

# BS in Molecular Biology (285125) MAP Sheet

Life Sciences, Microbiology and Molecular Biology

For students entering the degree program during the 2017-2018 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>Religion Cornerstones</b>	<b>Classes</b>	
Teachings and Doctrine of The Book of Mormon	1	2.0
Jesus Christ and the Everlasting Gospel	1	2.0
Foundations of the Restoration	1	2.0
The Eternal Family	1	2.0
<b>The Individual and Society</b>		
American Heritage	1-2	3-6.0
Global and Cultural Awareness	1	3.0
<b>Skills</b>		
First Year Writing	1	3.0
Advanced Written and Oral Communications	1	3.0
Quantitative Reasoning	1	3-4.0
Languages of Learning (Math or Language)	1	3-4.0
<b>Arts, Letters, and Sciences</b>		
Civilization 1	1	3.0
Civilization 2	1	3.0
Arts	1	3.0
Letters	1	3.0
Biological Science	1-2	3-4.0
Physical Science	1	3.0
Social Science	1	3.0
<b>Core Enrichment: Electives</b>		
Religion Electives	3-4	6.0
Open Electives	Variable	Variable
*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 or American Heritage	3.0	
REL A 275	2.0	
MMBIO 121 or BIO 130 or PDBIO 120	3-4.0	
CHEM 105	4.0	
General Education courses, and/or general electives	3.0	
<b>Total Hours</b>	<b>15-16.0</b>	
<u>2nd Semester</u>		
First-year Writing or American Heritage	3.0	
REL A 250	2.0	
MMBIO 240	3.0	
MMBIO 241	1.0	
CHEM 106	3.0	
CHEM 107	1.0	
Open elective	3.0	
<b>Total Hours</b>	<b>16.0</b>	
<b>SOPHOMORE YEAR</b>		
<u>3rd Semester</u>		
REL C 225	2.0	
BIO 165	3.0	
MATH 112 or 119	4.0	
PHSCS 105	3.0	
Civilization 1 elective	3.0	
<b>Total Hours</b>	<b>15.0</b>	
<u>4th Semester</u>		
PWS 340	3.0	
MMBIO 494R	2.0	
PHSCS 106	3.0	
REL C 200	2.0	
Civilization 2 elective	3.0	
Social Science elective	3.0	
<b>Total Hours</b>	<b>16.0</b>	
Note: Quantitative Reasoning elective fulfilled by Math 112 or Math 119.		
Note: This degree program requires a minimum of 120.0 hours for graduation. 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.		
<b>JUNIOR YEAR</b>		
<u>5th Semester</u>		
CHEM 351 or CHEM 285	3.0	
PDBIO 360	3.0	
MMBIO 494R	1.0	
Religion Elective	2.0	
Letters	3.0	
Arts elective	3.0	
<b>Total Hours</b>	<b>15.0</b>	
<u>6th Semester</u>		
MMBIO 390R	1.0	
MMBIO 490R	1.0	
Molecular Biology elective	9.0	
Religion elective	2.0	
Open elective	3.0	
<b>Total Hours</b>	<b>16.0</b>	
<b>SENIOR YEAR</b>		
<u>7th Semester</u>		
MMBIO 441	3.0	
MMBIO 442	2.0	
Molecular Biology elective	6.0	
Religion elective	2.0	
Global & Cultural Awareness elective	3.0	
<b>Total Hours</b>	<b>16.0</b>	
<u>8th Semester</u>		
BIO 420	2.0	
MMBIO 468	3.0	
Adv. Writing (ENGL 316 recommended)	3.0	
General Education courses, and/or general electives	3-6.0	
<b>Total Hours</b>	<b>11-14.0</b>	

**BS in Molecular Biology (285125)**  
**2017-2018 Program Requirements (56 - 60 Credit Hours)**

<p><b>REQUIREMENT 1</b> Complete 1 course  <b>INTRODUCTORY CORE COURSES:</b>            BIO 130 - Biology 4.0            MMBIO 121 - General Biology: Health and Disease 3.0            PDBIO 120 - Science of Biology 3.0</p>	<p><b>REQUIREMENT 7</b> Complete 3.0 hours from the following course(s)  <b>COMPLETE THREE CREDITS HOURS TOTAL DURING TWO SEMESTERS OF MENTORED RESEARCH:</b>            MMBIO 194A - Phage Hunters: Discovery 2.0            MMBIO 194B - Phage Hunters: Comparative Genomics 2.0            MMBIO 470R - Synthetic Biology 2.0v  <i>You may take up to 3 credit hours.</i>            MMBIO 494R - Mentored Research 3.0v  <i>You may take up to 3 credit hours.</i></p>	<p>MMBIO 522 - Flow Cytometry 2.0            MMBIO 528R - Current Topics in Pathogenesis 1.0            PDBIO 220 - Human Anatomy (with lab) 3.0            PDBIO 305 - Human Physiology 4.0            PDBIO 325 - Tissue Biology (with lab) 3.0            PDBIO 362 - Advanced Physiology 3.0            PDBIO 363 - Advanced Physiology Laboratory 1.0            PDBIO 382 - Developmental Biology 3.0            PDBIO 444 - BIO-Innovation and -Entrepreneurship 1 2.0            PDBIO 445 - BIO-Innovation and -Entrepreneurship 2 2.0            PDBIO 582 - Developmental Genetics 3.0            PHSCS 106 - General Physics 2 3.0            PWS 470 - Analysis of Genetic and Genomic Data 2.0</p>
<p><b>REQUIREMENT 2</b> Complete 3 courses  <b>INTRODUCTORY CORE COURSES:</b>            MMBIO 240 - Molecular Biology 3.0            MMBIO 241 - Molecular and Cellular Biology Laboratory 1.0            PDBIO 360 - Cell Biology 3.0</p>	<p><b>REQUIREMENT 8</b> Complete 9.0 hours from the following option(s)  <b>ELECTIVES:</b>  <b>OPTION 8.1</b> Complete up to 9.0 hours from the following course(s)            BIO 350 - Ecology 3.0            BIO 421 - Evolutionary Biology Laboratory 1.0            BIO 463 - Genetics of Human Disease 3.0            BIO 465 - Bioinformatics 3.0            CHEM 351 - Organic Chemistry 1 3.0            CHEM 352 - Organic Chemistry 2 3.0            CHEM 353 - Organic Chemistry Laboratory--Nonmajors 2.0v            CHEM 481 - Biochemistry 3.0            CHEM 482 - Mechanisms of Molecular Biology 3.0            MMBIO 110R - Extremophiles: Life in Extreme Environments 1.0            MMBIO 151 - Introduction to Microbiology 4.0            MMBIO 162R - Careers in Biomedical Sciences 1.0            MMBIO 261 - Infection and Immunity 3.0            MMBIO 360 - Microbial Genetics 4.0            MMBIO 364 - Bacterial Pathogenesis 3.0            MMBIO 365 - Bacterial Pathogenesis Laboratory 1.0            MMBIO 418 - Medical Parasitology 2.0            MMBIO 420 - Molecular Parasitology Laboratory 2.0            MMBIO 463 - Immunology 3.0            MMBIO 465 - Virology 3.0            MMBIO 466 - Virology Laboratory 1.0            MMBIO 467 - Immunology Lab 1.0            MMBIO 471 - Applied and Industrial Microbiology 2.0            MMBIO 510 - History and Philosophy of Microbiology and Molecular Bi 2.0            MMBIO 512 - Gene Regulation 2.0            MMBIO 514 - Advanced Immunology 2.0            MMBIO 516 - Bacteria-Host Interactions 2.0            MMBIO 518 - Select Pathogens 2.0            MMBIO 520 - Molecular Virology 2.0</p>	<p>PDBIO 362 - Advanced Physiology 3.0            PDBIO 363 - Advanced Physiology Laboratory 1.0            PDBIO 382 - Developmental Biology 3.0            PDBIO 444 - BIO-Innovation and -Entrepreneurship 1 2.0            PDBIO 445 - BIO-Innovation and -Entrepreneurship 2 2.0            PDBIO 582 - Developmental Genetics 3.0            PHSCS 106 - General Physics 2 3.0            PWS 470 - Analysis of Genetic and Genomic Data 2.0</p>
<p><b>REQUIREMENT 3</b> Complete 8 courses  <b>MOLECULAR BIOLOGY COURSES:</b>            BIO 165 - Introduction to Bioinformatics 3.0            BIO 420 - Evolutionary Biology 2.0            MMBIO 390R - Readings in Molecular Biology 1.0  <i>You may take this course up to 1 time.</i>            MMBIO 441 - Advanced Molecular Biology 3.0            MMBIO 442 - Advanced Molecular Biology Laboratory 2.0            MMBIO 468 - (MMBio-Bio-PWS) Genomics 3.0            MMBIO 490R - Molecular Biology Seminar 1.0  <i>You may take this course up to 1 time.</i>            PWS 340 - Genetics 3.0</p>	<p><b>OPTION 8.2</b> Complete up to 6.0 hours from the following course(s)  <b>ONLY 6 TOTAL CREDIT HOURS OF THE FOLLOWING WILL COUNT TOWARD MAJOR HOURS WITH A 4 CREDIT HOUR MAXIMUM FOR EACH INDIVIDUAL COURSE. (MORE CREDIT HOURS MAY BE TAKEN BUT THEY WILL NOT COUNT TOWARDS MAJOR REQUIREMENTS).</b>            MMBIO 194A - Phage Hunters: Discovery 2.0            MMBIO 194B - Phage Hunters: Comparative Genomics 2.0            MMBIO 399R - Academic Internship 9.0v  <i>You may take up to 4 credit hours.</i>            MMBIO 470R - Synthetic Biology 2.0v  <i>You may take up to 4 credit hours.</i>            MMBIO 494R - Mentored Research 3.0v  <i>You may take up to 4 credit hours.</i></p>	<p><b>OPTION 8.2</b> Complete up to 6.0 hours from the following course(s)  <b>ONLY 6 TOTAL CREDIT HOURS OF THE FOLLOWING WILL COUNT TOWARD MAJOR HOURS WITH A 4 CREDIT HOUR MAXIMUM FOR EACH INDIVIDUAL COURSE. (MORE CREDIT HOURS MAY BE TAKEN BUT THEY WILL NOT COUNT TOWARDS MAJOR REQUIREMENTS).</b>            MMBIO 194A - Phage Hunters: Discovery 2.0            MMBIO 194B - Phage Hunters: Comparative Genomics 2.0            MMBIO 399R - Academic Internship 9.0v  <i>You may take up to 4 credit hours.</i>            MMBIO 470R - Synthetic Biology 2.0v  <i>You may take up to 4 credit hours.</i>            MMBIO 494R - Mentored Research 3.0v  <i>You may take up to 4 credit hours.</i></p>
<p><b>REQUIREMENT 4</b> Complete 4 courses  <b>PHYSICAL SCIENCE COURSES:</b>            *CHEM 105 - General College Chemistry 1 with Lab (Integrated) 4.0            CHEM 106 - General College Chemistry 2 3.0            CHEM 107 - General College Chemistry Laboratory 1.0            *PHSCS 105 - General Physics 1 3.0</p>	<p><b>REQUIREMENT 9</b>            Pass the Biology Major Field Exam.</p>	<p><b>REQUIREMENT 9</b>            Pass the Biology Major Field Exam.</p>
<p><b>REQUIREMENT 5</b> Complete 1 course  <b>PHYSICAL SCIENCE COURSES (NOTE: FOR MEDICAL SCHOOL AND SOME GRADUATE SCHOOLS, CHEM 351, 352, 353, AND 481 ARE REQUIRED CLASSES. THESE CLASSES MAY BE USED AS ELECTIVES FOR THE MOLECULAR BIOLOGY DEGREE PROGRAM - SEE BELOW):</b>            CHEM 285 - Introductory Bio-organic Chemistry 4.0            CHEM 351 - Organic Chemistry 1 3.0</p>	<p><b>REQUIREMENT 10</b>            Complete an exit interview.</p>	<p><b>REQUIREMENT 10</b>            Complete an exit interview.</p>
<p><b>REQUIREMENT 6</b> Complete 1 course  <b>QUANTITATIVE COURSES (NOTE: MATH 119 IS OFFERED THROUGH BYU INDEPENDENT STUDY):</b>            *MATH 112 - Calculus 1 4.0            MATH 119 - Introduction to Calculus 4.0            STAT 121 - Principles of Statistics 3.0</p>	<p><b>RECOMMENDED</b> Complete 4 courses  <b>ALTHOUGH NOT REQUIRED, THE FOLLOWING COURSES ARE RECOMMENDED:</b>            ENGL 316 - Technical Communication 3.0            PHSCS 107 - General Physics Lab 1 1.0            PHSCS 108 - General Physics Lab 2 1.0            STAT 121 - Principles of Statistics 3.0</p>	<p><b>RECOMMENDED</b> Complete 4 courses  <b>ALTHOUGH NOT REQUIRED, THE FOLLOWING COURSES ARE RECOMMENDED:</b>            ENGL 316 - Technical Communication 3.0            PHSCS 107 - General Physics Lab 1 1.0            PHSCS 108 - General Physics Lab 2 1.0            STAT 121 - Principles of Statistics 3.0</p>

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2017-2018

### THE DISCIPLINE:

Molecular biology is the basic science that has as its goal an explanation of life processes at the subcellular and molecular level. Recent years have seen explosive advances in the study of DNA

and molecular genetics, including gene cloning, sequencing, and mapping.

Developments in molecular biology have opened new areas of study and provided powerful techniques that are revolutionizing the pharmaceutical, health, and agricultural industries.

They have spawned new industries in biotechnology, and opened avenues for answering basic and applied questions in all of the life sciences.

### PROGRAM OBJECTIVES:

The objectives of the molecular biology major are to provide a conceptual knowledge base and critical thinking skills related to the following areas:

- Molecular biology
- Cell biology
- Integrating themes (biochemistry, evolution, and diversity)

At the completion of the program, the student will be able to:

1. Possess basic knowledge and demonstrate critical thinking in molecular biology, cell biology, and evaluate literature in related areas.
2. Demonstrate basic laboratory skills including laboratory safety and basic molecular biology techniques.
3. Demonstrate laboratory thinking skills including cognitive processes, analytical skills, communication skills, and interpersonal and citizenry skills.
4. Demonstrate basic research skills to include formulating a clear, answerable question, developing a testable hypothesis, predicting expected results, developing, modifying, and/or following an experimental protocol, collecting and organizing data in a systematic fashion, presenting data in an appropriate form, assessing the validity of the data and drawing appropriate conclusions based on the results.

### CAREER OPPORTUNITIES:

Graduates are well prepared for continued study toward advanced degrees in agriculture, animal science biochemistry, biology, microbiology, molecular biology, medicine, and related fields or to enter the biotechnology work force.

Molecular biology is an excellent pre- professional course of study for those interested in health professions, law, or business.

### FINANCING:

Students may be employed either as research or teaching assistants. Several endowed scholarships are available.

### 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

#### Microbiology and Molecular Biology

Brigham Young University  
4007 Life Sciences Building  
Provo, UT 84602  
Telephone: (801) 422-2889

### ADVISEMENT CENTER INFORMATION

#### Life Science Student Services

Brigham Young University  
2060 Life Sciences Building  
Provo, UT 84602  
Telephone: (801) 422-3042  
lifesciences@byu.edu