Biochemistry and Biomedical Sciences

Biochemistry is the study of the chemical and molecular basis of life, seeking to describe and understand the structure, function, and organization of living matter in molecular terms. It is a continuum with structural and molecular biology, and builds on a strong foundation of the other natural sciences. Research ranges from the study of structures and properties of individual chemicals and molecules (such as proteins and DNA) to their function and integration into the whole organism and understanding vital biological processes in health and disease.

At McMaster, Biochemistry and Biomedical Sciences is an outstanding department for life science research and education, and one that places a high value on interdisciplinary research. Our faculty members run internationally competitive research programs of high productivity and impact. These investigators are likewise providing first rate and innovative training for the next generation of life scientists.

Examples of faculty research

**Dr. Gerry Wright** is looking to outwit microbes by designing novel antibiotics to fight infectious diseases and superbugs that are resistant to existing antibiotics. As founding director of McMaster’s Michael G. DeGroote Institute of Infectious Disease Research, he is committed to eradicating infectious diseases which account for millions of deaths worldwide annually and incur tremendous costs for our healthcare system.

**Dr. Mick Bhatia** is the director and senior scientist of the McMaster Stem Cell and Cancer Research Institute. He is examining the parallels between the behaviour of human stem cells and the initial stages of the development of human cancer in order to advance understanding of how cancer begins. This research has the potential to alleviate the suffering of cancer patients – and save lives – through pre-clinical modelling of new cancer drugs and by developing therapies to regenerate immune systems.

Other areas of faculty research include:
- Huntington’s disease
- Antimicrobial drug discovery
- Biofilm formation and development
- Type 2 diabetes and metabolic disease
- Maternal nutrition and fetal development
- Atherosclerosis
- Bacterial pathogenesis
- DNA replication and repair

Co-op opportunities

A Co-op program in the Biomedical Research Specialization is available beginning in Level III. Students in Co-op have conducted work terms in the following areas:
- Research and development in the fields of biochemistry, molecular biology, biotechnology, genetic engineering, toxicology, immunology and pharmacology
- Organic and analytical chemistry in the food, agricultural and pharmaceutical industries
- Product development, compound screening and drug efficacy studies
- Clinical trials and regulatory affairs
- Technical service and support
- Marketing and seed-investment analysis

Possible careers

- Emerging career sectors such as genomics, proteomics, gene therapy, biomedical engineering and biosensors
- Professional schools and graduate work (medicine, veterinary medicine, dentistry, law, MSc, PhD)
- Industry (pharmaceutical, biotechnology, occupational health and safety, drug design and toxicology)
- Research and development

Focus of study

Our programs offer a diverse background in biochemistry and molecular biology, including advanced courses in:
- Biotechnology and drug discovery
- Genetic engineering
- Protein structure and enzyme mechanisms
- Membrane structure and function
- Clinical biochemistry
- Molecular pharmacology
- Nutrition and metabolism
- Nucleic acid structure and function
- Gene expression
- Biochemistry research skills
- Structural and mechanistic aspects of macromolecules
Facilities
The laboratories of our investigators are located throughout the McMaster campus and affiliated hospitals with the majority located in the Health Sciences Centre at McMaster. Several faculty are associated with institutes, the Stem Cell and Cancer Research Institute and the Institute for Infectious Disease Research.

The Biochemistry programs at McMaster are supported by state-of-the-art equipment and instrumentation:
- Protein Crystallography facility
- High-Throughput Screening laboratory
- Instrumentation for protein analysis, purification and biophysical characterization
- Centralized facilities for DNA synthesis, automated DNA sequencing, electron microscopy, NMR spectroscopy
- Biophotonics Imaging facility

Level II Programs

Honours Biochemistry
(Honours B. Sc.)
See Admission Notes
A broad-based program for students who intend to apply to a professional school. It allows for more electives to pursue other interests (e.g., a minor).

Honours Biochemistry – Biomedical Research Specialization
(Honours B. Sc.)
See Admission Notes
A research focused specialization, ideal for students planning to pursue graduate studies or a career in research and development. Students in this specialization will gain practical laboratory skills ranging from presentation skills to specific laboratory techniques. The option for students to complete up to 21 units working with a faculty supervisor on a research project and thesis is available.

ADMISSION REQUIREMENTS
Enrolment in these programs is limited and possession of the published minimum requirements does not guarantee admission. Admission is by selection but requires, as a minimum, completion of any Level I program with a Grade Point Average (GPA) of at least 5.0 including:
- 6 units BIOLOGY 1A03, 1M03
- 6 units CHEM 1A03, 1AA3
- 3 units from MATH 1A03, 1LS3
- 3 units from PHYSICS 1A03, 1C03
- 6 units from the Science I Course List

A grade of at least C+ in four of BIOLOGY 1A03, 1M03, CHEM 1A03, 1AA3 and either MATH 1A03 or 1LS3 is required.

Science I Course List: ASTRON 1F03, BIOLOGY 1A03, 1M03, BIOPHYS 1S03, CHEM 1A03, 1AA3, ENVIRSC 1C03, 1G03, GEOG 1HA3, 1HB3, MATH 1A03, 1AA3, 1B03, 1LS3, 1LT3, 1MP3, MEDPHYS 1E03, PHYSICS 1A03, 1AA3, 1C03, 1CC3, PSYCH 1F03, 1X03, 1XX3, SCIENCE 1A03