YORK UNIVERSITÉ UNIVERSITY redefine THE POSSIBLE.

Since Fall 2003

A Specialized Honours degree stream in

Pharmaceutical & Biological Chemistry

The traditional boundaries separating the many sub-disciplines in Chemistry have been blurring. Modern Chemistry demands a broader education and outlook. Chemists now explore multi-disciplinary areas of Science and our undergraduate programs reflect this need. Indeed, hybrid areas, such as biological chemistry, materials chemistry and analytical chemistry, are among the hottest research areas. This is truly an exciting time to study chemistry and we have devised programs and study plans for students wishing to focus on one of these multi-disciplinary areas. The following describes one such area, and the program of study is given overleaf.

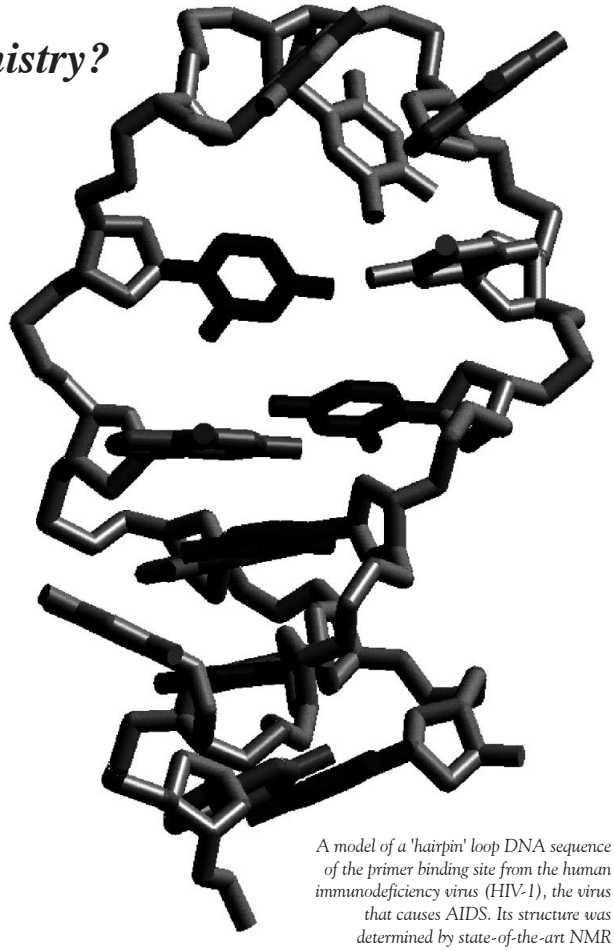
What is Pharmaceutical & Biological Chemistry?

By virtue of its intimate connection with medicine and health, and because of the profound attachment that we bear to these, the general field of Pharmaceutical and BiologicalChemistry is and will continue to be one of the most important areas of Chemistry. It is also one of the most compellingly relevant and perennially popular. Every day, we are reminded of the great strides that have been achieved and that inexorably continue to be made in the many battles against disease and in efforts to improve the quality of life. Chemists are rightfully proud of their seminal contributions in these endeavours, contributions that have propelled the rate and scope of progress to a degree that the very faces of biology and medicine have radically changed within a generation.

High-tech biology and medicine are greatly indebted to modern chemistry.

But Pharmaceutical and Biological Chemistry is not limited to medicine and human biology; the central position of Chemistry guarantees a role in many sectors. The fundamental knowledge elicited by chemists and brought to bear on the structure and function of biological and biologically active materials has found relevance and application in many other areas of biological science, not the least of which are biochemistry and molecular biology, but also including biotechnology, pharmacology, forensics and agriculture, to name a few.

The structure and mode of action of DNA, the reagents and techniques of molecular biology and genomics, the intricacy of enzymic pathways, the mystery of photosynthesis, the promise of biodegradable and biocompatible materials, the ingenuity of catalytic antibodies, MRI and the miracles of pharmaceuticals are all examples of Chemistry at work in biological systems and of problems solved through Chemistry. Indeed, many of the Nobel prizes for fundamental advances in the biological and medical sciences have been Nobel prizes in Chemistry awarded to chemists working on cross-disciplinary problems in collaborations with scientists of many stripes.



A model of a 'hairpin' loop DNA sequence of the primer binding site from the human immunodeficiency virus (HIV-1), the virus that causes AIDS. Its structure was determined by state-of-the-art NMR spectroscopic techniques used in Prof. Johnson's lab at York. For information on this work, see www.chem.yorku.ca/profs/johnson.

The most fascinating intellectual challenges ahead lie at the interface of chemistry with biology.

Chemists operating at the interface of Chemistry and Biology advance the fundamental science that is Chemistry by using it to explore and make understandable the staggeringly complex systems of the biological world. This is a world of great opportunity and timeliness, of immense challenge and reward. With enduring public interest, enormous prestige, attractive employment opportunities and consistently high levels of research support, the future is bright for Pharmaceutical and Biological Chemistry.

Who is this program for?

This is a program of study designed for students with an interest in the life and health sciences but wishing to base their studies in Chemistry, both for the intellectual challenge and satisfaction that this provides, and for the range of opportunities awaiting graduation.

This is for students interested in Bio-organic and Bio-inorganic Chemistry (enzyme mechanisms, biomimetics) and/or Bioanalytical Chemistry, Pharmaceutical Chemistry, Organic Synthesis, Biochemistry, or other aspects of biologically related Chemistry.

How is this different from Biochemistry?

Biochemistry concentrates on biological substances, their biological roles and the interplay between them. Pharmaceutical and Biological Chemistry deals with biologically active substances, both natural and synthetic, their synthesis and their chemical roles in biochemistry.

How is this degree different?

There are several degrees that allow you to study biochemistry and biologically related topics to greater or lesser depth, and they differ in the number of Chemistry, Biology and Biochemistry courses required.

This Pharmaceutical & Biological Chemistry stream requires 68 credits in Chemistry and only 18 credits of Biology. The Specialized Honours degree in Biochemistry requires much more Biology (47-56 credits) and much less Chemistry (32-41 credits). The Honours Double Major degree in Chemistry and Biology requires 42-49 credits of Chemistry courses and 36 credits in Biology courses. The Honours Major-Minor degree with a Major in Chemistry requires 57 credits in Chemistry courses, and a Minor in Biology requires 30 credits of Biology courses.

What does it get me?

The program leads to a Specialized Honours Chemistry degree in the Pharmaceutical and Biological Chemistry stream. It provides a solid grounding in Chemistry and the appropriate basics of Biological Science, plus a specialized exploration of the chemistry of pharmaceutically and biologically relevant substances and processes. The full program is listed below. It includes extensive, hands-on training in the theory and experimental practice of synthetic organic chemistry, biochemistry, genetics and analytical chemistry and the option of getting training in molecular biology theory and technique.

This degree provides excellent preparation for entrance to professional schools in the health sciences (medicine, dentistry, pharmacy, chiropractic, etc.). It is also suitable for pursuits at the graduate level in all areas of Chemistry, particularly in medicinal and biologically related fields, as well as in Biochemistry. Graduates will also find employment in the pharmaceutical and related sectors, in government agencies and other research environments.

Need more information?

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The Program of Study

Updated for 2006-2007

This sequence below is only a recommendation. Courses may be taken at any time, subject to prrequisites, enrolment maxima and availability. Consult the Calendar descriptions and/or an advisor for details on specific courses. This program leads to a Specialized Honours degree. Its specific requirements are reviewed periodically and are subject to change.

YEAR 1 (27 credits)

- *SC/CHEM 1000 3.0 ¶ Chemical Structure*
- *SC/CHEM 1001 3.0 ¶ Chemical Dynamics*
- *SC/PHYS 1010 6.0 * Physics*
  or SC/PHYS 1410 6.0 ¶ Physical Science
- *SC/CSE 1540 3.0 ¥ Computer Use for the Natural Sciences*
  or SC/CSE 1020 3.0 ¥ Introduction to Computer Science I
  or SC/CSE 1520 3.0 ¥ Introduction to Computer Use I
  or SC/CSE 1530 3.0 ¥ Introduction to Computer Use II
- *SC/BIOL 1010 6.0 ¶ Biological Science*
- *both SC/MATH 1013 3.0 Applied Calculus I and SC/MATH 1014 3.0 ¶ Applied Calculus II, or SC/MATH 1505 6.0 ¶ Mathematics for the Life and Social Sciences, with a minimum grade of B*

YEAR 2 (31 credits)

- *SC/CHEM 2010 3.0 Symmetry, Electronic Structure & Bonding*
- *SC/CHEM 2011 3.0 † Introduction to Thermodynamics*
- *SC/CHEM 2020 6.0 ¶ Organic Chemistry*
- *SC/CHEM 2030 3.0 ** Basic Inorganic Chemistry*
- *SC/CHEM 2080 4.0† Analytical Chemistry*
- *SC/BIOL 2020 4.0 Cell Biology and Biochemistry I*
- *SC/BIOL 2021 4.0 Cell Biology and Biochemistry II*
- *SC/BIOL 2040 4.0 † Genetics*

YEARS 3 & 4 (42-43 credits)

- *SC/CHEM 3011 4.0 Physical Chemistry*
- *SC/CHEM 3020 4.0 Organic Chemistry II*
- *SC/CHEM 3030 4.0 Transition Metal Chemistry*
- *SC/CHEM 3050 3.0 ‡ Advanced Biochemistry*
- *SC/CHEM 3051 3.0 Macromolecules of Biological Importance*
- *SC/CHEM 3071 3.0 Pharmaceutical Discovery*
- *SC/CHEM 3080 4.0 Instrumental Methods of Chemical Analysis*
- *SC/CHEM 4000 8.0 ¶ Research Project*
- *SC/CHEM 4050 3.0 § Bioanalytical Chemistry*
- *One of the following combinations:*
  - *SC/CHEM 3021 4.0 Organic Chemistry III, and SC/CHEM 4021 3.0 Synthetic Organic Chemistry*
  - *SC/CHEM 4051 3.0 § Biological Chemistry, and one of SC/CHEM 3021 4.0 Organic Chemistry III, SC/BIOL 3110 3.0 Nucleic Acid Metabolism or SC/BIOL 4151 3.0 Membrane Transport*

IN ADDITION (12+ credits)

- *GENERAL EDUCATION - 12 credits*
- *Additional courses as needed for a minimum overall total of 120 credits.*

** Requires SC/MATH 1025 3.0 ¶ or equivalent as co-requisite.*
† May be delayed one year.
¶ Usually also available in summer terms.
¥ SC/CSE courses were formerly labelled SC/COSC.
*** Students having taken SC/CHEM 2030 4.0 (before Fall 2006) will need one fewer elective credit for a 120-credit degree.*

‡ SC/CHEM 3050 3.0 = SC/BCHM 3010 3.0 = SC/BIOL 3010 3.0
§ May be taken in year 3. Students needing this course in 2006-2007 can substitute it with SC/CHEM 4093 3.0 'Biomaterials', otherwise, SC/CHEM 4050 3.0 will become available again in 2007-2008.