

# BS in Biochemistry (692826) MAP Sheet

Physical and Mathematical Sciences, Chemistry and Biochemistry

For students entering the degree program during the 2018-2019 curricular year.



University Core and Graduation Requirements				Suggested Sequence of Courses			
<b>University Core Requirements:</b>				<b>FRESHMAN YEAR</b>			
<b>Requirements</b>	<b>#Classes</b>	<b>Hours</b>	<b>Classes</b>	<b>1st Semester</b>		<b>JUNIOR YEAR</b>	
<b>Religion Cornerstones</b>				Open Electives	2.0	<b>5th Semester</b>	
Teachings and Doctrine of The Book of Mormon	1	2.0	REL A 275	CHEM 111* (F)	4.0	CHEM 391 (FW)	3.0
Jesus Christ and the Everlasting Gospel	1	2.0	REL A 250	First-year Writing or A HTG 100	3.0	CHEM 481M (F)	3.0
Foundations of the Restoration	1	2.0	REL C 225	MATH 112 (WSpSu)	4.0	PHSCS 220 (FWSu)	3.0
The Eternal Family	1	2.0	REL C 200	Religion Cornerstone course	2.0	Civilization 1	3.0
<b>The Individual and Society</b>				<b>Total Hours</b>	<b>15.0</b>	Letters	3.0
American Heritage	1-2	3-6.0	from approved list	*With department approval, CHEM 105 may be substituted for CHEM 111.		<b>Total Hours</b>	<b>15.0</b>
Global and Cultural Awareness	1	3.0	from approved list			481 may be substituted for 481M.	
<b>Skills</b>				<b>2nd Semester</b>		<b>6th Semester</b>	
First Year Writing	1	3.0	from approved list	First-year Writing or A HTG 100	3.0	CHEM 482 (W)	3.0
Advanced Written and Oral Communications	1	3.0	CHEM 391*	CHEM 112* (W)	3.0	CHEM 468 (W)	3.0
Quantitative Reasoning	1	4.0	MATH 112* or 113*	CHEM 113* (FW)	2.0	PWS 340 (FW)	3.0
Languages of Learning (Math or Language)	1	4.0	MATH 112* or 113*	CHEM 201 (FWSp)	0.5	Religion Elective	2.0
<b>Arts, Letters, and Sciences</b>				MATH 113 (FWSpSu)	4.0	Civilization 2	3.0
Civilization 1	1	3.0	from approved list	Religion Cornerstone course	2.0	PD BIO 360 (FWSp) or other course for requirement 3 (see Program Requirements)	3.0
Civilization 2	1	3.0	from approved list	<b>Total Hours</b>	<b>14.5</b>	<b>Total Hours</b>	<b>17.0</b>
Arts	1	3.0	from approved list	* With department approval, CHEM 106 may be substituted for CHEM 112; CHEM 107 for CHEM 113.		<b>SENIOR YEAR</b>	
Letters	1	3.0	from approved list	<b>SOPHOMORE YEAR</b>		<b>7th Semester</b>	
Biological Science	1	3.0	CHEM 481M*, BIO 130*	<b>3rd Semester</b>		CHEM 489 (F)	3.0
Physical Science	2	7.0	CHEM 111* and PHSCS 121*	CHEM 227 (FSp)	4.0	CHEM 584 (F)	3.0
				BIO 130 (FW)	4.0	CHEM 594R (FW)	0.5
				PHSCS 121 (FWSpSu)	3.0	Global and Cultural Awareness	3.0
				CHEM 351M (F)	3.0	Religion Elective	2.0
				Religion Cornerstone course	2.0	Open Electives	3.0
				<b>Total Hours</b>	<b>16.0</b>	<b>Total Hours</b>	<b>14.5</b>
				351 may be substituted for 351M.		<b>8th Semester</b>	
				<b>4th Semester</b>		CHEM 495 (FW)	1.0
				CHEM 352M (W)	3.0	CHEM 586 (W)	3.0
				CHEM 354 (FWSp)	2.0	Requirement 4 or other elective	3.0
				PHSCS 123 (FWSp)	3.0	Arts	3.0
				Religion Cornerstone course	2.0	Religion Elective	2.0
				STAT 201 (FW)	3.0	Social Science	3.0
				CHEM 497R or open electives	1.0	<b>Total Hours</b>	<b>15.0</b>
				<b>Total Hours</b>	<b>14.0</b>		
				352 may be substituted for 352M; 353 may be substituted for 354.			
<b>Graduation Requirements:</b>				<b>Note:</b> Enrolling in CHEM 497R gives students an opportunity to be mentored in a faculty's research lab and receive class credit. Enrollment in this course can be repeated for several successive semesters. Permission is required from the faculty member. Contact the department office for specific details and to receive a permission-to-add code.			
Minimum residence hours required		30.0		<b>Note:</b> 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.			
Minimum hours needed to graduate		120.0					

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### 2018-2019 Program Requirements (77 Credit Hours)

**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 program. These hours may also go toward BYU's 30-hour residency requirement for graduation.**

**REQUIREMENT 1** Complete 17 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 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 468 - Biophysical Chemistry	3.0
*CHEM 481M - Biochemistry--Majors	3.0
CHEM 482 - Mechanisms of Molecular Biology	3.0
CHEM 489 - Structural Biochemistry	3.0
CHEM 495 - Senior Seminar	1.0
CHEM 584 - Advanced Biochemistry Methods 1	3.0
CHEM 586 - Advanced Biochemistry Methods 2	3.0
CHEM 594R - General Seminar	0.5

**REQUIREMENT 2** Complete 8 courses

*BIO 130 - Biology	4.0
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
PHSCS 220 - Introduction to Electricity and Magnetism	3.0
PWS 340 - Genetics	3.0
STAT 201 - Statistics for Engineers and Scientists	3.0

**REQUIREMENT 3** Complete 1 course

MMBIO 463 - Immunology	3.0
MMBIO 465 - Virology	3.0
MMBIO 468 - (MMBio-Bio-PWS) Genomics	3.0
PDBIO 360 - Cell Biology	3.0
PDBIO 362 - Advanced Physiology	3.0

**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. CHEM 500 DOES NOT COUNT TOWARD FULFILLING THIS REQUIREMENT.**

CHEM 397R - Mentored Outreach and Service Learning	3.0v
CHEM 455 - Synthesis and Qualitative Organic Analysis	3.0
CHEM 496R - Academic Internship: Chemistry and Biochemistry	6.0v
<i>You may take up to 3 credit hours.</i>	
CHEM 497R - Undergraduate Special Problems	6.0v
<i>You may take up to 4 credit hours.</i>	
CHEM 514 - Inorganic Chemistry	3.0
CHEM 518 - Advanced Inorganic Laboratory	2.0
CHEM 521 - Instrumental Analysis Lecture	2.0
CHEM 523 - Instrumental Analysis Laboratory	2.0
CHEM 552 - Advanced Organic Chemistry	3.0
CHEM 553 - Advanced Organic Chemistry	3.0
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 581 - Advanced Biochemical Methodology 1	3.0
CHEM 583 - Advanced Biochemical Methodology 2	3.0
CHEM 596R - Special Topics in Chemistry	3.0v
<i>You may take up to 4 credit hours.</i>	
HONRS 499R - Honors Thesis	6.0v

**Recommended Courses: Chem 195; Math 302 or Math 313.**

**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.**

### PLANNING REGISTRATION

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 801-422-6269 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.

### 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 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).

## **BS in Biochemistry (692826)**

**2018-2019**

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**

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