PHARMACEUTICAL SCIENCES, PH.D.

The pharmaceutical sciences division (https://pharmacy.wisc.edu/psd) at the School of Pharmacy offers the doctor of philosophy (Ph.D.) degree in pharmaceutical sciences (students are accepted only for the Ph.D. program; the master of science degree is awarded only under special circumstances). The program provides a rigorous background in a range of scientific disciplines that are critical to the success of modern pharmaceutical scientists. The program's interdisciplinary design combines pharmaceutically relevant aspects of classical disciplines such as chemistry, biology, and engineering. Students concentrate in one of three research cores: drug discovery, drug action, or drug delivery. Extensive communication and collaboration occur between these cores, mirroring the importance of interdisciplinary research teams in the pharmaceutical field.

To enhance a required core curriculum (https://pharmacy.wisc.edu/programs/pharmsci/curriculum), an individualized course of study is planned with a faculty advisor. A list of pharmaceutical sciences graduate faculty and their respective areas of research specialization is available from the division website (https://pharmacy.wisc.edu/psd/faculty-research) and related links. The pharmaceutical sciences graduate program has educated generations of scientists for challenging positions in industry, academia, and government.

Research in drug discovery (https://pharmacy.wisc.edu/psd/drug-discovery-core) focuses on areas related to medicinal chemistry, such as small molecule development, natural products isolation and characterization, organic synthesis, chemical biology, and rational drug design.

Drug action (https://pharmacy.wisc.edu/psd/drug-action-core) focuses on areas related to pharmacology, toxicology, cellular differentiation, development, and disease. Interests include the impact of drugs and toxins on biological systems, mechanisms of normal biology, and mechanisms of disease. These are studied at the cellular, genetic, molecular, and biochemical levels using diverse model systems.

Drug delivery (https://pharmacy.wisc.edu/psd/drug-delivery-core) (pharmaceutics) emphasizes principles in physical chemistry and drug transport, aiming for advances in formulation, drug targeting, and multimodal therapy. Delivery research includes the solid-state chemistry of drugs, nano-pharmacy, biocompatibility, molecular recognition, computational chemistry, pharmacokinetics, and molecular imaging.

POSTGRADUATE INFORMATION

Recent program graduates have found employment in a variety of industrial, academic, and regulatory positions. These vary from research and development and other scientific roles for pharmaceutical, chemical, and biotechnology companies to academic research positions; some graduates eventually achieve faculty positions at small colleges or at larger research institutions. By partnering with other career services units on campus, the program has increased career services such that students can sharpen their professional and communication skills and reach a larger network of potential employers. The program graduated 37 Ph.D.s from 2011 to 2015; over 90 percent of these recent alumni were professionally placed within six months of graduation. For more information on first professional placement following graduation, see employers of recent pharmsci graduates on the program website (https://pharmacy.wisc.edu/programs/pharmsci/student-outcomes). Faculty and the school's graduate programs coordinator can be consulted for specific career information (both initial placement and longer-term employment information regarding Ph.D. alumni).

FUNDING

Financial support is provided to all graduate students in pharmaceutical sciences through a combined mechanism of fellowships, teaching assistantships, research assistantships, and project assistantships. Funding packages for first-year students in the Ph.D. program are provided by the School of Pharmacy and consist of a mixture of fellowships and/or teaching assistant support. In addition, first-year students earn $1500 in flexible funds to aid in the transition to Madison. After the first academic year, students are supported by their thesis advisor through research assistantship or teaching assistantship appointments. All students receive a stipend (the recommended minimum level for students in the division is $24,000 for 2015–16), full tuition remission (waiver), and reasonably priced, comprehensive health insurance for the duration of their Ph.D. studies, if they retain good academic standing and a faculty advisor.

REQUIREMENTS

MINIMUM DEGREE REQUIREMENTS AND SATISFACTORY PROGRESS

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirementstext) in addition to the requirements of the program.

DOCTORAL DEGREES

Ph.D.

MINIMUM GRADUATE DEGREE CREDIT REQUIREMENT

51 credits

MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT

32 credits

MINIMUM GRADUATE COURSEWORK (50%) REQUIREMENT

At least half of degree coursework (26 credits out of 51 total credits) must be in graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

PRIOR COURSEWORK REQUIREMENTS: GRADUATE WORK FROM OTHER INSTITUTIONS

With program approval, students are allowed to count no more than 15 credits of graduate coursework from other institutions (the student must have graduate student status on the other institution's transcript at the time the courses were taken). Coursework should be presented to the SoP graduate dean in the first semester of enrollment for consideration.
Coursework earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNDERGRADUATE

With approval of the School of Pharmacy’s graduate studies dean, students are allowed to count no more than 7 credits of UW–Madison courses numbered 500 or above (earned as a UW–Madison special student) toward the Ph.D. degree. Coursework should be presented to the SoP graduate dean in the first semester of enrollment for consideration. Coursework earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNIVERSITY SPECIAL

With program approval, students are allowed to count no more than 15 credits of coursework numbered 500 or above taken as a UW–Madison undergraduate toward the Ph.D. degree. Coursework should be presented to the SoP graduate dean in the first semester of enrollment for consideration. Coursework earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

CREDITS PER TERM ALLOWED

Non-dissertators may enroll in a maximum of 15 credits per fall/spring term and 12 credits in the summer; dissertators may enroll in a maximum of 15 credits each session (fall, spring, summer).

PROGRAM-SPECIFIC COURSES REQUIRED

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>PHM SCI 780</td>
<td>Principles of Pharmaceutical Sciences</td>
<td>3</td>
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Select at least two of the following core courses:

- PHM SCI 768 | Pharmacokinetics | 3
- PHM SCI 786 | Natural Product Synthesis, Biosynthesis and Drug Discovery | 3
- BIOCHEM/PHMCOL-M/ | Cellular Signal Transduction | 3
- ZOOLOGY 630 | Mechanisms | 3

Research ethics/responsible conduct of research course | 1
Three additional credits from the Drug Action, Drug Delivery, or Drug Discovery elective lists are required (courses meeting this requirement are listed in the Pharmaceutical Sciences Graduate Handbook) | 3
Complete a Research course (PHM SCI 718-PHM SCI 990) | 1-12

PHM SCI 931 | Pharmaceutical Sciences Seminar (required every fall term during enrollment as a graduate student in the program) | 1
PHM SCI 932 | Pharmaceutical Sciences Seminar (required every spring during enrollment as a graduate student in the program) | 1

Total Credits | 10-21

Faculty advisors have the option to require additional courses beyond the minimum requirements listed above.

DOCTORAL MINOR/BREADTH REQUIREMENTS

No doctoral minor is required.

OVERALL GRADUATE GPA REQUIREMENT

An overall minimum GPA of 3.0 in graduate level (300 level or higher, non-research) courses is required, unless conditions for probationary status require higher grades.

OTHER GRADE REQUIREMENTS

Candidates will be dropped from the program if they receive more than 7 credits of grades at the BC level or lower. This applies to formal courses and research credits.

PROBATION POLICY

A semester GPA below 3.0 will result in the student being placed on academic probation. If a semester GPA of 3.0 is not attained during the subsequent semester of full-time enrollment (or 12 credits of enrollment if enrolled part-time) the student may be dismissed from the program or allowed to continue for one additional semester based on advisor appeal to the Graduate School.

ADVISOR / COMMITTEE

All students in the Ph.D. program are required to have a major professor/advisor through the duration of their studies. Typically a permanent advisor is found by the end of one’s first semester.

All students are required to conduct a progress report meeting with their thesis committee each year after passing the preliminary exam. The progress meeting must be scheduled by mid-May and completed by the end of August of each consecutive academic year. For details on the progress report, see the PSD Student Handbook (https://pharmacy.wisc.edu/graduate-handbook-pharmaceutical-sciences/progress-report). For details on the composition requirements of the Ph.D. thesis committee, see Thesis Committee (https://pharmacy.wisc.edu/graduate-handbook-pharmaceutical-sciences/thesis-committee) in the PSD Student Handbook.

ASSESSMENTS AND EXAMINATIONS

The preliminary examination is expected to be completed before the beginning of the third year of graduate study. For specifics regarding the Preliminary Examination’s structure and requirements, see Preliminary Examination (https://pharmacy.wisc.edu/graduate-handbook-pharmaceutical-sciences/preliminary-examination) in the PSD Student Handbook.

A final oral defense of the dissertation is required; for more on the dissertation defense, see Ph.D. Thesis Defense (https://pharmacy.wisc.edu/graduate-handbook-pharmaceutical-sciences/phd-thesis-defense) in the PSD Student Handbook.

TIME CONSTRAINTS

It is expected that Ph.D. major course requirements will be completed by the end of year two in the program.

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 by require to take another preliminary examination and to be admitted to candidacy a second time.

LANGUAGE REQUIREMENTS

No language requirements.
ADMISSIONS

Accepted graduate students commonly have strong scientific backgrounds, a passion for research, and significant laboratory experience. Students with undergraduate degrees in the physical or biological sciences, engineering, pharmacy, and related fields are encouraged to apply.

Please see admissions (https://pharmacy.wisc.edu/programs/pharmsci/admissions) on the program website for the application deadline and required supplemental materials.

LEARNING OUTCOMES

KNOWLEDGE AND SKILLS

• Demonstrate critical knowledge and in-depth understanding of principles in the student’s area of expertise.
• Identify important research questions, formulate testable hypotheses, and design experiments to test those hypotheses.
• Conduct original research that contributes to the student’s field of study.
• Communicate scientific knowledge and research results effectively to a range of audiences.
• Demonstrates breadth within their learning experiences.
• Advances contributions of the field of study to society.

PROFESSIONAL CONDUCT

• Apply ethical principles in conducting scientific research.