

MAJOR IN BIOLOGY - CELL AND MOLECULAR BIOLOGY CONCENTRATION

Completion of this concentration provides background for advanced studies in cell biology, molecular biology, genetics, microbiology, immunology and diverse fields that involve molecular tools in research. In addition, students may select this concentration as preparation for professional degree programs in medicine, dentistry or veterinary medicine or for a career in biology education, biomedical research or fields that integrate biology with other disciplines such as business or law. Students completing this concentration are encouraged to take at least two upper-level labs among the elective courses within this concentration. Students are encouraged to participate in a research experience or as an intern (e.g., BIOL 491, BIOL 493 or BIOL 499). They should consult with their adviser regarding these opportunities.

Specific requirements for the Cell and Molecular Biology concentration are listed under Requirements and outlined in the suggested Four-Year Plan of Study. A complete list of Biology courses that **do not** count towards the Biology major may be found on the Resources for Students web page.

The Cell and Molecular Biology Concentration consists of 62-78 units. All Biology majors must complete minimum 19 units toward the major at Towson University, with at least 10 of these units at the upper (300-400) level. Courses taken to fulfill Ancillary Course requirements do not count toward units in residence.

Code	Title	Units
Foundation Courses		
BIOL 200 & 200L	BIOLOGY I: INTRODUCTION TO CELLULAR BIOLOGY AND GENETICS [LECTURE] and INTRODUCTION TO CELLULAR BIOLOGY AND GENETICS [LAB]	4
BIOL 204	EDUCATIONAL AND CAREER PLANNING FOR THE BIOLOGIST	1
BIOL 206 & 206L	BIOLOGY II: INTRODUCTION TO ECOLOGY AND EVOLUTION [LECTURE] and BIOLOGY II: INTRODUCTION TO ECOLOGY AND EVOLUTION [LAB]	4
BIOL 309	GENETICS	4
Breadth Courses		
Select one of the following:		3-8
BIOL 205 & BIOL 207	GENERAL BOTANY and GENERAL ZOOLOGY	
BIOL 208	BIODIVERSITY	
Select two of the following:		8
BIOL 405	MOLECULAR ECOLOGY, EVOLUTION AND CONSERVATION	
BIOL 408	CELL BIOLOGY	
BIOL 409	MOLECULAR BIOLOGY	
Select one of the following sets:		6-8
BIOL 325	ANIMAL PHYSIOLOGY	
& BIOL 491, BIOL 499 or one Biology (BIOL) elective from the lists of electives in any Biology major concentration		

or

BIOL 342 & BIOL 343	HUMAN PHYSIOLOGY I and HUMAN PHYSIOLOGY II
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or

BIOL 436	PLANT PHYSIOLOGY
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& BIOL 491, BIOL 499 or one Biology (BIOL) elective from the lists of electives in any Biology major concentration

Elective Courses

Select one of the following: 2-3

BIOL 410	MOLECULAR BIOLOGY LABORATORY
BIOL 412	CELL BIOLOGY LABORATORY
BIOL 474	MOLECULAR TECHNIQUES IN ECOLOGY, EVOLUTION, AND CONSERVATION
BIOL 475	GENETICS LABORATORY
CHEM 356	BIOCHEMISTRY LAB

Select two of the following: 6-8

BIOL 318	MICROBIOLOGY
BIOL 355	ANIMAL PARASITOLOGY
BIOL 360	HISTOLOGY
BIOL 411	CANCER BIOLOGY
BIOL 415	BIOTECHNOLOGY
BIOL 419	ENVIRONMENTAL MICROBIOLOGY
BIOL 420	MICROBIOLOGY OF INFECTIOUS DISEASE
BIOL 421	IMMUNOLOGY
BIOL 428	VIROLOGY
BIOL 463	DEVELOPMENTAL BIOLOGY
CHEM 351	BIOCHEMISTRY I
MBBB 301	INTRO TO BIOINFORMATICS
MBBB 315	GENOMICS

Ancillary Courses

Chemistry

CHEM 131 & 131L	GENERAL CHEMISTRY I LECTURE and GENERAL CHEMISTRY I LABORATORY	4
CHEM 132 & 132L	GENERAL CHEMISTRY II LECTURE and GENERAL CHEMISTRY II LABORATORY	4
CHEM 330	ESSENTIALS OF ORGANIC CHEMISTRY	5-10
or CHEM 331 & CHEM 332	ORGANIC CHEMISTRY I and ORGANIC CHEMISTRY II	

Physics

Select one of the following: 8

PHYS 211 & PHYS 212	GENERAL PHYSICS I; NON CALCULUS-BASED and GENERAL PHYSICS II; NON CALCULUS-BASED
PHYS 241 & PHYS 242	GENERAL PHYSICS I CALCULUS-BASED and GENERAL PHYSICS II CALCULUS-BASED

Mathematics

Select one of the following: 3-4

MATH 211	CALCULUS FOR APPLICATIONS
MATH 237	ELEMENTARY BIostatISTICS
MATH 273	CALCULUS I

PSYC 212

BEHAVIORAL STATISTICS

Total Units 62-78**Suggested Four-Year Plan**

Based on course availability and student needs and preferences, the selected sequences will probably vary from those presented below. Students should consult with their adviser to make the most appropriate elective choices.

Freshman

Term 1	Units	Term 2	Units
BIOL 200 & 200L	4	BIOL 206 & 206L	4
MATH 115 or 119 (Core 3) ¹	3-4	CHEM 131 & 131L (Core 7)	4
Core 1 (or Core 2)	3	MATH 211, 237, 273, or PSYC 212	3-4
Core 4	3	Core 2 (or Core 1)	3
Core 5	3	Core 12	3
16-17		17-18	

Sophomore

Term 1	Units	Term 2	Units
BIOL 205 or 208 & BIOL 204 ²	4	BIOL 207 (or Elective)	4
BIOL 309	4	PHYS 211 or 241 ⁴	4
CHEM 132 & 132L (Core 8)	4	Required Lab Elective (if prerequisites met)	2-3
Core 10	3	Core 9	3
16		17-18	

Junior

Term 1	Units	Term 2	Units
BIOL 325, 342, or 436 ⁵	4	BIOL 343 (or elective) ⁵	4
BIOL 405, 408, or 409	4	CHEM 330 or 331	5
PHYS 212 or 242	4	Elective	3-4
Core 6	3	Elective	3-4
Elective	3-4		
18-19		15-17	

Senior

Term 1	Units	Term 2	Units
CHEM 332 (or elective)	5	Core 11	3
Core 14	3	Core 13	3
Elective	3-4	Elective	3-4
Elective	3-4	Elective	3-4
14-16		12-14	

Total Units 125-135

⁵ Your choice for physiology (BIOL 342 & BIOL 343 or BIOL 325 or BIOL 436) depends on your career objectives. Consult your adviser. Students selecting BIOL 325 or BIOL 436 will also need to complete a free elective.

1. Explain the core concepts and principles of Biology.
2. Demonstrate the scientific method through the use of hypothesis testing in the design and implementation of an experiment.
3. Utilize scientific methodologies from the biological sciences in the evaluation of issues in society.
4. Apply appropriate critical-thinking/problem-solving skills in biological sciences.
5. Communicate both verbally and in writing in discipline specific contexts.
6. Identify fundamental similarities and differences among various fields of study within the Biological Sciences.

¹ MATH 237 and PSYC 212 can be substituted for a Calculus course depending on career objectives. Consult your adviser.

² A major assignment in BIOL 204 is the development of your own Degree Completion Plan.

³ CHEM 330 can be substituted for CHEM 331 and CHEM 332 depending on career objectives. Consult your adviser.

⁴ PHYS 241 and PHYS 242 can be substituted for PHYS 211 and PHYS 212 if Calculus prerequisites are met (requires MATH 273 and MATH 274).