University Core and Graduation Requirements

### University Core Requirements:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>#Classes</th>
<th>Hours</th>
<th>Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Religion Cornerstones</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachings and Doctrine of The Book of Mormon</td>
<td>1</td>
<td>2.0</td>
<td>REL A 275</td>
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<tr>
<td>Jesus Christ and the Everlasting Gospel</td>
<td>1</td>
<td>2.0</td>
<td>REL A 250</td>
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<tr>
<td>Foundations of the Restoration</td>
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<td>2.0</td>
<td>REL C 225</td>
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<tr>
<td>The Eternal Family</td>
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<td>2.0</td>
<td>REL C 200</td>
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<tr>
<td><strong>The Individual and Society</strong></td>
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<td></td>
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<tr>
<td>American Heritage</td>
<td>1-2</td>
<td>3-6.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Global and Cultural Awareness</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td><strong>Skills</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>First Year Writing</td>
<td>1</td>
<td>3.0</td>
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</tr>
<tr>
<td>Advanced Written and Oral Communications</td>
<td>1</td>
<td>3.0</td>
<td>CHEM 391*</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>1</td>
<td>4.0</td>
<td>MATH 112* or 113*</td>
</tr>
<tr>
<td>Languages of Learning (Math or Language)</td>
<td>1</td>
<td>4.0</td>
<td>MATH 112* or 113*</td>
</tr>
<tr>
<td><strong>Arts, Letters, and Sciences</strong></td>
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</tr>
<tr>
<td>Civilization 1</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Civilization 2</td>
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<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Arts</td>
<td>1</td>
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<td>from approved list</td>
</tr>
<tr>
<td>Letters</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
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<tr>
<td>Biological Science</td>
<td>1-2</td>
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<tr>
<td>Physical Science</td>
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<td>7.0</td>
<td>CHEM 111* and PHSCS 121*</td>
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<tr>
<td>Social Science</td>
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<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td><strong>Core Enrichment: Electives</strong></td>
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<tr>
<td>Religion Electives</td>
<td>3-4</td>
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<td>from approved list</td>
</tr>
<tr>
<td>Open Electives</td>
<td>Variable</td>
<td>Variable</td>
<td>personal choice</td>
</tr>
</tbody>
</table>

*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (21-22 hours overlap)*

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### 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**
- First-year Writing or A HTG 100 3.0
- Biological Science* 3-4.0
- CHEM 111** (F) 4.0
- MATH 112 (FWSpSu) 4.0
- Religion Cornerstone course 2.0

**Total Hours: 16-17.0**

*Suggested courses include: BIO 130, MM BIO 121, PD BIO 120
*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.

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#### SOPHOMORE YEAR

**3rd Semester**
- CHEM 227 (FSp) 4.0
- CHEM 351M* (F) 3.0
- STAT 201 (FW) or MATH 302 (FW) 3-4.0
- PHSCS 121 (FWSp) 3.0
- Religion Cornerstone course 2.0

**Total Hours: 15-16.0**

*CHEM 351 may substitute for CHEM 351M.

**4th Semester**
- CHEM 352M* (W) 3.0
- CHEM 354* (FWSp) 2.0
- PHSCS 123 (FWSp) 3.0
- CHEM 497R and/or open electives 4.5
- Religion Cornerstone course 2.0

**Total Hours: 14.5**

*CHEM 352 may substitute for CHEM 352M; CHEM 353 may substitute for CHEM 354.

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#### JUNIOR YEAR

**5th Semester**
- CHEM 462 (F) or CHEM 481M* (F) 3.0
- PHSCS 220 (FWSpSu) 3.0
- Social Science 3.0
- Global and Cultural Awareness 3.0

**Total Hours: 15.0**

*CHEM 481 can be substituted for 481M.

**6th Semester**
- CHEM 391 (FW) 3.0
- CHEM 463 (W) or CHEM 468 (W) 3.0

**Total Hours: 16-17.0**

**7th Semester**
- CHEM 384 (FW) or elective 3.0
- Requirement 4 or open electives 10.0
- Religion elective 2.0

**Total Hours: 15.0**

**8th Semester**
- CHEM 495 (FW) 1.0
- Requirement 4 or open elective 2.0
- Letters 3.0
- Religion elective 2.0
- Open electives 6.0

**Total Hours: 14.0**

#### SENIOR YEAR

**9th Semester**
- CHEM 462 or CHEM 463 (F) or other Requirement 4 3.0
- Requirement 4 or open electives 10.0
- Religion elective 2.0

**Total Hours: 15.0**

**10th Semester**
- CHEM 495 (FW) 1.0
- Requirement 4 or open elective 2.0
- Letters 3.0
- Religion elective 2.0
- Open electives 6.0

**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.
### REQUIREMENT 1 Complete 10 courses
- **CHEM 111 - Principles of Chemistry 1**: 4.0
- **CHEM 112 - Principles of Chemistry 2**: 3.0
- **CHEM 113 - Introductory General Chemistry Laboratory**: 2.0
- **CHEM 201 - Chemical Handling and Safe Laboratory Practices**: 0.5
- **CHEM 227 - Principles of Chemical Analysis**: 4.0
- **CHEM 351M - Organic Chemistry 1 - Majors**: 3.0
- **CHEM 352M - Organic Chemistry 2 - Majors**: 3.0
- **CHEM 354 - Organic Chemistry Laboratory--Majors**: 2.0
- **CHEM 391 - Technical Writing Using Chemical Literature**: 3.0
- **CHEM 495 - Senior Seminar**: 1.0

**Note:** With departmental approval, Chem 105 may substitute for Chem 111, and Chem 106 for Chem 112.

### REQUIREMENT 2 Complete 1 option

#### OPTION 2.1 Complete 4 courses
- **CHEM 468 - Biophysical Chemistry**: 3.0
- **CHEM 481M - Biochemistry--Majors**: 3.0
- **CHEM 584 - Advanced Biochemistry Methods 1**: 3.0
- **STAT 201 - Statistics for Engineers and Scientists**: 3.0

#### OPTION 2.2 Complete 5 courses
- **CHEM 462 - Physical Chemistry 1**: 3.0
- **CHEM 463 - Physical Chemistry 2**: 3.0
- **CHEM 464 - Physical Chemistry Laboratory 1**: 1.0
- **CHEM 465 - Physical Chemistry Laboratory 2**: 1.0
- **MATH 302 - Mathematics for Engineering 1**: 4.0

### REQUIREMENT 3 Complete 5 courses
- **MATH 112 - Calculus 1**: 4.0
- **MATH 113 - Calculus 2**: 4.0
- **PHSCS 121 - Introduction to Newtonian Mechanics**: 3.0
- **PHSCS 122 - Introduction to Waves, Optics, and Thermodynamics**: 3.0
- **PHSCS 220 - Introduction to Electricity and Magnetism**: 3.0

### REQUIREMENT 4 Complete 3.0 hours from the following option(s)
- **CHEM 397R - Mentored Outreach and Service Learning**: 3.0v

#### OPTION 4.1 Complete 3.0 hours from the following course(s)
- **CHEM 397R - Mentored Outreach and Service Learning**: 3.0v

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**BA in Chemistry (692827)**

**2019-2020 Program Requirements (57.5 Credit Hours)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 455 - Synthesis and Qualitative Organic Analysis</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 462 - Physical Chemistry 1</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 463 - Physical Chemistry 2</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 464 - Physical Chemistry Laboratory 1</td>
<td>1.0</td>
</tr>
<tr>
<td>CHEM 465 - Physical Chemistry Laboratory 2</td>
<td>1.0</td>
</tr>
<tr>
<td>CHEM 481M - Biochemistry--Majors</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 482 - Mechanisms of Molecular Biology</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 489 - Structural Biochemistry</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 496R - Academic Internship: Chemistry and Biochemistry</td>
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</tr>
<tr>
<td>CHEM 498R - Capstone Experience in Chemistry/Biochemistry</td>
<td>4.0v</td>
</tr>
<tr>
<td>CHEM 514 - Inorganic Chemistry</td>
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<tr>
<td>CHEM 518 - Advanced Inorganic Laboratory</td>
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</tr>
<tr>
<td>CHEM 521 - Instrumental Analysis Lecture</td>
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<tr>
<td>CHEM 523 - Instrumental Analysis Laboratory</td>
<td>2.0</td>
</tr>
<tr>
<td>CHEM 552 - Advanced Organic Chemistry</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 553 - Advanced Organic Chemistry</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 563 - Reaction Kinetics</td>
<td>3.0</td>
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<tr>
<td>CHEM 565 - Introduction to Quantum Chemistry</td>
<td>3.0</td>
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<tr>
<td>CHEM 567 - Statistical Mechanics</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 569 - Fundamentals of Spectroscopy</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 581 - Advanced Biochemical Methodology 1</td>
<td>3.0</td>
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<tr>
<td>CHEM 583 - Advanced Biochemical Methodology 2</td>
<td>3.0</td>
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<tr>
<td>CHEM 594R - General Seminar</td>
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<tr>
<td>CHEM 596R - Special Topics in Chemistry</td>
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<tr>
<td>HONORS 499R - Honors Thesis</td>
<td>6.0v</td>
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<tr>
<td>PDBIO 360 - Cell Biology</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**Note 1:** Elective courses must be different from required courses.

**Note 2:** With prior approval, complete 300-level and above courses in biology, engineering, physics, and statistics may be taken to satisfy this requirement.

**Recommended Courses:** Math 302, 303; PDBio 120; Phscs 225.

**Note:** Supporting courses suggested by most medical and dental schools are found by visiting the Preprofessional Advisement Office. The more rigorous chemistry, mathematics, and physics courses required for the chemistry majors will satisfy the minimum requirements listed there. Elective courses in biochemistry and in biological science are especially pertinent to these preprofessional programs.

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### 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 suemort@chem.byu.edu or coffice@chem.byu.edu

### THE DISCIPLINE

The Chemistry Bachelor of Arts degree provides preparation for individuals in preprofessional programs (e.g., medicine, dentistry, business administration, or law). It also provides background for careers in chemistry-related professions (e.g., information specialist, safety engineer, forensics). 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 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