CHEMISTRY, PH.D.

The mission of the Department of Chemistry at the University of Wisconsin–Madison is to conduct world-class, groundbreaking research in the chemical sciences while offering the highest quality of education to undergraduate students, graduate students, and postdoctoral associates. Our leadership in research includes the traditional areas of physical, analytical, inorganic, and organic chemistry, and has rapidly evolved to encompass environmental chemistry, chemical biology, biophysical chemistry, soft and hard materials chemistry, nanotechnology and chemistry education research. We pride ourselves on our highly interactive, diverse, and collegial scientific environment. Our emphasis on collaboration connects us to colleagues across campus, around the country, and throughout the world.

The Department of Chemistry is ranked very highly in all recent national rankings of graduate programs. We offer a doctor of philosophy in chemistry. Specializations within the program are analytical, inorganic, materials, organic, physical chemistry, chemical biology as well as chemistry education research. Breadth coursework may be taken in other departments including physics, mathematics, computer sciences, biochemistry, chemical engineering, and in fields other than the student's specialization within the Department of Chemistry.

Excellent facilities are available for research in a wide variety of specialized fields including synthetic and structural chemistry; natural product and bio-organic chemistry; molecular dynamics and photochemistry; biophysical, bioanalytical, and bioinorganic chemistry; spectroscopy (including magnetic resonance and microwave), theoretical and experimental chemical physics, chemical dynamics, quantum and statistical mechanics; macromolecular and polymer chemistry, materials science, surface and solid-state chemistry; x-ray crystallography, lasers, and light scattering; and chemical education. Programs are assisted by department computing and instrument centers and by other facilities on campus including those of the Division of Information Technology (DoIT).

Information on the research fields of faculty members is available on the chemistry website (http://www.chem.wisc.edu/).

The department offers opportunities for graduate students to obtain teaching experience. Financial assistance is available to most graduate students in the form of teaching or research assistantships, fellowships, or traineeships.

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/).

Requirements	Detail
Fall Deadline	December 1
Spring Deadline	The program does not admit in the spring.
Summer Deadline	The program does not admit in the summer.
GRE (Graduate Record Examinations)	Not required.
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

Prospective graduate students are expected to have satisfactorily completed the equivalent in classes and labs of the fundamental courses in chemistry offered at UW–Madison, one year of physics, and mathematics through calculus. Students who have not completed all the prerequisites may be admitted in exceptional cases, but any deficiencies must be made up in the first year of graduate study.

A grade point average of 3.0 (on a 4.0 scale) in the last 60 hours of undergraduate work is the minimum required for admission to graduate studies. Students for whom English is not the native language are required to present scores from the Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS). Before teaching assistant appointments can be finalized, students for whom English is a second language must participate in the SPEAK Test, the institutional version of the Test of Spoken English (TSE).

Admission for the spring semester is not the norm, and applications for spring should only be submitted following discussion with a faculty member and/or the Graduate Program Office. Most summer admissions are applicants who were already admitted for the fall semester and decided to start earlier so they could serve as a teaching assistant or research assistant.

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

With few exceptions, students admitted to the Ph.D. program in the Department of Chemistry are guaranteed support for five continuous academic years. The support will be at the level of at least 50% time, and may come from a variety of sources—teaching assistantships, research assistantships, project assistantships, traineeships, and fellowships. This guarantee requires that you remain a graduate student in good standing in

the Ph.D. program in the Department of Chemistry, and that your teaching or other assigned responsibilities are satisfactory.

Currently, graduate students who have at least a 33.4% appointment for a fall or spring term are eligible to receive a full tuition (but not segregated fee) waiver.

Although serving as a teaching assistant is not a requirement of the chemistry department at this time, teaching can be an important part of the graduate training you receive. Most students will serve at least two semesters as a teaching assistant, and many will serve for two years. Whether or not an individual student will be appointed as a teaching assistant, research assistant, trainee or fellow depends on the availability of funding from the major professor, and eligibility for traineeships and fellowships from other sources.

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.

MAJOR REQUIREMENTS

MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

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

Requirement	Detail
Minimum Credit Requirement	51 credits
Minimum Residence Credit Requirement	32 credits
Minimum Graduate Coursework Requirement	26 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 (https://policy.wisc.edu/library/UW-1244/)).
Overall Graduate GPA Requirement	3.00 GPA required. This program follows the Graduate School's GPA Requirement policy (https://policy.wisc.edu/library/UW-1203 (https://policy.wisc.edu/library/UW-1203/)).
Other Grade Requirements	n/a
Assessments and Examinations	During their second year, the students complete the Thesis Background Exam (TBE). They write a paper describing the background of their research, research progress, and future research plans and orally defend their understanding and research to their mentoring committee. During the third year, the students complete the Original Research Proposal (RP) Exam. The students propose an original research project outside their area of study and write a paper describing the project. They orally defend their proposed project to their mentoring committee. At the end of their fourth year, the students complete the 4th-Year Meeting with their mentoring committee. This meeting includes an oral presentation of their research and discussion of what research needs to be completed to obtain the PhD. The students and committee discuss the students' future plans. At the end of their fifth year, if not defending their dissertation, the students complete the 5th-Year Meeting with the mentoring committee. This meeting includes an oral presentation of their research and discussion of what research needs to be completed to obtain the PhD. The students and committee discuss the students' future plans. In the 5th or 6th year, the students write, defend, and submit their dissertation.
Language Requirements	There are currently no language requirements to obtain the Ph.D. in Chemistry.
Graduate School Breadth Requirement	Doctoral students in Chemistry are not required to complete a doctoral minor or graduate/professional certificate as breadth is built into the major requirements.

REQUIRED COURSES

The Department of Chemistry recognizes 7 paths to the Ph.D. in Chemistry. In addition to completing general Chemistry PhD requirements below, students in each path have specific required courses, called core courses, and other path-specific requirements.

General PhD Requirements

Code	Title	Credits
CHEM 901	Seminar-Teaching of Chemistry [1]	1
CHEM 607	Laboratory Safety [1]	1
CHEM 980	Seminar: Review of Current Research [2]	1
CHEM 990	Research [3]	1-12+
Seminar Requirement		*0-2+*

Students must enroll in one of the seminar courses below every fall and spring term for 0 credits until they obtain candidacy (dissertator status).		
CHEM 900	Seminar-Inorganic Chemistry	
CHEM 920	Seminar-Analytical Chemistry	
CHEM 940	Seminar-Organic Chemistry	
CHEM 960	Seminar-Physical Chemistry [4]	
Breadth Requirement		*8*
Students in the Chemistry PhD complete breadth by completing a minimum of 3 courses and a minimum of 8 credits with the following requirements:		
1. Only STEM courses may count toward the breadth requirements. STEM courses must be approved by your advisor and may include courses in chemistry, physics, or other physical sciences; courses from the many biological disciplines including pharmacy- and medical-related courses; courses in engineering; or courses with a computer science, statistics, math, or computational focus.		
2. The Department of Chemistry encourages the graduate students to take graduate-level courses but will count undergraduate mid- or upper-level STEM courses (300-500 level) toward the breadth requirement if these courses are approved by the research advisor.		
3. The Department of Chemistry will only count repeatable STEM courses once (for example, courses for traineeships, RCR courses). However, special topics courses that have different topics can be counted more than once.		
4. The Department of Chemistry will not count courses in which the student received a grade below a C.		
5. CHEM 607, CHEM 901, CHEM 980, and CHEM 990 do not count toward the breadth requirement.		
Electives - Credits to meet the minimum of 51.		
Students work with advisor to identify elective courses 300+.		
Total Credits		**51**

1

Students must complete CHEM 901 Seminar-Teaching of Chemistry in the fall of their first year and CHEM 607 Laboratory Safety in the spring of their first year.

2

After joining a research lab, usually in the fall semester of the first year, students enroll in CHEM 980 Seminar: Review of Current Research in subsequent semesters. Students do not enroll in this course after reaching dissertator status.

3

Students enroll in CHEM 990 Research credits to bring their semester load to 15 credits after enrolling in lecture courses and seminars; if the latter courses already total 15, no Research credits are required for that semester. After reaching dissertator status, students enroll in 3 credits.

4

Students taking CHEM 960 Seminar-Physical Chemistry for their seminar enroll in a 0-credit section every semester. They also enroll in a 2-credit literature course section of CHEM 960 Seminar-Physical Chemistry one time during their graduate career, usually in the spring of their first year.

Analytical Chemistry Path [1]

Code	Title	Credits
CHEM 721	Instrumental Analysis	3-4
Select any one of the following for the maximum credits offered:		2-3
CHEM 622	Organic Analysis	
CHEM 623	Experimental Spectroscopy	
CHEM 624	Electrochemistry	
CHEM/ GENETICS 626	Genomic Science	
CHEM 627		
CHEM 629	Atmospheric Chemical Mechanisms	
CHEM 630	Selected Topics in Analytical Chemistry	
CHEM 725	Separations in Chemical Analysis	
CHEM 728	Electronics for Chemical Instrumentation	

1

These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

Chemical Biology Path [1]

Code	Title	Credits
CHEM/ BIOCHEM 704	Chemical Biology	3
Select any one of the following for the maximum credits offered:		2-4
CHEM 606	Physical Methods for Structure Determination	
CHEM 622	Organic Analysis	
CHEM 627		
CHEM 630	Selected Topics in Analytical Chemistry	
CHEM/ BIOCHEM 665	Biophysical Chemistry	
CHEM 668	Biophysical Spectroscopy	
CHEM 721	Instrumental Analysis	

1

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Chemistry Education Research Path [1]

Code	Title	Credits
CHEM 758	Chemistry Education Research	2
CURRIC/ COUN PSY/ED POL/ ED PSYCH/ELPA/ RP & SE 719	Introduction to Qualitative Research	3
ED PSYCH/ ELPA 822	Introduction to Quantitative Inquiry in Education	3

1

These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

Inorganic Chemistry Path [1]

Code	Title	Credits
Take the following for the maximum credits offered:		6
CHEM 608	Symmetry, Bonding, and Molecular Shapes	
CHEM 713	Inorganic and Organometallic Chemistry of the Main Group Elements	

1

These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

Materials Chemistry Path [1]

Code	Title	Credits
Hard Materials		*3*
Select any one of the following for the maximum credits offered:		
CHEM 613	Chemical Crystallography	
CHEM 624	Electrochemistry	
CHEM 630	Selected Topics in Analytical Chemistry	
CHEM 652	Chemistry of Inorganic Materials	
CHEM 653	Chemistry of Nanoscale Materials	
Soft Materials		*3*
Select any one of the following for the maximum credits offered:		
CHEM 654	Materials Chemistry of Polymers	
CHEM 664	Physical Chemistry of Macromolecules	
CHEM 842	Advanced Organic Chemistry	
CBE 562	Special Topics in Chemical Engineering (work with advisor to identify appropriate topic)	
M S & E 521	Advanced Polymeric Materials	

1

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Organic Chemistry Path [1]

Code	Title	Credits
CHEM 641	Advanced Organic Chemistry	3
CHEM 841	Advanced Organic Chemistry	3

1

These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

Physical Chemistry Path [1]

Code	Title	Credits
CHEM 661	Chemical and Statistical Thermodynamics	3
CHEM 675	Introductory Quantum Chemistry	3

1

These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

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

With program approval, students are allowed to count no more than 12 credits of graduate coursework from other institutions. Coursework earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

UW–Madison Undergraduate

This program follows the Graduate School's policy for Satisfying Requirements with Coursework from Undergraduate Career at UW–Madison. (https://policy.wisc.edu/library/UW-1216/)

UW–Madison University Special

This program follows the Graduate School's policy for Transfer from UW–Madison University Special Student Career at UW–Madison. (https://policy.wisc.edu/library/UW-1216/)

PROBATION

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

ADVISOR / COMMITTEE

This program follows the Graduate School's Advisor policy (https://policy.wisc.edu/library/UW-1232/) and the Graduate School's Committees policy (https://policy.wisc.edu/library/UW-1201/).

CREDITS PER TERM ALLOWED

15 credits. 12 credits maximum of research.

TIME LIMITS

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

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://facstaff.provost.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)
- Graduate School (https://grad.wisc.edu/) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (https://compliance.wisc.edu/) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (https://conduct.students.wisc.edu/) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (http://www.ombuds.wisc.edu/) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (https://compliance.wisc.edu/titleix/) (for concerns about discrimination)

Students should contact the department chair or program director with questions about grievances. They may also contact the L&S Academic Divisional Associate Deans, the L&S Associate Dean for Teaching and Learning Administration, or the L&S Director of Human Resources.

OTHER

n/a

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. Articulates research problems, potentials, and limits with respect to theory, knowledge, and practice within an area of chemistry.
2. Formulates ideas, concepts, designs, and techniques beyond the current boundaries of knowledge within an area of chemistry.
3. Creates research and scholarship that makes a substantive contribution to an area of chemistry.
4. Demonstrates breadth within their learning experiences.
5. Advances the beneficial societal impacts of research in chemistry.
6. Communicates complex scientific ideas in a clear and understandable manner.
7. Fosters safe, ethical, and professional conduct.

PEOPLE

PROFESSORS

Berry, John
Bertram, Timothy
Blackwell, Helen
Boydston, AJ
Brunold, Thomas
Burstyn, Judith (Chair)
Cavagnero, Silvia
Choi, Kyoung-Shin
Coon, Joshua
Ediger, Mark
Fredrickson, Daniel
Gellman, Samuel
Hamers, Robert
Hermans, Ive
Jin, Song
Landis, Clark
McMahon, Robert
Moore, John
Nathanson, Gilbert
Record, Thomas
Schmidt, Jordan
Schomaker, Jennifer
Schwartz, David
Shakhashiri, Bassam
Sibert, Edwin (Associate Chair)
Smith, Lloyd
Stahl, Shannon
Weaver, Susanna Widicus
Weix, Daniel
Woods, Claude
Yethiraj, Arun
Yoon, Tehshik

Zanni, Martin

ASSOCIATE PROFESSORS

Boydston, Andrew
Garand, Etienne
Goldsmith, Randall

ASSISTANT PROFESSORS

Buller, Andrew
Martell, Jeffrey
Pazicni, Sam
Stowe, Ryan
Wang, Tina
Wickens, Zachary
Yang, Yang

AFFILIATE PROFESSORS

Feng, Dawei (Assistant Professor in Materials Science and Engineering)
Forest, Katrina (Professor of Bacteriology)
Ge, Ying (Professor of Cell and Regenerative Biology)
Gilbert, Pupa (Professor of Physics)
Golden, Jennifer (Assistant Professor of Pharmacy)
Gong, Shaoqin Sarah (Professor of Biomedical Engineering)
Gopalan, Padma (Professor of Materials Science and Engineering)
Hoskins, Aaron (Associate Professor of Biochemistry)
Kuech, Thomas (Professor of Chemical and Biological Engineering)
Li, Lingjun (Professor of Pharmacy)
Lynn, David (Professor of Chemical and Biological Engineering)
Mecozzi, Sandro (Professor of Pharmacy)
Middlecamp, Catherine (Professor, Nelson Institute for Environmental Studies)
Pedersen, Joel (Professor of Soil Science)
Schreier, Marcel (Assistant Professor in Chemical and Biological Engineering)
Tang, Weiping (Professor of Pharmacy)
Yu, Lian (Professor of Pharmacy)

CHEMISTRY ELECTRONICS SHOP

Thompson, Blaise (Instrument Tech)

CHEMISTRY MACHINE SHOP

Martin, Mathew (Instrument Maker–Advanced)
Mullarkey, James (Instrument Maker–Advanced)
Myers, Steven (Machine Shop Supervisor)
Schneider, Kendall (Instrument Maker–Advanced)

PAUL BENDER CHEMISTRY INSTRUMENTATION CENTER (CIC)

Clewett, Cathy (Senior Instrument Technologist)
Fry, Charles (Director of the NMR Laboratory)
Guzei, Ilia (Director of the X-Ray Laboratory)
Hofstetter, Heike (Associate Director of the NMR Laboratory)
Shanks, Robert (Senior Instrument Technologist)
Vestling, Martha (Director of the Mass Spectrometry Laboratory)

RESEARCH SUPPORT STAFF

Bates, Desiree (Computational Chemistry Leader)
Drier, Tracy (Master Glassblower)
McGuire, Paul (High Performance Computing Systems Administrator)
Silver, Alan (Computer Systems Administrator)