RESEARCH AREAS

The Department of Chemistry at Queen's is a vibrant community of award-winning faculty and graduate students who are engaged in a wide range of areas of chemical research (read below!). Our department also offers joint degrees with Trent University and the University of Stuttgart. If you have questions about joining our graduate programs email our Graduate Program Assistant at gradadm@chem.queensu.ca.

ANALYTICAL/ ENVIRONMENTAL

Analytical Chemistry quantifies (bio-) chemicals in samples ranging from pharmaceutical drugs to environmental contaminants and characterize their chemical properties. The analytical techniques developed ensures that we have safe water and food to consume and a clean environment to live in. It also plays an important role in Green Chemistry, because monitoring of chemicals can lead to action reducing environmental impact.

BIOLOGICAL

Biological chemistry studies the structures and functions of biomolecules. This can include DNA, RNA, enzymes, carbohydrates, and lipids, as well as drug-like small molecules produced by bacteria, fungi, and plants. Biological chemistry provides a path to understanding the origins of disease, drug discovery, and the creation of green catalysts for industrial biosynthesis or bioremediation.

CHEMISTRY EDUCATION RESEARCH

Chemistry Education Research (CER) is a field that bridges disciplines of chemistry, learning, social science, cognitive science, and psychology to tackle the question: How do people learn in chemistry? Chemistry courses are a gateway to all STEM programs at Queen's and to high-paying careers in Canada, and this research has crucial role to play in improving education for the next generation of scientists.

INORGANIC/ ORGANOMETALLIC

Inorganic chemistry involves the study of wide swaths of the periodic table, investigating the properties of many different elements, while organometallic chemistry studies the interaction of these elements with carbon. The species studied are often of significant importance to areas like catalysis, which is a major employer and global economic driver. Inorganic and organometallic chemistry can also involve the study of elements in biology (bio-inorganic chemistry) and the environment.

MATERIALS/ POLYMER

Materials chemistry studies the preparation of materials as well as their properties, such as catalytic, electronic, magnetic, optical, and mechanical originating from their composition and structure. Polymer chemistry is a genre of materials chemistry that studies the synthesis and properties of long-chain molecules, often based on carbon, but also other elements such as silicon. The modern world would be impossible to imagine without polymers, which are used to form everything from plastics, fabrics, surfaces, batteries, to smart phone screens.

ORGANIC CHEMISTRY

An organic chemist's toolkit contains the atoms and molecules essential for life, fuels, therapeutics, and plastics, with one common backbone: carbon. We study these molecules and their reactions in the lab and use our discoveries to create natural and 'unnatural' products efficiently and selectively. Our department is making innovations in catalysis, designing new antibiotics, synthesizing DNA sensors, creating the next generation of nanomaterials, and more!

PHYSICAL

If chemistry is the 'central science' that connects all of the physical sciences, then physical chemistry is the 'central chemistry' and plays critical roles in everything from biochemistry to advanced materials chemistry. Physical chemistry aims to improve our understanding of chemical reactions and bonds at a deep, fundamental level; with the goal of applying this knowledge to new reactions, substances, and properties.

THEORETICAL/ COMPUTATIONAL

Theoretical and computational chemistry use tools of physics, computer science, and mathematics to apply quantum mechanics, classical mechanics, and statistical mechanics to chemistry. It makes it possible to explain and predict the structure, dynamics, and also thermodynamic and kinetic properties of chemical systems.

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