Chemistry Graduate Program

Learning Objectives (Ph.D.)

Demonstrate a broad foundational knowledge of chemistry, particularly for a large subdiscipline such as biochemistry or analytical, inorganic, organic or physical chemistry.

- Students in the Chemistry Ph.D. program should have a broad working knowledge of the field at least comparable to the material taught in general chemistry and first undergraduate divisional classes (analytical, inorganic, organic, and physical chemistry, and biochemistry).
- Students should develop a deeper knowledge of their broader area of specialization, equivalent to material in the divisional graduate curriculum.
- This knowledge is evaluated through required classes and at the candidacy exam.

Demonstrate expertise (in-depth knowledge) in an area of specialization, including the current status of the area and what remains to be understood

- In the specific area of specialization, students should gain a deep knowledge of the field, equivalent to elective and special topics classes at the graduate level.
- Students should also be familiar with the current literature, both from their own lab and from other labs around the world working in the area.
- This specialized knowledge is evaluated in elective classes and at the candidacy and final oral exams.

Evaluate scientific work critically, by applying, analyzing, synthesizing, and evaluating scientific knowledge

- Critical thinking and the use of higher order cognitive functions are marks of a mature scientist.
- These traits are developed through critique of the literature (student seminar), proposal writing (candidacy exercise), and scientific inquiry (research/dissertation).

Conduct meaningful scientific inquiry leading to new knowledge in the field, including devising hypotheses, developing research strategies, executing research, and interpreting results

- Demonstration of a solid grasp of the scientific method occurs in proposal writing (candidacy exam) and through research in the laboratory (dissertation and publications).
- Conducting meaningful scientific inquiry necessarily means publication of peer-reviewed results.
- Proper planning and execution of experiments includes a grasp of essential methods, including statistical analysis and laboratory or computational skills, to produce rigorous and reproducible results.

Communicate scientific concepts, methods, results, and conclusions effectively to experts and non-experts, including the society at large, in oral and written form

- Written communication skills are developed through writing proposals (candidacy), the dissertation, and publications.
- Oral communication skills are developed through presentations in student seminar (literature), divisional seminar (research), at the candidacy exam, at the final oral exam, and at conferences.
- Presentations to broader audiences, such as at national and international conferences, develop communication skills to those outside the student's immediate expertise.

Conduct and disseminate research professionally, responsibly, and safely, in accord with the ethical standards and best practices of the profession

- Students must participate in required training for laboratory safety (online and first year class) and the responsible conduct of research (online and first year class).
- Safety and ethics should be addressed in all scientific work, regularly at laboratory group meetings and with specialized training as needed throughout the student's career.
- Students should develop skills in applicable professional areas, such as pedagogy, teamwork, leadership, and business, through teaching, workshops, interactions with alumni, and internships.