

# BS in Chemistry (692821) 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>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               | 3.0          | from approved list   |
| <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          | from approved list   |
| Biological Science   | 1               | 3.0          | CHEM 481M*, PD BIO 120*  |
| Physical Science   | 2               | 7.0          | CHEM 111* and PHSCS 121*   |
| 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 (16 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>  |
|  |                 |              | 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  |
|  |                 |              | <b>Total Hours 16.0</b>  |
|  |                 |              | *With department approval, CHEM 105 may be substituted for CHEM 111.   |
|  |                 |              | <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  |
|  |                 |              | <b>Total Hours 14.5</b>  |
|  |                 |              | * With department approval, CHEM 106 may be substituted for CHEM 112; CHEM 107 for CHEM 113.   |
|  |                 |              | <b>SOPHOMORE YEAR</b>  |
|  |                 |              | <u>3rd Semester</u>  |
|  |                 |              | CHEM 227 (FSp) 4.0   |
|  |                 |              | CHEM 351M* (F) 3.0   |
|  |                 |              | MATH 302 (FW) 4.0  |
|  |                 |              | PHSCS 121 (FWSp) 3.0   |
|  |                 |              | Religion Cornerstone course 2.0  |
|  |                 |              | <b>Total Hours 16.0</b>  |
|  |                 |              | *351 may be substituted for 351M.  |
|  |                 |              | <u>4th Semester</u>  |
|  |                 |              | CHEM 352M* (W) 3.0   |
|  |                 |              | CHEM 354* (FWSp) 2.0   |
|  |                 |              | PHSCS 123 (FWSp) 3.0   |
|  |                 |              | Religion Cornerstone course 2.0  |
|  |                 |              | Social Science 3.0   |
|  |                 |              | CHEM 497R or open elective 2.0   |
|  |                 |              | <b>Total Hours 15.0</b>  |
|  |                 |              | *352 may substitute for 352M; 353 for 354.   |
|  |                 |              | <b>JUNIOR YEAR</b>   |
|  |                 |              | <u>5th Semester</u>  |
|  |                 |              | CHEM 455 (F) 3.0   |
|  |                 |              | CHEM 462 (F) 3.0   |
|  |                 |              | PHSCS 220 (FWSu) 3.0   |
|  |                 |              | Civilization 1 3.0   |
|  |                 |              | Letters 3.0  |
|  |                 |              | <b>Total Hours 15.0</b>  |
|  |                 |              | <u>6th Semester</u>  |
|  |                 |              | CHEM 391 (FW) 3.0  |
|  |                 |              | CHEM 463 (W) 3.0   |
|  |                 |              | CHEM 464 (W) 1.0   |
|  |                 |              | CHEM 465 (W) 1.0   |
|  |                 |              | Civilization 2 3.0   |
|  |                 |              | Religion Elective 2.0  |
|  |                 |              | CHEM 497R or open elective 1.0   |
|  |                 |              | <b>Total Hours 14.0</b>  |
|  |                 |              | <b>SENIOR YEAR</b>   |
|  |                 |              | <u>7th Semester</u>  |
|  |                 |              | CHEM 481M (F) 3.0  |
|  |                 |              | CHEM 594R (FW) 0.5   |
|  |                 |              | CHEM 514 (F) 3.0   |
|  |                 |              | CHEM 521 (F) 2.0   |
|  |                 |              | Religion Elective 2.0  |
|  |                 |              | Arts 3.0   |
|  |                 |              | 497R or open elective 2.0  |
|  |                 |              | <b>Total Hours 15.5</b>  |
|  |                 |              | 481 may substitute for 481M.   |
|  |                 |              | <u>8th Semester</u>  |
|  |                 |              | CHEM 523 (W) 2.0   |
|  |                 |              | CHEM 495 (FW) 1.0  |
|  |                 |              | CHEM 518 (W) 2.0   |
|  |                 |              | Requirement #3 3.0   |
|  |                 |              | Global & Cultural Awareness elective 3.0   |
|  |                 |              | Religion elective 2.0  |
|  |                 |              | 497R or open elective 2.0  |
|  |                 |              | <b>Total Hours 15.0</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. |
|  |                 |              | <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.  |

## BS in Chemistry (692821)

### 2018-2019 Program Requirements (75.0 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 21 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 455 - Synthesis and Qualitative Organic Analysis      | 3.0 |
| 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 |
| *CHEM 481M - Biochemistry--Majors                          | 3.0 |
| CHEM 495 - Senior Seminar                                  | 1.0 |
| 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 594R - General Seminar                                | 0.5 |

*You may take this course up to 1 time.*

**REQUIREMENT 2** Complete 7 courses

**NOTE: MATH 313 AND MATH 314 MAY SUBSTITUTE FOR MATH 302.**

|   |     |
|---|-----|
| MATH 112 - Calculus 1   | 4.0 |
| MATH 113 - Calculus 2   | 4.0 |
| MATH 302 - Mathematics for Engineering 1                      | 4.0 |
| PDBIO 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 3.0 hours from the following course(s)

**AFTER CONSULTING WITH AN ADVISOR, COMPLETE 3 HOURS FROM THE FOLLOWING. 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. CHEM 500 DOES NOT COUNT TOWARD FULFILLING THIS REQUIREMENT.**

|   |      |
|---|------|
| CHEM 397R - Mentored Outreach and Service Learning          | 3.0v |
| CHEM 482 - Mechanisms of Molecular Biology                  | 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 3 credit hours.</i>                   |      |
| 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 584 - Advanced Biochemistry Methods 1                  | 3.0  |
| CHEM 586 - Advanced Biochemistry Methods 2                  | 3.0  |
| CHEM 596R - Special Topics in Chemistry                     | 3.0v |
| <i>You may take up to 3 credit hours.</i>                   |      |
| HONRS 499R - Honors Thesis                                  | 6.0v |

**Recommended Courses: Chem 195; Math 303; Phscs 140, 145; Stat 201.**

**Note: Elective courses, beyond the requirements above, should be selected in consultation with 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.**

#### 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 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

## **BS in Chemistry (692821)**

**2018-2019**

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