Biomolecular Science Major

University of Michigan - Department of Chemistry

Effective: Fall 2019

The *Biomolecular Science* major is designed to provide students with the core knowledge necessary to understand the chemical principles underpinning biology and the option to explore aspects of the subject of interest to them through a limited set of electives drawn from course offerings in chemistry, biophysics, and molecular, cellular and developmental biology. It is a less extensive major than *Biochemisty,* and is primarily aimed at those planning a career outside of the biological sciences. Students who are intending to pursue graduate studies or an industrial career in biochemistry or related areas are strongly encouraged to elect the *Biochemistry* major.

Prerequisites:

- AP credit for Physics (125/127 or 139) & (126/128 or 239) will fulfill the Physics requirement.
- AP credit for Math (120 & 121) will fulfill the Math requirement.
- AP credit for Biology (195) will fulfill the Biology 171 & 172 requirement.

Course #	Course Description	Term Completed	Typically Offered	Credits
One of the following groups: Students **must** take either CHEM 130/125/126 or CHEM 245/246/247; A.P. credit cannot substitute.				
CHEM 125/126	General Chemistry Laboratory I and II		*F, W, Su*	2
CHEM 130	General Chemistry: Macroscopic Investigations & Reaction Principles		*F, W, Su*	3
OR				
CHEM 245	Biomedical Analytical Chemistry		*F, W*	2
CHEM 246/247	Biomedical Analytical Chemistry Laboratory I and II		*F, W*	2
One of the following; 135/136 OR 140/141:				
PHYS 135/136	Physics for the Life Sciences I		*F, W, Sp*	4/1
OR				
PHYS 140/141	General Physics I/ Elementary Laboratory I		*F, W, Sp*	4/1
One of the following; 235/236 OR 240/241:				
PHYS 235/236	Physics for the Life Sciences II/ Laboratory II		*F, W, Sp*	4/1
OR				
PHYS 240/241	General Physics II/ Elementary Laboratory II		*F, W, Sp*	4/1
All of the below:				
BIO 171	Introductory Biology: Ecology and Evolution		*F, W, Sp, Su*	4
BIO 172	Introductory Biology: Molecular Cellular and Developmental		*F, W, Sp*	4
BIO 173	Introductory Biology Laboratory		*F, W, Sp*	2
MATH 115	Calculus I		*F, W, Sp, Su*	4
MATH 116	Calculus II		*F, W, Sp, Su*	4
OR				
STATS 250 or 280	Introduction to Statistics and Data Analysis		*F, W, Sp, Su*	4

The Biomolecular Science Program must include the following:

Core courses:

Students must elect 17 credits of core courses, with options for physical chemistry and introductory biochemistry courses.

Course #	Course Description	Term Completed	Typically Offered	Credits
CHEM 210	Structure and Reactivity I		*F, W, Sp*	3
CHEM 211	Investigations in Chemistry		*F, W, Sp*	2
CHEM 215	Structure and Reactivity II		*F, W, Sp*	3
*CHEM 351	Fundamentals of Biochemistry		*F, W*	4
CHEM 352 OR CHEM 353	Introduction to Biochemical Research Techniques: Laboratory		*F, W*	2
	Introduction to Biochemical Research Techniques and Scientific Writing: Laboratory (ULWR)		*F, W*	3
One of the following; 230 OR 260:				
CHEM 230 OR CHEM 260	Physical Chemical Principles and Applications		*F, W, Sp*	3
	Chemical Principles		*F, W, Sp*	3

Elective Courses:

You must choose 3 from the following: at least one from each category, and at least one 400 level.

(Typically offered: Fall, Winter, Spring, Summer, Every Other Winter (EOW).) If left blank, course is not regularly offered.)

Course #	Course Description	Term Completed	Term Typically Offered	Credits
At least one of the following:				
CHEM 302	Inorganic Chemistry: Molecules, Materials and Applications in Energy		*W*	3
CHEM 303	Introductory Bioinorganic Chemistry: the Role of Metals in Life		*F, W*	3
CHEM 419	Intermediate Physical Organic Chemistry		*F*	3
CHEM 420	Intermediate Organic Chemistry		*W*	3
CHEM 425	Special Topics in Organic Chemistry			3
CHEM 436	Polymer Synthesis and Characterization		*E.O.W.*	3
CHEM 451	Advanced Biochemistry: Macromolecular Structure and Function		*F, W*	4
CHEM 452	Advanced Biochemistry: Cellular Processes		*W*	4
CHEM 453	Biophysical Chemistry I: Thermodynamics and Kinetics		*F*	3
CHEM 455	Special Topics in Biochemistry		*F*	3
CHEM 465	Special Topics in Physical Chemistry			3
At least one of the following:				
CHEM 422 or BIOPHYS 422	Experimental Methods in Structural Biology		*W*	3
BIOPHYS 430	Medical Physics		*W*	3
CHEM 440 or BIOPHYS 440	Biophysics of Disease		*F*	3
BIOPHYS 420	Structural Biology: The Architecture of Life		*W*	3
BIOPHYS 421	Structural Biology: Biophysical Controversies		*F*	3

Elective Courses: Continue from page 2.				
Course #	**Course Description**	**Term Completed**	**Typically Offered**	**Credits**
BIO 305	Genetics		*F, W, Sp, Su*	4
MCDB 405	Molecular Develop		*E.O.W.*	3
MCDB 422	Brain Development		*W*	3
MCDB 427	Molecular Biology		*F*	4
MCDB 428	Cell Biology		F,W	4
MCDB 433	Plant Biochemistry		W	3
MCDB 436	Human Immunology		F	3
MCDB 452	The Visual System		W	3
MIRCRBIOL 405	Med Microbio & ID		F,W	3
PHRMACOL 310	Pharmacology and Therapeutics		F	4
PHRMACOL 425	Development of New Medications: Pharmacology in Action		W	3
PHYSIOL 502	Human Physiology		F	4

Biomolecular Science honors:

Students may obtain honors in Biomolecular Science by successfully completing all courses required for the Biomolecular Science major with an overall GPA of 3.4. In addition, students obtaining Honors must complete one additional upper-level Chemistry elective (chosen in consultation with the honors advisor), complete four credits elected over at least two terms of CHEM 398 and write a thesis based on their undergraduate research. Students must register for one credit of CHEM 498 in the term in which they plan to submit their thesis.

Biomolecular Science GPA requirement:

A student must earn a cumulative grade point average (GPA) of at least 2.0 in all courses required for the major including prerequisites. Transfer courses are not calculated into the GPA.

Exclusions: *Students who elect a major in Biomolecular Science may not elect the following majors: Biology, General Biology, Biology, Health, and Society, Neuroscience, Biochemistry, Interdisciplinary Chemical Sciences, Microbiology, or Cell and Molecular Biology. They may also not elect any of the Chemistry minors.*

NOTES:

Students **must** take either CHEM 130/125/126 or CHEM 245/246/247; A.P. credit cannot substitute.

***** Students are strongly encouraged to take CHEM 351 but could substitute this course requirement with MCDB 310 or BIOLCHEM 415.