# University Core and Graduation Requirements

## University Core Requirements:

### Religion Cornerstones
- Teachings and Doctrine of The Book of Mormon
- Jesus Christ and the Everlasting Gospel
- Foundations of the Restoration
- The Eternal Family

### Skills
- American Heritage
- Global and Cultural Awareness

### First Year Writing
- First-year Writing or A HTG 100
- MATH 112 (WSpSu)
- Religion Cornerstone course

### MATH 112* or 113*
- Quantitative Reasoning

### Languages of Learning (Math or Language)
- MATH 112* or 113*

### Arts, Letters, and Sciences
- Civilization 1
- Civilization 2
- Arts
- Letters
- Biological Science
- Physical Science
- Social Science

### Core Enrichment: Electives
- Religion Electives
- Open Electives

### Graduation Requirements:
- Minimum residence hours required: 30.0
- Minimum hours needed to graduate: 120.0

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## Suggested Sequence of Courses

### FRESHMAN YEAR

**1st Semester**
- Open Electives: 2.0
- CHEM 111* (F): 4.0
- First-year Writing or A HTG 100: 3.0
- MATH 112 (WSpSu): 4.0
- Religion Cornerstone course: 2.0
**Total Hours:** 15.0

*With department approval, CHEM 105 may be substituted for CHEM 111.

**2nd Semester**
- First-year Writing or A HTG 100: 3.0
- CHEM 112* (W): 3.0
- CHEM 113* (FW): 2.0
- CHEM 201 (FWSp): 0.5
- MATH 113 (FWSpSu): 4.0
- Religion Cornerstone course: 2.0
**Total Hours:** 14.5

* With department approval, CHEM 106 may be substituted for CHEM 112; CHEM 107 for CHEM 113.

### SOPHOMORE YEAR

**3rd Semester**
- CHEM 227 (FSp): CHEM 481M* or BIO 130* (FSp): 3.0
- PHYSCS 122 (FWSpSu): 3.0
- CHEM 351M* (F): 3.0
- Religion Cornerstone course: 2.0
**Total Hours:** 16.0

*CHEM 351 may be substituted for CHEM 351M.

**4th Semester**
- CHEM 352M* (W): 3.0
- CHEM 354* (FWSp): 2.0
- PHYSCS 123 (FWSpSu): 3.0
- Religion Cornerstone course: 2.0
- STAT 201 (FW): 3.0
- CHEM 497R or open electives: 1.0
**Total Hours:** 14.0

*CHEM 352 may be substituted for CHEM 352M; CHEM 353 may be substituted for CHEM 354.

### JUNIOR YEAR

**5th Semester**
- CHEM 391 (FW): 3.0
- CHEM 481M* (F): 3.0
- PHYSCS 220 (FWSpSu): 3.0
- CHEM 497R or open elective: 1.0
- Civilization 1: 3.0
- Social Science: 3.0
**Total Hours:** 16.0

*CHEM 481 may be substituted for CHEM 481M.

**6th Semester**
- CHEM 482 (W): 3.0
- CHEM 468 (W): 3.0
- PWS 340 (FW): 3.0
- CHEM 497 or open elective: 1.0
- Civilization 2: 3.0
- Religion Elective: 2.0
**Total Hours:** 15.0

### SENIOR YEAR

**7th Semester**
- CHEM 489 (F): 3.0
- CHEM 584 (F): 3.0
- CHEM 594R (FW): 0.5
- PD BIO 360 (FWSpSu) or other Requirement 3: 3.0
- CHEM 498R or other Requirement 4: 1.0
- Global and Cultural Awareness: 3.0
- Religion Elective: 2.0
**Total Hours:** 15.5

**8th Semester**
- CHEM 495 (FW): 1.0
- CHEM 586 (W): 3.0
- CHEM 498R or other Requirement 4: 2.0
- Arts: 3.0
- Letters: 3.0
- Religion Elective: 2.0
**Total Hours:** 14.0

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**Note:** CHEM 498R is a research capstone class. Typically, enrollment in CHEM 498R follows enrollment in CHEM 497R. Both courses give students an opportunity to be mentored in a faculty’s research lab and receive class credit. Permission from faculty to enroll in either course is required. Contact department office for specific details.
No more than 3 hours of D credit is allowed in major courses.

NOTE: WITH DEPARTMENT APPROVAL, CHEM 105 MAY SUBSTITUTE FOR CHEM 111; AND CHEM 106 FOR CHEM 112; AND CHEM 107 FOR CHEM 113.

MATH 214 MAY SUBSTITUTE FOR CHEM 460.

CHEM 111 - Principles of Chemistry 1
CHEM 112 - Principles of Chemistry 2
CHEM 113 - Introductory General Chemistry Laboratory
CHEM 201 - Chemical Handling and Safe Laboratory Practices
CHEM 227 - Principles of Chemical Analysis
CHEM 351H - Organic Chemistry 1 - Majors
CHEM 352H - Organic Chemistry 2 - Majors
CHEM 354 - Organic Chemistry Laboratory--Majors
"CHEM 391 - Technical Writing Using Chemical Literature
CHEM 468 - Biophysical Chemistry
CHEM 483H - Biochemistry—Majors
CHEM 482 - Mechanisms of Molecular Biology
CHEM 489 - Structural Biochemistry
CHEM 495 - Senior Seminar
CHEM 584 - Advanced Biochemistry Methods 1
CHEM 586 - Advanced Biochemistry Methods 2
CHEM 594B - General Seminar

REQUIREMENT 2 Complete 8 courses
BIO 130 - Biology
MATH 112 - Calculus 1
MATH 113 - Calculus 2
PHSCS 121 - Introduction to Newtonian Mechanics
PHSCS 123 - Introduction to Waves, Optics, and Thermodynamics
PHSCS 220 - Introduction to Electricity and Magnetism
PWS 340 - Genetics
STAT 201 - Statistics for Engineers and Scientists

REQUIREMENT 3 Complete 1 course
MMBIO 463 - Immunology
MMBIO 460 - Virology
MMBIO 468 - (M McBio-PWS) Genomics
PDBIO 360 - Cell Biology
PDBIO 362 - Advanced Physiology

REQUIREMENT 4 Complete 3.0 hours from the following course(s)
AFTER CONSULTING WITH AN ADVISOR, COMPLETE 3 HOURS FROM THE FOLLOWING: NOTE: WITH PRIOR APPROVAL, MANY 300-LEVEL AND ABOVE COURSES IN BIOLOGY, INTEGRATIVE BIOLOGY, MICROBIOLOGY AND MOLECULAR BIOLOGY, AND PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY WILL FILL THIS REQUIREMENT.

REGISTRATION ADVISEMENT

We want to assist students in their academic pursuit toward an undergraduate degree. Students are encouraged to complete an average of 15 credit hours each semester or 30 credit hours each year, which could include spring and/or summer terms. Taking fewer credits substantially increases the number of semesters to graduate.

New students should attend the chemistry and biochemistry session during New Student Orientation, where they can meet with a faculty advisor and review their planned registration. Transfer or mid-year incoming students should meet with an advisor prior to the add/drop deadline of their first semester, usually after the first week of class.

The department recommends a review of progress and planned registration with a faculty advisor in the semester when 30, 60, and 90 hours are completed. However, academic advisement is available to all majors at any point in their academic career. Contact the department advisement office to schedule an appointment with a faculty advisor: in person C104 BNSN; by phone 801-422-6269; by email quemort@chem.byu.edu or coffice@chem.byu.edu

THE DISCIPLINE

The Biochemistry Bachelor of Science degree provides excellent preparation for students preparing for health-related fields (medicine, dentistry, veterinary medicine) or for those who desire an advanced degree (MS or PhD) in biochemistry, molecular biology, or the health sciences. Chemists and biochemists study the fundamental processes that govern the natural world, including atomic structure and how atoms interact to form molecules and materials. They study the mechanisms of chemical processes, including those that underpin living systems such as the transfer of information from DNA to RNA to proteins. They work to develop simplifying models (theories) that permit the correlation and explanation of observations about the behavior of life to the structure of rocks and minerals.

Chemistry and biochemistry provide an essential foundation for the medical sciences, engineering (especially chemical engineering), electronics, energy, environmental sciences, materials science, pharmacy, and virtually all manufacturing processes.

Chemistry and biochemistry are active branches of science that are vital to human existence. Inasmuch as the field embraces all aspects of the material world, it is subdivided into five areas of interest. Examples of these diverse areas include the regulation of protein synthesis, cellular signal transduction at the molecular

**BS in Biochemistry (692826)**

**2020-2021 Program Requirements (77 Credit Hours)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CHEM 397R</td>
<td>Mentored Outreach and Service Learning</td>
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<tr>
<td>CHEM 455</td>
<td>Synthesis and Qualitative Organic Analysis</td>
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<tr>
<td>CHEM 460</td>
<td>Mathematics for Physical Chemistry</td>
<td>1.0v</td>
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<tr>
<td>CHEM 496R</td>
<td>Academic Internship: Chemistry and Biochemistry</td>
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<tr>
<td>CHEM 498R</td>
<td>Capstone Experience in Chemistry/Biochemistry</td>
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<tr>
<td>CHEM 514</td>
<td>Inorganic Chemistry</td>
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<td>CHEM 518</td>
<td>Advanced Inorganic Laboratory</td>
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<td>CHEM 521</td>
<td>Instrumental Analysis Lecture</td>
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<tr>
<td>CHEM 523</td>
<td>Instrumental Analysis Laboratory</td>
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<tr>
<td>CHEM 552</td>
<td>Advanced Organic Chemistry</td>
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<td>CHEM 553</td>
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<td>CHEM 563</td>
<td>Reaction Kinetics</td>
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<td>CHEM 565</td>
<td>Introduction to Quantum Chemistry</td>
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<td>CHEM 567</td>
<td>Statistical Mechanics</td>
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<td>CHEM 569</td>
<td>Fundamentals of Spectroscopy</td>
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<td>CHEM 581</td>
<td>Advanced Biochemical Methodology 1</td>
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<td>Advanced Biochemical Methodology 2</td>
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<td>CHEM 596R</td>
<td>Special Topics in Chemistry</td>
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<tr>
<td>CHEM 695R</td>
<td>Honors Thesis</td>
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**Recommended Course:** Chem 460.

Note: Supporting courses suggested by most medical and dental schools are found by visiting the Preprofessional Advisement Office. The more rigorous preparation for students preparing for health-related fields (medicine, dentistry, veterinary medicine) or for those who desire an advanced degree (MS or PhD) in biochemistry, molecular biology, or the health sciences. Chemists and biochemists study the fundamental processes that govern the natural world, including atomic structure and how atoms interact to form molecules and materials. They study the mechanisms of chemical processes, including those that underpin living systems such as the transfer of information from DNA to RNA to proteins. They work to develop simplifying models (theories) that permit the correlation and explanation of observations about the behavior of life to the structure of rocks and minerals.

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level and proteomics (biochemistry), design and synthesis of medicinal compounds, catalysts and polymers (organic chemistry), design and synthesis of new molecular structures and materials (inorganic chemistry), spectroscopic study of energy transfer and molecular structures (physical chemistry), and analysis of medicinal compounds, biological materials, and contaminants or trace elements found in the environment (analytical chemistry).

Chemistry and biochemistry involve far more than test tubes and beakers. They include sophisticated methodologies such as recombinant DNA technology, working with a variety of instruments such as mass spectrometers, calorimeters, chromatographs, ultracentrifuges, lasers, X-ray diffractometers, electron microscopes and nuclear magnetic resonance spectrometers, all of which are used by undergraduate chemistry and biochemistry students at BYU. Computers also play an important role in these disciplines, with applications ranging from simulation of molecules and their interactions to the collection and analysis of data. The chemistry and biochemistry curricula are both rigorous and intellectually rewarding.

CAREER OPPORTUNITIES

Graduates in chemistry and biochemistry obtain positions in education and many different industries, performing analysis, synthesis, characterization, observation, and modeling. Those who work hard, are creative, and have intellectual curiosity are in particular demand. The discipline also provides an excellent preprofessional course of study for those interested in medicine, dentistry, law, and business.

MAP DISCLAIMER

While every reasonable effort is made to ensure accuracy, there are some student populations that could have exceptions to listed requirements. Please refer to the university catalog and your college advisement center/department for complete guidelines.

DEPARTMENT INFORMATION

Department of Chemistry and Biochemistry Advisement

Brigham Young University
C-104 BNSN
Provo, UT 84602
Telephone: (801) 422-6269

ADVISEMENT CENTER INFORMATION

Physical and Mathematical Sciences College Advisement Center
Brigham Young University
N-181 ESC
Provo, UT 84602
Telephone: (801) 422-2674