

State University of New York at Stony Brook

Chemical Science

**Bachelor of Science
in Chemistry Option**

Department of Chemistry

Department of Chemistry
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Chemical Science

The Chemical Science Option of the Bachelor of Science Degree in Chemistry is designed to provide students with a basic understanding of the chemical principles combined with a thorough training in laboratory techniques.

Of the various available options that lead to the B.S. degree in Chemistry, the Chemical Science Option places the greatest emphasis on the core subject of Chemistry. In particular the undergraduate laboratory courses are the foundation of each student's course of study. The choice of suitable electives will help the student to prepare for work or advanced study in areas of the Chemical Sciences.

What is Chemical Science? The Chemical Sciences occupy a central position in today's rapidly developing world of science and technology. The fundamentals of Chemistry are based on an understanding of the composition and properties of matter, of the interconversions of one form of matter to another form. An understanding of these fundamentals leads one to the greater realm of the Chemical Sciences, where one attempts to understand such diverse topics as chemical biology, the synthesis of new forms of matter from pharmaceuticals to new materials, the chemical phenomena of the human environment. and an in depth comprehension of the chemical physics of matter. A student who elects the Chemical Science Option will have the flexibility needed to enter any of these fascinating fields of study.

Declaring the Major. The Chemical Science Option of the Chemistry Major is open to all Stony Brook undergraduates. Perhaps the ideal time to declare the major is at the beginning of a student's sophomore year. It is usually unwise to postpone the declaration past the beginning of the student's junior year. Students who wish to elect this major should speak to the Director of Undergraduate Studies.

Plan of Study. Freshman students usually begin their studies toward the major by completing their introductory studies in chemistry and mathematics. In the sophomore year studies in organic chemistry are combined with mathematics and physics courses. In the junior and senior years, physical and inorganic chemistry courses are completed as well as a series of advanced chemistry courses.

Research. Chemistry is based upon research. This is why students in the major have so many laboratory courses required for their degree. However structured instructional laboratories can not truly introduce students to independent research. For this experience the student must seek out independent research opportunities. The faculty of the Department of Chemistry welcome qualified undergraduate students into their research laboratories. These opportunities are especially suitable for students in their junior and senior years of study. Interested students should review the research interests of the various faculty members and then discuss the possibilities for independent study or research with the individual faculty members who have the research programs of greatest interest. Each summer there are numerous special research programs available at Stony Brook, at nearby Brookhaven Laboratory and at universities across the country, open to qualified students. Interested students should talk to the Director of Undergraduate Studies several months in advance.

Careers. Students who have completed the Chemical Science Option are well prepared for entry level positions in many different industries. Such students are particularly attractive to the chemical industry, the pharmaceutical industry, the petroleum industry, the electronics industry, the biotechnology industry and the various health care industries. The best jobs go to students with good records and with lots of laboratory experience, including research. Students who earn a degree certified by the American Chemical Society may have an edge (see next section). Many students choose to pursue graduate study in such fields as Chemistry, Biochemistry, Materials Science, Pharmacology or Health Science, at various universities around the nation. Masters degrees are usually obtainable after one and a half to two years additional study. Ph.D. degrees usually require four-five years study beyond the Bachelor of Science Degree. Graduate students usually receive substantial stipends throughout their period of graduate study.

Internships. Special internships are available for qualified undergraduate students majoring in the chemical sciences. These programs allow students to combine work in an industrial setting with their academic studies. Students in the program work in an industrial laboratory one or two days a week. In return they receive a salary from the company and academic credit from Stony Brook. Interested students should talk to the Student Affairs Coordinator several months in advance.

Double Majors. Highly motivated students often choose to complete the requirements for two majors. Students choosing to major in chemistry may wish to consider a second major in such fields as engineering chemistry, biochemistry, physics, mathematics or biology. Students completing a double major will have an extra credential when looking for a job or when applying for graduate study. However a double major is certainly not a good idea for everyone. Often a better approach is to choose particular advanced courses as electives, matching one's own interests and abilities. And in all cases students should consider the importance of research and additional laboratory courses.

American Chemical Society Certification. The American Chemical Society is the national organization for chemists in the United States. The Society publishes the most prestigious journals, hosts the major national chemistry conferences, and influences chemical education in the country. The Society sets standards for the undergraduate chemistry programs at American universities. As part of this program the American Chemical Society's Committee on Professional Training has defined a minimum set of courses that they consider necessary for a student to achieve the skills needed for entry into the chemistry profession. Students who complete these requirements have their degrees certified by the Society. Students receiving certified degrees are eligible for immediate entry into the Society upon graduation. Certification requires the completion of a small number of courses in addition to those required for the major.

Chemical Science Option

Major Requirements for the Bachelor of Science Degree:

Candidates for the Bachelors of Science Degree in Chemistry who elect the Chemical Science option must complete the Chemistry Core Requirements of basic chemistry, mathematics and physics courses, plus a series of area requirements unique to the Chemical Science Option. In addition all students must fulfill the Upper-Division Writing Requirement.

All required courses must be taken for a letter grade; P/NC grades are not acceptable. All chemistry courses must be passed with a grade of C or higher with the exception of three courses for which the grade may be C-. No transferred course with a grade lower than C may be used to fulfill any major requirement.

Completion of the major requirements entails approximately 65 to 67 credits.

A. Core Requirements

- _____ CHE 129/ 130 or 131, 132 or 141, 142 General or Honors Chemistry
- _____ CHE 133, 134 or 143, 144 General or Honors Chemistry Laboratory
- _____ CHE 301, 302 Physical Chemistry I, II
- _____ CHE 303 Solution Chemistry Laboratory
- _____ CHE 321, 326 Organic Chemistry I, IIB
- _____ CHE 375 Inorganic Chemistry
- _____ CHE 383 Introductory Synthetic and Spectroscopic Laboratory Techniques
- _____ CHE 385 Tools of Chemistry
- _____ MAT 131, 132 Calculus I, II (Substitutions are possible, see note 1)
- _____ MAT 211 or AMS 210 Linear Algebra
- _____ PHY 131, 132 Classical Physics I, II or PHY 141,142 Classical Physics I, II Honors;
(PHY 121, 122 acceptable with permission)

B. Area Requirements for Chemical Science Option

- _____ CHE 304 Chemical Instrumentation Laboratory
- _____ CHE 384 Intermediate Synthetic and Spectroscopic Laboratory Techniques
- _____ CHE 357 Molecular Structure and Spectroscopy Laboratory
- _____ CHE 487 Research in Chemistry or CHE 496 Senior Research
- _____ Two electives chosen from CHE 345, 346, 351, 376, 378 PHY 251 or ESG 281

C. Upper-Division Writing Requirement

Successful Completion of CHE 385.

Notes:

1. Alternate Mathematics Sequences

The following alternate sequences may be substituted for major requirements or prerequisites: MAT 125, 126, 127 or 141, 142 for 131, 132. MAT 203 or MAT 205 for AMS 210 or 211

2. Transfer Credit

At least twelve credits of upper-division work in chemistry must be taken at Stony Brook; these must be taken in at least two of the major subdisciplines (inorganic, physical, and organic chemistry).

3. American Chemical Society Certification

The American Chemical Society's Committee on Professional Training has set nationally recognized standards for professional preparation in chemistry. The Chemistry faculty recommends that students intending to pursue careers in the Chemical Sciences secure ACS certification along with their Bachelor of Science in Chemistry degree.

For ACS certification, students electing the Chemical Science Option need to complete the following courses:

_____ CHE 346 Biomolecular Structure and Reactivity

**Sample Course Sequence for Students
Electing Chemical Science Option
With ACS Certification**

Required Courses:

(major)	Required for CHE Major: Chemical Science Option
(DEC)	Diversified Education Curriculum
(ACS)	Required for American Chemical Society Certified Degree (These courses are not required for the CHE degree, but are required for ACS certification.)

Only the minimum number of required credits are listed. Good students will elect to take additional courses in both the major and other areas. Suggested electives include research and additional specialized courses.

Fall - Freshman year

MAT 131	4	(major)
CHE 141 or 131 or 129/130	4	(major)
CHE 143 or 133	1	(major)
WRT 101	3	(DEC)
DEC course	3	(DEC)

Total 15 credits

Spring - Freshman year

CHE 142 or 132	4	(major)
CHE 144 or 134	1	(major)
MAT 132	4	(major)
WRT 102	3	(DEC)
DEC course	3	(DEC)

Total 15 credits

Fall - Sophomore year

CHE 321	4	(major)
CHE 383	2	(major)
MAT 211 or AMS 210	3	(major)
PHY 131 or 141	4	(major)
DEC course	3	(DEC)

Total 16 credits

Spring - Sophomore year

CHE 326	4	(major)
CHE 384	3	(major)
CHE 385	1	(major)
PHY 132 or 142	4	(major)
DEC course	3	(DEC)

Total 15 credits

Fall - Junior year

CHE 301	4	(major)
CHE 303	2	(major)
CHE 375	4	(major)
DEC course	3	(DEC)
Open Elective	3	

Total 16 credits

Spring - Junior year

CHE 302	4	(major)
CHE 304	2	(major)
DEC courses	6	(DEC)
Open Elective	3	

Total 15 credits

Fall - Senior year

Elective	3	
CHE 357	2	(major)
CHE Elective	3	(major)
CHE 495	3	
DEC course	3	(DEC)

Total 14 credits

Spring - Senior year

CHE 496	2	(major)
CHE 346	3	(ACS)
CHE Elective	3	(major)
DEC course	3	(DEC)
Open Elective	3	

Total 14 credits

Grand Total 120 credits

Chemistry at Stony Brook

The Department of Chemistry offers a variety of degree opportunities for undergraduates.

The Bachelor of Science in Chemistry Degree

Students who wish to complete the B.S. degree in Chemistry must elect one of the following options. All the options feature a common core of basic introductory chemistry, physics and mathematics courses combined with additional courses unique to each option. A separate brochure is available describing the features of each option.

Chemical Science

This option is the most traditional path with a greatest emphasis given to courses in the Chemistry Department. Students electing this option will acquire a considerable amount of laboratory experience. This option is an excellent one for students who wish to seek employment as a chemist or who wish to go to graduate school in chemistry.

Biological Chemistry

Students choosing this option take a variety of courses in the biological sciences in addition to advanced courses in chemistry. The program prepares students for work or further study in such fields as chemistry, biochemistry, biotechnology, pharmacology, medicinal chemistry, medicine or other health sciences.

Chemical Physics

The Chemical Physics option is for students who wish to combine their studies in chemistry with additional courses in Physics and Mathematics. The program is strongly recommended for students who have an interest in the more physical aspects of chemistry. Students who complete the program are well trained for employment in chemistry and well prepared for graduate studies in chemical physics or physical chemistry.

Environmental Chemistry

This option is a unique one that combines traditional studies in chemistry with additional work in biology and environmental science. Student completing the program are well prepared for employment as chemists and for graduate studies in chemistry as well as various environmental specialties.

The Bachelor of Arts in Chemistry Degree

Students who wish to complete the B.A. degree in Chemistry must complete a set of requirements somewhat less lengthy than those required for the B.S. degree. The B.A. degree may be a good choice for students seeking further professional training or those who wish to combine their major in chemistry with a second major in some other department.

The Bachelor of Science in Engineering Chemistry Degree

The Engineering Chemistry Program is an interdisciplinary program sponsored by the Department of Chemistry and the Department of Materials Science and Engineering. The program is designed to provide students with a basic understanding of the chemical principles and materials technology underlying modern materials technology. Students take a core of courses in chemistry, physics and mathematics combined with a set of courses offered by the Materials Science and Engineering Department. Students completing the program are well trained for employment in the materials field or for graduate study in solid state chemistry or materials science.