

Biochemistry Major

University of Michigan - Department of Chemistry

Effective 9/2017

Biochemistry is, literally the chemistry of life. Biochemists seek to understand the chemical principles that underpin all living organisms. Biochemistry is central to medical science as almost all diseases and drugs act to change the body's chemistry. Advances in biochemistry directly impact the fields of biotechnology, pharmaceutical science, agriculture and environmental science, among many others. The B.S. major in Biochemistry is for those are interested in learning about life from a chemical perspective. Students will be well equipped for graduate studies in biochemistry, chemical biology, and many other fields of inquiry in the life sciences. The degree will also provide excellent preparation for students intending to pursue professional careers in industry and medicine.

Prerequisites

Course #	Course Description	Term Completed	Term Typically Offered	Credits
CHEM 210	Structure and Reactivity I		<i>F, W, Sp</i>	4
CHEM 211	Investigations in Chemistry: Laboratory		<i>F, W, Sp</i>	1
CHEM 215	Structure and Reactivity II		<i>F, W, Sp</i>	3
BIO 171	Introductory Biology: Ecology and Evolution		<i>F, W, Sp, Su</i>	4
BIO 172	Introductory Biology: Molecular Cellular and Developmental		<i>F, W, Sp</i>	4
MATH 115	Calculus I		<i>F, W, Sp, Su</i>	4
MATH 116	Calculus II		<i>F, W, Sp, Su</i>	4
One of the Following:				
CHEM 262 OR MATH 215	Mathematical Methods for Chemists		<i>F, W</i>	4
	Calculus III		<i>F, W, Sp, Su</i>	4
One of the Following groups:				
PHYS 135/136 OR PHYS 140/141	Physics for the Life Sciences I/Laboratory I		<i>F, W, Sp</i>	4/1
	General Physics I/Elementary Laboratory I		<i>F, W, Sp</i>	4/1
One of the Following groups:				
PHYS 235/236 OR PHYS 240/241	Physics for the Life Sciences II/ Laboratory II		<i>F, W, Sp</i>	4/1
	General Physics II/ Elementary Laboratory II		<i>F, W, Sp</i>	4/1

The Biochemistry Program must include the following:

Core courses

Course #	Course Description	Term Completed	Term Typically Offered	Credits
CHEM 260	Chemical Principles		<i>F, W, Sp</i>	3
** CHEM 351	Fundamentals of Biochemistry		<i>F, W</i>	4
CHEM 352 OR CHEM 353	Introduction to Biochemical Research Techniques: Laboratory		<i>F, W</i>	2
	Introduction to Biochemical Research Techniques and Scientific Writing: Laboratory (ULWR)		<i>F, W</i>	3
CHEM 451	Advanced Biochemistry I Macromolecular Structure and Function		<i>F, W</i>	4
CHEM 452	Advanced Biochemistry II Cellular Processes		<i>W</i>	4
CHEM 453	Biophysical Chemistry		<i>F</i>	3
BIO 305	Genetics		<i>F, W, Sp, Su</i>	3
One of the following; 241, 245, 302, OR 303:				
CHEM 241	Chemical Analysis		<i>F, W</i>	2
CHEM 245	Biomedical Analytical Chemistry		<i>F, W</i>	2
CHEM 302	Inorganic Chemistry		<i>W</i>	3
CHEM 303	Introductory Bioinorganic Chemistry: the Role of Metals in Life		<i>F, W</i>	3
One of the following; 216, 242, OR 246/247:				
CHEM 216	Structure and Reactivity II: Laboratory		<i>F, W, Sp</i>	2
CHEM 242	Chemical Analysis: Laboratory		<i>F, W</i>	2
CHEM 246/247	Biomedical Analytical Chemistry Laboratory I and II		<i>F, W</i>	1/1

Elective Courses: at least 6 credit hours from the courses listed below. Electives should be selected in consultation with a departmental advisor.

Course #	Course Description	Term Completed	Term Typically Offered	Credits
CHEM 417	Dynamic Biophysics		<i>F, W</i>	3
CHEM 419	Intermediate Physical Organic Chemistry		<i>F</i>	3
CHEM 420	Intermediate Organic Chemistry		<i>W</i>	3
CHEM 440	Biophysics of Disease		<i>F</i>	3
CHEM 447	Physical Methods of Analysis		<i>F, W</i>	3
CHEM 454	Biophysical Chem II: Macromolecular Structure, Dynamics		<i>W</i>	3
CHEM 455	Special Topics in Biochemistry		<i>F</i>	3
CHEM 461	Physical Chemistry I		<i>F</i>	3
CHEM 467	Biogeochemical Cycles		<i>W</i>	3
CHEM 528	Enzyme Mechanisms, Ligand Binding		<i>W</i>	2
CHEM 673	Enzyme Kinetics		<i>W</i>	2
MCDB 405	Molecular Basis of Development		<i>W</i>	2
MCDB 411	Protein Structure and Function		<i>F, W</i>	3

Elective Courses: at least 6 credit hours from the courses listed below, continue from page 2.

Course #	Course Description	Term Completed	Term Typically Offered	Credits
MCDB 417	Chromosome Structure and Function		W	3
MCDB 418	Endocrinology		F, Sp, Su	3
MCDB 422	Cellular and Molecular Neurobiology		W	3
MCDB 427	Molecular Biology		F, W	4
MCDB 428	Cell Biology		F, W	4
MCDB 435	Intracellular Trafficking		F, W	3
MCDB 436	Introductory Immunology		F	3
MCDB 441	Cell Biology of Disease		F	3
BIOLCHEM 528	Enzyme Mechanisms		W	2
BIOLCHEM 530	Structural Biology		F	3
BIOLCHEM 550	Macromolecular Structure and Function		F	3
BIOLCHEM 640	Post-transcriptional Gene Regulation		W	2
BIOLCHEM 650	Mechanisms of Eukaryotic Gene Expression		W	3
BIOLCHEM 673	Ligand Binding, Enzyme Kinetics		W	2
BIOPHYS 420	Structural Biology I		W	3
BIOPHYS 435	Biophysical Modeling		W	3
BIOPHYS 440	Biophysics of Disease		F	3
BIOPHYS 521	Biophysical Chemistry II		W	3

An advanced laboratory or undergraduate research course, one of the following:

Course #	Course Description	Term Completed	Term Typically Offered	Credits
CHEM 482	Synthesis and Characterization		F	3
CHEM 483	Physical and Instrumental Chemistry		W	3
MCDB 429	Laboratory in Cell and Molecular Biology		W	3
CHEM 398	Undergraduate Research in Biochemistry- taken over 2 semesters		F, W, Sp, Su	4
BIOLCHEM 398	Undergraduate Research in Biochemistry- taken over 2 semesters		F, W, Sp, Su	4

Biochemistry honors:

Qualified students may elect an Honors major. This program requires a thesis which describes and analyzes independent experimental work. The research topic and advisor must be approved by the Honors advisor in Biochemistry. Students in this program are expected to maintain an overall GPA of 3.4 and at least a 3.4 in their major. CHEM 398 (4 credits) and the thesis course, CHEM 498, replaces the requirement for an upper-level laboratory course outlined above.

Exclusions: Students who elect a major in Biochemistry may not elect the following majors: Biology, General Biology; Cell and Molecular Biology; CMB:Biomedical Engineering; Ecology and Evolutionary Biology; Microbiology; or Neuroscience. They may also not elect a minor in Biology, or any of the Chemistry minors.

Chemistry GPA requirement:

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

NOTES:

* Students with AP credit may waive the General Chemistry prerequisites

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

ACS certified degree:

To receive an ACS certified degree you must complete CHEM 241 OR CHEM 242 OR CHEM 245 OR CHEM 246/247.