

# BS in Chemistry Education (692828) MAP Sheet

## Physical and Mathematical Sciences, Chemistry and Biochemistry

For students entering the degree program during the 2017-2018 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 Student Services, 120 MCKB, (801) 422-3426.



University Core and Graduation Requirements				Suggested Sequence of Courses		
<b>University Core Requirements:</b>						
<b>Requirements</b>	<b>#Classes</b>	<b>Hours</b>	<b>Classes</b>			
<b>Religion Cornerstones</b>						
Teachings and Doctrine of The Book of Mormon	1	2.0	REL A 275			
Jesus Christ and the Everlasting Gospel	1	2.0	REL A 250			
Foundations of the Restoration	1	2.0	REL C 225			
The Eternal Family	1	2.0	REL C 200			
<b>The Individual and Society</b>						
American Heritage	1-2	3-6.0	from approved list			
Global and Cultural Awareness	1	2.0	SC ED 353*			
<b>Skills</b>						
First Year Writing	1	3.0	from approved list			
Advanced Written and Oral Communications	1	3.0	CHEM 391*			
Quantitative Reasoning	1	4.0	MATH 112* or 113*			
Languages of Learning (Math or Language)	1	4.0	MATH 112* or 113*			
<b>Arts, Letters, and Sciences</b>						
Civilization 1	1	3.0	from approved list			
Civilization 2	1	3.0	from approved list			
Arts	1	3.0	from approved list			
Letters	1	3.0	PHIL 423*			
Biological Science	1	3.0	BIO 100* or PWS 150*			
Physical Science	1	3.0	CHEM 111* and PHSCS 121*, or 123*,			
Social Science	1	3.0	from approved list			
<b>Core Enrichment: Electives</b>						
Religion Electives	3-4	6.0	from approved list			
Open Electives	Variable	Variable	personal choice			
*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (25 hours overlap)						
<b>Graduation Requirements:</b>						
Minimum residence hours required		30.0				
Minimum hours needed to graduate		120.0				
				<b>FRESHMAN YEAR</b>		
				<u>1st Semester</u>		
				CHEM 111 (F)	4.0	
				First-year Writing	3.0	
				MATH 112 (FWSpSu)	4.0	
				Religion Cornerstone course	2.0	
				BIO 100 (FWSPSu) or PWS 150 (FWSu) - requirement 4	3.0	
				<b>Total Hours</b>	<b>16.0</b>	
				<u>2nd Semester</u>		
				American Heritage	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	0.5	
				<b>Total Hours</b>	<b>15.0</b>	
				<b>SOPHOMORE YEAR</b>		
				<u>3rd Semester</u>		
				CHEM 227 (FSp)	4.0	
				CHEM 351M (F)	3.0	
				PHSCS 121 (FWSp)	3.0	
				Religion Cornerstone course	2.0	
				Arts	3.0	
				<b>Total Hours</b>	<b>15.0</b>	
				351 may substitute for 351M		
				<u>4th Semester</u>		
				CHEM 352M (W)	3.0	
				PHSCS 123 (FWSp)	3.0	
				Religion Cornerstone course	2.0	
				Letters	3.0	
				Social Science	3.0	
				Open electives	2.0	
				<b>Total Hours</b>	<b>16.0</b>	
				352 may substitute for 352M		
				<b>JUNIOR YEAR</b>		
				<u>5th Semester</u>		
				CHEM 462 (F)	3.0	
				IP&T 286	1.0	
				PHY S 276R	4.0	
				Civilization 1	3.0	
				Religion elective	2.0	
				Open electives	2.0	
				<b>Total Hours</b>	<b>15.0</b>	
				<u>6th Semester</u>		
				CHEM 391 (FW)	3.0	
				CHEM/Science/MATH elective (requirement 4)	3.0	
				SC ED 353	2.0	
				SC ED 375	3.0	
				Civilization 2	3.0	
				Religion Elective	2.0	
				<b>Total Hours</b>	<b>16.0</b>	
				<b>SENIOR YEAR</b>		
				<u>7th Semester</u>		
				CHEM 495 (FW)	1.0	
				CHEM 497R or advanced lab elective	3.0	
				CPSE 402	2.0	
				PHY S 377	3.0	
				PHY S 378	1.0	
				Religion Elective	2.0	
				Global and Cultural Awareness	3.0	
				<b>Total Hours</b>	<b>15.0</b>	
				<u>8th Semester</u>		
				PHY S 476 or 496 (FW)	12.0	
				<b>Total Hours</b>	<b>12.0</b>	
				<p>**Note: The department recommends a review of progress and planned registration with a faculty advisor by the end of the first week of classes in the first semester or term at BYU and in the semester when 30, 60, and 90 hours are completed. Call 422-6269 or come to C104 BNSN to schedule an appointment. New incoming 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.</p> <p>Note: 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 cost and the number of semesters to graduate.</p>		

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### 2017-2018 Program Requirements (82.5 Credit Hours)

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.**

*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 331 - Guided Learning for Chemistry Instruction	3.0
*CHEM 351M - Organic Chemistry 1 - Majors	3.0
*CHEM 352M - Organic Chemistry 2 - Majors	3.0
*CHEM 391 - Technical Writing Using Chemical Literature	3.0
*CHEM 462 - Physical Chemistry 1	3.0
*CHEM 495 - Senior Seminar	1.0

**REQUIREMENT 2** Complete 4 courses

*MATH 112 - Calculus 1	4.0
*MATH 113 - Calculus 2	4.0
*PHSCS 121 - Introduction to Newtonian Mechanics	3.0
*PHSCS 123 - Introduction to Waves, Optics, and Thermodynamics	3.0

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

*CHEM 354 - Organic Chemistry Laboratory--Majors	2.0
*CHEM 464 - Physical Chemistry Laboratory 1	1.0
*CHEM 465 - Physical Chemistry Laboratory 2	1.0
*CHEM 497R - Undergraduate Special Problems	6.0v

*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 290 - Fundamentals of Mathematics	3.0
*MATH 302 - Mathematics for Engineering 1	4.0
*MATH 313 - Elementary Linear Algebra	3.0
*MATH 334 - Ordinary Differential Equations	3.0
*PHIL 423R - History and Philosophy of Science	3.0
*PHSCS 127 - Descriptive Astronomy	3.0
*PHSCS 137 - Energy, Ecology, Weather, and the Environment	3.0
*PHSCS 140 - Electronics Lab	1.0
*PHSCS 145 - Experimental Methods in Physics	1.0
*PWS 150 - Environmental Biology	3.0

**REQUIREMENT 5** Complete 2 options

**PROFESSIONAL EDUCATION COMPONENT:**

**Licensure requirements: Contact the Education Advisement Center, 120 MCKB, 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 Classro	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 S 276 - Exploration of Teaching	4.0
*PHY S 377 - Teaching Methods and Instruction	3.0
*PHY S 378 - Practicum in Secondary Education	1.0
*SC ED 353 - Multicultural Education for Secondary Education	2.0
*SC ED 375 - Adolescent Development and Classroom Management	3.0

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

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

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

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

#### 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,

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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**

Brigham Young University  
C-100 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