

DOCTOR OF PHILOSOPHY IN NATURAL SCIENCES: CHEMISTRY

Student Learning Outcomes

Students graduating from this program will:

- Demonstrate a thorough degree of knowledge in the disciplines
- Demonstrate an ability to use proper investigation techniques for the disciplines
- Use oral and written forms of communication to convey their ideas

Program Structure

Total Credits Required for Graduation: 42*

Residency requirements: Ph.D. students must satisfy the doctoral residency requirement by satisfactory completion of at least 18 credits in no more than 24 consecutive months. When satisfying the residency requirement, all Ph.D. students are subject to the following restrictions:

- The doctoral residency requirement must be satisfied no later than the end of the semester in which the student completes his or her comprehensive examinations.
- Students must achieve a cumulative graduate grade-point average of at least 3.0 in all courses counted toward satisfying the residency requirement.

** Specific disciplines may require more credit hours for graduation. See discipline specific coursework requirements for more information on total credit hours required for graduation.*

Program Requirements

The coursework requirements encompass:

- A minimum of 12 credit hours of coursework within the primary area, accompanied by at least 12 dissertation hours. The primary disciplines retain the flexibility to potentially request more than the minimum credit hours.
- A minimum of 9 credit hours within a secondary discipline area, with the secondary discipline also having the option to specify additional credit hours beyond the minimum.
- A minimum of 30 classroom credits is required beyond the baccalaureate, including fundamental and advanced courses along with seminars.
- Any primary area discipline can be combined with any secondary area discipline.

Participating Disciplines

Participating disciplines encompass a range of fields, including:

- Biomedical and Health Informatics
- Cell Biology and Biophysics
- Chemistry
- Geosciences
- Mathematics
- Molecular Biology and Biochemistry
- Oral and Craniofacial Sciences
- Pharmaceutical Science
- Pharmacology
- Physics

Student Learning Outcomes

Students graduating from this program will:

- Demonstrate a thorough degree of knowledge in the discipline
- Demonstrate an ability to use proper investigation techniques for the discipline
- Use oral and written forms of communication to convey their ideas

Chemistry

Students must successfully complete 15-18 credit hours of didactic Chemistry graduate coursework, among which one course must be from Group A, one course from Group B, a minimum of two electives (6 credit hours) from any graduate chemistry course numbered 5500 to 5589 (excluding CHEM 5520R, CHEM 5530, and CHEM 5540R), and at least 1 credit hour of CHEM 5611. The remaining required Chemistry credit hours may be satisfied with directed studies (CHEM 5590).

Students must also complete at least 9 credit hours in a secondary discipline, and at least 15 dissertation hours in the primary discipline.

Primary Discipline Program Requirements

Code	Title	Credits
Minimum of 15 credit hours of coursework within primary area.		15
Group A at least one from:		
CHEM 5531	Classical Thermodynamics	
CHEM 5532	Chemical Kinetics	
CHEM 5533	Quantum Chemistry	
CHEM 5534	Molecular Spectroscopy	
CHEM 5535	Statistical Thermodynamics	
Group B at least one from:		
CHEM 5521R	Mechanisms Of Organic Reactions	
CHEM 5522	Synthetic Organic Chemistry	
Other:		
CHEM 5611	Chemistry Seminar	
CHEM 5590	Directed Studies	
Dissertation		15
Total Credit Hours: 42		

Secondary Discipline Program Requirements

Code	Title	Credits
Minimum of 9 credit hours from the Department of Chemistry, at the 400-level or above. At least 3 hours must be at the 5500-level or above.		9
CHEM 5590, CHEM 5599, and CHEM 5699 do not count toward satisfying these requirements.		
CHEM 5520R and CHEM 5530 can satisfy the 400-level requirement but not the 5500-level requirement.		
Total Credits		9

Admission Requirements

Normally, only applications to full-time academic status will be considered. To qualify for full admission (Note: full admission is unrelated to full-time academic status), applicants are expected to have the equivalent of an American Chemical Society-approved bachelor's degree in chemistry, which includes coursework in general chemistry, analytical chemistry, one year of organic chemistry, inorganic chemistry and one year of physical chemistry requiring calculus and physics as prerequisites. (For example, see UMKC's B.S. program in the Chemistry section in this catalog.) Applicants will be admitted as provisional students with a limited number of undergraduate deficiencies. They will be notified, at the time admission is offered, of any requirements to be met for reclassification as fully admitted. Undergraduate courses included in these requirements must be completed with grades of "C" or higher.

Applicants should take particular note of the physical chemistry requirement.

Applications are only accepted through the online system, and include:

1. Official, confidentially transmitted transcripts.
2. Statement of purpose
3. Three confidentially transmitted letters of recommendation (academic and/or professional).
4. English language proficiency requirement.

Special Requirements

Chemistry as a Primary Discipline

Placement Examinations

Incoming students take placement examinations in analytical inorganic, organic and physical chemistry. Placement examinations are typically administered the week preceding the first week of classes of the fall and spring semesters. Students scoring below the 50th percentile in the organic and/or physical chemistry exams are required to enroll in CHEM 5520R (<https://catalog.umkc.edu/search/?P=CHEM%205520R>) and/or CHEM 5530 (<https://catalog.umkc.edu/search/?P=CHEM%205530>), respectively. Enrollment in other graduate organic or physical chemistry courses is not permitted until CHEM 5520R (<https://catalog.umkc.edu/search/?P=CHEM%205520R>) and/or CHEM 5530 (<https://catalog.umkc.edu/search/?P=CHEM%205530>), respectively, is(are) successfully completed. These courses may not be counted toward the coursework requirements above. Students must complete all additional coursework required as a result of the placement exam scores by the end of their first three regular semesters.

Research Advisor

Full-time students are to select a research advisor from the doctoral faculty of the Department of Chemistry and a supervisory committee by the end of their first regular (e.g. fall or spring) semester on campus. For chemistry as the primary discipline, the student's supervisory committee shall consist

of the research advisor in chemistry and two additional chemistry doctoral faculty as well as at least one doctoral faculty member from each co-discipline.

Seminar

Students are required to attend and participate in all regularly scheduled and special Chemistry Department seminars and colloquia. Students are required to present a one-hour chemistry seminar (CHEM 5611 (<https://catalog.umkc.edu/search/?P=CHEM%205611>)) during their second year following full admission to the Ph.D. program, based on their dissertation research project. This seminar will include a thorough review of the literature pertinent to their project and a description of the objectives, the proposed methodology and the significance of this research. An abstract is to be posted and distributed one week prior to the presentation date.

Time Constraints and Financial Support

Students must complete all requirements for their degree within seven years from the date of full admission to the Ph.D. program. Under compelling circumstances and on the written recommendation of a majority of the supervisory committee, a single extension for up to one year may be requested for approval by the dean of the School of Graduate Studies. Full-time (as defined in the current UMKC catalog) Ph.D. students may receive financial support (in the form of fellowships or teaching assistantships) for a maximum of five years. Students from countries not having English as their first language, and who are to be supported as GTAs, must meet the UMKC standards for international students to become certified as GTAs. Full information on that process can be found here: Policy on Award of Teaching Assistantships (<https://catalog.umkc.edu/general-graduate-academic-regulations-information/international-graduate-student-academic-regulations/>).

Dissertation

All supervisory committee members are to receive a final draft of the dissertation for approval of form and content at least two weeks before submission to the dean of the School of Graduate Studies for certification. Candidates should submit preliminary drafts well in advance of this deadline. After the dissertation is certified for acceptance, the student must present an oral defense of his/her research in the form of a dissertation seminar. The supervisory committee will make a final determination of the acceptability of the dissertation immediately following this presentation. Only minor changes may be made to the dissertation at this point.

Expectations for Interdisciplinary Work

Chemistry as a Primary Discipline

Students develop and pursue a plan of study that includes coursework from the primary discipline and co-discipline(s). The interdisciplinary nature of the student's program is emphasized in the comprehensive examination, which includes material from all disciplines in the plan of study.

Chemistry as a Co-discipline

The Department of Chemistry will cooperate with the student's primary discipline in assessing the interdisciplinary nature of the student's progress.

Comprehensive Examination Guidelines

Chemistry as Primary Discipline

All students are required to prepare a research proposal describing a research project. An abstract is to be posted and distributed, and a written copy of this proposal (in standard NSF or NIH format) given to all members of the examination committee (consisting of the student's supervisory committee and others selected by the Dean of the School of Graduate Studies) at least one week prior to presentation in a proposal seminar. This seminar must be presented to all members of the examination committee by the end of the second year following full admission to the Ph.D. program.

A written comprehensive examination will be prepared and administered by the examination committee before completion of the student's third year following full admission to the Ph.D. program. This examination will be based on the student's coursework and on general knowledge in all areas of his/her specialization. All efforts will be made to emphasize the multidisciplinary nature of the student's program in this examination. If the student fails the written portion of the comprehensive examination, he/she may petition the examination committee to allow for a single opportunity to retake it. This second examination must be completed no earlier than 12 weeks and no later than six months from the date of completion of the first examination.

The research proposal and the written comprehensive exam constitute parts of the comprehensive exam. A PhD student may elect to enroll in 3 credit hours of CHEM 5590 (<https://catalog.umkc.edu/search/?P=CHEM%205590>), the grade for which will be CR/NC-only and will be based on the outcome of the comprehensive exam; retroactive enrollment is allowed. A PhD student with chemistry as the primary discipline, who has passed the comprehensive exam can have up to 9 credit hours of CHEM 5590 (<https://catalog.umkc.edu/search/?P=CHEM%205590>)/CHEM 5599 (<https://catalog.umkc.edu/search/?P=CHEM%205599>)/CHEM 5699 (<https://catalog.umkc.edu/search/?P=CHEM%205699>) counted towards a non-thesis MS degree in Chemistry.

Chemistry as a Co-discipline

The comprehensive examination will be determined by the student's primary discipline in cooperation with the co-discipline(s).