BS in Chemistry (692821) MAP Sheet
Physical and Mathematical Sciences, Chemistry and Biochemistry
For students entering the degree program during the 2020-2021 curricular year.

### 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>1</td>
<td>2.0</td>
<td>REL A 275</td>
</tr>
<tr>
<td>Teachings and Doctrine of The Book of Mormon</td>
<td>1</td>
<td>2.0</td>
<td>REL A 250</td>
</tr>
<tr>
<td>Jesus Christ and the Everlasting Gospel</td>
<td>1</td>
<td>2.0</td>
<td>REL C 225</td>
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<tr>
<td><strong>The Individual and Society</strong></td>
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<td>2.0</td>
<td>REL C 200</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>
<td></td>
</tr>
<tr>
<td>First Year Writing</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</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>
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<td>4.0</td>
<td>MATH 112* or 113*</td>
</tr>
<tr>
<td><strong>Arts, Letters, and Sciences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civilization 1</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Civilization 2</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Arts</td>
<td>1</td>
<td>3.0</td>
<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</td>
<td>3.0</td>
<td>CHEM 481M* or PD BIO 120*</td>
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<tr>
<td>Physical Science</td>
<td>2</td>
<td>7.0</td>
<td>CHEM 111* and PHSCS 121*</td>
</tr>
<tr>
<td>Social Science</td>
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<td>3.0</td>
<td>from approved list</td>
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<tr>
<td><strong>Core Enrichment: Electives</strong></td>
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<td></td>
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<tr>
<td>Religion Electives</td>
<td>3-4</td>
<td>6.0</td>
<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 hours overlap)*

**Graduation Requirements:**

- Minimum residence hours required: 30.0
- Minimum hours needed to graduate: 120.0

### Suggested Sequence of Courses

#### FRESHMAN YEAR

**1st Semester**
- A HTG 100 or First-year Writing: 3.0
- CHEM 111* (F): 4.0
- PDBIO 120 (FWSp): 3.0
- MATH 112 (FWSpSu): 4.0
- Religion Cornerstone course: 2.0

**Total Hours: 16.0**

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

**2nd Semester**
- A HTG 100 or First-year Writing: 3.0
- CHEM 112* (W): 3.0
- CHEM 113* (W): 2.0
- CHEM 201 (FWSp): 0.5
- 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 (FWSp): 4.0
- CHEM 351M* (F): 3.0
- MATH 213 (FWSpSu): 2.0
- MATH 215 (FW): 1.0
- PHSCS 121 (FWSp): 3.0
- Religion Cornerstone course: 2.0

**Total Hours: 15.0**

*CHEM 351 may be substituted for CHEM 351M.*

**4th Semester**
- CHEM 352M* (W): 3.0
- CHEM 354* (FWSp): 2.0
- PHSCS 123 (FWSpSu): 3.0
- CHEM 497R or open elective: 2.0
- Social Science: 3.0
- Religion Cornerstone course: 2.0

**Total Hours: 14.0**

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

#### JUNIOR YEAR

**5th Semester**
- CHEM 481M* (F): 3.0
- CHEM 462 (F): 3.0
- PHSCS 220 (FWSpSu): 3.0
- CHEM 460: 1.0
- Letters: 3.0
- Religion Elective: 2.0

**Total Hours: 16.0**

*CHEM 481 (FWSp) may be substituted for CHEM 481M*

**6th Semester**
- CHEM 391 (FW): 3.0
- CHEM 463 (W): 3.0
- CHEM 464 (W): 1.0
- CHEM 465 (W): 1.0
- CHEM 497R or open elective: 1.0
- Civilization 2: 3.0
- Religion Elective: 2.0

**Total Hours: 14.0**

#### SENIOR YEAR

**7th Semester**
- CHEM 455* (F) -- Opt. 3.1: 4.0
- AND/OR CHEM 521* (F) -- Opt. 3.2 and Req. #4: 4.0
- CHEM 514 (F): 3.0
- CHEM 498R and/or other Req. #4: 3.0
- CHEM 594R (FW): 0.5
- Arts: 3.0
- Open Elective: 2.0

**Total Hours: 15.5**

*Only one option, 3.1 or 3.2 is required. The other option may be used for elective credit, Req. #4.*

**8th Semester**
- CHEM 495 (FW): 1.0
- CHEM 518 (W): 2.0
- CHEM 523* (W) Opt. 3.2 and/or other Req. #4: 2.0
- CHEM 498R or other Req. #4: 2.0
- Global & Cultural Awareness elective: 3.0
- Religion elective: 2.0
- Open elective: 3.0

**Total Hours: 15.0**

*Complete option 3.2, Requirement #3 or choose other Requirement #4.*

**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.

The Chemistry and Biochemistry Department requires the final 10 hours of required chemistry credit to be taken in residence at BYU for this degree requirement for graduation.

REQUIREMENT 1 Complete 19 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 314 MAY SUBSTITUTE FOR CHEM 460.

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 355 - Organic Chemistry Laboratory—Majors 3.0
CHEM 455 - Synthesis and Qualitative Organic Analysis 4.0
CHEM 518 - Advanced Inorganic Chemistry 4.0
CHEM 521 - Instrumental Analysis Lecture 2.0
CHEM 523 - Instrumental Analysis Laboratory 2.0
CHEM 586 - Advanced Biochemistry Methods 1 3.0
CHEM 587 - Advanced Biochemistry Methods 2 3.0
CHEM 596R - Academic Internship: Chemistry and Biochemistry 6.0v
CHEM 598R - Capstone Experience in Chemistry/Biochemistry 3.0
CHEM 599R - Thesis 6.0v

REQUIREMENT 2 Complete 8 courses
MATH 112 - Calculus 1 4.0
MATH 113 - Calculus 2 4.0
MATH 213 - Elementary Linear Algebra 2.0
MATH 215 - Computational Linear Algebra 1.0
PBIO 120 - Science of Biology 3.0
PHSCS 121 - Introduction to Newtonian Mechanics 3.0
PHSCS 123 - Introduction to Waves, Optics, and Thermodynamics 3.0
PHSCS 220 - Introduction to Electricity and Magnetism 3.0

REQUIREMENT 3 Complete 1 option

COMPLETE ONE OF THE FOLLOWING ADVANCED OPTIONS:

OPTION 3.1 Complete 1 course

After consulting with an advisor, complete 6 hours from the following course(s)
NOTE: WITH APPROVAL, CERTAIN OTHER 300-LEVEL AND ABOVE COURSES IN THE ALLIED FIELDS OF PHYSICS, STATISTICS, ENGINEERING, AND BIOLOGY MAY BE TAKEN TO SATISFY THIS REQUIREMENT. NOTE: ANY COURSE NOT TAKEN TO SATISFY REQUIREMENT 4 CAN BE TAKEN TO SATISFY REQUIREMENT 3.

CHEM 397R - Mentored Outreach and Service Learning 3.0v
CHEM 455 - Synthesis and Qualitative Organic Analysis 4.0
CHEM 482 - Mechanisms of Molecular Biology 3.0
CHEM 496R - Academic Internship: Chemistry and Biochemistry 6.0v
CHEM 498R - Capstone Experience in Chemistry/Biochemistry 4.0v
CHEM 521 - Instrumental Analysis Lecture 2.0
CHEM 523 - Instrumental Analysis Laboratory 2.0
CHEM 553 - Advanced Organic Chemistry 3.0
CHEM 555 - Organic Spectroscopic Identification 2.0
CHEM 563 - Reaction Kinetics 3.0
CHEM 565 - Introduction to Quantum Chemistry 3.0
CHEM 567 - Statistical Mechanics 3.0
CHEM 569 - Fundamentals of Spectroscopy 3.0
CHEM 584 - Advanced Biochemistry Methods 1 3.0
CHEM 586 - Advanced Biochemistry Methods 2 3.0
CHEM 596R - Special Topics in Chemistry 3.0v

Recommended Courses: Phscs 225; Stat 201.

Note: Elective courses, beyond the requirements above, should be selected in consultation an an advisor. The following should be given consideration: advanced chemistry, foreign languages (especially French, German, Japanese, and Russian), biological sciences, computer science, engineering, mathematics, physics, statistics.

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 orientation 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, which usually follows 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 Science degree is the preferred degree for chemistry majors (approved by the American Chemical Society), especially those who desire an advanced degree (MS or PhD) in chemistry. It also provides excellent preparation for individuals in preprofessional programs (e.g., medicine, dentistry, business administration, or law).

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

ADVISEMENT CENTER INFORMATION

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N-181 ESC
Provo, UT 84602
Telephone: (801) 422-2674