BS in Chemistry Education (692828) MAP Sheet

Physical and Mathematical Sciences, Chemistry and Biochemistry

For students entering the degree program during the 2019-2020 curricular year.

This major is designed to prepare students to teach in public schools. In order to graduate with this major, students are required to complete Utah State Office of Education licensing requirements. To view these requirements go to http://education.byu.edu/ess/licensing.html or contact Education Advisement Center, 350 MCKB, 801-422-3426.

<table>
<thead>
<tr>
<th>University Core Requirements</th>
<th>Suggested Sequence of Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>University Core Requirements:</strong></td>
<td><strong>FRESHMAN YEAR</strong></td>
</tr>
<tr>
<td>Requirements</td>
<td>#Classes</td>
</tr>
<tr>
<td>Religion Cornerstones</td>
<td></td>
</tr>
<tr>
<td>Teachings and Doctrine of The Book of Mormon</td>
<td>1</td>
</tr>
<tr>
<td>Jesus Christ and the Everlasting Gospel</td>
<td>1</td>
</tr>
<tr>
<td>Foundations of the Restoration</td>
<td>1</td>
</tr>
<tr>
<td>The Eternal Family</td>
<td>1</td>
</tr>
<tr>
<td><strong>The Individual and Society</strong></td>
<td><strong>Total Hours</strong> 16.0</td>
</tr>
<tr>
<td>American Heritage</td>
<td>1-2</td>
</tr>
<tr>
<td>Global and Cultural Awareness</td>
<td>1</td>
</tr>
<tr>
<td><strong>Skills</strong></td>
<td></td>
</tr>
<tr>
<td>First Year Writing</td>
<td>1</td>
</tr>
<tr>
<td>Advanced Written and Oral Communications</td>
<td>1</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>1</td>
</tr>
<tr>
<td>Languages of Learning (Math or Language)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Arts, Letters, and Sciences</strong></td>
<td></td>
</tr>
<tr>
<td>Civilization 1</td>
<td>1</td>
</tr>
<tr>
<td>Civilization 2</td>
<td>1</td>
</tr>
<tr>
<td>Arts</td>
<td>1</td>
</tr>
<tr>
<td>Letters</td>
<td>1</td>
</tr>
<tr>
<td>Biological Science</td>
<td>1</td>
</tr>
<tr>
<td>Physical Science</td>
<td>2</td>
</tr>
<tr>
<td>Social Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>Core Enrichment: Electives</strong></td>
<td></td>
</tr>
<tr>
<td>Religion Electives</td>
<td>3-4</td>
</tr>
<tr>
<td>Open Electives</td>
<td>Variable</td>
</tr>
<tr>
<td><strong>Graduation Requirements:</strong></td>
<td><strong>JUNIOR YEAR</strong></td>
</tr>
<tr>
<td>Minimum residence hours required</td>
<td>30.0</td>
</tr>
<tr>
<td>Minimum hours needed to graduate</td>
<td>120.0</td>
</tr>
</tbody>
</table>

| **Core Enrichment Electives** | **Total Hours** 15.5 |
| Religion Electives | 3-4 | 6.0 | from approved list |
| Open Electives | Variable | Variable | personal choice |

*These classes fill both University Core and Program requirements (up to 27 hours overlap)

**FRESHMAN YEAR**

1st Semester
- CHEM 111* (F) 4.0
- First-year Writing or A HTG 100 3.0
- MATH 112 (FWSpSu) 4.0
- Religion Cornerstone course 2.0
- PWS 150** (FWSu) 3.0
- **Total Hours 16.0

*With department approval, CHEM 105 may be substituted for CHEM 111.
**PWS 150 fulfills Requirement #4 and G.E. Biological Sciences. If another course is chosen for Requirement #4, another Biological Sciences course from the G.E. approved list will also be required.

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
- Open electives 1.0
- **Total Hours 15.5

*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
- PHSCS 121 (FWSp) 3.0
- Religion Cornerstone course 2.0
- Arts 2.0
- **Total Hours 15.0

*CHEM 351 may substitute for CHEM 351M.

4th Semester
- CHEM 352M* (W) 3.0
- PHSCS 123 (FWSp) 3.0
- Religion Cornerstone course 2.0
- Civilization 1 3.0
- Social Science 3.0
- IP&T 371 1.0
- IP&T 373 1.0
- **Total Hours 16.0

*CHEM 352 may substitute for CHEM 352M.

**JUNIOR YEAR**

5th Semester
- CHEM 462 (F) 3.0
- IP&T 372 1.0
- PHY S 276R 4.0
- SC ED 353 3.0
- PHIL 423* 3.0
- Religion elective 2.0
- **Total Hours 16.0

*PHIL 423 fulfills Requirement #4 and G.E. Letters. If another course is chosen for Requirement #4, another Letters course from the G.E. approved list will also be required.

**SENIOR YEAR**

7th Semester
- CHEM 391 (FW) 3.0
- CHEM 331 3.0
- SC ED 375 3.0
- Requirement #3* 2.0
- Civilization 2 3.0
- Religion Elective 2.0
- **Total Hours 16.0

*If CHEM 464 or 465 are chosen for Requirement #3, enroll this semester. (Only offered in winter)

8th Semester
- CHEM 495 (FW) 1.0
- CPSE 402 2.0
- PHY S 377 3.0
- PHY S 378 1.0
- Requirement #4 3.0
- Religion Elective 2.0
- Open elective 0.5
- **Total Hours 13.5

9th Semester
- PHY S 476 or 496 (FW) 12.0
- **Total Hours 12.0

**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.
This major is designed to prepare students to teach in public schools. In order to graduate with this major, students are required to complete Utah State Office of Education licensing requirements. To view these requirements go to http://education.byu.edu/ess/licensing.html or contact Education Student Services, 350 MCKB, (801) 422-3426.

For students accepted into the major after August 1, 2014, grades below C in any required coursework in a teaching major or teaching minor will not be accepted. Teacher candidates must maintain a total GPA of 3.0 or higher throughout the program and to qualify for student teaching. For details on admission and retention requirements for teaching majors and teaching minors, see Educator Preparation Program (EPP) Requirements.

The Chemistry and Biochemistry Department requires the final 10 hours of required chemistry credit to be taken in residence at BYU for this degree program. These hours may also go toward BYU's 30-hour residency requirement for graduation.

Contact Education Student Services for entrance requirements into the licensure program.

A teaching minor is not required for licensure. However, it is strongly recommended.

### REQUIREMENT 1
Complete 11 courses

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 111</td>
<td>Principles of Chemistry 1</td>
<td>4.0</td>
</tr>
<tr>
<td>CHEM 112</td>
<td>Principles of Chemistry II</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 113</td>
<td>Introduction General Chemistry Laboratory</td>
<td>2.0</td>
</tr>
<tr>
<td>CHEM 201</td>
<td>Chemical Handling and Safe Laboratory Practices</td>
<td>0.5</td>
</tr>
<tr>
<td>CHEM 227</td>
<td>Principles of Chemical Analysis</td>
<td>4.0</td>
</tr>
<tr>
<td>CHEM 331</td>
<td>Guided Learning for Chemistry Instruction</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 351M</td>
<td>Organic Chemistry 1 - Majors</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 352M</td>
<td>Organic Chemistry 2 - Majors</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 391</td>
<td>Technical Writing Using Chemical Literature</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 462</td>
<td>Physical Chemistry 1</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 495</td>
<td>Senior Seminar</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### REQUIREMENT 2
Complete 4 courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 112</td>
<td>Calculus 1</td>
<td>4.0</td>
</tr>
<tr>
<td>MATH 113</td>
<td>Calculus 2</td>
<td>4.0</td>
</tr>
<tr>
<td>PHSCS 121</td>
<td>Introduction to Newtonian Mechanics</td>
<td>3.0</td>
</tr>
<tr>
<td>PHSCS 123</td>
<td>Introduction to Waves, Optics, and Thermodynamics</td>
<td>3.0</td>
</tr>
</tbody>
</table>

### REQUIREMENT 3
Complete 3.0 hours from the following course(s)

- CHEM 354 - Organic Chemistry Laboratory--Majors: 2.0
- CHEM 397R - Mentored Outreach and Service Learning: 3.0v
  
You may take up to 1 credit hour.

- CHEM 464 - Physical Chemistry Laboratory 1: 1.0
- CHEM 465 - Physical Chemistry Laboratory 2: 1.0
- CHEM 498R - Capstone Experience in Chemistry/Biochemistry: 4.0v
  
You may take up to 3 credit hours.

### REQUIREMENT 4
Complete 6.0 hours from the following option(s)

Only ONE of Geol 101 or 111 can be taken. With approval, certain other courses in physics, geology, mathematics, and biology may be taken to satisfy this requirement.

**OPTION 4.1** Complete 6.0 hours from the following course(s)

- BIO 100 - Principles of Biology: 3.0
- CHEM 463 - Physical Chemistry 2: 3.0
- CHEM 481M - Biochemistry--Majors: 3.0
- GEOL 101 - Introduction to Geology: 3.0
- GEOL 111 - Physical Geology: 4.0
- MATH 213 - Elementary Linear Algebra: 2.0
- MATH 215 - Computational Linear Algebra: 1.0
- MATH 290 - Fundamentals of Mathematics: 3.0
- MATH 302 - Mathematics for Engineering 1: 4.0
- MATH 334 - Ordinary Differential Equations: 3.0
- PHIL 423R - History and Philosophy of Science: 3.0
- PHSCS 127 - Descriptive Astronomy: 3.0
- PHSCS 220 - Introduction to Electricity and Magnetism: 3.0
- PHSCS 222 - Modern Physics: 3.0
- PHSCS 225 - Introduction to Experimental Physics: 2.0
- PHSCS 240 - Design, Fabrication, and Use of Scientific Apparatus: 2.0
- PWS 150 - Environmental Biology: 3.0

### REQUIREMENT 5
Complete 2 options

**PROFESSIONAL EDUCATION COMPONENT:**

Licensure requirements: Contact the Education Advisement Center, 350 MCKB, 801-422-3426, to schedule the final interview to clear your application for the secondary teaching license. You should be registered for your last semester at BYU prior to the scheduled appointment.

**OPTION 5.1** Complete 9 courses

- CPSE 402 - Educating Students with Disabilities in Secondary Classroom: 2.0
- IP&T 371 - Integrating K-12 Educational Technology 1: 1.0
- IP&T 372 - Integrating K-12 Educational Technology 2: 1.0
- IP&T 373 - Teaching in K-12 Online and Blended Learning Contexts: 1.0
- PHY 5 276 - Exploration of Teaching: 4.0
- PHY 5 377 - Teaching Methods and Instruction: 3.0
- PHY 5 378 - Practicum in Secondary Education: 1.0
- *SC ED 353 - Multicultural Education for Secondary Education: 3.0
- SC ED 375 - Adolescent Development and Classroom Management: 3.0

Note: FBI fingerprint and background clearance must be completed before enrollment into Phy 5 276.

**OPTION 5.2** Complete 12.0 hours from the following course(s)

- PHY 5 476 - Secondary Student Teaching: 12.0v
- PHY 5 496 - Academic Internship: Secondary Education: 12.0v

**Student teachers/interns must complete three forms in their Educator accounts (PIBS, CDS, FED) and attach their TWS to the Educator account for their program. All four must be completed for clearance for graduation.**

**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 at the end of 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 CNSN; by phone 801-422-6269; by email suemort@chem.byu.edu or coffice@chem.
THE DISCIPLINE

The Chemistry Education Bachelor of Science degree provides preparation for chemistry/science high school teaching. High school chemistry teachers will find exciting opportunities available to help students take the first steps to becoming scientists. 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 in 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

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

PACS IN ADVISEMENT CENTER

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Physical and Mathematical Sciences College Advisement Center
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