

CHEMISTRY

Overview

The chemistry program at New College encourages and develops independence, collaboration, and scientific judgment. From the beginning, students work closely with faculty in a non-competitive environment, learning the skills and techniques necessary for scientific work. Tutorials, Independent Study Projects, and the senior thesis provide opportunities for intensive study on specific topics and original laboratory research.

Laboratories are well equipped for organic, inorganic, and physical chemistry projects as well as for biochemistry and molecular biology. Students enjoy access to research-grade instruments in laboratory courses and research projects.

Research facilities include a 400 MHz NMR spectrometer, several FTIR and UV-visible spectrophotometers, a fluorimeter, high-performance liquid chromatographs, inert atmosphere glove boxes, electrochemistry equipment, a GC, a real-time PCR machine, a digital imaging system, and a state-of-the-art microwave spectrometer.

Courses offered in the core program in chemistry include General Chemistry I and II, Organic Chemistry-Structure and Reactivity I and II, Inorganic Chemistry, Physical Chemistry I and II, and Biochemistry I. General, Organic, Inorganic, and Physical Chemistry are each accompanied by separate laboratory courses. In addition to the core chemistry courses, other courses offered include Environmental Chemistry, Advanced Organic Chemistry, Biochemistry II, Biochemistry Laboratory, Structure Elucidation and Organometallic Chemistry and Catalysis for Organic & Polymer Synthesis. Recent tutorials have been conducted in Green Chemistry, Atmospheric Chemistry, Computational Chemistry, Virology, and Enzyme Kinetics. Many opportunities are available for tutorials on other topics, as well as for laboratory research tutorials.

For students with little experience in the natural sciences, Chemistry and the Environment and Environmental Chemistry are occasionally offered. Both courses present chemistry within the context of society and the environment. Chemistry and the Environment and General Chemistry I satisfy the CYC Natural Sciences Curriculum requirement (and the Natural Sciences Liberal Arts Curriculum requirement.)

Faculty in Chemistry

Briana Aguila-Ames (<https://www.ncf.edu/directory/briana-aguila-ames/>), Visiting Assistant Professor in Chemistry

Rebecca Black (<https://www.ncf.edu/directory/rebecca-e-black/>), Associate Professor of Organic Chemistry

Lin Jiang (<https://www.ncf.edu/directory/lin-jiang/>), Associate Professor of Bioorganic Chemistry

Suzanne Sherman (<https://www.ncf.edu/directory/suzanne-sherman/>), Associate Professor of Chemistry (On Leave)

Steven Shipman (<https://www.ncf.edu/directory/steven-shipman/>), Professor of Physical Chemistry/Leonard Florsheim Chair (On Leave)

Katherine Walstrom (<https://www.ncf.edu/directory/katherine-walstrom/>), Professor of Biochemistry

Requirements for the AOC in Chemistry

A minimum of twenty-one (21) academic units.

Code	Title
General Chemistry	
CHEM 2100	General Chemistry I*
CHEM 2150	General Chemistry II
CHEM 2160	General Chemistry Laboratory
Mathematics	
MATH 2311	Calculus I*
MATH 2312	Calculus II*
Organic Chemistry	
CHEM 3100	Organic Chemistry I: Structure and Reactivity*
CHEM 3110	Organic Chemistry Inquiry Laboratory
CHEM 3600	Organic Chemistry II: Structure and Reactivity*
CHEM 3610	Organic Chemistry II Laboratory*
Physics	
PHYS 2525 or PHYS 2500	Physics I (Calculus-based)* Physics I (Algebra-based)*
PHYS 2510	Physics I Laboratory*
PHYS 2550	Physics II
PHYS 2555	Physics II Laboratory* (recommended))
Physical Chemistry	
CHEM 4750	Physical Chemistry: Quantum Mechanics
CHEM 4760	Physical Chemistry: Thermodynamics of Biomolecular Systems
CHEM 4755	Physical Chemistry Laboratory
Inorganic Chemistry	
CHEM 3200	Inorganic Chemistry*
CHEM 3210	Inorganic Chemistry Laboratory*
Biochemistry	
CHEM 4400	Biochemistry I
Elective	
One Advanced Chemistry Course	

Additional Requirements

One Independent Study Project (ISP) in Chemistry
Senior Thesis in Chemistry and Baccalaureate Exam

***Note:** For students interested in graduate school, Calculus III and a second semester of Physics lab are strongly recommended.

Requirements for the Joint AOC in Chemistry

A minimum of seventeen (17) academic units.

Code	Title
General Chemistry	
CHEM 2100	General Chemistry I*
CHEM 2150	General Chemistry II
CHEM 2160	General Chemistry Laboratory
Math	

MATH 2311	Calculus I*
MATH 2312	Calculus II*

Organic Chemistry

CHEM 3100	Organic Chemistry I: Structure and Reactivity*
CHEM 3110	Organic Chemistry Inquiry Laboratory
CHEM 3600	Organic Chemistry II: Structure and Reactivity*
CHEM 3610	Organic Chemistry II Laboratory*

Physics

PHYS 2525	Physics I (Calculus-based)*
PHYS 2510	Physics I Laboratory*
PHYS 2550	Physics II
PHYS 2555	Physics II Laboratory* (recommended)

Electives

Three Advanced Chemistry Courses

Additional Requirement

One Independent Study Project (ISP), Lab Course, or Lab Tutorial in Chemistry

Requirements for a Secondary Field in Chemistry

A minimum of eight (8) academic units, at least four (4) of which must be completed at New College.

Code	Title
General Chemistry	
CHEM 2100	General Chemistry I*
CHEM 2150	General Chemistry II
CHEM 2160	General Chemistry Laboratory
Organic Chemistry	
CHEM 3100	Organic Chemistry I: Structure and Reactivity*
CHEM 3110	Organic Chemistry Inquiry Laboratory
CHEM 3600	Organic Chemistry II: Structure and Reactivity*
CHEM 3610	Organic Chemistry II Laboratory*

Elective

One Advanced Chemistry Course (Lecture, Lab, or Tutorial)

Chemistry Facilities

Chemistry laboratories provide excellent research and teaching facilities for chemical synthesis, separation and structure determination, and for a variety of studies of structure, bonding and reactivity. Specialized glassware, photochemical apparatus, and glove boxes for work in controlled atmospheres allow many different synthetic methods to be used. A spin-coater is available for constructing ultra-thin organic films down to a fraction of a nanometer. Gas chromatography are available for separations, and structure determination can be carried out by use of nuclear magnetic resonance, infrared, ultraviolet-visible spectroscopy, and mass spectrometry. A research grade 400 MHz nuclear magnetic

resonance spectrometer is available for use in laboratory courses and research.

A research-grade electrochemical apparatus allows study of fast electrochemical reactions, and chemical kinetics can be studied using computer-controlled ultraviolet-visible spectrophotometers. Three Fourier transform infrared spectrophotometers are used for teaching and research as well as for characterization of inorganic and organic molecules and for experiments in physical chemistry.

The physical chemistry laboratory is also equipped with tools for modern surface characterization techniques, which include a state-of-the-art dynamic surface tensiometer, a single wavelength ellipsometer, and a static tensiometer. Most of the more specialized instruments for teaching and research are computer-controlled through LabView. Our PTI fluorescence research instrument is the most sensitive bench-top fluorometer available and is used in the physical chemistry laboratory for energy transfer and kinetics studies.

Representative Senior Theses in Chemistry

- Homology Modeling of Glucose-6-phosphate Dehydrogenase from a Halophilic Bacteria
- The Search for MicroRNAs Encoded by the Influenza A Virus
- TACN and Jibing Toward Synthetic Models of Oxalate Degrading Metalloenzymes
- Partial Synthesis of Fe(III) - Tetraamido Macrocyclic Ligands as Potential Green Oxidation Catalysts
- Bdippza: Synthesis and Metal Complexes of a New Monoanionic [N20] Heteroscorpionate Ligand
- Mn-doped (CdS)ZnS Quantum Dots as Sensitizers for Sensitized Solar Cells
- The Microwave Spectroscopy of Small Molecules with Methyl Rotors
- Purification and Characterization of *C. elegans* Mitochondrial Malate Dehydrogenase
- Towards the Synthesis of 1,4-Dibenzyl-1,4,7-Triazacyclononane-7-Monoacetate for a Potential Mimic of Oxalate Degrading Enzymes"
- Metabolomics Study on Hard Clams' Response to Red Tide Toxins
- Topical Plant-Based Natural Dyes Combination and Adsorption Optimization for Natural Dye-sensitized Solar Cell.