CHEMISTRY MAJOR, B.S.–BIOCHEMISTRY TRACK

Contact Information
Department of Chemistry
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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.S. chemistry, biochemistry track degree provides students with the opportunity to specialize in biochemistry and chemical biology.

Department Programs

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

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

Graduate Programs
- M.A. in Chemistry (http://catalog.unc.edu/graduate/schools-departments/chemistry/)
- M.S. in Chemistry (http://catalog.unc.edu/graduate/schools-departments/chemistry/)
- Ph.D. in Chemistry (http://catalog.unc.edu/graduate/schools-departments/chemistry/)

Student Learning Outcomes
Upon completion of the chemistry B.S. program, students are expected to be able to:
- Demonstrate a solid understanding of basic chemical principles (knowledge base in chemistry)
- Demonstrate the ability to solve chemical problems (analytical skills)
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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 (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/#degreerequirementstext).

This program meets the requirements of the American Chemical Society for the training of professional chemists.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gateway Course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 101 &amp; 101L</td>
<td>General Descriptive Chemistry I and Quantitative Chemistry Laboratory I</td>
<td>4</td>
</tr>
<tr>
<td>Core Requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 102</td>
<td>General Descriptive Chemistry II H</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 102H</td>
<td>General Descriptive Chemistry II</td>
<td></td>
</tr>
<tr>
<td>CHEM 102L</td>
<td>Quantitative Chemistry Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 241</td>
<td>Modern Analytical Methods for Separation and Characterization H</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 241L</td>
<td>Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds</td>
<td>1</td>
</tr>
<tr>
<td>or CHEM 245L</td>
<td>Honors Laboratory in Separations and Analytical Characterization of Organic and Biological Compound</td>
<td></td>
</tr>
<tr>
<td>CHEM 251</td>
<td>Introduction to Inorganic Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 430</td>
<td>Introduction to Biological Chemistry H</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 431</td>
<td>Macromolecular Structure and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 432</td>
<td>Metabolic Chemistry and Cellular Regulatory Networks</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 481</td>
<td>Physical Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 481L</td>
<td>Physical Chemistry Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>or CHEM 482L</td>
<td>Physical Chemistry Laboratory II</td>
<td></td>
</tr>
<tr>
<td>CHEM 482</td>
<td>Physical Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 530L</td>
<td>Laboratory Techniques for Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 550L</td>
<td>Synthetic Chemistry Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 261</td>
<td>Introduction to Organic Chemistry I H</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 262</td>
<td>Introduction to Organic Chemistry II H</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 262L</td>
<td>Laboratory in Organic Chemistry</td>
<td>1</td>
</tr>
<tr>
<td>or CHEM 263L</td>
<td>Honors Laboratory in Organic Chemistry</td>
<td></td>
</tr>
</tbody>
</table>

One advanced chemistry elective course from the following list:
- BIOC 601 Enzyme Properties, Mechanisms, and Regulation
- BIOC 650 Basic Principles: From Basic Models to Collections of Macromolecules
### 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 science (biochemistry track) degree is listed below. At least 18 semester hours of credit in chemistry courses above CHEM 101/101L with individual grades of C or better are required. Grades of C- do not satisfy this requirement. Courses in chemistry and other courses specifically required (and designated by number) may not be declared Pass/Fail.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 231</td>
<td>Calculus of Functions of One Variable I</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 105</td>
<td>English Composition and Rhetoric</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Foreign language through level 3 (with level 2 placement)</td>
<td>6</td>
</tr>
<tr>
<td>BIOL 101</td>
<td>Principles of Biology</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 101L</td>
<td>and Introductory Biology Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 101</td>
<td>General Descriptive Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 101L</td>
<td>and Quantitative Chemistry Laboratory I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lifetime fitness</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 202</td>
<td>Molecular Biology and Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 205</td>
<td>Cellular and Developmental Biology</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 102</td>
<td>General Descriptive Chemistry II</td>
<td>3</td>
</tr>
</tbody>
</table>

### Additional Requirements

- **CHEM 102** General Descriptive Chemistry II
- **CHEM 102L** Quantitative Chemistry Laboratory II
- **CHEM 241** Modern Analytical Methods for Separation and Characterization
- **CHEM 241L** Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds
- **CHEM 245L** Honors Laboratory in Separations and Analytical Characterization of Organic and Biological Compound
- **CHEM 251** Introduction to Inorganic Chemistry
- **CHEM 261** Introduction to Organic Chemistry
- **CHEM 262** Introduction to Organic Chemistry
- **CHEM 262L** Laboratory in Organic Chemistry
- **CHEM 263L** Honors Laboratory in Organic Chemistry
- **CHEM 233** Calculus of Functions of Several Variables
- **CHEM 232** Calculus of Functions of One Variable
- **CHEM 383** First Course in Differential Equations
- **PHYS 116** Mechanics
- **PHYS 117** Electromagnetism and Optics
- **PHYS 118** Introductory Calculus-based Mechanics and Relativity
- **PHYS 119** Introductory Calculus-based Electromagnetism and Quanta

Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/) (three courses)

Other Connections (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/)

### Junior and Senior Years

- **CHEM 430** Introduction to Biological Chemistry
- **CHEM 481** Physical Chemistry I
- **CHEM 481L** Physical Chemistry Laboratory I
- **CHEM 482** Physical Chemistry II
- **CHEM 530L** Laboratory Techniques for Biochemistry
- **CHEM 431** Macromolecular Structure and Metabolism
- **CHEM 432** Metabolic Chemistry and Cellular Regulatory Networks
- **CHEM 550L** Synthetic Chemistry Laboratory I
- **Advanced chemistry elective 2-3**

Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/) (three courses)

Other Connections (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/)

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

**1** Placement (PL) credits (zero hours) for MATH 232, MATH 233, or MATH 383 do not satisfy chemistry major requirements.
CHEM 395 may be taken for credit as many times as desired but may be counted for no more than nine hours of total credit toward fulfillment of graduation requirements. Additionally, CHEM 395 may not be counted more than once as an advanced chemistry elective in the B.S. chemistry degree, B.S. chemistry degree (biochemistry track), or B.S. chemistry degree (polymer track). Only one of CHEM 395 or CHEM 396 may be counted as an advanced chemistry elective. Students must sign up for CHEM 395 and CHEM 396 within the first week of classes. CHEM 396 may only be counted as an advanced chemistry elective with departmental permission.

One course must be taken from the following list: BIOC 601, BIOL 650; BIOL 422; CHEM 395; or any two- or three-credit chemistry lecture course numbered 420 or above that is not already required.

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 department 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 department 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.
- 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.
- The Chapel Family Student Excellence Fund: This award supports undergraduate chemistry majors through research and travel support.
- The 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.

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. In the B.S. curriculum CHEM 395 may be counted no more than once as an advanced chemistry elective.

**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 meet all the degree requirements for their chemistry degree using CHEM 410 as one of their upper-level chemistry courses. 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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>EDUC 516</td>
<td>Introduction to the Education of Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>or EDUC 689</td>
<td>Foundations of Special Education</td>
<td></td>
</tr>
<tr>
<td>EDUC 532</td>
<td>Human Development and Learning</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 615</td>
<td>Schools and Community Collaboration</td>
<td>3</td>
</tr>
<tr>
<td>or EDUC 533</td>
<td>Social Justice in Education</td>
<td></td>
</tr>
<tr>
<td>EDUC 593</td>
<td>Internship/Student Teaching (final semester)</td>
<td>12</td>
</tr>
<tr>
<td>EDUC 601</td>
<td>Education Workshops (final semester)</td>
<td>1</td>
</tr>
<tr>
<td>Total Hours</td>
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<td>22</td>
</tr>
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For more details on admission requirements, application deadlines, and instructions for submitting an online application, visit the School of Education website.