

# BIOCHEMISTRY, BS (CALS)

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

### 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 either CALS or the College of Letters & Science (L&S). Students interested in the differences or transferring between CALS and L&S should meet with the advisor to discuss this in more detail.

Students who attend Student Orientation, Advising, and Registration (SOAR) with the College of Agricultural and Life Sciences (CALS) have the option to declare biochemistry at SOAR. Students may otherwise declare after they have begun their undergraduate studies.

Students who intend to major in Biochemistry may not combine this major ("double major") with the Molecular and Cell Biology major.

## 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
- Breadth–Humanities/Literature/Arts: 6 credits
  - 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
  - Breadth–Social Studies: 3 credits
  - Communication Part A & Part B \*
  - Ethnic Studies \*
  - Quantitative Reasoning Part A & Part B \*

\* 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 AGRICULTURAL AND LIFE SCIENCES REQUIREMENTS

In addition to the University General Education Requirements, all undergraduate students in CALS must satisfy a set of college and major requirements. Courses may not double count within university requirements (General Education and Breadth) or within college requirements (First-Year Seminar, International Studies, Science, and Capstone), but courses counted toward university requirements may also be used to satisfy a college and/or a major requirement; similarly, courses counted toward college requirements may also be used to satisfy a university and/or a major requirement.

### COLLEGE REQUIREMENTS FOR ALL CALS BS DEGREE PROGRAMS

Code	Title	Credits
Quality of Work: Students must maintain a minimum cumulative grade point average of 2.000 to remain in good standing and be eligible for graduation.		
Residency: Students must complete 30 degree credits in residence at UW–Madison after earning 86 credits toward their undergraduate degree.		
first year seminar/ ( <a href="http://guide.wisc.edu/undergraduate/agricultural-life-sciences/biochemistry/calsfirstyearseminarcourses/">http://guide.wisc.edu/undergraduate/agricultural-life-sciences/biochemistry/calsfirstyearseminarcourses/</a> )		1
international studies/ ( <a href="http://guide.wisc.edu/undergraduate/agricultural-life-sciences/biochemistry/calsinternationalstudiescourses/">http://guide.wisc.edu/undergraduate/agricultural-life-sciences/biochemistry/calsinternationalstudiescourses/</a> )		3
Physical science fundamentals		4-5
CHEM 103	General Chemistry I	
or CHEM 108	Chemistry in Our World	
or CHEM 109	Advanced General Chemistry	
Biological science		5
Additional science (biological, physical, or natural)		3
Science breadth (biological, physical, natural, or social)		3

cals capstone learning experience: included in the requirements for each cals major (see "major requirements" (<http://guide.wisc.edu/undergraduate/agricultural-life-sciences/biochemistry/calscapstonerequirement/>))

## REQUIREMENTS FOR THE MAJOR MATHEMATICS

### Mathematics Requirements

Code	Title	Credits
Complete one of the following options:		
MATH 221 & MATH 222	Calculus and Analytic Geometry I 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

## CHEMISTRY

### General Chemistry

Code	Title	Credits
Complete one of the following options:		
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 of the following courses:		
CHEM 343	Organic Chemistry I	3
CHEM 345	Organic Chemistry II	3
CHEM 344	Introductory Organic Chemistry Laboratory	2

### Analytical Chemistry

Code	Title	Credits
Complete one of the following options:		
CHEM 327	Fundamentals of Analytical Science	4
CHEM 329	Fundamentals of Analytical Science	4
CHEM 115 & CHEM 116	Chemical Principles I and Chemical Principles II (satisfies both general and analytical chemistry requirements)	10

## Physical Chemistry

Code	Title	Credits
Complete one:		
CHEM 665	Biophysical Chemistry (Recommended)	3
CHEM 561 & CHEM 563	Physical Chemistry and Physical Chemistry Laboratory I	4

## 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 (Introductory and Upper-Level Biology) 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:** A course may not double count in both the "upper-level biology" and the "biochemistry" requirements for the major. 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, they will need one advanced biochemistry elective to fulfill the biochemistry requirement, and then any additional biochemistry courses taken can count for upper-level biology.

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 338	Plant Breeding and Biotechnology	3	BIOCHEM/ NUTR SCI 560	Principles of Human Disease and Biotechnology	2
AGRONOMY/ BOTANY/HORT 339	Plant Biotechnology: Principles and Techniques I	4	BIOCHEM 570	Computational Modeling of Biological Systems	3
AGRONOMY/ BOTANY/HORT 340	Plant Cell Culture and Genetic Engineering	3	BIOCHEM/ M M & I 575	Biology of Viruses	2
AGRONOMY/A A E/ NUTR SCI 350	World Hunger and Malnutrition	3	BIOCHEM 601	Protein and Enzyme Structure and Function	2
AGRONOMY/ BOTANY/ SOIL SCI 370	Grassland Ecology	3	BIOCHEM/B M I/ BMOLCHEM/ MATH 609	Mathematical Methods for Systems Biology	3
AGRONOMY 377	Global Food Production and Health	3	BIOCHEM/ GENETICS/ MICROBIO 612	Prokaryotic Molecular Biology	3
AGRONOMY/ HORT 501	Principles of Plant Breeding	3	BIOCHEM/ NUTR SCI 619	Advanced Nutrition: Intermediary Metabolism of Macronutrients	3
AGRONOMY/ ATM OCN/ SOIL SCI 532	Environmental Biophysics	3	BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology	3
AN SCI/ FOOD SCI 305	Introduction to Meat Science and Technology	4	BIOCHEM/ BOTANY 621	Plant Biochemistry	3
AN SCI/DY SCI/ NUTR SCI 311	Comparative Animal Nutrition	3	BIOCHEM 625	Mechanisms of Action of Vitamins and Minerals	2
AN SCI 314	Poultry Nutrition	3	BIOCHEM/ NUTR SCI 645	Molecular Control of Metabolism and Metabolic Disease	3
AN SCI/DY SCI 320	Animal Health and Disease	3	BSE 349	Quantitative Techniques for Biological Systems	3
AN SCI/DY SCI 361	Introduction to Animal and Veterinary Genetics	2	BSE 364	Engineering Properties of Food and Biological Materials	3
AN SCI/DY SCI 362	Veterinary Genetics	2	BSE 365	Measurements and Instrumentation for Biological Systems	3
AN SCI/DY SCI 363	Principles of Animal Breeding	2	BSE/ENVIR ST 367	Renewable Energy Systems	3
AN SCI/DY SCI 370	Livestock Production and Health in Agricultural Development	3	BSE 460	Biorefining: Energy and Products from Renewable Resources	3
AN SCI/DY SCI 414	Ruminant Nutrition & Metabolism	3	BSE 461	Food and Bioprocessing Operations	3
AN SCI 415	Application of Monogastric Nutrition Principles	2	BSE 472	Sediment and Bio-Nutrient Engineering and Management	3
AN SCI 431	Beef Cattle Production	3	BMOLCHEM/ MICROBIO 668	Microbiology at Atomic Resolution	3
AN SCI 432	Swine Production	3	B M I/STAT 541	Introduction to Biostatistics	3
AN SCI/DY SCI 434	Reproductive Physiology	3	B M I/ COMP SCI 576	Introduction to Bioinformatics	3
AN SCI 503	Avian Physiology	3	BOTANY 300	Plant Anatomy	4
AN SCI 508	Poultry Products Technology	3	BOTANY 305	Plant Morphology and Evolution	4
AN SCI 511	Breeder Flock and Hatchery Management	3	BOTANY 330	Algae	3
AN SCI 512	Management for Avian Health	3	BOTANY/ PL PATH 332	Fungi	4
AN SCI/ FOOD SCI 515	Commercial Meat Processing	2	BOTANY/ AGRONOMY/ HORT 339	Plant Biotechnology: Principles and Techniques I	4
AN SCI/F&W ECOL/ ZOOLOGY 520	Ornithology	3	BOTANY 400	Plant Systematics	4
AN SCI/F&W ECOL/ ZOOLOGY 521	Birds of Southern Wisconsin	3	BOTANY 401	Vascular Flora of Wisconsin	4
AN SCI 610	Quantitative Genetics	3	BOTANY/ F&W ECOL 402	Dendrology: Woody Plant Identification and Ecology	3
AN SCI/ NUTR SCI 626	Experimental Diet Design	1	BOTANY/ANTHRO/ ZOOLOGY 410	Evolutionary Biology	3
B M E/MED PHYS/ PHMCOL- M/PHYSICS/ RADIOL 619	Microscopy of Life	3			
BIOCHEM/ NUTR SCI 510	Nutritional Biochemistry and Metabolism	3			

BOTANY 422	Plant Geography	3	ENVIR ST/ F&W ECOL 515	Natural Resources Policy	3
BOTANY/ F&W ECOL 455	The Vegetation of Wisconsin	4	ENVIR ST/ ATM OCN 520	Bioclimatology	3
BOTANY/ F&W ECOL/ ZOOLOGY 460	General Ecology	4	FOOD SCI/ MICROBIO 324	Food Microbiology Laboratory	2
BOTANY/ENTOM/ ZOOLOGY 473	Plant-Insect Interactions	3	FOOD SCI/ MICROBIO 325	Food Microbiology	3
BOTANY/AMER IND/ ANTHRO 474	Ethnobotany	3-4	FOOD SCI 410	Food Chemistry	3
BOTANY 500	Plant Physiology	3-4	FOOD SCI 440	Principles of Food Engineering	3
BOTANY/ENTOM/ PL PATH 505	Plant-Microbe Interactions: Molecular and Ecological Aspects	3	FOOD SCI 511	Chemistry and Technology of Dairy Products	3
BOTANY/ PL PATH 563	Phylogenetic Analysis of Molecular Data	3	FOOD SCI 514	Integrated Food Functionality	4
BOTANY/HORT/ SOIL SCI 626	Mineral Nutrition of Plants	3	FOOD SCI 550	Fermented Foods and Beverages	2
BOTANY/ENVIR ST/ F&W ECOL/ ZOOLOGY 651	Conservation Biology	3	FOOD SCI 611	Chemistry and Technology of Dairy Products	3
BOTANY/ GENETICS/M M & I/ PL PATH 655	Biology and Genetics of Fungi	3	F&W ECOL 300	Forest Measurements	4
BOTANY/ LAND ARC 670	Adaptive Restoration Lab	2	F&W ECOL 306	Terrestrial Vertebrates: Life History and Ecology	4
CHEM 575	Advanced Topics in Chemistry (Topics in Chemical Biology)	1-4	F&W ECOL 318	Principles of Wildlife Ecology	3
CRB 625	Stem Cell Seminar	1	F&W ECOL/ ZOOLOGY 335	Human/Animal Relationships: Biological and Philosophical Issues	3
CRB 640	Fundamentals of Stem Cell and Regenerative Biology	3	F&W ECOL/ ENVIR ST/ ZOOLOGY 360	Extinction of Species	3
CRB 650	Molecular and Cellular Organogenesis	3	F&W ECOL 379	Principles of Wildlife Management	3
DY SCI 378	Lactation Physiology	3	F&W ECOL 401	Physiological Animal Ecology	3
DY SCI 535	Dairy Farm Management Practicum	3	F&W ECOL 404	Wildlife Damage Management	3
ENTOM/ ZOOLOGY 302	Introduction to Entomology	4	F&W ECOL 410	Principles of Silviculture	3
ENTOM 321	Physiology of Insects	3	F&W ECOL 415	Tree Physiology	3
ENTOM 331	Taxonomy of Mature Insects	4	F&W ECOL/ SURG SCI 548	Diseases of Wildlife	3
ENTOM 351	Principles of Economic Entomology	3	F&W ECOL 550	Forest Ecology	3
ENTOM/ ZOOLOGY 371	Medical Entomology	3	F&W ECOL 561	Wildlife Management Techniques	3
ENTOM 432	Taxonomy and Bionomics of Immature Insects	4	F&W ECOL/ LAND ARC/ ZOOLOGY 565	Principles of Landscape Ecology	2
ENTOM/ F&W ECOL 500	Insects in Forest Ecosystem Function and Management	2	F&W ECOL 590	Integrated Resource Management	3
ENTOM/ ZOOLOGY 540	Theoretical Ecology	3	F&W ECOL/ AGRONOMY/ ENTOM/ M&ENVTOX 632	Ecotoxicology: The Chemical Players	1
ENTOM/GENETICS/ ZOOLOGY 624	Molecular Ecology	3	F&W ECOL/ AGRONOMY/ ENTOM/ M&ENVTOX 633	Ecotoxicology: Impacts on Individuals	1
ENVIR ST/ LAND ARC 361	Wetlands Ecology	3	F&W ECOL/ AGRONOMY/ ENTOM/ M&ENVTOX 634	Ecotoxicology: Impacts on Populations, Communities and Ecosystems	1
ENVIR ST/ POP HLTH 471	Introduction to Environmental Health	3	F&W ECOL/ A A E 652	Decision Methods for Natural Resource Managers	3
ENVIR ST/ POP HLTH 502	Air Pollution and Human Health	3	F&W ECOL 655	Animal Population Dynamics	3
			GEN&WS 533	Special Topics in Gender and Biology	3
			GENETICS 466	Principles of Genetics	3

GENETICS 467	General Genetics 1	3	MICROBIO 632	Industrial Microbiology/ Biotechnology	2
GENETICS 468	General Genetics 2	3	NEURODPT/ NTP 629	Molecular and Cellular Mechanisms of Memory	3
GENETICS 525	Epigenetics	3	NTP/ NEURODPT 610	Cellular and Molecular Neuroscience	4
GENETICS 545	Genetics Laboratory	2	NTP/NEURODPT/ PSYCH 611	Systems Neuroscience	4
GENETICS/ HORT 550	Molecular Approaches for Potential Crop Improvement	3	NUTR SCI 332	Human Nutritional Needs	3
GENETICS/ MD GENET 565	Human Genetics	3	NUTR SCI 431	Nutrition in the Life Span	3
GENETICS 566	Advanced Genetics	3	ONCOLOGY 401	Introduction to Experimental Oncology	2
HORT 320	Environment of Horticultural Plants	3	ONCOLOGY/ M&ENVTOX/ PHM SCI/PHMCOL- M/POP HLTH 625	Toxicology I	3
HORT/ AGRONOMY 501	Principles of Plant Breeding	3	PHM SCI 310	Drugs and Their Actions	2
M M & I 301	Pathogenic Bacteriology	2	PHM SCI/B M E 430	Biological Interactions with Materials	3
M M & I 341	Immunology	3	PL PATH 300	Introduction to Plant Pathology	4
M M & I/ENTOM/ PATH-BIO/ ZOOLOGY 350	Parasitology	3	PL PATH/ SOIL SCI 323	Soil Biology	3
M M & I/PATH- BIO 528	Immunology	3	PL PATH 517	Plant Disease Resistance	2-3
M M & I 554	Emerging Infectious Diseases and Bioterrorism	2	PL PATH 558	Biology of Plant Pathogens	3
MED PHYS/ H ONCOL 410	Radiobiology	2-3	PL PATH 559	Diseases of Economic Plants	3
MED PHYS/ B M E/H ONCOL/ PHYSICS 501	Radiation Physics and Dosimetry	3	PL PATH 602	Ecology, Epidemiology and Control of Plant Diseases	3
MICROBIO 303	Biology of Microorganisms	3	PL PATH 622	Plant-Bacterial Interactions	2-3
MICROBIO 304	Biology of Microorganisms Laboratory	2	PL PATH/M M & I/ ONCOLOGY 640	General Virology-Multiplication of Viruses	3
MICROBIO 305	Critical Analyses in Microbiology	1	PSYCH 454	Behavioral Neuroscience	3
MICROBIO 330	Host-Parasite Interactions	3	PSYCH 513	Hormones, Brain, and Behavior	4
MICROBIO/AN SCI/ BOTANY 335	The Microbiome of Plants, Animals, and Humans	3	PSYCH 612	Neuropharmacology	3
MICROBIO 345	Introduction to Disease Biology	3	SOIL SCI/ F&W ECOL 451	Environmental Biogeochemistry	3
MICROBIO 357	General Bioinformatics for Microbiologists	3	SOIL SCI/ CIV ENGR 623	Microbiology of Waterborne Pathogens and Indicator Organisms	3
MICROBIO/ SOIL SCI 425	Environmental Microbiology	3	SOIL SCI/ CIV ENGR/ M&ENVTOX 631	Toxicants in the Environment: Sources, Distribution, Fate, & Effects	3
MICROBIO 450	Diversity, Ecology and Evolution of Microorganisms	3	ZOOLOGY 300	Invertebrate Biology and Evolution	3
MICROBIO 470	Microbial Genetics & Molecular Machines	3	ZOOLOGY 301	Invertebrate Biology and Evolution Lab	2
MICROBIO 520	Planetary Microbiology: What Life Here Tells Us About Life Out There	3	ZOOLOGY 304	Marine Biology	2
MICROBIO/ SOIL SCI 523	Soil Microbiology and Biochemistry	3	ZOOLOGY/ ENVIR ST 315	Limnology-Conservation of Aquatic Resources	2
MICROBIO 525	Field Studies of Planetary Microbiology and Life in the Universe	3	ZOOLOGY 316	Laboratory for Limnology- Conservation of Aquatic Resources	2-3
MICROBIO 526	Physiology of Microorganisms	3	ZOOLOGY 425	Behavioral Ecology	3
MICROBIO 527	Advanced Laboratory Techniques in Microbiology	2	ZOOLOGY 430	Comparative Anatomy of Vertebrates	5
MICROBIO 551	Capstone Research Project in Microbiology	2	ZOOLOGY 470	Introduction to Animal Development	3
MICROBIO 607	Advanced Microbial Genetics	3	ZOOLOGY 504	Modeling Animal Landscapes	3-5
MICROBIO 626	Microbial and Cellular Metabolomics	3	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 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

Option B (Biocore)

Biocore is an honors-level, integrated sequence of lecture and lab courses that covers introductory and intermediate biology topics. Students must apply and be accepted to the program to take BIOCORE classes.

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)

Physics Requirements

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 if they have credit for PHYSICS 103 and PHYSICS 104 to discuss options.

BIOCHE MISTRY

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

Introductory Courses

Code	Title	Credits
Complete one of the following options:		
BIOCHEM 507 & BIOCHEM 508	General Biochemistry I and General Biochemistry II (recommended)	6
OR		
BIOCHEM 501	Introduction to Biochemistry	3
AND one of the following advanced biochemistry electives:		
BIOCHEM/ NUTR SCI 510	Nutritional Biochemistry and Metabolism	
BIOCHEM/ NUTR SCI 560	Principles of Human Disease and Biotechnology	
BIOCHEM 570	Computational Modeling of Biological Systems	
BIOCHEM/ M M & I 575	Biology of Viruses	
BIOCHEM 601	Protein and Enzyme Structure and Function	
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/ NUTR SCI 645	Molecular Control of Metabolism and Metabolic Disease	

Capstone Course (required)

Code	Title	Credits
BIOCHEM 551	Biochemical Methods	4

HONORS IN THE MAJOR

Students admitted to the university and to the College of Agricultural and Life Sciences are invited to apply to be considered for admission to the CALS Honors Program.

Admission Criteria for New First-Year Students:

- Complete program application including essay questions

Admission Criteria for Transfer and Continuing UW-Madison Students:

- UW-Madison cumulative GPA of at least 3.25
- Complete program application including essay questions



## HOW TO APPLY

The application is available on the CALS Honors Program website (<https://cals.wisc.edu/academics/undergraduate/current-students/honors-program/>). Applications are accepted at any time.

New first-year students with accepted applications will automatically be enrolled in Honors in Research. It is possible to switch to Honors in the Major in the student's first semester on campus after receiving approval from the advisor for that major. Transfer and continuing students may apply directly to Honors in Research or Honors in the Major (after approval from the major advisor).

## REQUIREMENTS

All CALS Honors programs have the following requirements:

- Earn at least a cumulative 3.25 GPA at UW-Madison (some programs have higher requirements)
- Complete the program-specific requirements listed below
- Submit completed thesis documentation to CALS Academic Affairs

## 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 overall 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, present research in a public forum and submit documentation to CALS Academic Affairs.
- Complete at least 14 credits of any combination of the following coursework:
  - Honors courses that would fulfill the biological science requirement 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 beyond the major requirements (does not need to be taken for Honors): NUTR SCI/BIOCHEM 510, BIOCHEM/NUTR SCI 560, BIOCHEM 570, M M & I/BIOCHEM 575, BIOCHEM 601, MATH/B M I/BIOCHEM/BMOLCHEM 609, MICROBIO/BIOCHEM/GENETICS 612, MD GENET/BIOCHEM/GENETICS 620, BOTANY/BIOCHEM 621, BIOCHEM 625, BIOCHEM/NUTR SCI 645
  - Honors coursework in MATH, CHEM, or PHYSICS from the list below:

### Math

Code	Title	Credits
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	Organic Chemistry I	3
CHEM 345	Organic Chemistry II	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 I	1
CHEM 562	Physical Chemistry	3
CHEM 564	Physical Chemistry Laboratory II	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.

LEARNING OUTCOMES

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

Students must complete at least 120 total credits to be eligible for graduation.

First Year

Fall	Credits Spring	Credits
CHEM 103 or 109	4-5 CHEM 104 (if needed)	5
MATH 221	5 MATH 222	4
Communications Part A	3 Humanities Course	3
INTER-AG 155 or BIOCHEM 100 <sup>1</sup>	1 Elective	3
13-14		15

Second Year

Fall	Credits Spring	Credits
CHEM 343	3 CHEM 344	2
ZOOLOGY/BIOLOGY/BOTANY 151 (or BIOCORE 381 & BIOCORE 382) <sup>2</sup>	5 CHEM 345	3
Humanities Course	3 ZOOLOGY/BIOLOGY/BOTANY 152 (or BIOCORE 383 & BIOCORE 384)	5
Social Science Course	3 Ethnic Studies Course	3
14		13

Third Year

Fall	Credits Spring	Credits
BIOCHEM 507 <sup>3</sup>	3 BIOCHEM 508	3-4
PHYSICS 207 or 201	5 PHYSICS 208 or 202	5
Upper-Level Biology for major (or BIOCORE 485 & BIOCORE 487 if needed)	Upper-Level Biology for major (or BIOCORE 587)	
International Studies Course	3 CHEM 327	4

Electives	3 Elective	3
14		15-16
Fourth Year		
Fall	Credits Spring	Credits
CHEM 665 or BIOCHEM 551	3-4 BIOCHEM 551 or CHEM 665	3-4
BIOCHEM 691 or 681 (if needed) <sup>4</sup>	2-3 BIOCHEM 692 or 682 (if needed)	2-3
Electives or Remaining Requirements	10 Electives or Remaining Requirements	10
15-17		15-17

Total Credits 114-120

- <sup>1</sup> First-year students interested in exploring the major can enroll in INTER-AG 155 or BIOCHEM 100.
- <sup>2</sup> BIOCORE sequence requires four lecture courses plus two lab courses. Student may also take ZOOLOGY/BIOLOGY/BOTANY 151 and ZOOLOGY/BIOLOGY/BOTANY 152 plus 6 credits of upper-level biology instead of BIOCORE.
- <sup>3</sup> Students must take either: (1) both BIOCHEM 507 and BIOCHEM 508 or (2) BIOCHEM 501 and one additional course in biochemistry from the 500/600-level electives.
- <sup>4</sup> Senior thesis, independent study or work experience in laboratory are recommended, but are not required. However, a senior honors thesis is required to earn honors in the major.

ADVISING AND CAREERS

ADVISING AND CAREERS

HOW TO SEEK ADVISING

- To schedule an appointment with the advisor, use Starfish (<https://advising.wisc.edu/facstaff/starfish/starfish-student-resources/>).
- Send an email with brief questions to biochemmicrobio-advisor@wisc.edu.
- Drop-in advising hours for quick (10-15 minute) questions, on a first-come, first-served basis, are posted on the Biochemistry / Microbiology Undergraduate Advising Hub website (<https://biochemmicrobio.wisc.edu/>) 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.



## CALS CAREER RESOURCES

CALS Career Services provides expertise to support students and alumni of the college as they explore, experience, and achieve their career goals. In short, CALS Career Services helps students in the College of Agriculture and Life Sciences discover themselves, find opportunities, and develop the skills they need for success after graduation.

CALS Career Services can also assist students in career advising, résumé and cover letter writing, networking opportunities, and interview skills, as well as assisting undergraduates to begin their career exploration early in their undergraduate career.

Students should set up their profiles in Handshake (<https://wisc.joinhandshake.com/login/>) 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.

- CALS Career Services (<https://cals.wisc.edu/academics/undergraduate-students/career-services/>)
- Set up a career advising appointment (<https://cals.wisc.edu/academics/undergraduate-students/career-services/advising/>)
- INTER-LS 210 (<https://guide.wisc.edu/search/?P=INTER-LS%20210>) L&S Career Development: Taking Initiative (1 credit, targeted to first- and second-year students)
- INTER-LS 215 (<https://guide.wisc.edu/search/?P=INTER-LS%20215>) Communicating About Careers (3 credits, fulfills Com B General Education Requirement)
- Handshake (<https://wisc.joinhandshake.com/login/>)

Chaudhari, Snehal  
Coyle, Scott  
Grant, Tim  
Kirchdoerfer, Robert  
Lim, Ci Ji  
Neugebauer, Monica  
Romero, Phil  
Simcox, Judith  
Weeks, Amy

## ASSOCIATE FACULTY

Pennella, Mario  
Shu, Erica

## ACADEMIC ADVISORS

Biochemistry & Microbiology Undergraduate Advising Hub (<https://biochemmicrobio.wisc.edu/advising/>)

For more information, see the Department of Bacteriology directory (<https://bact.wisc.edu/people.php>).

## WISCONSIN EXPERIENCE

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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://studyabroad.wisc.edu/academics/major-advising-pages-maps/biochemistry/>) 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 advisors can provide more information on finding research opportunities. Summer funding awards for research are available through the department.

## PEOPLE

## PEOPLE PROFESSORS

Amasino, Rick  
Attie, Alan  
Bednarek, Sebastian  
Butcher, Sam  
Chaudhari, Snehal  
Fox, Brian (Chair)  
Friesen, Paul  
Henzler-Wildman, Katie  
Holden, Hazel  
Hoskins, Aaron  
Kimble, Judith  
Landick, Bob  
Ntambi, James  
Ralph, John  
Rayment, Ivan  
Rienstra, Chad  
Senes, Alessandro  
Sussman, Mike  
Wright, Elizabeth

## ASSOCIATE PROFESSORS

Raman, Vatsan  
Venturelli, Ophelia

## ASSISTANT PROFESSORS

Cantor, Jason