

# BIOCHEMISTRY, B.S. (L&S)

Biochemistry is a very broad science that studies the molecules and chemistry of life. Biochemistry focuses on the structure, properties, and interactions of molecules such as proteins, nucleic acids, sugars and lipids. Biochemistry's aim is to understand how these molecules participate in the processes that support the various functions of the living cell. These studies are therefore essential for understanding disease and finding cures, for improving agriculture and the production of food and biofuels, and to produce innovation in biotechnology.

Whereas other biological science majors may focus on cellular, organismal or population level biology, biochemistry focuses on processes that occur at the molecular to cellular levels. Therefore, this major has a greater focus on basic and quantitative sciences, such as math and, particularly, on chemistry.

Biochemistry graduates go on to a variety of careers in science and science-related fields. The major is designed to fit the needs of the student who wishes to achieve bachelor's level training as well as those planning to pursue graduate or professional study. The degree serves as an excellent background for medical school or veterinary school admission, as well as for graduate study in biochemistry or other allied fields (biology, bacteriology, genetics, molecular biology, or oncology).

## HOW TO GET IN

Students may declare the major via an appointment with the undergraduate advisor at any time.

The Biochemistry major is offered through the College of Letters & Science (L&S) and the College of Agriculture and Life Sciences (CAL S). Students interested in the differences or transferring between CAL S and L&S should meet with the advisor to discuss this in more detail.

## REQUIREMENTS

### UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (<http://guide.wisc.edu/undergraduate/#requirementsforundergraduatetext>) section of the *Guide*.

General Education	<ul style="list-style-type: none"> <li>• Breadth—Humanities/Literature/Arts: 6 credits</li> <li>• Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits</li> <li>• Breadth—Social Studies: 3 credits</li> <li>• Communication Part A &amp; Part B *</li> <li>• Ethnic Studies *</li> <li>• Quantitative Reasoning Part A &amp; Part B *</li> </ul>
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\* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

## COLLEGE OF LETTERS & SCIENCE BREADTH AND DEGREE REQUIREMENTS: BACHELOR OF SCIENCE (B.S.)

Students pursuing a bachelor of science degree in the College of Letters & Science must complete all of the requirements below. The College of Letters & Science allows this major to be paired with either a bachelor of arts or a bachelor of science curriculum. View a comparison of the degree requirements here. (<https://pubs.wisc.edu/home/archives/ug15/images/babs2009.pdf>)

### BACHELOR OF SCIENCE DEGREE REQUIREMENTS

Mathematics	Two (2) 3+ credits of intermediate/advanced level MATH, COMP SCI, STAT Limit one each: COMP SCI, STAT
Foreign Language	Complete the third unit of a foreign language Note: A unit is one year of high school work or one semester/term of college work.
L&S Breadth	<ul style="list-style-type: none"> <li>• Humanities, 12 credits: 6 of the 12 credits must be in literature</li> <li>• Social Sciences, 12 credits</li> <li>• Natural Sciences, 12 credits: must include 6 credits in biological science; and must include 6 credits in physical science</li> </ul>
Liberal Arts and Science Coursework	108 credits
Depth of Intermediate/Advanced work	60 intermediate or advanced credits
Major	Declare and complete at least one (1) major
Total Credits	120 credits
UW-Madison Experience	30 credits in residence, overall 30 credits in residence after the 90th credit
Minimum GPAs	2.000 in all coursework at UW–Madison 2.000 in intermediate/advanced coursework at UW–Madison

### NON-L&S STUDENTS PURSUING AN L&S MAJOR

Non-L&S students who have permission from their school/college to pursue an additional major within L&S *only need to fulfill the major requirements* and do not need to complete the L&S breadth and

degree requirements above. Please note that the following special degree programs are not considered majors so are not available to non-L&S-degree-seeking candidates:

- Applied Mathematics, Engineering and Physics (Bachelor of Science–Applied Mathematics, Engineering and Physics)
- Journalism (Bachelor of Arts–Journalism; Bachelor of Science–Journalism)
- Music (Bachelor of Music)
- Social Work (Bachelor of Social Work)

## REQUIREMENTS FOR THE MAJOR

### MATHEMATICS

Code	Title	Credits
Complete one of the following options:		
MATH 221 & MATH 222	Calculus and Analytic Geometry 1 and Calculus and Analytic Geometry 2	9
MATH 171 & MATH 217 & MATH 222	Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II and Calculus and Analytic Geometry 2	14
MATH 275 & MATH 276	Topics in Calculus I and Topics in Calculus II	10

### CHEMISTRY

#### General Chemistry

Code	Title	Credits
Complete one sequence:		
CHEM 103 & CHEM 104	General Chemistry I and General Chemistry II	9
CHEM 109	Advanced General Chemistry	5
CHEM 115 & CHEM 116	Chemical Principles I and Chemical Principles II (satisfies both general and analytical chemistry requirements)	10

#### Organic Chemistry

Code	Title	Credits
Complete All:		
CHEM 343	Introductory Organic Chemistry	3
CHEM 344	Introductory Organic Chemistry Laboratory	2
CHEM 345	Intermediate Organic Chemistry	3

#### Analytical Chemistry

Code	Title	Credits
Complete one:		
CHEM 327	Fundamentals of Analytical Science	4
CHEM 329	Fundamentals of Analytical Science	4
CHEM 116	Chemical Principles II (satisfies both general and analytical chemistry requirements)	5

### Physical Chemistry

Code	Title	Credits
Complete one:		
CHEM 565	Biophysical Chemistry (recommended)	4
CHEM 561 & CHEM 563	Physical Chemistry and Physical Chemistry Laboratory	4-5

### BIOLOGY

Students must complete either Option A (introductory + upper-level biology), or Option B (Biocore), for 16 total credits of biological science coursework.

#### Option A

##### Option A Introductory Biology

Code	Title	Credits
Complete one of the following introductory biology options:		
BIOLOGY/BOTANY/ZOOLOGY 151 & BIOLOGY/BOTANY/ZOOLOGY 152	Introductory Biology and Introductory Biology (recommended)	10
BIOLOGY/ZOOLOGY 101 & BIOLOGY/ZOOLOGY 102 & BOTANY/BIOLOGY 130	Animal Biology and Animal Biology Laboratory and General Botany	10

#### AND Option a Upper-Level Biology

At least 6 credits of upper-level biological science coursework are required (to achieve 16 total credits—more than 6 credits may be required if introductory biology totals less than 10 credits due to transfer credits). Select from the course list below. To see courses offered in specific upcoming semesters, please see the Biochemistry website ([https://biochem.wisc.edu/undergraduate\\_program/advanced-biology-courses-undergraduate-program](https://biochem.wisc.edu/undergraduate_program/advanced-biology-courses-undergraduate-program)).

Important: Biochemistry courses on this list can count only for "upper-level biology" if they are above-and-beyond what is needed to fulfill the "biochemistry" portion of the major. For example, if students have taken BIOCHEM 501 (<http://guide.wisc.edu/search/?P=BIOCHEM%20501>), they will need one upper-level biochemistry elective to fulfill the biochemistry requirement, and then any additional biochemistry courses taken can count for upper-level biology. A course may not double count in both the "upper-level biology" and the "biochemistry" requirements for the major.

Code	Title	Credits
ANAT&PHY 335	Physiology	5
ANAT&PHY 337	Human Anatomy	3
ANAT&PHY 435	Fundamentals of Human Physiology	5
AGRONOMY 300	Cropping Systems	3
AGRONOMY 302	Forage Management and Utilization	3
AGRONOMY/HORT/SOIL SCI 326	Plant Nutrition Management	3

AGRONOMY/ HORT 328	Integrated Weed Management	4	B M E/ANATOMY/ MED PHYS/ PHMCOL-M/ PHYSICS/ RADIOL 619	Microscopy of Life	3
AGRONOMY/ HORT 338	Plant Breeding and Biotechnology	3	BIOCHEM/ NUTR SCI 510	Nutritional Biochemistry and Metabolism	3
AGRONOMY/ BOTANY/HORT 339	Plant Biotechnology: Principles and Techniques I	4	BIOCHEM 550	Topics in Medical Biochemistry	2
AGRONOMY/ BOTANY/HORT 340	Plant Cell Culture and Genetic Engineering	4	BIOCHEM 570	Computational Modeling of Biological Systems	3
AGRONOMY/ A A E/INTER-AG/ NUTR SCI 350	World Hunger and Malnutrition	3	BIOCHEM/ M M & I 575	Biology of Viruses	2
AGRONOMY/ BOTANY/ SOIL SCI 370	Grassland Ecology	3	BIOCHEM 601	Protein and Enzyme Structure and Function	2
AGRONOMY 377	Cropping Systems of the Tropics	3	BIOCHEM/B M I/ BMOLCHEM/ MATH 606	Mathematical Methods for Structural Biology	3
AGRONOMY/ HORT 501	Principles of Plant Breeding	3	BIOCHEM/B M I/ BMOLCHEM/ MATH 609	Mathematical Methods for Systems Biology	3
AGRONOMY/ ATM OCN/ SOIL SCI 532	Environmental Biophysics	3	BIOCHEM/ GENETICS/ MICROBIO 612	Prokaryotic Molecular Biology	3
AN SCI/ FOOD SCI 305	Introduction to Meat Science and Technology	4	BIOCHEM/ NUTR SCI 619	Advanced Nutrition: Intermediary Metabolism of Macronutrients	3
AN SCI/DY SCI/ NUTR SCI 311	Comparative Animal Nutrition	3	BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology	3
AN SCI/DY SCI 313	Animal Feeds and Diet Formulation	1	BIOCHEM/ BOTANY 621	Plant Biochemistry	3
AN SCI 314	Poultry Nutrition	3	BIOCHEM 625	Mechanisms of Action of Vitamins and Minerals	2
AN SCI/DY SCI 320	Animal Health and Disease Management	3	BIOCHEM/PHMCOL- M/ZOOLOGY 630	Cellular Signal Transduction Mechanisms	3
AN SCI/DY SCI 361	Introduction to Animal and Veterinary Genetics	2	BIOCHEM/ NUTR SCI 645	Molecular Control of Metabolism and Metabolic Disease	3
AN SCI/DY SCI 362	Veterinary Genetics	2	BSE 349	Quantitative Techniques for Biological Systems	3
AN SCI/DY SCI 363	Principles of Animal Breeding	2	BSE 364	Engineering Properties of Food and Biological Materials	3
AN SCI/DY SCI 370	Livestock Production and Health in Agricultural Development	3	BSE 365	Measurements and Instrumentation for Biological Systems	3
AN SCI/DY SCI 414	Ruminant Nutrition	2	BSE/ENVIR ST 367	Renewable Energy Systems	3
AN SCI 415	Application of Monogastric Nutrition Principles	2	BSE 460	Biorefining: Energy and Products from Renewable Resources	3
AN SCI 430	Sheep Production	3	BSE 461	Food and Bioprocessing Operations	3
AN SCI 431	Beef Cattle Production	3	BSE 472	Sediment and Bio-Nutrient Engineering and Management	3
AN SCI 432	Swine Production	3	BSE/FOOD SCI 642	Food and Pharmaceutical Separations	2-3
AN SCI/DY SCI 434	Reproductive Physiology	3	BMOLCHEM 504	Human Biochemistry Laboratory	3
AN SCI 503	Avian Physiology	3	BMOLCHEM/ MICROBIO 668	Microbiology at Atomic Resolution	3
AN SCI 508	Poultry Products Technology	3	B M I/STAT 541	Introduction to Biostatistics	3
AN SCI 511	Breeder Flock and Hatchery Management	3	B M I/COMP SCI 576	Introduction to Bioinformatics	3
AN SCI 512	Management for Avian Health	3	BOTANY 300	Plant Anatomy	4
AN SCI/ FOOD SCI 515	Commercial Meat Processing	2			
AN SCI/F&W ECOL/ ZOOLOGY 520	Ornithology	3			
AN SCI/F&W ECOL/ ZOOLOGY 521	Birds of Southern Wisconsin	3			
AN SCI/ NUTR SCI 626	Experimental Diet Design	1			

BOTANY 305	Plant Morphology and Evolution	4	ENTOM/ F&W ECOL 500	Insects in Forest Ecosystem Function and Management	2
BOTANY 330	Algae	3	ENTOM/ ZOOLOGY 540	Theoretical Ecology	3
BOTANY/ PL PATH 332	Fungi	4	ENTOM/GENETICS/ ZOOLOGY 624	Molecular Ecology	3
BOTANY/ AGRONOMY/ HORT 339	Plant Biotechnology: Principles and Techniques I	4	ENVIR ST/ LAND ARC 361	Wetlands Ecology	3
BOTANY 400	Plant Systematics	4	ENVIR ST/ POP HLTH 471	Introduction to Environmental Health	3
BOTANY 401	Vascular Flora of Wisconsin	4	ENVIR ST/ POP HLTH 502	Air Pollution and Human Health	3
BOTANY/ F&W ECOL 402	Dendrology	2	ENVIR ST/ F&W ECOL 515	Natural Resources Policy	3
BOTANY/ANTHRO/ ZOOLOGY 410	Evolutionary Biology	3	ENVIR ST/ ATM OCN 520	Bioclimatology	3
BOTANY 422	Plant Geography	3	ENVIR ST/A A E/ F&W ECOL 652	Decision Methods for Natural Resource Managers	3-4
BOTANY/ F&W ECOL 455	The Vegetation of Wisconsin	4	FOOD SCI/ MICROBIO 324	Food Microbiology Laboratory	2
BOTANY/F&W ECOL/ ZOOLOGY 460	General Ecology	4	FOOD SCI/ MICROBIO 325	Food Microbiology	3
BOTANY/ENTOM/ ZOOLOGY 473	Plant-Insect Interactions	3	FOOD SCI 410	Food Chemistry	3
BOTANY/AMER IND/ ANTHRO 474	Ethnobotany	3-4	FOOD SCI 440	Principles of Food Engineering	3
BOTANY 500	Plant Physiology	3-4	FOOD SCI 511	Chemistry and Technology of Dairy Products	3
BOTANY/ENTOM/ PL PATH 505	Plant-Microbe Interactions: Molecular and Ecological Aspects	3	FOOD SCI 514	Integrated Food Functionality	4
BOTANY 563	Phylogenetic Analysis of Molecular Data	3	FOOD SCI 550	Fermented Foods and Beverages	2
BOTANY/HORT/ SOIL SCI 626	Mineral Nutrition of Plants	3	FOOD SCI 610	Food Proteins	2
BOTANY/GENETICS/ ZOOLOGY 645	Modeling in Population Genetics and Evolution	3	FOOD SCI 611	Chemistry and Technology of Dairy Products	3
BOTANY/ENVIR ST/ F&W ECOL/ ZOOLOGY 651	Conservation Biology	3	F&W ECOL 300	Forest Biometry	4
BOTANY/GENETICS/ M M & I/MICROBIO/ PL PATH 655	Biology and Genetics of Fungi	3	F&W ECOL 306	Terrestrial Vertebrates: Life History and Ecology	4
BOTANY/ LAND ARC 670	Adaptive Restoration Lab	2	F&W ECOL/ HORT/LAND ARC/ PL PATH 309	Diseases of Trees and Shrubs	3
CRB 650	Molecular and Cellular Organogenesis	3	F&W ECOL 318	Principles of Wildlife Ecology	3
CRB 675	Topics in Cell and Regenerative Biology <small>Stem Cell Seminar</small>	1-3	F&W ECOL/ ZOOLOGY 335	Human/Animal Relationships: Biological and Philosophical Issues	3
DY SCI 305	Lactation Physiology	3	F&W ECOL/ ENVIR ST/ ZOOLOGY 360	Extinction of Species	3
DY SCI 535	Dairy Farm Management Practicum	3	F&W ECOL 379	Principles of Wildlife Management	3
ENTOM/ ZOOLOGY 302	Introduction to Entomology	4	F&W ECOL 401	Physiological Animal Ecology	3
ENTOM 321	Physiology of Insects	3	F&W ECOL 404	Wildlife Damage Management	3
ENTOM 331	Taxonomy of Mature Insects	4	F&W ECOL 410	Principles of Silviculture	3
ENTOM 342	Insect Ecology	3	F&W ECOL 415	Tree Physiology	3
ENTOM 351	Principles of Economic Entomology	3	F&W ECOL/ SURG SCI 548	Diseases of Wildlife	3
ENTOM/ ZOOLOGY 371	Medical Entomology	3	F&W ECOL 550	Forest Ecology	3
ENTOM 432	Taxonomy and Bionomics of Immature Insects	4	F&W ECOL 561	Wildlife Management Techniques	3
			F&W ECOL/ LAND ARC/ ZOOLOGY 565	Principles of Landscape Ecology	2
			F&W ECOL 590	Integrated Resource Management	3

F&W ECOL/ AGRONOMY/ ENTOM/ M&ENVTOX 632	Ecotoxicology: The Chemical Players	1	MED PHYS/ H ONCOL 410	Radiobiology	2-3
F&W ECOL/ AGRONOMY/ ENTOM/ M&ENVTOX 633	Ecotoxicology: Impacts on Individuals	1	MED PHYS/ B M E/H ONCOL/ PHYSICS 501	Radiological Physics and Dosimetry	3
F&W ECOL/ AGRONOMY/ ENTOM/ M&ENVTOX 634	Ecotoxicology: Impacts on Populations, Communities and Ecosystems	1	MICROBIO 303	Biology of Microorganisms	3
F&W ECOL 635	Forest Stand Dynamics	1-2	MICROBIO 304	Biology of Microorganisms Laboratory	2
F&W ECOL 655	Animal Population Dynamics	3	MICROBIO 330	Host-Parasite Interactions	3
GENETICS 466	Principles of Genetics	3	MICROBIO/ SOIL SCI 425	Environmental Microbiology	3
GENETICS 467	General Genetics 1	3	MICROBIO 450	Diversity, Ecology and Evolution of Microorganisms	3
GENETICS 468	General Genetics 2	3	MICROBIO 470	Microbial Genetics & Molecular Machines	3
GENETICS 545	Genetics Laboratory	2	MICROBIO/ SOIL SCI 523	Soil Microbiology and Biochemistry	3
GENETICS/ HORT 550	Molecular Approaches for Potential Crop Improvement	3	MICROBIO 526	Physiology of Microorganisms	3
GENETICS/ MD GENET/ ZOOLOGY 562	Human Cytogenetics	2	MICROBIO 527	Advanced Laboratory Techniques in Microbiology	2
GENETICS/ MD GENET 565	Human Genetics	3	MICROBIO 551	Capstone Research Project in Microbiology	2
GENETICS 566	Advanced Genetics	3	MICROBIO/ PL PATH 622	Plant-Bacterial Interactions	2-3
GENETICS/ MICROBIO 607	Advanced Microbial Genetics	3	MICROBIO 625	Advanced Microbial Physiology	3
GENETICS/ AN SCI 610	Quantitative Genetics	3	MICROBIO 632	Industrial Microbiology/ Biotechnology	2
HORT 320	Environment of Horticultural Plants	3	MICROBIO/ ONCOLOGY/ PL PATH 640	General Virology-Multiplication of Viruses	3
HORT/ AGRONOMY 501	Principles of Plant Breeding	3	NEURODPT 533	Molecular Physiology	2
M M & I 301	Pathogenic Bacteriology	2	NTP/ NEURODPT 610	Cellular and Molecular Neuroscience	4
M M & I 302	Medical Microbiology Laboratory	3	NTP/NEURODPT/ PSYCH 611	Systems Neuroscience	4
M M & I 341	Immunology	3	NTP/ NEURODPT 629	Molecular and Cellular Mechanisms of Memory	3
M M & I/ENTOM/ PATH-BIO/ ZOOLOGY 350	Parasitology	3	NTP/ NEURODPT 630	Neuronal Mechanisms for Sensation and Memory in Cerebral Cortex	3
M M & I/PATH-BIO/ ZOOLOGY 351	Parasitology Laboratory	2	NUTR SCI 332	Human Nutritional Needs	3
M M & I 410	Medical Mycology	2	NUTR SCI 431	Nutrition in the Life Span	3
M M & I 412	Medical Mycology Laboratory	1	NUTR SCI/ PHM PRAC 672	Herbals, Homeopathy, and Dietary Supplements	2-3
M M & I 460	Techniques in DNA Science for Microbiologists	3	ONCOLOGY 401	Introduction to Experimental Oncology	2
M M & I/MICROBIO/ PATH-BIO 528	Immunology	3	ONCOLOGY/ M&ENVTOX/ MEDICINE/PHM SCI/ PHM COL-M/ POP HLTH 625	Toxicology I	3
M M & I/PATH- BIO 529	Immunology Laboratory	2	PEDIAT 646	Cancer Genetics Risk Assessment and Counseling	2
M M & I 554	Emerging Infectious Diseases and Bioterrorism	2	PHM SCI 310	Drugs and Their Actions	2
M M & I 555	Vaccines: Practical Issues for a Global Society	3	PHM SCI 401	Survey of Pharmacology	3
M M & I/ POP HLTH 603	Clinical and Public Health Microbiology	5			

PHM SCI/B M E 430	Biological Interactions with Materials	3
PHYSICS/ ANATOMY/B M E/ MED PHYS/ PHM COL-M/ RADIOL 619	Microscopy of Life	3
PL PATH 300	Introduction to Plant Pathology	4
PL PATH/ SOIL SCI 323	Soil Biology	3
PL PATH 517	Plant Disease Resistance	2-3
PL PATH 558	Biology of Plant Pathogens	3
PL PATH 559	Diseases of Economic Plants	3
PL PATH 602	Ecology, Epidemiology and Control of Plant Diseases	3
PSYCH 454	Behavioral Neuroscience	3
SOIL SCI/ F&W ECOL 451	Environmental Biogeochemistry	3
SOIL SCI/ CIV ENGR 623	Microbiology of Waterborne Pathogens and Indicator Organisms	3
SOIL SCI/CIV ENGR/ M&ENVTOX 631	Toxicants in the Environment: Sources, Distribution, Fate, & Effects	3
ZOOLOGY 300	Invertebrate Biology and Evolution	3
ZOOLOGY 301	Invertebrate Biology and Evolution Lab	2
ZOOLOGY/ ENVIR ST 315	Limnology-Conservation of Aquatic Resources	2
ZOOLOGY 316	Laboratory for Limnology-Conservation of Aquatic Resources	2-3
ZOOLOGY 425	Behavioral Ecology	3
ZOOLOGY 430	Comparative Anatomy of Vertebrates	5
ZOOLOGY 470	Introduction to Animal Development	3
ZOOLOGY 504	Modeling Animal Landscapes	3-5
ZOOLOGY/ ENVIR ST 510	Ecology of Fishes	3
ZOOLOGY/ ENVIR ST 511	Ecology of Fishes Lab	2
ZOOLOGY/ PSYCH 523	Neurobiology	3
ZOOLOGY/ GEOSCI 541	Paleobiology	3
ZOOLOGY/ GEOSCI 542	Invertebrate Paleontology	3
ZOOLOGY/ PSYCH 550	Animal Communication and the Origins of Language	3
ZOOLOGY 555	Laboratory in Developmental Biology	3
ZOOLOGY 570	Cell Biology	3
ZOOLOGY 603	Endocrinology	3-4
ZOOLOGY 611	Comparative and Evolutionary Physiology	3
ZOOLOGY 612	Comparative Physiology Laboratory	2
ZOOLOGY/ANTHRO/ NTP/PSYCH 619	Biology of Mind	3

ZOOLOGY 625	Development of the Nervous System	2
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### Option B (Biocore)

Code	Title	Credits
Complete these lecture courses:		
BIOCORE 381	Evolution, Ecology, and Genetics	3
BIOCORE 383	Cellular Biology	3
BIOCORE 485	Principles of Physiology	3
BIOCORE 587	Biological Interactions	3
Complete two of these lab classes:		
BIOCORE 382	Evolution, Ecology, and Genetics Laboratory	4
BIOCORE 384	Cellular Biology Laboratory	
BIOCORE 486	Principles of Physiology Laboratory	
Total Credits		16

### PHYSICS (CALCULUS-BASED)

Code	Title	Credits
Complete one of the following options: <sup>1</sup>		
PHYSICS 207 & PHYSICS 208	General Physics and General Physics (recommended)	10
PHYSICS 201 & PHYSICS 202	General Physics and General Physics	10

<sup>1</sup> Students should consult with their advisor to discuss options if they have credit for PHYSICS 103 (<http://guide.wisc.edu/search/?P=PHYSICS%20103>) and PHYSICS 104 (<http://guide.wisc.edu/search/?P=PHYSICS%20104>).

### BIOCHEMISTRY

One set of introductory coursework **and** the capstone course are required, for a total of **three** BIOCHEM courses.

#### Introductory Courses

Code	Title	Credits
Select one of the following options:		
BIOCHEM 507 & BIOCHEM 508	General Biochemistry I and General Biochemistry II (recommended)	6-7

#### OR

BIOCHEM 501	Introduction to Biochemistry	3
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And one of the following upper-level biochemistry electives:

BIOCHEM/ NUTR SCI 510	Nutritional Biochemistry and Metabolism	
BIOCHEM 550	Topics in Medical Biochemistry	
BIOCHEM/ M M & I 575	Biology of Viruses	
BIOCHEM 601	Protein and Enzyme Structure and Function	
BIOCHEM/B M I/ BMOLCHEM/ MATH 606	Mathematical Methods for Structural Biology	
BIOCHEM/B M I/ BMOLCHEM/ MATH 609	Mathematical Methods for Systems Biology	

BIOCHEM/ GENETICS/ MICROBIO 612	Prokaryotic Molecular Biology
BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology
BIOCHEM/ BOTANY 621	Plant Biochemistry
BIOCHEM 625	Mechanisms of Action of Vitamins and Minerals
BIOCHEM/ PHMCOL-M/ ZOOLOGY 630	Cellular Signal Transduction Mechanisms
BIOCHEM/ NUTR SCI 645	Molecular Control of Metabolism and Metabolic Disease
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Total Credits	9-10

### Capstone

Code	Title	Credits
BIOCHEM 551	Biochemical Methods	4
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Total Credits		4

## RESIDENCE AND QUALITY OF WORK

- 2.000 GPA in all BIOCHEM and major courses
- 2.000 GPA on at least 15 upper-level major credits in Residence.<sup>2</sup>
- 15 credits in BIOCHEM, taken on campus

<sup>2</sup> Major courses numbered 300-699 are considered Upper-Level in the major for purposes of this requirement.

## HONORS IN THE MAJOR

Students may declare Honors in the Biochemistry Major in consultation with the Biochemistry undergraduate advisor. To be admitted to Honors in the Major in Biochemistry, students must have declared a major in biochemistry and have a 3.300 overall university GPA.

### HONORS IN THE MAJOR IN BIOCHEMISTRY: REQUIREMENTS

To earn Honors in the Major in Biochemistry, students must satisfy the requirements for the major (above) as well as the following requirements. All courses used for Honors in the Major requirements must receive "B" or better grades to fulfill requirements.

- Earn a 3.300 University GPA
- Earn a 3.300 GPA for all BIOCHEM courses, and all courses accepted in the major
- Complete BIOCHEM 507 and BIOCHEM 508 for Honors
- Complete a two-semester Senior Honors Thesis for 6 credits total
- Complete at least 14 credits of any combination of the following coursework:
  - Honors courses that would fulfill the Biology or Biochemistry requirements in the major (see above)
  - Statistics coursework (does not need to be taken for Honors): STAT 301, STAT 371, or STAT/B M I 541
  - Biochemistry elective coursework (does not need to be taken for Honors): NUTR SCI/BIOCHEM 510, BIOCHEM 550, M M & I/

BIOCHEM 575, BIOCHEM 601, MATH/B M I/BIOCHEM/BMOLCHEM 606, MATH/B M I/BIOCHEM/BMOLCHEM 609, MICROBIO/BIOCHEM/GENETICS 612, MD GENET/BIOCHEM/GENETICS 620, BOTANY/BIOCHEM 621, BIOCHEM 625, BIOCHEM/PHMCOL-M/ZOOLOGY 630, BIOCHEM/NUTR SCI 645

- Coursework in MATH, CHEM, or PHYSICS for Honors, from the list below:

### Math

Code	Title	Credits
MATH 275	Topics in Calculus I	5
MATH 276	Topics in Calculus II	5
MATH 341	Linear Algebra	3
MATH 375	Topics in Multi-Variable Calculus and Linear Algebra	5
MATH 376	Topics in Multi-Variable Calculus and Differential Equations	5
MATH 521	Analysis I	3
MATH 522	Analysis II	3
MATH 541	Modern Algebra	3
MATH 542	Modern Algebra	3

### Chemistry

Code	Title	Credits
CHEM 109	Advanced General Chemistry	5
CHEM 115	Chemical Principles I	5
CHEM 116	Chemical Principles II	5
CHEM 343	Introductory Organic Chemistry	3
CHEM 345	Intermediate Organic Chemistry	3
CHEM 344	Introductory Organic Chemistry Laboratory	2
CHEM 329	Fundamentals of Analytical Science	4
CHEM 547	Advanced Organic Chemistry	3
CHEM 561	Physical Chemistry	3
CHEM 565	Biophysical Chemistry	4
CHEM 563	Physical Chemistry Laboratory	1-2
CHEM 562	Physical Chemistry	3
CHEM 564	Physical Chemistry Laboratory	1

### Physics

Code	Title	Credits
PHYSICS 201	General Physics	5
PHYSICS 202	General Physics	5
PHYSICS 207	General Physics	5
PHYSICS 208	General Physics	5
PHYSICS 241	Introduction to Modern Physics	3
PHYSICS 247	A Modern Introduction to Physics	5
PHYSICS 248	A Modern Introduction to Physics	5
PHYSICS 249	A Modern Introduction to Physics	4

## UNIVERSITY DEGREE REQUIREMENTS

**Total Degree** To receive a bachelor's degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.

**Residency** Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. "In residence" credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.

**Quality of Work** Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

ZOOLOGY/BIOLOGY/ BOTANY 151 (or BIOCORE 381 & 382)	5 Ethnic Studies/Social Science	3
INTER-LS 210	1 Social Science Breadth	3
	15	16

### Junior

Fall	Credits Spring	Credits
Upper-Level Biology for major (or BIOCORE 485)	3-4 PHYSICS 208 or 202	5
PHYSICS 207 or 201	5 CHEM 327	4
Humanities Breadth	3 BIOCHEM 508	3-4
BIOCHEM 507	3 Humanities Breadth	4
	15	16

### Senior

Fall	Credits Spring	Credits
CHEM 565	4 BIOCHEM 551	4
BIOCHEM 691 or 681 <sup>2</sup>	3 Electives (or BIOCORE 587)	8
Electives	8 BIOCHEM 692 or 682	3
	15	15

Total Credits 120

<sup>1</sup> First-year students interested in exploring the major can enroll in BIOCHEM 100.

<sup>2</sup> Senior Thesis, Directed Study or work experience in laboratory are strongly recommended, but are not required. However, a Senior Honors Thesis is required to earn Honors in the Major.

## LEARNING OUTCOMES

1. Identify the fundamental biochemical principles that underlie all biological processes.
2. Communicate biochemical knowledge in both written reports and oral presentations to scientists and non-scientists.
3. Evaluate how biochemistry relates to other scientific disciplines and to contemporary issues in our society.
4. Demonstrate professional and ethical responsibility in scientific research.
5. Design and conduct quantitative experiments and/or interpret data to address a scientific question.

## FOUR-YEAR PLAN

### FOUR-YEAR PLAN

#### SAMPLE BIOCHEMISTRY FOUR-YEAR PLAN

##### Freshman

Fall	Credits Spring	Credits
Communications Part A	3 CHEM 104 (if took CHEM 103)	5
CHEM 103 or 109	4-5 MATH 222	4
MATH 221	5 Literature Breadth	3
BIOCHEM 100 <sup>1</sup>	1 Social Science Breadth	3
	13	15

##### Sophomore

Fall	Credits Spring	Credits
CHEM 343	3 CHEM 344	2
Literature Breadth	3 CHEM 345	3
Social Science Breadth	3 ZOOLOGY/BIOLOGY/ BOTANY 152 (or BIOCORE 383 & 384)	5

## ADVISING AND CAREERS

### HOW TO SEEK ADVISING

- To schedule an appointment with the advisor, use the Scheduling Assistant.
- Send an email with brief questions to [undergradadvisor@biochem.wisc.edu](mailto:undergradadvisor@biochem.wisc.edu).
- Drop-in advising hours for quick (10–15 minute) questions, on a first-come, first-serve basis, are posted on the Biochemistry website ([https://biochem.wisc.edu/undergraduate\\_program/advising-information-undergraduate-program](https://biochem.wisc.edu/undergraduate_program/advising-information-undergraduate-program)) each semester.

### CAREER EXAMPLES

- Take your skills to a rewarding career in product development, quality control, hospitals, biotechnology, university labs, pharmaceuticals, forensics, and more. Possibilities at top organizations and leading companies include positions such as protein purification scientist, lab manager, medical scribe, clinical research coordinator, and food safety and quality chemist.
- Pursue a professional degree in medical, dental, or veterinary school, using your background in biochemistry to aid your admission and success.
- Build on your research experience and continue graduate studies in biochemistry or a related field to shape a career in academia as a professor or in industry.



- Use your science background to inform patent law, science policy and ethics, sales and marketing for science and technology companies, scientific article publishing, and related fields.

## L&S CAREER RESOURCES

SuccessWorks at the College of Letters & Science helps students leverage the academic skills learned in their major, certificates, and liberal arts degree; explore and try out different career paths; participate in internships; prepare for the job search and/or graduate school applications; and network with professionals in the field (alumni and employers). In short, SuccessWorks helps students in the College of Letters & Science discover themselves, find opportunities, and develop the skills they need for success after graduation.

SuccessWorks can also assist students in career advising, résumé and cover letter writing, networking opportunities, and interview skills, as well as course offerings for undergraduates to begin their career exploration early in their undergraduate career.

Students should set up their profiles in Handshake (<https://careers.ls.wisc.edu/handshake>) to take care of everything they need to explore career events, manage their campus interviews, and **apply to jobs and internships from 200,000+ employers around the country.**

- SuccessWorks (<https://careers.ls.wisc.edu>)
- Set up a career advising appointment (<https://careers.ls.wisc.edu/make-an-appointment>)
- INTER-LS 210 L&S Career Development: Taking Initiative (1 credit, targeted to first- and second-year students)—for more information, see Inter-LS 210: Career Development, Taking Initiative (<https://careers.ls.wisc.edu/inter-ls-210-career-development-taking-initiative>)
- INTER-LS 215 Communicating About Careers (3 credits, fulfills Com B General Education Requirement)
- Handshake (<https://careers.ls.wisc.edu/handshake>)
- Learn how we're transforming career preparation: L&S Career Initiative (<http://ls.wisc.edu/lsci>)

## PEOPLE

### PROFESSORS

Amasino, Rick  
 Ansari, Aseem  
 Attie, Alan  
 Bednarek, Sebastian  
 Butcher, Sam  
 Clagett-Dame, Margaret  
 Cox, Mike  
 Craig, Elizabeth  
 Fox, Brian (Chair)  
 Friesen, Paul  
 Hayes, Colleen  
 Holden, Hazel  
 Kimble, Judith  
 Landick, Bob  
 Markley, John  
 Martin, Tom  
 Mitchell, Julie  
 Ntambi, James  
 Palmenberg, Ann  
 Pike, Wes

Ralph, John  
 Rayment, Ivan  
 Record, Tom  
 Sussman, Mike  
 Weibel, Doug  
 Wickens, Marv

### ASSOCIATE PROFESSORS

Henzler-Wildman, Katie  
 Pagliarini, Dave  
 Senes, Alessandro

### ASSISTANT PROFESSORS

Hoskins, Aaron  
 Raman, Vatsan  
 Romero, Phil  
 Venturelli, Ophelia  
 Wildonger, Jill

### ASSOCIATE FACULTY ASSOCIATES

Prost, Lynne  
 Pennella, Mario

## WISCONSIN EXPERIENCE

The following opportunities can help students connect with other students interested in biochemistry, build relationships with faculty and staff, and contribute to out-of-classroom learning:

- The American Society for Biochemistry and Molecular Biology (ASBMB) UW–Madison Student Chapter (<https://win.wisc.edu/organization/ASBMB>) is a student organization for students interested in biochemistry. ASBMB provides information about careers and job opportunities, how to get involved in research, and volunteer and outreach opportunities.
- Several biochemistry faculty members offer experiential study abroad programs, where students can immerse themselves in research or global health field experiences. Students can review the Biochemistry Major Advising Page ([https://biochem.wisc.edu/undergraduate\\_program/advising-information-undergraduate-program](https://biochem.wisc.edu/undergraduate_program/advising-information-undergraduate-program)) on the International Academic Programs website for information on these and other programs, as well as requirements that can typically be fulfilled abroad and things to consider when fitting study abroad into an academic plan.
- Students are encouraged to get involved in research, whether in the biochemistry department or through other life science or chemistry-related departments. Research can be performed for either course credit or pay, depending on the opportunity. The Biochemistry website ([https://biochem.wisc.edu/undergraduate\\_program/research-opportunities-undergraduate-program](https://biochem.wisc.edu/undergraduate_program/research-opportunities-undergraduate-program)) and the advisor can provide more information on finding research opportunities. Summer funding awards for research are available through the department.