

CHEMISTRY MAJOR, B.A.

Chemistry is the scientific study of the composition and properties of matter and the investigation of the laws that govern them. All chemists have a common core of knowledge, learned through a highly structured sequence of undergraduate courses in which the content is divided into the classical subdisciplines. The B.A. degree provides students with a rigorous foundation in chemistry.

Student Learning Outcomes

Upon completion of the chemistry (B.A.) program, students should be able to:

- Demonstrate a solid understanding of basic chemical principles (knowledge base in chemistry)
- Demonstrate the ability to solve chemical problems (analytical skills)
- Demonstrate the use of critical and creative thinking skills in conducting research with mentoring from a faculty member (critical thinking skills in chemistry)

Requirements

In addition to the program requirements, students must

- earn a minimum final cumulative GPA of 2.000
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major core requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.000 in the major core requirements. Some programs may require higher standards for major or specific courses.

For more information, please consult the degree requirements section of the catalog (<https://catalog.unc.edu/undergraduate/degree-requirements/>).

Code	Title	Hours
Gateway Course		
CHEM 101 & 101L	General Descriptive Chemistry I and Quantitative Chemistry Laboratory I ^{H, F}	4
Core Requirements		
CHEM 102 or CHEM 102H	General Descriptive Chemistry II ^{H, F} and General Descriptive Chemistry II	3
CHEM 102L	Quantitative Chemistry Laboratory II	1
CHEM 241	Modern Analytical Methods for Separation and Characterization ^H	3
CHEM 241L or CHEM 245L	Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds and Honors Laboratory in Separations and Analytical Characterization of Organic and Biological Compound	1
CHEM 251	Introduction to Inorganic Chemistry	3
CHEM 430	Introduction to Biological Chemistry ^H	3
CHEM 480 or CHEM 481	Introduction to Biophysical Chemistry and Physical Chemistry I	3
CHEM 550L	Synthetic Chemistry Laboratory I	2

CHEM 261	Introduction to Organic Chemistry I ^H	3
CHEM 262	Introduction to Organic Chemistry II ^H	3
CHEM 262L	Laboratory in Organic Chemistry	1
One course from the following list (three hours): ¹		3
CHEM 395	Research in Chemistry for Undergraduates ^H	
CHEM 420	Introduction to Polymers	
CHEM 421	Synthesis of Polymers	
CHEM 431	Macromolecular Structure and Metabolism	
CHEM 432	Metabolic Chemistry and Cellular Regulatory Networks	
CHEM 441	Intermediate Analytical Chemistry	
CHEM 444	Separations	
CHEM 446	Analytical Spectroscopy	
CHEM 448	Mass Spectrometry	
CHEM 450	Intermediate Inorganic Chemistry ^H	
CHEM 460	Intermediate Organic Chemistry ^H	
CHEM 463	Bioorganic Chemistry	
CHEM 530L	Laboratory Techniques for Biochemistry	

Additional Requirements

BIOL 101	Principles of Biology ^{2, H, F}	3
MATH 231	Calculus of Functions of One Variable I ^{H, F}	4
MATH 232	Calculus of Functions of One Variable II ^{H, F}	4
One of the following:		4
PHYS 114	General Physics I: For Students of the Life Sciences ^F	
PHYS 118	Introductory Calculus-based Mechanics and Relativity ^{H, F}	
One of the following:		4
PHYS 115	General Physics II: For Students of the Life Sciences ^F	
PHYS 119	Introductory Calculus-based Electromagnetism and Quanta ^{H, F}	

Total Hours 52

^H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

^F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

¹ Other courses numbered above 420 may be substituted with the permission of the instructor.

² BIOL 101 is a required prerequisite for CHEM 430.

Sample Plan of Study

Sample plans can be used as a guide to identify the courses required to complete the major and other requirements needed for degree completion within the expected eight semesters. The actual degree plan may differ depending on the course of study selected (second major,

minor, etc.). Students should meet with their academic advisor to create a degree plan that is specific and unique to their interests. The sample plans represented in this catalog are intended for first-year students entering UNC–Chapel Hill in the fall term. Some courses may not be offered every term.

The recommended course sequence for the bachelor of arts degree is listed below.

Code	Title	Hours
First Year		
First-Year Foundation Courses		
IDST 101	College Thriving	1
ENGL 105 or ENGL 105I	English Composition and Rhetoric English Composition and Rhetoric (Interdisciplinary)	3
First-Year Seminar or First-Year Launch (https://catalog.unc.edu/undergraduate/ideas-in-action/first-year-seminars-launches/) ^F		3
Triple-I and Data Literacy (https://catalog.unc.edu/undergraduate/ideas-in-action/triple-i/)		4
Global Language through level 3 (https://catalog.unc.edu/undergraduate/ideas-in-action/global-language/)		varies
Major Courses		
MATH 231	Calculus of Functions of One Variable I ^{H, F}	4
MATH 232	Calculus of Functions of One Variable II ^{1, H, F}	4
BIOL 101	Principles of Biology ^{H, F}	3
CHEM 101 & 101L	General Descriptive Chemistry I and Quantitative Chemistry Laboratory I ^{H, F}	4
CHEM 102 or CHEM 102H	General Descriptive Chemistry II ^{H, F} General Descriptive Chemistry II	3
CHEM 102L	Quantitative Chemistry Laboratory II	1
Sophomore Year		
CHEM 241	Modern Analytical Methods for Separation and Characterization ^H	3
CHEM 241L or CHEM 245L	Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds Honors Laboratory in Separations and Analytical Characterization of Organic and Biological Compound	1
CHEM 251	Introduction to Inorganic Chemistry	3
CHEM 261	Introduction to Organic Chemistry I ^H	3
CHEM 262	Introduction to Organic Chemistry II ^H	3
CHEM 262L	Laboratory in Organic Chemistry	1
PHYS 114 or PHYS 118	General Physics I: For Students of the Life Sciences ^{2, F} Introductory Calculus-based Mechanics and Relativity	4
PHYS 115 or PHYS 119	General Physics II: For Students of the Life Sciences ^{2, F} Introductory Calculus-based Electromagnetism and Quanta	4
Additional Gen Ed courses (three courses)		9
Junior and Senior Years		

Lifetime fitness		1
CHEM 430	Introduction to Biological Chemistry ^H	3
CHEM 480 or CHEM 481	Introduction to Biophysical Chemistry Physical Chemistry I	3
One CHEM elective course (see course list on Requirements tab) ³		3
CHEM 550L	Synthetic Chemistry Laboratory I	2
Remaining Gen Eds; Supplemental General Education; electives		47
Note: All MATH, PHYS and CHEM courses numbered < 400 must be completed prior to semester 7 to graduate in 8 semesters.		
Total Hours		120

^H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

^F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

¹ Placement (PL) credits (zero hours) for MATH 232, MATH 233, or MATH 383 do not satisfy chemistry major requirements.

² PHYS 118 and PHYS 119 are encouraged for those students considering careers as professional chemists or those students who want the option to switch from the B.A. program to the B.S. program.

³ With the permission of the course instructor, CHEM 420 or other chemistry courses numbered above 420 may be substituted for the listed courses.

Special Opportunities in Chemistry

Honors in Chemistry

Upon the recommendation of the Department of Chemistry, the B.A. or B.S. degree with a major in chemistry may be awarded with honors in chemistry or highest honors in chemistry.

To attain the honors or highest distinction, the candidate must satisfy the following guidelines:

- Achieve an overall grade point average of 3.30 or higher.
- Achieve a chemistry major grade point average of 3.40 or higher.
- Prior to the final semester during which the honors thesis is completed, conduct two semesters or one semester plus one summer of research in the laboratory in which the thesis work will be completed.

Honors in chemistry is a distinction bestowed on an outstanding student who has completed a research project of considerable merit, as certified by the research advisor and two faculty members appointed by the director of undergraduate studies.

Highest honors in chemistry is a distinction bestowed on a truly exceptional student who has completed a research project of considerable depth and significance that meets the most rigorous standards of scholarly excellence, as certified by the research advisor and two faculty members appointed by the director of undergraduate studies.

Students who wish to complete an honors thesis should begin planning their course programs and research activities during or before the junior year so that ample time and effort may be devoted to research.

Departmental Involvement

Majors are encouraged to participate in Alpha Chi Sigma (chemistry fraternity) and the undergraduate advisory board.

Laboratory Teaching Internships and Assistantships

Undergraduates have the opportunity to serve as laboratory teaching assistants for entry-level undergraduate laboratory courses.

Special Topics

Special topics not offered through the normal course sequence may be pursued through directed reading and registration in CHEM 396 with the approval of the supervising faculty member, advisor, and vice chair for undergraduate studies. An approved learning contract is required, and students must be registered no later than the end of the second week of classes (fall and spring semesters).

Undergraduate Awards

Excellent performances by undergraduates in chemistry are recognized by the department through the following awards:

- Francis P. Venable Medal: A medallion and cash award are presented to the two most outstanding graduating seniors majoring in chemistry in honor of Dr. Francis P. Venable, who was chair of the department, president of the University from 1900 to 1914, and president of the American Chemical Society.
- Emmett Gladstone Rand Premedical Scholarship: This scholarship is presented to exceptionally talented graduating seniors intending to pursue a career in medicine.
- David L. Stern Scholar: Top students from upper-division laboratory courses are chosen for this cash award.
- Jason D. Altom Memorial Award for Undergraduate Research: This award recognizes research potential of an undergraduate chemistry major.
- James H. Maguire Memorial Award: This award recognizes an outstanding and academically gifted junior student majoring in chemistry.
- Tanya R. Ellison Scholarship: A junior female B.S. chemistry major is selected for this cash award on the basis of character and academic commitment.
- Carrie Ann Largent Scholarship: This merit based scholarship is awarded annually to senior chemistry majors.
- The Bunki Bankaitis-Davis Memorial Scholarship: This need-based scholarship is awarded annually to chemistry majors.
- Alpha Chi Sigma Sophomore Chemist Award: A cash award is given annually to the top sophomore chemistry student from the previous academic year, as determined by a search committee including members of Alpha Chi Sigma.
- J. Thurman Freeze Scholarship: This scholarship serves to fund summer research between a student's junior and senior years.
- E.C. Markham Summer Research Fund: The department chair selects the recipient of this award, who will use the salary to perform research between the junior and senior years.
- Chapel Family Student Excellence Fund: This award supports undergraduate chemistry majors through research and travel support.
- Matthew Neely Jackson Undergraduate Research Award: This award provides support for undergraduate chemistry majors to conduct faculty-mentored summer research.
- Tommie and Billie Hinton Undergraduate Research Fellowship: This award provides support for undergraduate chemistry majors to conduct faculty-mentored summer research to support the development of gender equality, diversity and inclusiveness within the chemistry department.
- Alan Rauch and Merrill King Undergraduate Student Research Fund: This award supports undergraduate student research in the Department of Chemistry.
- The Todd and Sherri Elder Undergraduate Research Fund in Chemistry: This award provides support for undergraduate chemistry majors to conduct faculty-mentored summer research to support the development of gender equality, diversity, and inclusiveness within the chemistry department.
- Mia Pizzagalli and Ken Shelton Undergraduate Research Fund: This award provides support for undergraduate research.
- Anne Cooper Schout Chemistry Excellence Fund: This award provides support for undergraduate research. Preference will be given to students with financial needs, with eligibility determined by the Office of Scholarships and Student Aid.
- Maurice Burse Undergraduate Research Award: This award provides support for undergraduate research.

Undergraduate Research

Undergraduates find research to be an exciting and rewarding experience. Undergraduate research can help them acquire a spirit of inquiry, initiative, independence, sound judgment, patience, persistence, alertness, and the ability to use the chemical literature. Undergraduate research also affords an opportunity to make pioneering discoveries at the forefront of science, using instrumentation and techniques far more sophisticated than those usually encountered in standard laboratory courses.

More than 80 students are involved in undergraduate research projects in chemistry each year. Although successful completion of an undergraduate research project is a requirement for graduation with honors or highest honors (see above), it is not necessary to be a participant in Honors Carolina to undertake a research project.



The usual mechanism for becoming involved in a research project involves making direct contact with faculty researchers to inquire about research opportunities. The Chemistry Student Services Office also maintains a list of undergraduate research opportunities. This process begins well in advance of a preregistration or registration period. Once a research opportunity is identified, a student will register for CHEM 395.

CHEM 395 and CHEM 396 together may be taken for credit as many times as desired but may be counted for no more than nine hours total credit toward graduation in either the B.A. or B.S. traditional and polymer tracks and for no more than six hours in the B.S. biochemistry track. Only one of CHEM 395 or CHEM 396 may be counted as an advanced chemistry elective. In the B.S. curriculum CHEM 395 and CHEM 396 together may be counted no more than once as an advanced chemistry elective. CHEM 396 may only be counted as an advanced chemistry elective with departmental permission.

UNC-BEST

The UNC Baccalaureate Education in Science and Teaching (UNC-BEST) Program is a collaboration between the School of Education and the

College of Arts and Sciences and is designed to allow undergraduate science majors interested in teaching high school science the opportunity to earn their science degree and obtain licensure as a North Carolina high school science teacher in four years. UNC–BEST students also fulfill teaching licensure coursework requirements as well as many General Education and elective requirements as they complete courses in teaching and learning.

Code	Title	Hours
Pedagogy Course		
EDUC 760	Methods and Materials for Teaching Secondary/K-12 Subjects I	3
Educational Foundations		
EDUC 532	 Human Development and Learning	3
EDUC 615	Schools and Community Collaboration	3
EDUC 689	Foundations of Special Education	3
Student Teaching		
EDUC 593	 Internship/Student Teaching (final semester)	12
Seminar		
EDUC 601	Education Workshops (must be completed during student teaching semester)	1
Total Hours		25

For more details on admission requirements, application deadlines, and instructions for submitting an online application, visit the School of Education website.

Department Programs

Majors

- Chemistry Major, B.A. (p. 1)
- Chemistry Major, B.S. (<https://catalog.unc.edu/undergraduate/programs-study/chemistry-major-bs/>)
- Chemistry Major, B.S.–Biochemistry Track (<https://catalog.unc.edu/undergraduate/programs-study/chemistry-major-bs-biochemistry-track/>)
- Chemistry Major, B.S.–Polymer Track (<https://catalog.unc.edu/undergraduate/programs-study/chemistry-major-bs-polymer-track/>)

Minor

- Chemistry Minor (<https://catalog.unc.edu/undergraduate/programs-study/chemistry-minor/>)

Graduate Programs

- M.A. in Chemistry (<https://catalog.unc.edu/graduate/schools-departments/chemistry/>)
- M.S. in Chemistry (<https://catalog.unc.edu/graduate/schools-departments/chemistry/>)
- Ph.D. in Chemistry (<https://catalog.unc.edu/graduate/schools-departments/chemistry/>)

Contact Information

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Visit Program Website (<http://www.chem.unc.edu>)

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