Biochemistry, Ph.D.

Biochemistry is the study of biological molecules, their roles in the cell, and the chemistry of their reactions in living systems. The Integrated Program in Biochemistry (IPiB) is the merged graduate program between the Department of Biochemistry (in the College of Agricultural and Life Sciences) and the Department of Biomolecular Chemistry (in the School of Medicine and Public Health). The program trains the next generation of biochemists and prepares them for 21st Century challenges in science. IPiB offers a Ph.D. degree with a major in biochemistry. Although an M.S. degree is officially offered, students are not admitted for a terminal master's degree.

From atoms and cells to plants and animals, biochemistry research in IPiB is at the forefront of modern science. We are home to around 100 graduate students and 55 world-class faculty pursuing cutting-edge research in all areas of biochemistry, including: cell and developmental biology, chemical biology, endocrinology, enzymology, immunology, metabolism, molecular genetics, molecular medicine, physical biochemistry and biophysics, quantitative biology, structural biology, systems and synthetic biology, and virology. The program teaches critical thinking skills, applicable to a wide range of professional fields that students pursue after graduation.

The size and breadth of IPiB provide unique opportunities for graduate students who want to pursue a degree in one of the top biochemistry graduate programs in the nation. Our modern facilities are filled with labs carrying out groundbreaking research in a collaborative, friendly, and inspirational atmosphere. Welcome to IPiB and we hope that you can share our enthusiasm for the biochemical sciences!

DUAL DEGREES

The program participates with the School of Medicine and Public Health in offering a dual degree program for students wishing to complete both the M.D. and Ph.D. degrees. For the prerequisites and degree requirements for the M.D. degree, as well as the online application form, see Medical Scientist Training Program (http://mstp.med.wisc.edu/).

ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. Applicants must meet the minimum requirements (https://grad.wisc.edu/apply/requirements/) of the Graduate School as well as the program(s). Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/apply/).

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding/) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

PROGRAM RESOURCES

IPiB students receive a full stipend (https://ipib.wisc.edu/education/financial-support/) as well as tuition remission and comprehensive health insurance. The stipends take the form of traineeships, research assistantships, or fellowships, and are guaranteed for all IPiB Ph.D. candidates in good academic standing and making satisfactory research progress. IPiB also assists its graduate students with outstanding academic records in competing for University or national awards.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Deadline</td>
<td>December 1</td>
</tr>
<tr>
<td>Spring Deadline</td>
<td>This program does not admit in the spring.</td>
</tr>
<tr>
<td>Summer Deadline</td>
<td>This program does not admit in the summer.</td>
</tr>
<tr>
<td>GRE (Graduate Record Examinations)</td>
<td>Not required.</td>
</tr>
</tbody>
</table>

English Proficiency Test

Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (https://grad.wisc.edu/apply/requirements/#english-proficiency).

Other Test(s) (e.g., GMAT, MCAT)

n/a

Letters of Recommendation Required

3

To qualify for admission to IPiB, an applicant must complete a bachelor's degree at a recognized, accredited college or university. The basic background for graduate study in biochemistry ordinarily would be provided by an undergraduate degree in biochemistry, chemistry, physics, or in one of the biological or medical sciences. The Admission Committee assesses a candidate's potential for success in the IPiB program by taking all aspects of their application into consideration. Most successful applicants have completed a rigorous undergraduate curriculum that includes courses in biology, chemistry, physics, and math. Most have also had a substantive laboratory experience that demonstrates commitment and talent for research. The applicant's undergraduate grade point average must be at least 3.0 (4.0 scale). For more information, please visit the Prospective Students (https://ipib.wisc.edu/p_students.php) tab on the IPiB website.
MAJOR REQUIREMENTS

MODE OF INSTRUCTION

<table>
<thead>
<tr>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students are able to complete a program with minimal disruptions to careers and other commitments.

Evening/Weekend: Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

Face-to-Face: Courses typically meet during weekdays on the UW-Madison Campus.

Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.

Online: These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

CURRICULAR REQUIREMENTS

Requirements Detail

<table>
<thead>
<tr>
<th>Minimum Credit Requirement</th>
<th>54 credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Residence Credit Requirement</td>
<td>42 credits</td>
</tr>
</tbody>
</table>

Minimum Graduate Coursework Requirement

| 54 credits must be graduate-level coursework. Details can be found in the Graduate School's Minimum Graduate Coursework (50%) policy (https://policy.wisc.edu/library/UW-1244/). |

Overall GPA

| 3.00 GPA required |

Graduate GPA Requirement

This program follows the Graduate School’s GPA Requirement policy (https://policy.wisc.edu/library/UW-1203/).

Other Grade Requirements

| n/a |

Assessments and Examinations

Deposit of the doctoral dissertation in the Graduate School is required.

Language Requirements

| n/a |

REQUIRED COURSES

Program Course Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEM/ BMOLCHEM 701</td>
<td>Professional Responsibility (taken Fall of first year)</td>
<td>1</td>
</tr>
<tr>
<td>BIOCHEM 719</td>
<td>From Atoms to Molecules (taken Fall of first year)</td>
<td>3</td>
</tr>
<tr>
<td>BMOLCHEM 720</td>
<td>Experimental Design and Paradigms in Cellular Biochemistry and Molecular Biology (taken Spring of first year)</td>
<td>3</td>
</tr>
<tr>
<td>BIOCHEM 721</td>
<td>Biochemical Communication (taken Fall of second year)</td>
<td>2</td>
</tr>
<tr>
<td>BIOCHEM 990</td>
<td>Research</td>
<td>1-12</td>
</tr>
</tbody>
</table>

Breadth Requirements

Students must complete a minimum of two additional graduate level (600 or above or that carry the graduate attribute) didactic or laboratory courses in order to fulfill their breadth requirements, and a minimum of 6 total credits is required. Courses must be chosen from at least 2 of the following categories: physical sciences, biological sciences, or quantitative sciences. One-credit seminars do not count toward the breadth requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEM/ NUTR SCI 510</td>
<td>Nutritional Biochemistry and Metabolism</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 570</td>
<td>Computational Modeling of Biological Systems</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 609</td>
<td>Mathematical Methods for Systems Biology</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/ GENETICS/ MICROBIO 612</td>
<td>Prokaryotic Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/ NUTR SCI 619</td>
<td>Advanced Nutrition: Intermediary Metabolism of Macronutrients</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/ GENETICS/ MD GENET 620</td>
<td>Eukaryotic Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/ BOTANY 621</td>
<td>Plant Biochemistry</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 625</td>
<td>Mechanisms of Action of Vitamins and Minerals</td>
<td></td>
</tr>
<tr>
<td>BMOLCHEM/ CHEM 627</td>
<td>Methods and Technologies for Protein Characterization</td>
<td></td>
</tr>
</tbody>
</table>
BIOCHEM/PHMCOL-M/ZOOLOGY 630 Cellular Signal Transduction, Mechanisms
BIOCHEM/NUTR SCI 645 Molecular Control of Metabolism and Metabolic Disease
BIOCHEM/CHEM 665 Biophysical Chemistry
BMOLCHEM/MICROBIO 668 Microbiology at Atomic Resolution
BIOCHEM/CHEM 704 Chemical Biology
BIOCHEM 729 Advanced Topics (Membrane Protein Structure and Function (Advanced))

Seminar Requirement
PhD students must successfully complete at least five semesters of advanced seminars from the following list:
- Any 900-level BIOCHEM or BMOLCHEM Seminar
- BIOCHEM 729 Advanced Topics (IPiB Seminar, Practicum in Undergraduate Teaching, or Responsible Conduct of Research)
- BIOCHEM/CHEM 872 Selected Topics in Macromolecular and Biophysical Chemistry
- BMOLCHEM 675 Advanced or Special Topics in Biomolecular Chemistry
- B M E 780 Methods in Quantitative Biology
- BOTANY 950 Seminar-Plant Ecology
- LSC 875 Special Topics
- NEURODPT 675 Selected Topics in Physiology (Ion Channels Seminar)
- NUTR SCI 931 Seminar-Nutrition
- PL PATH/BOTANY 930 Seminar-Mycology

Policies

Graduate School Policies
The Graduate School's Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy/) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

Major-Specific Policies

Prior Coursework
Graduate Work from Other Institutions
For well-prepared advanced students, the Program may accept up to 6 credits of prior graduate coursework from other institutions towards the minimum graduate degree credit and minimum graduate coursework (50%) requirement. The minimum graduate residence credit requirement can be satisfied only with courses taken as a graduate student at UW–Madison.

UW–Madison Undergraduate
No credits from a UW–Madison undergraduate degree are allowed to count toward the graduate degree.

UW–Madison University Special
No credits taken as a University Special student are allowed to count toward the graduate degree.

Probation
This program follows the Graduate School's Probation policy. (https://policy.wisc.edu/library/UW-1217/)

Advisor / Committee
Every graduate student must have an IPiB faculty thesis advisor. The thesis advisor advises the student about coursework, supervises the student's research, and acts as a mentor to the student through the student's graduate career. The thesis advisor must approve the student's coursework before registration for a given semester and must also approve any subsequent changes to it.

A Ph.D. thesis committee is composed of at least four graduate University faculty members, including the thesis advisor. The thesis committee is empowered by the Program to advise the student about certification, administer the preliminary examination, oversee annual progress reports, approve thesis composition, and conduct the final Ph.D. examination.

Credits Per Term Allowed
12 credits in Fall and Spring semesters and 2 credits in Summer semesters for non-dissertators; 3 credits in Fall, Spring, and Summer semesters for dissertators.

Time Limits
This program follows the Graduate School's Time Limits policy. (https://policy.wisc.edu/library/UW-1221/)

A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may be required to take another preliminary examination and to be admitted to candidacy a second time.

Grievances and Appeals
These resources may be helpful in addressing your concerns:
- Bias or Hate Reporting (https://doso.students.wisc.edu/bias-or-hate-reporting/)
- Graduate Assistantship Policies and Procedures (https://hr.wisc.edu/policies/gapp/#grievance-procedure)
- Hostile and Intimidating Behavior Policies and Procedures (https://hr.wisc.edu/hib/)
- Office of the Provost for Faculty and Staff Affairs (https://facstaffprovost.wisc.edu/)
- Dean of Students Office (https://doso.students.wisc.edu/) (for all students to seek grievance assistance and support)
- Employee Assistance (http://www.eao.wisc.edu/) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (https://employeedisabilities.wisc.edu/) (for qualified employees or applicants with disabilities to have equal employment opportunities)
College of Agricultural and Life Sciences: Grievance Policy

In the College of Agricultural and Life Sciences (CALS), any student who feels unfairly treated by a member of the CALS faculty or staff has the right to complain about the treatment and to receive a prompt hearing. Some complaints may arise from misunderstandings or communication breakdowns and be easily resolved; others may require formal action. Complaints may concern any matter of perceived unfairness.

To ensure a prompt and fair hearing of any complaint, and to protect the rights of both the person complaining and the person at whom the complaint is directed, the following procedures are used in the College of Agricultural and Life Sciences. Any student, undergraduate or graduate, may use these procedures, except employees whose complaints are covered under other campus policies.

1. The student should first talk with the person at whom the complaint is directed. Most issues can be settled at this level. Others may be resolved by established departmental procedures.

2. If the student is unsatisfied, and the complaint involves any unit outside CALS, the student should seek the advice of the dean or director of that unit to determine how to proceed.
   a. If the complaint involves an academic department in CALS the student should proceed in accordance with item 3 below.
   b. If the grievance involves a unit in CALS that is not an academic department, the student should proceed in accordance with item 4 below.

3. The student should contact the department's grievance advisor within 120 calendar days of the alleged unfair treatment. The departmental administrator can provide this person's name. The grievance advisor will attempt to resolve the problem informally within 10 working days of receiving the complaint, in discussions with the student and the person at whom the complaint is directed.
   a. If informal mediation fails, the student can submit the grievance in writing to the grievance advisor within 10 working days of the date the student is informed of the failure of the mediation attempt by the grievance advisor. The grievance advisor will provide a copy to the person at whom the grievance is directed.
   b. The grievance advisor will refer the complaint to a department committee that will obtain a written response from the person at whom the complaint is directed, providing a copy to the student. Either party may request a hearing before the committee. The grievance advisor will provide both parties a written decision within 20 working days from the date of receipt of the written complaint.
   c. If the grievance involves the department chairperson, the grievance advisor or a member of the grievance committee, these persons may not participate in the review.
   d. If not satisfied with departmental action, either party has 10 working days from the date of notification of the departmental committee action to file a written appeal to the CALS Equity and Diversity Committee. A subcommittee of this committee will make a preliminary judgement as to whether the case merits further investigation and review. If the subcommittee unanimously determines that the case does not merit further investigation and review, its decision is final. If one or more members of the subcommittee determine that the case does merit further investigation and review, the subcommittee will investigate and seek to resolve the dispute through mediation. If this mediation attempt fails, the subcommittee will bring the case to the full committee. The committee may seek additional information from the parties or hold a hearing. The committee will present a written recommendation to the dean who will provide a final decision within 20 working days of receipt of the committee recommendation.

4. If the alleged unfair treatment occurs in a CALS unit that is not an academic department, the student should, within 120 calendar days of the alleged incident, take his/her grievance directly to the Associate Dean of Academic Affairs. The dean will attempt to resolve the problem informally within 10 working days of receiving the complaint. If this mediation attempt does not succeed the student may file a written complaint with the dean who will refer it to the CALS Equity and Diversity Committee. The committee will seek a written response from the person at whom the complaint is directed, subsequently following other steps delineated in item 3d above.

OTHER

All students, both US and international, receive an annual stipend and tuition remission for the duration of their studies, provided satisfactory progress is made toward their degree. Comprehensive medical coverage is also offered. In addition, some of our students are supported on fellowships or training grants. Students are chosen based on criteria specified by the different training grants.

Students may matriculate only in the fall semester, and a master's degree is not offered as a terminal degree.

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School's professional development resources (https://grad.wisc.edu/pd/) to build skills, thrive academically, and launch your career.

LEARNING OUTCOMES

1. Gain a broad understanding of the biochemical principles that underlie all biological processes.
2. Become aware of the current limitations of the state of understanding of this discipline and the strategies that are required to advance the field.
3. Formulate and design new approaches that extend and apply biochemical principles beyond their current boundaries.
5. Think critically to address research challenges using a broad range of the theories, research methods, and approaches to scientific inquiry.
6. Collaborate with investigators within the program, university, and beyond since current and future advances in the biomolecular sciences demand interdisciplinary skills.
7. Foster professional and ethical conduct in the sciences, including but not limited to: exposition of the scientific method; ethical design of experimental protocols; reproducibility in science; professional behavior in industrial, government, and academic settings; documentation of scientific results; communication to other scientists and the public; peer review; and confidentiality.
8. Develop communications skills that enable the articulation of research to fellow scientists and non-scientists.
9. Explore career development opportunities in industry, government and academia to realize professional goals and paths.
10. Develop teaching and mentoring skills in both lecture and laboratory settings.

PEOPLE

Faculty: Professors B. Fox (Chair, Department of Biochemistry), Kiley (Chair, Department of Biomolecular Chemistry), Amasino, Attie, Audhya, Bednarek, Brow, Buller, Butcher, Cantor, Cavagnero, Coon, Cox, Coyle, Craciun, Craig, Denu, Engin, C. Fox, Friesen, Gellman, Grant, Harrison, Henzler-Wildman, Hess, Holden, Hoskins, Hull, Keck, Kimble, Kirchdoerfer, Landick, Lewis, Lim, Martin, Merrins, Mosher, Ntambi, Palmenberg, Pike, Ralph, Raman, Rayment, Record, Rienstra, Romero, Senes, Sheets, Simcox, Sussman, Venturelli, Weeks, Wickens, Wildonger, Wright