

Interested in This Major?

Current Students: Visit us in the Chemistry Building, Room 144, call us at 414-229-4411, or email chem-info@uwm.edu

Not a UWM Student yet? Call our Admissions Counselor at 414-229-7711 or email let-sci@uwm.edu

web: uwm.edu/chemistry



What is Biochemistry?

Our world is made up of an enormous variety of both naturally-occurring and man-made elements and compounds. From our galaxy to the earth's inner crust to the ecosystem of the rain forest to our own bodies, everything is made from elementary parts. There are new substances evolving from old substances with and without our help. Chemistry is a science that attempts to organize and explain, in a systematic and logical manner, knowledge about the existence, purpose and interaction of these substances. Chemists are involved in the development of synthetic fibers, paints, adhesives, electronic components, lubricants and thousands of other products. Chemists also devise ways to save energy and reduce pollution.

Biochemistry poses the same questions but with a focus on the substances that make up living systems - plant, animal, human. It is a basic tool of biology and medicine and the foundation for the manufacture and design of drugs, improvements in food processing and food safety, and best practices in agriculture.

Why Study Biochemistry?

A biochemistry major is the foundation of careers where chemical knowledge is applied to solve biological problems - medicine, biotech, forensic science, pharmacology, clinical research, toxicology, veterinary medicine, agriculture, dentistry, research and development in the food and cosmetic industries, brewing and other fermentation, the freshwater industry, and botany are just a few examples.

Many of these career paths will require further graduate study or an advanced professional degree beyond college.



UWMLetSci

UWM's Programs

There are three different options within the biochemistry major at UWM.

The general option provides a broad overview of biochemistry. This option is a good choice for most students, especially those planning careers in healthcare, dentistry, pharmacy, veterinary medicine, and all types of research and development. It is not adequate preparation, though, for a Master's or Doctoral program specifically in Biochemistry. Students who plan to pursue one of these degrees should major in standard Chemistry under the biochemical track.

The Biochemistry major with an industrial fermentation and biotechnology option provides instruction and practical experience on fermentation in the drug discovery marketplace. The approval process required by the Food & Drug Administration (FDA) is covered in this track. This option is for students specifically interested in R&D in pharmaceuticals.

The Biochemistry major with the clinical pharmacology option is an expansive program that includes extra coursework in Biomedical Sciences.

Preparatory Courses

Ideally, high school students should take four years of math and science, including chemistry and physics. Students without high school chemistry or whose background in science is weak may need to take Chem 100 first before starting the courses required for the major.

Standard Biochemistry, Requirements

52-55 credits in chemistry and biology.

Course #	Course Title
Chem 102, 104	General Chemistry sequence
Chem 343/344/345	Organic chemistry sequence
Chem 221	Elementary Quantitative Analysis

Course #	Course Title
Chem 501	Intro to Biochemistry
Chem 560	Biophysical Chemistry
Choose two from Chem 601, 602, or 604	
Chem 603	Intro to Biochemistry Lab
Chem 691 or 692	Senior Research or Senior Thesis
Bio Sci 150 and 152	Foundations of Biological Sciences I and II
Bio Sci 325	Genetics
7 elective credits in Biological Sciences at the 300-level or higher chosen from a list of approved courses	

Industrial Fermentation/Biotechnology Option, Requirements

52-65 credits in chemistry and biology.

Course #	Course Title
Chem 102, 104	General Chemistry sequence
Chem 343/344/345	Organic chemistry sequence
Chem 560	Biophysical Chemistry
Chem 501	Intro to Biochemistry
Chem 541	Bioprocess Chemical Engineering
Chem 537	Industrial Microbiology and Biochemistry Laboratory
Chem 543	Bioproduct Regulatory Protocols Laboratory
Chem 489	Internship (must complete 2 different internships)
Two 600-level biochemistry courses chosen from 601, 602, or 604	
Chem 603	Intro to Biochemistry Lab
Chem 691 or 692	Senior Research or Senior Thesis
Bio Sci 150 and 152	Foundations of Biological Sciences I and II
Bio Sci 325	Genetics
Bio Sci 383	General Microbiology
Bio Sci 536	Applied Microbiology and Biotechnology

Clinical Pharmacology Option, Requirements

70-73 credits in chemistry and biology.

Course #	Course Title
Chem 102, 104	General Chemistry sequence
Chem 343/344/345	Organic Chemistry sequence

Course #	Course Title
Chem 560	Biophysical Chemistry
Chem 501	Intro to Biochemistry
Choose two from Chem 601, 602, or 604	
Chem 603	Intro to Biochemistry Lab
Chem 691 or 692	Senior Research or Senior Thesis
Bio Sci 150/152	Foundations of Biological Sciences I and II
Bio Sci 325	Genetics
Bio Sci 202	Anatomy and Physiology I
Bio Sci 383	General Microbiology
Bio Sci 596	Neuropharmacology
BMS 427/428	Clinical Immunology and Lab
BMS 431/432	Clinical Chemistry and Lab
BMS 560/561	Molecular and Genetic Diagnostics & Lab
BMS 610	Pharmacology

Other Required Coursework

All biochemistry majors, regardless of option, also must take:

Course #	Course Title
Math 213	Calculus with Life Science Applications
Mth Stat 215	Elementary Statistical Analysis
2 semesters of non-calculus based physics with labs for the standard option or 1 semester of non-calculus-based physics for the other options	

Faculty Research Areas

- drug discovery and medicinal chemistry
- environmental chemistry
- laser spectroscopy of proteins
- nanoparticle trapping
- enzymology
- iron metabolism
- DNA & RNA metabolism
- multidrug resistance issues
- pre-steady state kinetics
- trafficking, toxicity, and drugs
- natural product biosynthesis and secondary metabolism
- statistical thermodynamics
- quantum mechanics
- photodynamic chemistry
- molecular recognition
- nucleic acid
- molecular-surface interactions
- smart materials
- chemistry education and teaching formats



This sample four-year plan shows just one possible pathway to earning a degree with this major in four years. This plan **does not** replace the advice of your advisor, and students are cautioned to meet regularly with their advisor to create a personalized plan that matches their particular circumstances. This plan also follows the degree requirements for students who began their college education in Fall of 2013 or later. If you started college prior to Fall of 2013, your degree requirements may be different.

Degree Requirements for a Bachelor of Science with a Biochemistry major, standard option (brief summary):

- English Proficiency and UWM Oral and Written Communication (OWC) GER - English 102 (fulfills Part A) and one OWC-Part B course.
- Math Proficiency and UWM Quantitative Literacy (QL) GER, and Formal Reasoning - two courses are required for the Bachelor of Science. All BS students will take Math through the first semester of calculus as part of the degree. They will also take one additional 200-level Math course, or Philosophy 212, or a Letters and Science statistics course. (A student may end up taking more than 2 classes, though, depending on placement test scores.)
- Foreign Language – 2 semesters of a single Foreign Language (may be satisfied through 2 years of a single Foreign Language in high school)
- L&S Humanities – 12 credits
- L&S Social Sciences – 12 credits
- L&S Natural Science – 12 credits including a laboratory course in three distinct natural science areas
- L&S International – 9 credits usually accomplished in conjunction with Humanities and/or Social Science courses
- UWM Arts GER – 3 credits
- UWM Cultural Diversity GER – 3 credits usually accomplished in conjunction with a Humanities or Social Science course
- 120 credits including 90 credits in L&S and with 36 of the 90 credits in L&S upper-level (numbered 300 and above) courses and 30 of those 36 credits in designated upper-level Natural Science
- Complete the Biochemistry major requirements:
 - Math 213
 - Math Stat 215
 - All of Physics 120, 121, 122, and 123
 - All of Chem 102, 104, 221, 343, 344, 345, 501, 560, 603
 - Two of Chem 601, 602, 604
 - One of Chem 691 or 692
 - All of BioSci 150, 152, and 325
 - 7 credits from BioSci 315, 316, 356, 383, 401, 402, 405, 455, 490, 529, 539, 540, 564, 572, 573, 580

Sample Four Year Plan:

There are hundreds of courses that satisfy various requirements and courses can count towards more than one requirement. For example, Chemistry 102 counts as a natural science with lab and counts towards the requirements for the major. (This sample assumes no high school Foreign Language was taken and that the student placed into college algebra.)

	Semester 1	Semester 2
Year 1	Math 105 (QL-A)	Math 115
	Chem 100 (NS)	Chem 102 (NS+)
	1st semester Foreign Language	2nd semester Foreign Language
	English 101	English 102 (OWC-A)
	L&S Humanities/International	
Year 2	Math 213	MathStat 215
	Bio Sci 150 (NS+)	Chem 221
	Chem 104 (NS+)	Chem 343
	OWC-B course	L&S Social Science/International
		Bio Sci 152
Year 3	Chem 344	Chem 501
	Chem 345	Bio Sci 325
	Physics 120/121 (NS+)	Physics 122/123 (NS+)
	Chem 560	L&S Social Science
	L&S Social Science	L&S Humanities
Year 4	Chem 603	Chem 602
	Chem 601	Chem 691 or 692
	Bio Sci Upper-level elective	L&S Upper-level, natural science if needed
	Bio Sci Upper-level elective	L&S Humanities/Cultural Diversity
	L&S Social Science/International	Arts GER

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