

CHEMISTRY (BS)

Department Website (<http://as.nyu.edu/chemistry/>)

NYSED: 79645 HEGIS: 1905.00 CIP: 40.0501

Program Description

The Department of Chemistry has a long tradition in the College of Arts and Science, dating back well before the founding of the American Chemical Society at New York University in 1876. Professor John W. Draper, the first president of the society and chair of the department, was a remarkable polymath: chemist, physician, philosopher, historian, and pioneering photographer.

The department has undertaken a major development plan, strengthening its faculty, instructional laboratories, course offerings, and research facilities in the areas of physical, biophysical, bioorganic, and biomedical chemistry, as well as in chemical biology, nanoscience, and materials sciences. Qualified undergraduates are strongly encouraged to participate in research as early as their sophomore year of study. The department houses state-of-the-art laboratory facilities for its undergraduate chemistry courses.

Majoring in chemistry at NYU provides strong preparation for graduate study in chemistry and biochemistry; professional education in medicine, dentistry, or patent law; and careers in industrial or pharmaceutical chemistry and biotechnology.

Departmental Objectives

Chemistry is an incredibly broad field. It is known as the central natural science because it intersects with physics, biology, engineering, materials science, and environmental science. The atomic and molecular structure and properties of matter are fundamental to the investigation of the physical world and to the understanding of living systems. Our chemistry program has an interdisciplinary approach that creates context for studying real-world problems and their solutions.

The department offers majors in chemistry, biochemistry, and global public health/science with a concentration in chemistry. Students have the opportunity to earn either a B.A. or B.S. in the chemistry major. A selection of elective advanced courses, undergraduate and graduate, can be combined (in consultation with the director of undergraduate studies) to provide a broad, varied program of study in chemistry or an undergraduate specialization in organic, biochemical, physical, or theoretical chemistry. The opportunity to participate in scientific research as an undergraduate is one of the most exciting features of a chemistry major. Research allows you to work alongside graduate students, postdoctoral fellows and faculty to develop new ideas to solve real-world problems and make new discoveries. Many of our students produce results that lead to publications and research is also a great preparation for graduate school and a wide range of chemistry careers.

The programs of study in chemistry and biochemistry prepare students for graduate study leading to careers in research, development, and teaching and/or for further study in areas such as medicine, dentistry, basic medical sciences, and allied health fields (including forensic science). In addition, the chemistry and biochemistry majors both prepare students for alternative careers, especially when paired with a minor in economics, data science, or business studies: for example, patent law, technology investment, or management in the chemical industry.

General Information

For Majors in Chemistry and Biochemistry

Students considering a major in chemistry or biochemistry are strongly urged to seek course advisement from the undergraduate academic team as early in their academic careers as possible. Chemistry is a sequential subject with courses building on earlier courses. Delay in taking certain key prerequisite courses can make it impossible to complete a major in four years without summer attendance.

Students must earn a grade of C or better in all courses required for the chemistry or biochemistry major, even if they are in other departments (such as mathematics or physics). Students who do not have an average of 2.0 or better in courses required by the department by the time they have completed 64 points in all courses will be asked to change their major.

The Department of Chemistry strictly enforces all prerequisites and de-enrolls students from courses for which they do not meet the prerequisites. Prerequisite courses must be completed with a grade of C (not C minus) or better.

AP, IB, and A Level credit by examination in chemistry is not accepted toward any departmental majors or minors.

Research Opportunities

The department endeavors to make research opportunities available during the summer and the academic year to well-qualified students at all levels. We encourage interested students to begin research as early as freshman or sophomore year. Students are encouraged to apply for the FAST and DURF grants awarded by the College. To participate in research in the department, students must meet any prerequisites and register for the research courses Advanced Independent Study and Research (CHEM-UA 997, 998) or, if eligible, Senior Honors in Chemistry (CHEM-UA 995, 996). In either case, permission of the director of undergraduate studies is required before registering for these courses.

Honors Program

While the Department of Chemistry has several accelerated courses—for example, CHEM-UA 129 Accelerated General Chemistry and CHEM-UA 227 Majors Organic Chemistry I & Laboratory and CHEM-UA 228 Majors Organic Chemistry II & Laboratory—these offerings need not be taken to earn a chemistry or biochemistry degree with departmental honors. The main requirement for earning an honors degree is the completion of an honors thesis based upon independent experimental or theoretical research. Students interested in research and an honors degree must enroll in CHEM-UA 995 Senior Honors in Chem and CHEM-UA 996. Students must first become involved in research, CHEM-UA 997 Adv Independent Study & Research or CHEM-UA 998 Adv Independent Study & Research for at least one semester or one summer prior to the senior year, as two semesters of research are generally not enough time to execute a successful project. Students seeking entry into the honors program must obtain the approval of the director of undergraduate studies prior to the end of their junior year. Candidates for a degree with honors in chemistry must have an overall GPA of 3.65 and a GPA of 3.65 in all required courses for the chemistry or biochemistry major. A senior thesis based on this work must be prepared, approved by the adviser, and presented in a seminar format during the spring term of the senior year. Please contact Carol Hollingsworth, academic program administrator, or

Professor Walters, director of undergraduate studies, for more detailed information.

Admissions

New York University's Office of Undergraduate Admissions supports the application process for all undergraduate programs at NYU. For additional information about undergraduate admissions, including application requirements, see How to Apply (<https://www.nyu.edu/admissions/undergraduate-admissions/how-to-apply.html>).

Program Requirements

The major in chemistry builds on a core of required courses in chemistry, physics, and mathematics.

Note: *Biology is not required for any major or minor offered by the Department of Chemistry, but only for the prehealth program. Students should also note that the BS program is more challenging to complete within a normal four-year academic program and that it confers no particular advantage to students in premedical or pre dental programs.*

Course	Title	Credits
General Education Requirements		
First-Year Seminar		4
EXPOS-UA 1	Writing The Essay:	4
Foreign Language ¹		16
Texts and Ideas		4
Cultures and Contexts		4
Societies and the Social Sciences		4
Expressive Culture		4
Major Requirements		
<i>General Chemistry Sequence</i> ²		
CHEM-UA 125	General Chemistry I & Laboratory	5
CHEM-UA 126	General Chemistry II & Laboratory	5
<i>Organic Chemistry Sequence</i>		
CHEM-UA 225	Organic Chemistry I & Laboratory	5
or CHEM-UA 227	Majors Organic Chemistry I & Laboratory	
CHEM-UA 226	Organic Chemistry II & Laboratory	5
or CHEM-UA 228	Majors Organic Chemistry II & Laboratory	
<i>Physical Chemistry Courses</i>		
CHEM-UA 651	Quantum Mechanics & Spectroscopy	4
CHEM-UA 652	Thermodynamics & Kinetics	4
<i>Mathematics & Physics Courses</i>		
MATH-UA 121	Calculus I ³	4
MATH-UA 122	Calculus II ⁴	4
PHYS-UA 11	General Physics I ⁵	5
PHYS-UA 12	General Physics II ⁶	5
<i>Additional Chemistry Courses</i>		
CHEM-UA 661	Physical Chemistry Laboratory	4
CHEM-UA 711	Inorganic Chemistry	4
Electives		
Advanced Chemistry Electives ⁷		12
Computer Science Elective ⁸		4
Advanced Independent Study and Research		8

Other Elective Credits	10
Total Credits	128

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The foreign language requirement is satisfied upon successful completion through the Intermediate level of a language. This may be accomplished in fewer than 16 credits, but those credits must then be completed as elective credit.

2

When offered, the one-semester CHEM-UA 129 Accelerated General Chemistry may substitute for the CHEM-UA 125 General Chemistry I & Laboratory, CHEM-UA 126 General Chemistry II & Laboratory sequence.

3

Or Advanced Placement (or equivalent international exam) credit.

4

Advanced Placement credit for MATH-UA 122 Calculus II (a score of 5 on BC Calculus) is not accepted for this major requirement. Students with this AP credit must either (1) take Calculus II at NYU and forfeit 4 of the 8 AP credits, or (2) register for one of the following: CHEM-UA 140 Mathematics of Chemistry, MATH-UA 123 Calculus III, or MATH-UA 140 Linear Algebra, using the BC credits as a prerequisite.

5

Credit for AP Physics C: Mechanics with a score of 4 or 5 is accepted, but only for students who are not prehealth. No other AP or equivalent international credit is accepted. *Because of medical, dental, etc. school admissions requirements, students on the prehealth track cannot use AP Physics C credit to place out of either or both semesters of General Physics.*

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Credit for AP Physics C: Electricity and Magnetism with a score of 4 or 5 is accepted, but only for students who are not prehealth. No other AP or equivalent international credit is accepted. *Because of medical, dental, etc. school admissions requirements, students on the prehealth track cannot use AP Physics C credit to place out of either or both semesters of General Physics.*

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Please note that CHEM-UA 997 Adv Independent Study & Research, CHEM-UA 998 Adv Independent Study & Research, CHEM-UA 995 Senior Honors in Chem, and CHEM-UA 996 do not count as advanced electives for the major.

8

At, or above, the level of CSCI-UA 2 (CSCI-UA 101 Intro to Computer Science preferred).

Program Notes

CHEM-UA 140 Mathematics of Chemistry is strongly recommended as preparation for both Physical Chemistry: Quantum Mechanics and Spectroscopy (CHEM-UA 651) and Physical Chemistry: Thermodynamics and Kinetics (CHEM-UA 652), as well as for students interested in pursuing chemistry on the graduate level or who have an interest in theoretical chemistry or physical chemistry. Students may choose instead to take Calculus III (MATH-UA 123) and/or Linear Algebra (MATH-UA 140).

Freshmen who intend to pursue a major in chemistry and are well prepared in mathematics and the physical sciences are strongly encouraged to take General Physics I and II as their second science sequence (concurrently with general chemistry) in the first year. This

allows the physical chemistry courses to be taken as early as sophomore year if the mathematics prerequisites are completed. However, if students choose to take biology with chemistry in the freshman year they may wish to defer taking physics (e.g., for students who are undecided, are considering a major in biology or neural science, and/or are on the prehealth track).

The core courses listed above provide a basic background in chemistry. Students are required to complete the courses in general chemistry, physics, and calculus prior to entry into CHEM-UA 651, 652 (the physical chemistry sequence), which is usually in the third year. It is strongly advised that advanced-level chemistry course enrollment begin no later than the fifth semester of study. This allows at least three more semesters to complete all major requirements.

Students interested in careers in medicine, dentistry, or basic medical sciences may wish to consider the major in biochemistry, which recommends additional courses in biology. Together these courses satisfy admission requirements for schools of the health professions. The appropriate preprofessional adviser should be consulted for details.

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
CHEM-UA 125	General Chemistry I & Laboratory	5
MATH-UA 121	Calculus I	4
First-Year Seminar		4
Texts and Ideas		4
Credits		17
2nd Semester/Term		
CHEM-UA 126	General Chemistry II & Laboratory	5
MATH-UA 122	Calculus II	4
EXPOS-UA 1	Writing The Essay:	4
Cultures and Contexts		4
Credits		17
3rd Semester/Term		
CHEM-UA 225	Organic Chemistry I & Laboratory	5
CHEM-UA 140	Mathematics of Chemistry ¹	4
PHYS-UA 11	General Physics I	5
Foreign Language		4
Credits		18
4th Semester/Term		
CHEM-UA 226	Organic Chemistry II & Laboratory	5
PHYS-UA 12	General Physics II	5
CSCI-UA 101	Intro to Computer Science	4
Foreign Language		4
Credits		18
5th Semester/Term		
CHEM-UA 651	Quantum Mechanics & Spectroscopy	4
Expressive Culture		4
Foreign Language		4
Elective		4
Credits		16
6th Semester/Term		
CHEM-UA 652	Thermodynamics & Kinetics	4
CHEM-UA 661	Physical Chemistry Laboratory	4
Advanced Chemistry Elective 1 of 3		4
Foreign Language		4
Credits		16
7th Semester/Term		
Advanced Chemistry Elective 2 of 3		4

CHEM-UA 997	Adv Independent Study & Research	2-4
Societies and the Social Sciences		4
Elective		2
Credits		14
8th Semester/Term		
CHEM-UA 998	Adv Independent Study & Research	2-4
CHEM-UA 711	Inorganic Chemistry	4
Advanced Chemistry Elective 3 of 3		4
Credits		12
Total Credits		128

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CHEM-UA 140 Mathematics of Chemistry is recommended, but not required. Does **not** count toward any major requirement. Can be substituted with an elective course.

Learning Outcomes

Upon completion of program requirements, students are expected to have acquired:

1. A fundamental command of chemistry, as well as of the subdisciplines of organic, inorganic, and physical chemistry.
2. Facility (via elective offerings) in analytical chemistry and/or mathematical and machine computational methods.
3. Mastery of laboratory skills in organic and physical chemistry.
4. Familiarity with contemporary problems in chemistry and the ability to articulate these problems and to propose well-considered solutions.
5. Expertise in modern research methods applied in contemporary scientific studies.

Policies

Grading and GPA Policy

The Chemistry (BS) major requires six core courses (28 credits), four mathematics and physics courses (18 credits), and five chemistry courses (20 credits) completed with a grade of C or better even if they are in other departments (such as mathematics or physics). Students who do not have an average of 2.0 or better in courses required by the department by the time they have completed 64 credits in all courses will be asked to change their major.

Prerequisite Policy

The Department of Chemistry strictly enforces all prerequisites and de-enrolls students from courses for which they do not meet the prerequisites. Prerequisite courses must be completed with a grade of C (not C minus) or better.

Laboratory Policy

Due to the potential hazard of any chemical experimentation, safety goggles, laboratory coats, and other protective gear must be worn at all times in the laboratories (but cannot be worn outside the laboratory). Laboratory equipment loaned to students must be replaced if damaged or broken. Students who do not return borrowed laboratory equipment at the end of a course are charged an additional fee, and their grade may be recorded as incomplete and not released until "checkout" is completed.

NYU Policies

University-wide policies can be found on the New York University Policy pages (<https://bulletins.nyu.edu/nyu/policies/>).

College of Arts and Science Policies

A full list of relevant academic policies can be found on the CAS Academic Policies page (<https://bulletins.nyu.edu/undergraduate/arts-science/academic-policies/>).