**Graduate Degree Assessment Plans**

Department of Chemistry and Biochemistry

December 2018

**Ph.D. Program**

**General**. The Chemistry and Biochemistry Department has three internal divisions (Biochemistry; Organic/Inorganic/Materials Chemistry; and Physical Chemistry), each with different requirements and assessments. The specific divisional requirements, assessments, and the purposes of the assessments are detailed below by division. These requirements and assessments apply to all Ph.D. students entering Fall 2017 and beyond.

## Biochemistry Division. *Cumulative exams* are intended to expose students to topics outside their own area of research and to assess literature comprehension skills. Students in the Biochemistry division must complete four exams, typically each term of their first academic year and the Fall term of their second year. The usual format is a series of questions based on readings from the current literature, provided one week before the exam.

The *Advancement to Candidacy* exam in Biochemistry requires success on two benchmarks.

1. Qualifying examination. Students must pass an advancement to candidacy examination, typically taken in the Winter term of a student’s second year. The usual format requires formulating the student’s thesis project into a hypothesis-driven proposal and includes both a written and an oral component.

2. Satisfactory research progress. The student’s thesis committee will evaluate research progress during a fourth term review receiving input from both the advisor and the student. Additional thesis committee meetings can be called if the thesis committee or advisor deems it necessary.

*Course requirements.* Students must com­plete at least three graded graduate courses (3 or 4 credits each) in Biochemistry or a related field. A student’s advising committee may recommend or require specific courses to be included. A student’s grades in coursework are reviewed as part of the requirement to be making satisfactory progress.

## Organic/Inorganic/Materials Division. *Cumulative exams* are intended to expose students to topics outside their own area of research and to assess literature comprehension skills. Students in the Organic/Inorganic division must complete five exams with a grade of B or better, typically each term of their first academic year and the Fall and Winter terms of their second year. The usual format is a series of questions based on readings from the current literature provided one week before the exam.

*Advancement to Candidacy.* Organic/Inorganic students typically undergo this examination during the sixth regular term of their graduate career (excluding summers).

The purpose of the Advancement to Candidacy exam is to assess the student’s general understanding of Chemistry and the scientific method and the student’s ability to successfully carry out research at the doctoral level. These criteria are evaluated in the context of the student’s presentation of one original research proposal and a research report/proposal. The original research proposal demonstrates the student’s ability to propose research ideas outside of his/her immediate thesis area and to defend those ideas. The research report/proposal allows an evaluation of the student’s research to date, the student’s ability to place his/her research in the context of the field and the student’s understanding of the future direction of the research that will ultimately constitute the basis of his/her thesis.

To advance to candidacy in the Organic/Inorganic division, a student must:

1. Have passed five Cumulative exams with B or better grade,

2. Have taken six graded graduate courses with at least a 3.0 GPA,

3. Prepare an original research proposal and a research report (details below), and

4. Orally defend the original research proposal and research report in an Advancement to Candidacy Exam.

The *original research proposal* is a written document that describes: (1) an interesting original research problem, and (2) how the student proposes to inves­tigate the problem. The purpose is to demonstrate ability to select significant research questions and to suggest reasonable scientific approaches for solving the problems. At least four weeks in advance of the exam date, a student should submit a written abstract of the proposed topic to his or her committee chair. While it is not appropriate to discuss the proposal in any detail with faculty, students are encouraged to talk to other students to get their opinions of the proposed ideas. Likewise, students are encouraged to have other students read and critique the proposals.

The *research report/proposal* summarizes in detail a student’s research accomplishments while working in the mentor’s research group, and future direc­tions and possible extensions of this research area. The purpose is to assess both the student’s depth of knowledge in the field and research progress. Because students are expected to have worked closely with their advisor on the research, students are encouraged to discuss the content of the research report/proposal with their mentor and other faculty. Manuscripts submitted or in preparation can be submitted in lieu of a for­mal research report if authorized in advance by the committee. A brief document (2-3 pages) outlining future directions should be included with the manuscript.

The *Advancement to Candidacy oral defense* will test the student’s ability to think on one’s feet when confronted with probing questions and to demonstrate specific, as well as general, chemical knowledge. In both the written and oral presentations, the student should stress the question(s) to be examined and indicate clearly how a successful completion of the proposed research would answer the questions posed. Students are advised to prepare a 15-20 minute talk on each proposal (i.e. the original research proposal and the research report/proposal). Numerous questions from the committee will lengthen the presentation beyond the twenty minutes prepared time. Generally, two hours are required for a discussion of both proposals.

*Course Requirements.* The programs of first‑year students will be worked out in consultation with faculty members at the time of entering the graduate program. The student, following discussions of degree and research objectives with the research supervisor, should select subsequent coursework. A student’s advising committee may recommend or require specific courses to be included. Students must complete at least six (6) graded graduate courses (3 or 4 credits each) at the 500 or 600 level. At least four courses must be in Chemistry; two may be in an obviously related field. *Reading and Independent Study Courses* may qualify as one or more of the required six courses with approval by the student’s committee, and if the courses are taken for a grade at a load of at least 4 credits. Graduate students must maintain a cumulative grade point average of 3.00 in all graduate courses taken during the degree program.

## Physical Chemistry Division. Students seeking to advance to candidacy under Physical Chemistry ground rules must have taken at least three Physical Chemistry graduate courses.

*Cumulative exams* are intended to expose students to topics outside their own area of research and to assess literature comprehension skills.Students in the Physical Chemistry division must complete four exams, typically each term of their first academic year and the Fall term of their second year, with a grade of B or higher to count towards the total of four exams.

*Advancement to candidacy* in the Physical Chemistry division has three components.

1. Cumulative Exams: pass four exams with a grade of B or higher.
2. Satisfactory research progress:  The student’s thesis committee will evaluate research progress during a fourth term review, receiving input from both the advisor and the student. Additional thesis committee meetings can be called if the thesis committee or advisor deems it necessary.
3. Advancement to Candidacy Examination: The exam is typically taken in Winter term of a student’s second year and not later than Spring term. The purpose is to assess the student’s general understanding of Physical Chemistry and the student’s ability to successfully carry out research at the doctoral level. These criteria are evaluated in the context of the student’s presentation of a research proposal. The proposal and the examination should demonstrate that the student has a sufficient understanding of the relevance of her or his research project in the larger context of the related current research. The student needs to have a vision of the novel scientific directions in which the project could develop in the course of the thesis, as well as of the possible long-term scientific implications of the research performed. A short written proposal will be due one week before the examination.

*Research presentation*.In the third year the student is required to present a short talk on her or his research as a divisional or departmental seminar or as a (contributed) talk at a national or regional conference.

*Course Requirements*. The programs of first‑year students will be worked out in consultation with faculty members at the time of entering the graduate program. The subsequent program of coursework should be selected by the student following discussions of degree and research objectives with the research supervisor. A student’s advising committee may recommend or require specific courses to be included. Students must complete at least six (6) graded graduate courses (3 or 4 credits each) at the 500 or 600 level. At least four courses must be in Chemistry; two may be in an obviously related field. *Reading and independent study courses* may qualify as one or more of the required six courses with approval by the student’s committee, and if the courses are taken for a grade at a load of at least 4 credits. Graduate students must maintain a cumulative grade point average of 3.00 in all graduate courses taken during the degree program.

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# Other Assessments

## *Journal Clubs and Seminars*

### Biochemistry Division

1. All Biochemistry graduate students are expected to sign up for, attend, and participate in the Institute of Molecular Biology (IMB) Student Research Seminar Series. Beginning in the third year, students will be asked to present a seminar on their ongoing thesis research once a year. This provides an opportunity to present and defend research results to a general audience.

2. To improve general seminar and lecture presentation skills, all Biochemistry graduate students are expected to sign up for, attend, and partici­pate in the IMB Journal Club Series. Beginning in their second year, graduate students will be called upon to present a journal club seminar in this series once a year.

### Organic/Inorganic/Materials Division

1. Students in the O/I Division are required to give two formal seminars for the Ph.D. degree. A literature seminar is given in the Fall term of the second year. A seminar on the student’s thesis research is given in the Spring term of the third year. All first‑year students are expected to register for CH 623, the course for students giving a seminar. As part of this course, a series of “how to give a seminar” lectures will be given in the Fall term each year.

### Physical Chemistry Division

1. Enrollment in the physical chemistry journal club is required for all physical chemistry students in their first two years, but is optional for more advanced students. First year students will give 10-15 minute talks to faculty and graduate students in the division at the end of each term-long research rotation.

## *Teaching*

## Candidates for an advanced degree are required to participate in the under­graduate teaching program in Chemistry for a period of three terms sometime during their graduate career. This typically occurs during the first year of study. Non‑English‑speaking students are required to take the SPEAK test and to score 50 or higher before they may teach.

## *Research*

## The Ph.D. program prepares a candidate for independent scientific research. Such preparation requires active experience with the research process.

### 1. Rotations. All graduate students are required to rotate through three different laboratories during the Fall, Winter, and Spring terms of their first year. Research rotations give students an opportunity to work in three different environments that both broadens the educational experience and provides a strong basis for the selection of a thesis advisor. Students are expected to discuss possible rotations with faculty before the beginning of each term. At the end of each rotation period, students will present a 10-15 minute talk on the results of their research project to faculty and students.

### 2. Doctoral Research. The ultimate, and by far the most important, requirement for the Ph.D. degree is for a student to pursue a research problem to a point culminating in a written thesis that makes a significant and original contribution to the understanding of some aspect of Chemistry. The student will submit the written thesis to the advisory committee for review. The candidate must then defend the thesis before the committee and be prepared to answer questions about the thesis and related subjects.

7-year limit. Graduate School regulations stipulate that the residency requirement, advancement to candidacy, and the doctoral dissertation must be completed within a seven‑year period from the initial date of enrolling, unless an “on‑leave” status has been approved.

## Additional Reviews of Progress

### *Prior to Joining a Research Group*

### A student’s progress in the first year will be assessed by quarterly rotation reports, which are submitted by the student’s rotation supervisor; course grades; cumulative exams; and teaching evaluations. These are reviewed by the Depart­ment Head. Should a minor problem arise, the Department Head will meet with the student to assess the situation and offer advice. For more substantial issues, the Department Head will assemble a review committee of faculty to consult/ advise the student and to make appropriate recommendations to the Department Head.

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### *Fourth‑Term Review*

### During the fourth term of residence (usually the Fall term of the second year), graduate students are required to meet with their assigned thesis advisory committees. The purpose is to assess the student’s early progress toward the Ph.D. degree. The fourth-term review has three parts:

1. To review course requirements and progress

2. To review initial cumulative exam results

3. To review and discuss the student’s ideas and progress towards a thesis

This review is not a pass/fail situation, but should be viewed as an opportunity to get better acquainted with your thesis committee and to discuss your research ideas and goals with them.

*A. Report*. Students must write a 3‑5 page report summarizing ideas and plans for the thesis. Included in this report should be specific plans for what the student will do first (and why), what the student will do second (and why), etc. This report should be presented to the committee one week before the scheduled review.

*B. Talk.* Students prepare a ten-minute talk describing the proposed work. This talk is the framework for the discussion at the review.

Immediately following the review, students will be given an oral evaluation of their performance to date. In addition, a brief report summarizing the meeting and the committee’s assessment of the student’s progress will be forwarded for placement in the student’s file. A copy of the report will be sent to the student.

### *Annual Review of Academic Progress*

### Each year following advancement to candidacy, students are required to meet with their thesis advisory committee during Winter term. For third year students, the annual review can coincide with the Spring term 3rd-year research presen­tation. The Department will notify students when it is time to schedule the review. Students should contact all members of their committee and try to accommodate their schedules in arranging a meeting.

*A. Report.* Students are expected to write a brief report, usually 3−5 pages, summarizing research progress and plans for the coming year. Students are also encouraged to list other academic activities since the last Annual Review, such as courses taken for a grade, seminars presented and scientific meetings attended, at the beginning of the report.

*B. Talk.* Students should be prepared to give a short talk (10 minutes) on their work, including a brief introduction, suitable for com­mittee members who are not specialists in the immediate area of research. Immediately following the review, students are given an oral evaluation of their progress.

# Master’s Degree Program

## Course Requirements. Students must complete at least six (6) graded graduate courses (3 or 4 credits each) at the 500 or 600 level. Graduate students must maintain a cumulative grade point average of 3.00 in all graduate courses taken during the degree program.

## Master’s Thesis. Master’s degree candidates are strongly advised to undertake a research problem and write a thesis. The specifications for this thesis should represent a research effort on a problem of significance. The thesis is prepared for review by a faculty committee and is presented orally as a seminar topic.