

# Bachelor of Science Chemistry

## INFORMATION

Chemistry is the study of the composition, structure, and properties of substances, and the chemical processes and transformations that substances undergo. It is fundamental to the understanding of many other sciences. The field of chemistry includes: organic chemistry - the study of carbon compounds, including synthesizing new compounds, studying the reaction chemistry of compounds, and determining reaction mechanisms; analytical chemistry – the measurement and identification of chemical substances from samples of any source, including medical, industrial, environmental and other natural sources; physical chemistry - the study of mathematical models upon which chemistry is based, including thermodynamics, quantum mechanics, and kinetics; inorganic chemistry – the study of the chemistry of elements other than carbon, including synthesizing new compounds, studying the reaction chemistry of compounds, and determining reaction mechanisms; and biochemistry - the study of the chemistry of life processes.

## CAREER OPPORTUNITIES

Chemists work to discover new compounds and reactions that lead to the development of new drugs, plastics, energy sources and various other materials such as paints, adhesives, cosmetics, pesticides and others. Chemists work in various fields, including environmental science, measuring and reducing pollution; medicine, contributing to advances in disease diagnosis and treatment; agriculture, food processing, and many other areas and industries. Chemists work as scientists in various testing and research laboratories.

Bachelor graduates have many employment opportunities as

technicians in environmental, pharmaceutical, clinical, and forensic testing laboratories and as technicians in biotechnology laboratories. Graduates work as research assistants in industrial, government and academic labs. Graduates work in technical sales and service for chemical and other related industries. There is also a high demand for bachelor graduates as high school chemistry/science teachers (licensure required).

Bachelor graduates also pursue advanced degrees to receive doctorates in medicine, dentistry and veterinary science; or pursue master's and Ph.D. degrees in chemistry or a related science. Master's graduates assume positions of greater technical and supervisory responsibility in laboratories and industry and also work in more specialized chemistry areas. Doctoral (Ph.D.) graduates assume university faculty positions teaching and directing research, direct research in government laboratories, or work in high-level positions directing research in industry.

## PROGRAMS

### ***BACHELOR OF SCIENCE (B.S.) IN CHEMISTRY:***

***American Chemical Society (ACS) Certified Track:*** Provides a strong foundation in chemistry, physics, and mathematics, and meets the requirements for professional certification. This program provides broad fundamental knowledge for students planning to become professional chemists or pursue graduate studies.

***Pre-Professional Studies Tracks:*** For pre-medical, pre-dental, pre-veterinary and pre-pharmacy students, providing

courses that are required and/or strongly recommended by most professional schools. There are two choices: a **Pre-Professional Studies Track** and a **Pre-Professional Studies Track with a Concentration in Pharmaceutical Sciences**.

### ***Secondary Teacher Licensure Track:***

Available for students interested in high school teaching. Contact the chemistry advisor for the science course requirements and the Education Student Service Center for the education course requirements.

An **Honors Program** is available for qualified students, giving intensive research experience. A **Biotechnology Certificate** is also available for chemistry majors, requiring additional specified course work in biology and engineering. In addition, a **Forensics Chemistry Certificate** is available. Engaged learning experiences (for all programs) include research experience with nationally recognized Cleveland State University faculty who have obtained prestigious federal grants; co-op and internship opportunities; and inquiry-based chemistry laboratories. Most courses are taught by doctoral faculty. A chemistry minor is offered, which requires 24 credit hours of specified chemistry courses. Student organizations include the American Chemical Society, Student Affiliates Chapter. An evening B.S. degree is also available. All students receive individual advising.

### **For more information, contact: College of Science**

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**Requirements of the College of Science:** A minimum of 128 credit hours is required for a Bachelor of Science (B.S.) degree, of which 42 semester credit hours must be earned in 300-and/or 400-level courses. Introduction to University Life (one credit hour) is required for all newly admitted freshmen (not required for transfer students).

**General Education Requirements:** All degree-seeking students are required to meet general education requirements. Students are responsible for ensuring that courses chosen satisfy these requirements and are encouraged to consult with their academic advisor. A comprehensive description of the requirements is available online at <http://www.csuohio.edu/academic/gened/>.

## Required Courses for B.S. in Chemistry (ACS Certified Track) (credit hours in parentheses):

### Chemistry Courses:

CHM 261/266 General Chemistry I/Lab (5)	CHM 331/336 Organic Chemistry I/Lab (6)	CHM 431 Advanced Organic Chemistry (2)
CHM 262/267 General Chemistry II/Lab (5)	CHM 332/337 Organic Chemistry II/Lab (6)	CHM 441/446 Inorganic Chemistry/Lab (6)
CHM 311/316 Analytical Chemistry/Lab (6)	CHM 401 Chemical Information (2)	CHM 471 Faculty Colloquium (1)
CHM 321/426 Physical Chemistry I/Lab (7)	CHM 402 Biochemistry (3)	CHM 472 Student Colloquium (1)
CHM 322/427 Physical Chemistry II/Lab (7)	CHM 411/416 Instrumental Analysis/Lab (7)	CHM 489 Senior Research (3)

### Mathematics Courses:

MTH 181 Calculus I (4)  
MTH 182 Calculus II (4)  
MTH 281 Multivariable Calculus (4)

### Physics Courses:

PHY 241 or 243 University Physics I (5)  
PHY 242 or 244 University Physics II (5)

## Required Courses for B.S. in Chemistry (Both Pre-Professional Studies Tracks) (credit hours in parentheses):

### Chemistry Courses:

CHM 261/266 General Chem I/ Lab (5)  
CHM 262/267 General Chem II/Lab (5)  
CHM 310/315 Analytical Chem/Lab (4)  
CHM 331/336 Organic Chem I/Lab (6)  
CHM 332/337 Organic Chemistry II/Lab (6)  
CHM 402 Biochemistry (3)  
CHM 471 Faculty Colloquium (1)

### Biology Courses:

BIO 200/201 Introductory Bio I/Lab (5)  
BIO 202/203 Introductory Bio II/Lab (4)  
BIO 310/311 Genetics and Recitation (4)  
BIO 416/417 Microbiology/Lab (5)

### Mathematics Courses:

MTH 181 Calculus I (4)  
MTH 182 Calculus II (4)

### Physics Courses:

PHY 221 College Physics I (5)  
PHY 222 College Physics II (5)

## Additional Required Courses for Pre-Professional Studies Track:

CHM 320 Survey of Physical Chem (4)  
BIO 302/303 Animal Biology and Lab (4)  
BIO 308/309 Cell Biology and Lab (4)

TWO Additional CHM Electives (300/400 level)  
ONE Additional BIO Electives (300/400 level)

## Additional Required Courses for Pre-Professional Studies Track with a Concentration in Pharmaceutical Sciences:

CHM 341 Pharmacology I (3)  
CHM 342 Pharmacology II (3)  
CHM 351 Medicinal Chemistry I (3)  
CHM 352 Medicinal Chemistry II (3)  
CHM 455 Biotechnology Techniques (4)

FOUR Additional CHM or BIO Electives (300/400 level)

## Required Courses for the B.S. in Chemistry (Honors) (All Tracks)

- Course requirements for the particular B.S. in Chemistry Track (as listed above)
- Register for a minimum of two credit hours of the following research courses (eight hours total required) each semester of honors study: CHM 379H Independent Study (in a non-senior year) or CHM 479H Senior Research (senior year)

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