Biochemistry (BIOC) Related Programs

Interdepartmental Honours in Immunology

For more information, see Immunology. This program is offered by the Departments of Biochemistry, Microbiology and Immunology, and Physiology.

Students interested in the program should contact:

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