Biochemistry, B.S. (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

Students who have completed a semester or more on campus must have a 2.5 previous semester GPA in order to declare or transfer into the major. Students may declare the major via an appointment with the undergraduate advisor.

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. 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 in other schools/colleges (Business, Education, Engineering, etc.) may add biochemistry as an additional major with permission of their home school/college.

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/#requirementsforundergraduatetestudytext) section of the Guide.

Requirements Detail

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. Specific requirements for all majors in the college and other information on academic matters can be obtained from the Office of Academic Affairs (http://www.cals.wisc.edu/academics), College of Agricultural and Life Sciences, 116 Agricultural Hall, 1450 Linden Drive, Madison, WI 53706; 608-262-3003. Academic departments and advisors also have information on requirements. Courses may not double count within university requirements (General Education and Breadth) or within college requirements (First-Year Seminar, International Studies and Science), 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 B.S. DEGREE PROGRAMS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 103</td>
<td>General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 108</td>
<td>Chemistry in Our World</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 109</td>
<td>Advanced General Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>Biological Science</td>
<td></td>
<td>5</td>
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<tr>
<td>Additional Science (Biological, Physical, or Natural)</td>
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<tr>
<td>Science Breadth (Biological, Physical, Natural, or Social)</td>
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</table>
CALS Capstone Learning Experience: included in the requirements for each CALS major (see "Major Requirements") ([http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext](http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext))

### MAJOR REQUIREMENTS

#### MATHEMATICS

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<td>Calculus and Analytic Geometry 1</td>
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<tr>
<td>MATH 171</td>
<td>Calculus with Algebra and Trigonometry I</td>
<td>14</td>
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<tr>
<td>&amp; MATH 217</td>
<td>and Calculus with Algebra and Trigonometry II</td>
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<tr>
<td>&amp; MATH 222</td>
<td>and Calculus and Analytic Geometry 2</td>
<td>2</td>
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<tr>
<td>MATH 275</td>
<td>Topics in Calculus I</td>
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<tr>
<td>&amp; MATH 276</td>
<td>and Topics in Calculus II</td>
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#### CHEMISTRY

**General Chemistry**

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<td>CHEM 103</td>
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<td>&amp; CHEM 104</td>
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<tr>
<td>CHEM 109</td>
<td>Advanced General Chemistry</td>
<td>5</td>
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<tr>
<td>CHEM 115</td>
<td>Chemical Principles I</td>
<td>10</td>
</tr>
<tr>
<td>&amp; CHEM 116</td>
<td>and Chemical Principles II (satisfies both general and analytical chemistry requirements)</td>
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</table>

**Organic Chemistry**

Select ALL of the following courses:

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<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 343</td>
<td>Introductory Organic Chemistry</td>
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<tr>
<td>CHEM 345</td>
<td>Intermediate Organic Chemistry</td>
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<td>CHEM 344</td>
<td>Introductory Organic Chemistry Laboratory</td>
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**Analytical Chemistry**

Select one of the following options:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>CHEM 327</td>
<td>Fundamentals of Analytical Science</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 329</td>
<td>Fundamentals of Analytical Science</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 115</td>
<td>Chemical Principles I</td>
<td>10</td>
</tr>
<tr>
<td>&amp; CHEM 116</td>
<td>and Chemical Principles II (satisfies both general and analytical chemistry requirements)</td>
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</tr>
</tbody>
</table>

### Physical Chemistry

Must complete 4 credits of physical chemistry. Select one of the following options:

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<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 565</td>
<td>Biophysical Chemistry (recommended)</td>
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</tr>
<tr>
<td>CHEM 561</td>
<td>Physical Chemistry</td>
<td>4-5</td>
</tr>
<tr>
<td>&amp; CHEM 563</td>
<td>and Physical Chemistry Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

### 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 + Upper Level Biology)**

**Option A Introductory Biology**

Select one of the following introductory biology options:

<table>
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<th>Title</th>
<th>Credits</th>
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<tr>
<td>BIOLOGY/BOTANY/ ZOOLOGY 151</td>
<td>Introductory Biology</td>
<td>10</td>
</tr>
<tr>
<td>&amp; BIOLOGY/BOTANY/ ZOOLOGY 152</td>
<td>and Introductory Biology (recommended)</td>
<td></td>
</tr>
<tr>
<td>BIOLOGY/ ZOOLOGY 101</td>
<td>Animal Biology</td>
<td>10</td>
</tr>
<tr>
<td>&amp; BIOLOGY/ ZOOLOGY 102</td>
<td>and Animal Biology Laboratory</td>
<td></td>
</tr>
<tr>
<td>&amp; BOTANY/ BIOLOGY 130</td>
<td>and General Botany</td>
<td></td>
</tr>
</tbody>
</table>

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 courses in the course list below. To see courses sorted by subject, as well as a list of 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 only count 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 Biochemistry 501, 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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANATOMY/ KINES 328</td>
<td>Human Anatomy</td>
<td>3</td>
</tr>
<tr>
<td>ANATOMY/ NTP/PHMCOl-M/PHYSIOL/ PSYCH 611</td>
<td>Systems Neuroscience</td>
<td>4</td>
</tr>
<tr>
<td>ANATOMY/NTP/ PHYSIOL 625</td>
<td>Brain Cell Cultures and Imaging: A Lab Course</td>
<td>4</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>ANATOMY/NTP/PHYSIO 630</td>
<td>Neuronal Mechanisms for Sensation and Memory in Cerebral Cortex</td>
<td>3</td>
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<tr>
<td>ANATOMY 637</td>
<td>Functional Neuroanatomy</td>
<td>3</td>
</tr>
<tr>
<td>ANATOMY/AN SCI 660</td>
<td>Electron Microscopy. Theory &amp; Practice</td>
<td>3</td>
</tr>
<tr>
<td>AGRONOMY 300</td>
<td>Cropping Systems</td>
<td>3</td>
</tr>
<tr>
<td>AGRONOMY 302</td>
<td>Forage Management and Utilization</td>
<td>3</td>
</tr>
<tr>
<td>AGRONOMY/HORT/SOIL SCI 326</td>
<td>Plant Nutrition Management</td>
<td>3</td>
</tr>
<tr>
<td>AGRONOMY/HORT 328</td>
<td>Integrated Weed Management</td>
<td>4</td>
</tr>
<tr>
<td>AGRONOMY/HORT 338</td>
<td>Plant Breeding and Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>AGRONOMY/BOTANY/HORT 339</td>
<td>Plant Biotechnology: Principles and Techniques I</td>
<td>4</td>
</tr>
<tr>
<td>AGRONOMY/BOTANY/HORT 340</td>
<td>Plant Cell Culture and Genetic Engineering</td>
<td>4</td>
</tr>
<tr>
<td>AGRONOMY/A A E/INTER-AG/NUTR SCI 350</td>
<td>World Hunger and Malnutrition</td>
<td>3</td>
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<tr>
<td>AGRONOMY/BOTANY/SOIL SCI 370</td>
<td>Grassland Ecology</td>
<td>3</td>
</tr>
<tr>
<td>AGRONOMY 377</td>
<td>Cropping Systems of the Tropics</td>
<td>3</td>
</tr>
<tr>
<td>AGRONOMY/HORT 501</td>
<td>Principles of Plant Breeding</td>
<td>3</td>
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<td>AGRONOMY/ATM OCN/SOIL SCI 532</td>
<td>Environmental Biophysics</td>
<td>3</td>
</tr>
<tr>
<td>AN SCI/FOOD SCI 305</td>
<td>Introduction to Meat Science and Technology</td>
<td>4</td>
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<tr>
<td>AN SCI/DY SCI/NUTR SCI 311</td>
<td>Comparative Animal Nutrition</td>
<td>3</td>
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<tr>
<td>AN SCI/DY SCI 313</td>
<td>Animal Feeds and Diet Formulation</td>
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<tr>
<td>AN SCI 314</td>
<td>Poultry Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>AN SCI/DY SCI 320</td>
<td>Animal Health and Disease Management</td>
<td>3</td>
</tr>
<tr>
<td>AN SCI/DY SCI 361</td>
<td>Introduction to Animal and Veterinary Genetics</td>
<td>2</td>
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<tr>
<td>AN SCI/DY SCI 362</td>
<td>Veterinary Genetics</td>
<td>2</td>
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<tr>
<td>AN SCI/DY SCI 363</td>
<td>Principles of Animal Breeding</td>
<td>2</td>
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<tr>
<td>AN SCI/DY SCI 370</td>
<td>Livestock Production and Health in Agricultural Development</td>
<td>3</td>
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<tr>
<td>AN SCI/DY SCI 414</td>
<td>Ruminant Nutrition</td>
<td>2</td>
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<td>AN SCI 415</td>
<td>Application of Monogastric Nutrition Principles</td>
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<tr>
<td>AN SCI 430</td>
<td>Sheep Production</td>
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<tr>
<td>AN SCI 431</td>
<td>Beef Cattle Production</td>
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</tr>
<tr>
<td>AN SCI 432</td>
<td>Swine Production</td>
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<tr>
<td>AN SCI/DY SCI 434</td>
<td>Reproductive Physiology</td>
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<tr>
<td>AN SCI/DY SCI/ENVIR ST/SOIL SCI 468</td>
<td>Managing the Environmental Impacts of Livestock Operations</td>
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<td>AN SCI 503</td>
<td>Avian Physiology</td>
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<tr>
<td>AN SCI 508</td>
<td>Poultry Products Technology</td>
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<tr>
<td>AN SCI 511</td>
<td>Breeder Flock and Hatchery Management</td>
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<tr>
<td>AN SCI 512</td>
<td>Management for Avian Health</td>
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<td>AN SCI/FOOD SCI 515</td>
<td>Commercial Meat Processing</td>
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<tr>
<td>AN SCI/F&amp;W ECOL/ZOOLOGY 520</td>
<td>Ornithology</td>
<td>3</td>
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<td>Birds of Southern Wisconsin</td>
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<tr>
<td>AN SCI/NUTR SCI 626</td>
<td>Experimental Diet Design</td>
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<tr>
<td>AN SCI/ANATOMY 660</td>
<td>Electron Microscopy. Theory &amp; Practice</td>
<td>3</td>
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<td>B M E/MED PHYS/PHMCOL-M/PHYSICS/RADIOL 619</td>
<td>Microscopy of Life</td>
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<tr>
<td>BIOCHEM/NUTR SCI 510</td>
<td>Biochemical Principles of Human and Animal Nutrition</td>
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<tr>
<td>BIOCHEM 550</td>
<td>Topics in Medical Biochemistry</td>
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<td>BIOCHEM/ M M &amp; I 575</td>
<td>Biology of Viruses</td>
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<tr>
<td>BIOCHEM 601</td>
<td>Protein and Enzyme Structure and Function</td>
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<td>BIOCHEM/B M I/BMOLCHEM/MATH 606</td>
<td>Mathematical Methods for Structural Biology</td>
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<td>Mathematical Methods for Systems Biology</td>
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<td>BIOCHEM/GENETICS/MICROBIO 612</td>
<td>Prokaryotic Molecular Biology</td>
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<td>Eukaryotic Molecular Biology</td>
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<td>Plant Biochemistry</td>
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<td>Mechanisms of Action of Vitamins and Minerals</td>
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<td>BIOCHEM/PHMCOL-M/ZOOLOGY 630</td>
<td>Cellular Signal Transduction Mechanisms</td>
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<td>BIOCHEM/NUTR SCI 645</td>
<td>Molecular Control of Metabolism and Metabolic Disease</td>
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<td>BSE 349</td>
<td>Quantitative Techniques for Biological Systems</td>
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<td>BSE 364</td>
<td>Engineering Properties of Food and Biological Materials</td>
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<td>BSE 365</td>
<td>Measurements and Instrumentation for Biological Systems</td>
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<td>Renewable Energy Systems</td>
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<td>BSE 460</td>
<td>Biorefining: Energy and Products from Renewable Resources</td>
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<td>BSE 461</td>
<td>Food and Bioprocessing Operations</td>
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<td>BSE 472</td>
<td>Sediment and Bio-Nutrient Engineering and Management</td>
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<td>BMOLCHEM/ MICROBIO 668</td>
<td>Microbiology at Atomic Resolution</td>
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<td>Introduction to Biostatistics</td>
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<td>B M I/COMP SCI 576</td>
<td>Introduction to Bioinformatics</td>
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<td>BOTANY 300</td>
<td>Plant Anatomy</td>
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<td>BOTANY 305</td>
<td>Plant Morphology and Evolution</td>
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<td>BOTANY 330</td>
<td>Algae</td>
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<td>BOTANY/ PL PATH 332</td>
<td>Fungi</td>
<td>4</td>
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<td>BOTANY/ AGRONOMY/ HORT 339</td>
<td>Plant Biotechnology: Principles and Techniques I</td>
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<td>BOTANY 400</td>
<td>Plant Systematics</td>
<td>4</td>
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<td>BOTANY 401</td>
<td>Vascular Systematics</td>
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<td>Dendrology</td>
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<td>BOTANY/ANTHRO/ ZOOLOGY 410</td>
<td>Evolutionary Biology</td>
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<td>BOTANY 422</td>
<td>Plant Geography</td>
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<td>BOTANY/</td>
<td>The Vegetation of Wisconsin</td>
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<td>Plant-Insect Interactions</td>
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<td>Ethnobotany</td>
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<td>BOTANY 500</td>
<td>Plant Physiology</td>
<td>3-4</td>
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<tr>
<td>BOTANY/ENTOM/ PL PATH 505</td>
<td>Plant-Microbe Interactions: Molecular and Ecological Aspects</td>
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<td>Introductory Cytogenetics</td>
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<tr>
<td>BOTANY 563</td>
<td>Phylogenetic Analysis of Molecular Data</td>
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</tr>
<tr>
<td>BOTANY/HORT/ SOIL SCI 626</td>
<td>Mineral Nutrition of Plants</td>
<td>3</td>
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<tr>
<td>BOTANY/GENETICS/ MD GENET 629</td>
<td>Evolutionary Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BOTANY/GENETICS/ ZOOLOGY 645</td>
<td>Modeling in Population Genetics and Evolution</td>
<td>3</td>
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<tr>
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**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 to and be accepted to the program to take Biocore classes. For more information, see their website (https://biocore.wisc.edu).

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<td>BIOCORE 587</td>
<td>Biological Interactions</td>
<td>3</td>
</tr>
</tbody>
</table>

AND, select two of the following lab classes:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCORE 382</td>
<td>Evolution, Ecology, and Genetics Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOCORE 384</td>
<td>Cellular Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOCORE 486</td>
<td>Organismal Biology Laboratory</td>
<td>2</td>
</tr>
</tbody>
</table>

**PHYSICS (CALCULUS-BASED)**

Select one of the following options (students should consult with advisor if they have credit for PHYSICS 103 and/or 104 to discuss options):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 207 &amp; PHYSICS 208</td>
<td>General Physics and General Physics (recommended)</td>
<td>10</td>
</tr>
</tbody>
</table>

AND, select two of the following lab classes:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 201 &amp; PHYSICS 202</td>
<td>General Physics and General Physics</td>
<td>10</td>
</tr>
</tbody>
</table>

**BIOCHEMISTRY**

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

### Introductory Courses

Select one of the following options:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEM 507 &amp; BIOCHEM 508</td>
<td>General Biochemistry I and General Biochemistry II (recommended)</td>
<td>6</td>
</tr>
</tbody>
</table>

OR

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEM 501</td>
<td>Introduction to Biochemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

AND one of the following upper-level biochemistry electives:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEM/ NUTR SCI 510</td>
<td>Biochemical Principles of Human and Animal Nutrition</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 550</td>
<td>Topics in Medical Biochemistry</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/ M M &amp; I 575</td>
<td>Biology of Viruses</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 601</td>
<td>Protein and Enzyme Structure and Function</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/B M I/ BMOLCHEM/ MATH 606</td>
<td>Mathematical Methods for Structural Biology</td>
<td></td>
</tr>
</tbody>
</table>
Biochemistry, B.S. (CALS)

- **Mathematical Methods for Systems Biology**
- **Prokaryotic Molecular Biology**
- **Eukaryotic Molecular Biology**
- **Plant Biochemistry**
- **Mechanisms of Action of Vitamins and Minerals**
- **Cellular Signal Transduction**
- **Molecular Control of Metabolism and Metabolic Disease**

**Capstone Course (required)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEM 551</td>
<td>Biochemical Methods</td>
<td>4</td>
</tr>
</tbody>
</table>

**RECOMMENDED COURSES**

First year students interested in exploring the major can enroll in Biochemistry Freshman Seminar (BIOCHEM 100). Additional courses in math, biology, chemistry, biochemistry, statistics, and computer science are common elective courses, depending on student's areas of interest and future career goals.

**HONORS IN THE MAJOR**

Students may declare Honors in the Biochemistry Major in consultation with the Biochemistry Undergraduate Advisor. To be admitted to the Honors Program in Biochemistry, students must have declared a major in Biochemistry and achieved a 3.300 overall University GPA.

**HONORS IN THE BIOCHEMISTRY MAJOR REQUIREMENTS**

To earn Honors in the Major in Biochemistry students must satisfy both the requirements for the major (above) and the following additional requirements:

- 3.300 overall University GPA
- 3.300 GPA in courses designated as Biological, Physical or Natural science Breadth
- Complete two biological science courses for Honors chosen from the list of courses (below) that can fulfill the biological science requirements for the major (introductory biology, upper-level biology, or Biocore)
- Complete BIOCHEM 507 General Biochemistry I and BIOCHEM 508 General Biochemistry II for Honors. This is in addition to the biological and physical science Honors requirements above.
- Complete a two-semester Senior Honors Thesis in BIOCHEM 681 Senior Honors Thesis and BIOCHEM 682 Senior Honors Thesis , for a total of 6 credits. Students seeking to complete this requirement in a related department, such as Chemistry, must seek approval from the Undergraduate Biochemistry Advisor.
- Complete at least 20 credits, taken for Honors, from the following list:

**Math**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 275</td>
<td>Topics in Calculus I</td>
<td>5</td>
</tr>
<tr>
<td>MATH 276</td>
<td>Topics in Calculus II</td>
<td>5</td>
</tr>
<tr>
<td>MATH 341</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 375</td>
<td>Topics in Multi-Variable Calculus</td>
<td>5</td>
</tr>
<tr>
<td>MATH 376</td>
<td>Topics in Multi-Variable Calculus</td>
<td>5</td>
</tr>
<tr>
<td>MATH 521</td>
<td>Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 522</td>
<td>Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 541</td>
<td>Modern Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 542</td>
<td>Modern Algebra</td>
<td>3</td>
</tr>
</tbody>
</table>

**Chemistry**

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

**Physics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 201</td>
<td>General Physics</td>
<td>5</td>
</tr>
<tr>
<td>PHYSICS 202</td>
<td>General Physics</td>
<td>5</td>
</tr>
<tr>
<td>PHYSICS 207</td>
<td>General Physics</td>
<td>5</td>
</tr>
<tr>
<td>PHYSICS 208</td>
<td>General Physics</td>
<td>5</td>
</tr>
<tr>
<td>PHYSICS 241</td>
<td>Introduction to Modern Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 247</td>
<td>A Modern Introduction to Physics</td>
<td>5</td>
</tr>
<tr>
<td>PHYSICS 249</td>
<td>A Modern Introduction to Physics</td>
<td>4</td>
</tr>
</tbody>
</table>

**Statistics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 301</td>
<td>Introduction to Statistical Methods</td>
<td>3</td>
</tr>
<tr>
<td>STAT 371</td>
<td>Introductory Applied Statistics for the Life Sciences</td>
<td>3</td>
</tr>
</tbody>
</table>

**How to Apply**

Apply to the Honors Program by filling out the application (http://www.cals.wisc.edu/academics/undergraduate-programs/get-involved/honors-program/getting-admitted). Be sure to check the “Honors in the Major” box on your application. The undergraduate advisor must sign your application.

CALS students must deposit their thesis with the Honors Dean and submit an Honors checklist at the time of graduation in order to graduate with Honors in the Major. See the website (http://

**UNIVERSITY DEGREE REQUIREMENTS**

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Degree</td>
<td>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.</td>
</tr>
<tr>
<td>Residency</td>
<td>Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. &quot;In residence&quot; means on the UW–Madison campus with an undergraduate degree classification. &quot;In residence&quot; credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.</td>
</tr>
<tr>
<td>Quality of Work</td>
<td>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.</td>
</tr>
</tbody>
</table>

**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**

**SAMPLE BIOCHEMISTRY FOUR YEAR PLAN**

<table>
<thead>
<tr>
<th>Freshman</th>
<th>Credits Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>CHEM 103 or 109</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>CHEM 104 (if needed)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>MATH 221</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>COMM A or Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>INTER-AG 155 or BIOCHEM 100</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3 Humanities Course</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1 Elective</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>13-14</td>
<td>15</td>
</tr>
<tr>
<td>Total Credits</td>
<td>28-29</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore</th>
<th>Credits Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>CHEM 343</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CHEM 344</td>
<td>2</td>
</tr>
</tbody>
</table>

**Junior**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 565 or BIOCHEM 551</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 691 or 681</td>
<td>2-3</td>
<td></td>
</tr>
<tr>
<td>Electives or Remaining Requirements</td>
<td>6-10</td>
<td></td>
</tr>
<tr>
<td>12-17</td>
<td>12-17</td>
<td></td>
</tr>
</tbody>
</table>

**Senior**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 551 or 551</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 692 or 682</td>
<td>2-3</td>
<td></td>
</tr>
<tr>
<td>Electives or Remaining Requirements</td>
<td>6-10</td>
<td></td>
</tr>
<tr>
<td>12-17</td>
<td>12-17</td>
<td></td>
</tr>
</tbody>
</table>

**ADVISING AND CAREERS**

**HOW TO SEEK ADVISING**

- To schedule an appointment with the advisor, Kendra Gurnee, use the Scheduling Assistant (https://calendar.wisc.edu/scheduling-assistant/public/profiles/XkmJSxml.html).
- Email (kgurnee@wisc.edu) Kendra Gurnee with brief questions.
- 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) 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.

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 ASSOCIATE

Prost, Lynne

UNDERGRADUATE ADVISOR

Gurnee, Kendra

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://www.studyabroad.wisc.edu/map_biochem.asp) 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) and the advisor can provide more information on finding research opportunities. Summer funding awards for research are available through the department.