

## REQUIREMENTS (EFFECTIVE FOR STUDENTS ENTERING FALL 2020 & ONWARD)

### Description of the Ph.D. Program

#### I. Formal Coursework

Students must satisfactorily complete 72 credits derived from courses and research. 20 credits must be earned in lecture-based courses maintaining a cumulative GPA of 3.0 or greater and a grade of B- or better in each class. To maintain full-time status in the graduate program, students must register for 12 credits each semester until they achieve these 72 credits. Courses outside the department may be acceptable but require approval from the Director of Graduate Studies (DGS). In addition to the 20 credits of lecture-based courses, students are required to complete the following three classes with a grade of B- or better or a grade of passing:

- CHEM-GA 2673 *Professional Development in the Sciences*: fall semester of Year 1
- CHEM-GA 3010 *Graduate Seminar*: fall semester of Year 2
- CHEM-GA 3200 *Original Research Proposal*: fall semester Year 3

#### II. Colloquium Attendance

Departmental colloquia and seminars are held each semester of the academic year. Graduate students are expected to attend these on a regular basis throughout their graduate school career. Students must attend a minimum of ten (10) colloquia/seminars prior to scheduling their Ph.D. qualifying examination by February 15th of their second year (see below). Students not fulfilling this requirement will not be permitted to take the qualifying exam, thereby risking having their candidacy withheld. Students must submit a [colloquium/seminar attendance form](#) for their attendance to be counted. In addition, students must attend a minimum of ten (10) additional colloquia/seminars prior to the first part of the Dissertation Exam (see below). Students who have not attended the requisite number of colloquia will not be permitted to take the Dissertation Exam and, therefore, risk having their dissertation defense delayed.

#### III. Requirements by Year

##### YEAR 1 – FALL SEMESTER

**Orientation:** During orientation week, which is held prior to the beginning of the Fall semester, students receive guidance on course selection and research rotation choices.

**Coursework:** During the Fall Semester, students must register for, attempt, and finish 12 credits worth of academic courses (a W is not acceptable under these guidelines). Exceptions to this rule must be approved by the DGS. Students are also required to take the zero-credit course *Professional Development in the Sciences* (CHEM-GA 2673).

**Research Rotations:** Students are required to perform two 5-week research rotations during the Fall Semester. Rotations are intended to introduce students to ongoing research

projects within the Department. A rotation typically consists of a set of training exercises and/or a small independent project related to the research activities of the selected group(s). Rotation assignments are group dependent and will vary among the research groups. Individual research faculty will provide the student with their expectations for a given rotation cycle.

In preparation for choosing their rotations, students are required to meet with four faculty members during the first two weeks of the semester. Additional faculty meetings can be arranged if helpful for the student. All students should bring the [Research Interest and Rotation Form](#) to these meetings and will have the faculty member sign the form after the meeting has taken place. Students must submit this completed form to the Graduate Program Administrator, indicating their two preferred rotation labs and one alternate lab. The requested rotation labs choices must correspond to faculty members who have signed the form. Students will be notified about rotation assignments soon after this deadline. The rotation schedule is set each year and announced during orientation. The typical timeline is given below:

- Rotation #1 begins the 3<sup>rd</sup> Monday of September
- Rotation #2 begins the 3<sup>rd</sup> or 4<sup>th</sup> Monday of October, following rotation #1

Students are expected to spend at least 10 hours per week on their rotation projects. At the end of the second rotation, students must turn in the [Dissertation Advisor Selection Form](#) by Friday, December 2, 2022. Faculty supervisors will submit a performance evaluation to the DGS for each rotation student. These evaluations become part of the permanent student record. These choices will be reviewed by the Departmental Executive Committee, after which the DGS will inform each student of the Committee's recommendation, typically by the middle of December. The Committee will make every effort to approve the first or second choice of dissertation advisor, but these choices cannot be guaranteed. If a particular research group is full, or if it is deemed that a student is not suited to the research of a particular group, the Committee may not immediately approve a student's first or second choice. Students who are assigned in December should initiate their research activities toward their dissertation projects on or about the first business day in January. In certain circumstances, the Departmental Executive Committee may defer their decision until later in January. In addition, the Committee may request that students carry out a third or potentially fourth rotation during the spring semester, in which case the student would need to submit another choice of faculty advisor to the DGS by the end of the spring semester. Students are encouraged to communicate with the DGS during this time.

## **YEAR 1 – SPRING SEMESTER**

**Coursework:** Students must enroll and complete eight credits worth of class work and enroll for a section of "Research" (CHEM-GA 2931). The Research section replaces a formal academic course, allowing the student to pursue research in greater depth. Research is a credit-bearing academic course and, as such, students will receive a grade for Research from their dissertation advisors based on their research performance during the semester.

## **Year 1 Evaluations:**

- After the end of the spring semester, the Graduate Program Administrator will review all grades of students in academic courses and Research. Students with an overall GPA < 3.0 or any single course with a grade of B- will be notified that this is below the coursework requirement in the PhD program. In these cases, students will be placed on academic probation and warned that failure to achieve the GPA and grade requirements will result in dismissal from the program.
- Students complete an Individual Development Plan (IDP) and discuss the IDP with their PhD advisor in the summer of Year 1. This discussion serves as a way for students to start thinking about skills they need to build for their career and forms the basis for their advisor to complete a required annual assessment. See [this link](#) for details on IDP options and the detailed policy.

## **YEAR 2 – FALL SEMESTER**

**Core Dissertation Committee:** By the third Friday of September in the Fall Semester of Year 2, each student submits to the Department Graduate Office the names of the members of his/her Dissertation Committee, using the [Departmental Dissertation Committee Form](#). At this stage, the Dissertation Committee must include four tenure-track/tenured faculty members (herein denoted the “Core”) from the Department, including the student’s dissertation advisor. The chair of the student’s Dissertation Committee cannot be the student’s dissertation advisor. (Note: The Dissertation Committee for the final defense requires five members; see below.) The Core Dissertation Committee is responsible for evaluating the student’s Ph.D. qualifying examination and monitoring the student’s progress throughout his/her years in the Ph.D. program. Three of the committee members must be full time members of the FAS faculty. One of the four Core Dissertation Committee members must be from outside of the student’s area of specialization as defined by the department (biomedical chemistry and chemical biology, biomolecular and biophysical chemistry, nanoscience and materials, synthetic chemistry, and theory and computation). With the permission of the DGS and the student’s dissertation advisor, a student can select one expert who is not a member of the Department’s tenure-track/tenured faculty to serve as a member of the Core Dissertation Committee. However, before choosing outside members, students should bear in mind that serving on a Dissertation Committee is a substantial commitment and the student should ensure that all their selected Committee members will be able to attend the required examinations, seminars, and periodic meetings, as described below. Students are encouraged to discuss Dissertation Committee choices with their dissertation advisor prior to selection.

**Coursework:** During the Fall Semester of Year 2, students should complete any remaining required academic course work. In addition, students must register for Graduate Seminar, a course designed to give students the opportunity to present a seminar in front of the department and to attend seminars presented by their peers (CHEM-GA 3010). Graduate Seminar should not be confused with the weekly Departmental Colloquia. Students also must register for Research credits sufficient to maintain full-time status. As in Year 1, Research is

regarded as an academic course, and students receive a grade for Research from their dissertation advisor.

## YEAR 2 – SPRING SEMESTER

**Coursework:** During the Spring Semester of Year 2, students should complete remaining required academic courses and Research credits sufficient to maintain full-time status (typically 12 credits). As in Year 1, Research is regarded as an academic course, and students receive a grade for Research from their dissertation advisor.

**Ph.D. Qualifying Examination:** Students must schedule and take their Ph.D. qualifying examination following the spring semester of Year 2. The student arranges the date and time for the examination with the members of their Dissertation Committee by April 1. The exam is recommended to take place between May 23 and June 10 but must be completed by August 20. The Ph.D. qualifying examination consists of both written and oral components, as described below.

- **Written Report:** The written report is submitted to the Exam Committee at least two weeks before the scheduled exam date. The report should consist of: (a) a 250-word abstract understandable to a technically-trained individual outside of the student's field; (b) a 1-page discussion of the background, motivation, and significance of their research project; (c) a 5-page description of specific research accomplishments; (d) a two-page description of future research plans; and (e) an appendix containing experimental or computational details (all sections single spaced, 12-point font). This report should be submitted in a format that stringently corresponds to that of a high-impact journal in the student's area of specialization, which may include, but is not limited to, the Journal of the American Chemical Society, Physical Review, or Proceedings of the National Academy of Sciences. Formatting includes font sizes, margins and figures, among others. If available for a given journal, the use of a template is encouraged. In contrast to most journal requirements, 'single space' must be used for the written report.
- **Oral Presentation:** The oral portion of the exam consists of a 30-minute presentation by the student to the Core Dissertation Committee. Faculty may ask questions throughout the presentation, leading to a total session length of up to two hours. The oral presentation should include the background, motivation and significance of the research project, specific methods and techniques used, results obtained to date, and future research plans. The Committee asks questions to the student about the research, concepts related to courses completed by the student, and general fundamental concepts that every chemistry student at this stage is expected to have mastered.

The written and oral portions of the exam are evaluated on the following criteria:

- Research progress
- Organization

- Depth of technical knowledge about the research project
- Breadth of knowledge in the general research field
- Understanding of the methodology/techniques employed
- Understanding of specific results obtained during the research project
- Ability to communicate effectively
- Ability to understand and answer questions accurately

Examinations are awarded one of the following grades:

- Pass with Distinction
- Pass
- Conditional Pass
- Conditional Fail
- Fail

To be granted Ph.D. candidacy status, students must earn at least a “Pass,” which will be awarded only if all the above criteria are met at a satisfactory level. “Pass with Distinction” is reserved for students who perform exceptionally well in all the above categories. Failure to satisfy some of the above criteria will result in a “Conditional Pass,” which requires that some part(s) of the exam, to be determined by the Core Dissertation Committee, be repeated prior to August 20th of that year. In certain marginal cases, a student might be given a grade of “Pass” but be asked to submit certain materials, within four weeks, to the Core Dissertation Committee for reevaluation and final approval of a passing grade, without requiring another examination. Failure to satisfy a majority or all the above criteria will result either in a “Conditional Fail” or “Fail.” A grade of “Conditional Fail” requires that the exam be repeated in its entirety between July 1st and August 20th of that year. A grade of “Fail” will result in the student’s dismissal from the program by the end of the summer of that year (August 31st).

After taking the exam, the student must submit the completed [Qualifying Exam Completion Form](#) to the Graduate Program Administrator.

### **Year 2 Evaluation:**

- The end of year evaluation is satisfied through the PhD Qualifying Exam, as described above.

## **YEAR 3 – FALL AND SPRING SEMESTERS**

**Research/Coursework:** During Year 3, students should focus on dissertation research and prepare for the Original Research Proposal Exam (ORP) (see below). To prepare for the ORP Exam, students are required to complete the 1-credit Original Research Proposal course (CHEM-GA 3200). MacCracken supported students are eligible for a tuition scholarship only for the courses needed to meet the 72 points toward the degree requirements. The tuition scholarship is reduced by the number of advanced credits accepted by the department. Any

student wishing to take additional courses must obtain the approval of their dissertation advisor before enrolling in or choosing to audit additional courses.

**Original Research Proposal (ORP) Exam:** The ORP exam provides an opportunity for the student to demonstrate proficiency in the design, planning, and communication of an original research problem. Students are asked to propose a series of experiments to a specific problem or system or the application of an existing technique to a specific problem or application. The proposal must be original, meaning that there should be no overlap with the student's dissertation topic and the proposed technique and/or application should not have appeared in the scientific literature. The ORP consists of written and oral components.

- **Written component:** The written part of the exam, which must be submitted to the ORP Committee members at least two weeks prior to the scheduled exam date, typically at the beginning of the January term each year, consists of a five-page, single-spaced document following NSF Guidelines (From the [NSF Grant Proposal Guide](#): (a) Use one of the following typefaces identified below: Arial, Courier New, or Palatino Linotype at a font size of 10 points or larger; Times New Roman at a font size of 11 points or larger; (b) No more than 6 lines of text within a vertical space of 1 inch; and (c) Margins, in all directions, must be at least an inch.). The student must submit only the basic proposal following the NSF guidelines; all other forms and requirements described in the NSF grant proposal guidelines (such as biosketches, budget pages, equipment, etc.) should be neglected. In the written proposal, students should (a) identify a research topic in chemistry not related to their dissertation research, (b) explain its importance and broader context, (c) describe a project that falls within the scope of the topic, (d) describe how the project would be performed and how its feasibility would be demonstrated, and (e) describe the overall aims of the project and the results anticipated upon its completion. Experimental proposals should include details of the experiments needed for project completion whereas theoretical proposals should describe specific calculations as well as methodological and theoretical developments.
- **Oral component:** The oral portion of the exam will take place at the end of January term or beginning of the Spring semester. The exam consists of a 15-minute, uninterrupted presentation by the student to the ORP Committee followed by a question-and-answer session lasting up to 15 additional minutes. The total meeting should last about half an hour. The oral presentation by the student should summarize the written proposal.
- **Exam scheduling and completion form:** The oral portion of the exam will be scheduled by the graduate program administrator. The examination is required to be completed in January or February of the student's third year in residence. After taking the exam, the student should submit the [Original Research Proposal Exam Form](#) to the Graduate Program Administrator.

**Year 3 Evaluation:**

- The end of year evaluation is satisfied through the ORP Exam, as described above.

## **YEAR 4 – FALL AND SPRING SEMESTERS**

**Research:** During Year 4, students should focus on dissertation research.

**Departmental Seminar:** Students are required to present a department-wide seminar as part of the Work-in-Progress series during the spring semester of their 4<sup>th</sup> year. Each student's individual talk will be 20 minutes, followed by 5-10 minutes of questions-and-answers. This requirement can also be accomplished at a departmental retreat, if available.

### **Year 4 Evaluation:**

- Students complete an Individual Development Plan (IDP), as in Year 1, and discuss the IDP with their PhD advisor in the summer of Year 4. This discussion serves as a way for students consider additional skills they need to build for their career and forms the basis for their advisor to complete a required annual assessment. See [this link](#) for details on IDP options and the detailed policy.

## **YEAR 5 AND BEYOND – FALL AND SPRING SEMESTERS**

**Dissertation Defense Committee:** Prior to taking the Dissertation Defense Exam, students must choose an [additional reader](#) to serve on their final Dissertation Committee. With the permission of the DGS and the student's dissertation advisor, a student can select one expert who is not a member of the Department's tenure-track/tenured faculty to serve as a member of the Core Dissertation Committee. The student is responsible for informing the Department Graduate Office of the choice using the 'Dissertation Committee Reader Selection Form.'

**Submission of the Dissertation:** At least four (4) weeks prior to the Dissertation Defense Exam (Part 1), the student must submit a complete draft of their dissertation to their Dissertation Defense Committee. The Committee will recommend changes to the dissertation during the Dissertation Defense Exam (Part 1). The student must address these changes in their revised dissertation.

**Dissertation Defense Exam, Part 1:** This exam consists of evaluation of the dissertation and an oral presentation before the student's dissertation committee members. Students must submit the written dissertation at least four (4) weeks before the dissertation defense date. The dissertation defense consists of an oral presentation by the student, approximately 45-50 minutes in length before the dissertation committee. The dissertation committee discusses the student's performance in a closed-door session. If any concerns remain, the student might be called back for additional discussions with the dissertation committee. The exam is judged on a "Pass" or "Fail" basis. If the student fails the exam, the student can retake the exam in consultation of the recommendation of the student's Dissertation Defense Committee.

**Dissertation Defense Exam, Part 2:** After successful completion of Part 1 of the Dissertation Defense Exam, the student will present a lecture of their work, approximately 45-50 minutes in length, which is open to the public. The student's Dissertation Defense Committee is not required to attend the public lecture. The advisor of the student must confirm that the student has completed the Dissertation Defense Exam, Part 2, by attesting on the [Dissertation Defense Part 2 Submission Form](#).

**Year 5 Evaluation:**

- If a student has not graduated by the end of Year 5, they are required to meet with their Dissertation Committee at the end of Years 5, 6, 7, 8, etc. until graduation. The meeting format is: (a) uninterrupted seminar (20 min), (b) questions from committee (10 min), (c) discussion of thesis timeline (5 min), and (d) discussion of individual development plan (10 min). The meeting should last no longer than one hour.

**IV. Miscellaneous**

**Submission of Forms:** Students are responsible for the submission of all required forms at the above outlined deadlines to the graduate office of the chemistry department. The link to all forms is below:

- [Graduate Student Forms](#)

**Cheating and Scientific Fraud:** It is expected that all students will maintain the highest standards of scientific integrity. Cheating and fraud, including any form of plagiarism, copying, collusion on exams, or data falsification, will not be tolerated at any point in your graduate career. Students found guilty of any infractions can expect to be placed on departmental probation at the very least and/or dismissed from the program.

**Departmental Citizenship:** The department functions only as well as its individual members. Students are expected to behave as good departmental citizens. This means showing up on time for meetings, attending as many Friday colloquia as possible (even those outside your field of study – you might just learn something!), and being on time for exams.

**Petitions:** In selected cases of hardship (medical etc.), a student can petition the graduate committee to delay an exam or waive a deadline. These petitions must be approved prior to the deadline of the exam/deadline in question. Petitions should be submitted in writing to the Director of Graduate Studies.