Biomolecular Science Major

University of Michigan - Department of Chemistry

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 set of electives drawn from course offerings in chemistry, biophysics, and molecular, cellular, and developmental biology. *Biomolecular Science* is ideal for pre-health students as well as those planning careers in fields such as education, journalism, science policy, business, law, etc. This degree provides exposure to all of the core topics in the area of biochemistry but also provides more flexibility in course selection than the B.S. Major in *Biochemistry*.

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 requirements; (196) will fulfill Biology 173.

Course #	Course Description	Term 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	Gen Chem: 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 groups: 150/151 or 140/141:			
PHYS 150/151	Fundamental Physics for the Life Sciences I/ Lab	*F, W, Sp*	4/1
OR			
PHYS 140/141	General Physics I/ Elementary Laboratory I	*F, W, Sp*	4/1
One of the following groups: 250/251 or 240/241:			
PHYS 250/251	Fundamental Physics for the Life Sciences II/ Lab	*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 (Minimum 25 credits):

Course #	Course Description	Term 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*	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*	3

Elective Courses:

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

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

Course #	Course Description	Typically Offered	Credits
At least one course from the following group:			
CHEM 302	Inorganic Chemistry: Molecules, Materials and Applications in Energy	*W*	3
CHEM 303	Introductory Bioinorganic Chemistry: the Role of Metals in Life	*F*	3
CHEM 419	Intermediate Physical Organic Chemistry	*F*	3
CHEM 420	Intermediate Organic Chemistry	*W*	3
CHEM 421	Organic Chemistry of Drug Design		3
CHEM 425	Special Topics in Organic Chemistry		3
CHEM 436	Polymer Synthesis and Characterization	*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
CHEM 474	Environmental Chemistry	*F*	3

Second group of elective courses can be found on the next page:

Course #	Course Description	Typically Offered	Credits
At least one course from the following group:			
BIOPHYS 420	Structural Biology: The Architecture of Life	*W*	3
BIOPHYS 421	Structural Biology: Biophysical Controversies	*F*	3
BIOPHYS 430	Medical Physics	*W*	3
BIOPHYS 440	Biophysics of Disease	*F*	3
BIOLOGY 305	Genetics	*F, W, Su*	4
MCDB 411	Protein Structure and Function	*F, W*	3
MCDB 420	Structural Biology: The Architecture of Life	*W*	3
MCDB 422	Brain Development	*W*	3
MCDB 427	Molecular Biology	*F*	4
MCDB 428	Cell Biology	*F, W*	4
MCDB 436	Human Immunology	*F*	3
MCDB 441	Cell Biology and Disease		3
MCDB 452	The Visual System	*W*	3
MICRBIOL 405	Med Microbio & ID	*F, W*	3
MICRBIOL 440	Human Immunology	*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 who have a major GPA of 3.4 and an overall GPA of 3.4 are eligible to declare an honors major in Biomolecular Science. They are required to complete four credits of research by enrolling in CHEM 398 over at least two semesters and writing a thesis based on their undergraduate research. Students must register for one credit of CHEM 498 during their final semester when they submit their thesis. In addition, students obtaining Honors must complete one additional approved upper-level Chemistry elective course.

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: Biochemistry, Chemistry, Interdisciplinary Chemical Sciences, Biophysics, Biology, General Biology; Biology, Health, and Society; Molecular, Cellular, and Developmental Biology (formerly known as Cell and Molecular Biology, or CMB); Ecology and Evolutionary Biology; Microbiology; or Neuroscience. They may not elect a minor in Biology or any of the Chemistry minors. They may also not elect a degree program in Biomedical Engineering or Pharmaceutical Sciences.*

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.