

CHEMISTRY DEPARTMENT

Ph.D. Guidelines & Requirements

INTRODUCTION

The Department of Chemistry accepts applications for its graduate program leading to the degree of Doctor of Philosophy in chemistry. Research specialties comprise both traditional and interdisciplinary areas, which include, but are not limited to, catalysis, synthesis, materials science, chemical biology, environmental chemistry and nanotechnology. A Master of Science in Teaching (M.S.T.) is offered in cooperation with and administered by the Lynch School of Education.

GENERAL REQUIREMENTS

GPA

Every student is expected to attain a grade point average of at least 3.0 at the end of his or her second semester in the Graduate School and to maintain it thereafter. If this standard is not met, the student may be required to withdraw from the graduate program.

Coursework

All entering graduate students are required to take the core graduate courses that are designed to provide a reasonable and broad level of proficiency in the various chemistry disciplines, in addition to a student's chosen focus of research. There is no total credit requirement for the Ph.D. degree.

Cumulative Exams

Each Ph.D. candidate must pass eight cumulative exams (or six cumulative exams and submit an original research proposal) in his/her area of study. Cumulative exams are given to encourage students to engage in independent study on selected topics considered important in the individual fields of chemistry. These exams are given in each area of specialization, and while in some cases there will be overlap between areas, students should take the cumulative exam in their area of study.

Oral Exams

At the end of the second year, Ph.D. candidates must pass the Ph.D. Comprehensive Examination that covers fundamental concepts in chemistry as well as advanced areas of chemistry critical to his/her research project. The exam consists of an oral presentation summarizing the student's research over the first two years, the research the student is currently conducting, and where the research project is headed. Members of the student's thesis committee comprise the exam committee. Students who do not pass the exam will no longer be considered eligible for the Ph.D. program in chemistry.

Original Research Proposal

Students may choose to submit an original research proposal usually no earlier than the end of their third year of study. The proposal, six pages maximum, will be presented to the student's orals committee at least one week prior to the verbal presentation of

the proposal. Students who satisfy these guidelines will reduce the number of cumulative exams they must pass to six.

Research

The Ph.D. degree requires a thesis based upon original research, either experimental or theoretical. Research projects typically require at least three to four years of sustained effort and will begin during the first year of study. An oral defense of the dissertation, before a faculty thesis committee, and a public presentation of the dissertation complete the degree requirements.

Teaching

Some teaching or equivalent educational experience is required. This requirement may be satisfied by a minimum of one year of service as a teaching assistant or by suitable teaching duties. Arrangements are made with each student for a teaching program best suited to his/her overall program of studies. Waivers of teaching requirements may be granted under special circumstances with the approval of the Graduate Program Director.

Evaluation

A student's teaching/research performance will be monitored and evaluated in the following manner: by the student's advisor and the Graduate Studies Committee prior to completing oral exams and by their oral/thesis committee and the Graduate Studies Committee thereafter.

The following sections lay out the normal timelines for progress through the Chemistry Ph.D. and M.S. degree programs.

For the policies applicable to the Boston College Graduate School of Arts and Sciences as a whole, see <http://www.bc.edu/schools/gsas/policies.html>

Ph.D. Program - YEAR 1

Financial Support for Students

Most first-year students will begin their Ph.D. program as full-time teaching assistants (TAs) and will be involved in all aspects of teaching, grading and administering undergraduate laboratories and/or recitation sections for introductory lecture courses. Some students may be supported by fellowships. TA stipends provide support for the ten-month period from September 1 through June 30. Summer support usually comes from the faculty in the form of a research assistant stipend. A few full time summer TA positions are available. However, full time summer TA positions require daily laboratory teaching and are not an effective mechanism for support of students wishing to make progress in the research component of their degree program.

Core Curriculum

All Ph.D. candidates are required to demonstrate proficiency in organic, inorganic, physical chemistry and chemical biology by completing the core curriculum. Ph.D. students who have not demonstrated proficiency in all four areas by the end of their fourth semester are expected to take their second year oral exam at the normal time. However, they cannot advance to doctoral candidacy until the proficiency requirement is complete.

All graduate students are required to take and pass a minimum of four graduate level regular classroom courses in the department (courses numbered 500 or above) with an overall grade point average of B or better. In addition, each graduate student must complete two courses that are more advanced than the core courses listed below.

The recommended graduate student curriculum for first year students is as follows:

Fall Semester

CHEM 556001 Principles of Chemical Biology

CHEM 553701 Mechanistic Organic Chemistry

CHEM 667601 Physical Chemistry: Principles and Applications

Students who have an interest in organic chemistry will also take:

CHEM 553101 Modern Methods of Organic Synthesis I

Spring Semester

1 or 2 advanced course(s) in the student's area of interest

Advanced courses will be determined in collaboration with the student's faculty advisor and be consistent with the focus of their research. It should be noted that in selecting courses, demonstration of proficiency in Inorganic Chemistry is a requirement. Any additional course work, outside of the required credits, must be approved by the

Director of the Graduate Program Director (GPD).

Graduate level courses taken in other departments (physics, biology, etc.) or at other institutions can be counted as advanced electives only with approval of the GPD, in consultation with the student's research advisor. By the end of the first year, a student should have demonstrated proficiency in the core curriculum.

Cumulative Exams

Students must start taking these exams in the beginning of the second year of the program; however, they are encouraged to begin to take these exams in the first year. (See Year 2, Cumulative Exams).

Joining a Research Group

During the fall semester, all first year students, including those who have already undertaken some preliminary research during the summer, will begin the research advisor selection process. An exploration period follows orientation week, during which students are required to meet with all research faculty either in small groups or one-on-one. Many labs will offer an "open house" event where new students are invited to attend a group meeting. No one is permitted to join a research group during this initial exploration period. After the exploration period, the student will submit their top three choices for the selection of faculty advisors to the Associate Director of Administration and Graduate Student Services. A matching of students with advisors will then take place. An effort will be made to accommodate the students' choices, but sometimes that is not possible. In such cases the department will work with the student to explore options and to find a solution that works for all concerned.

While there is no mandated deadline by which time graduate students in Chemistry must have joined a research group, it is nevertheless important that doctoral students reach a mutual agreement with a research advisor about joining a group by the end of their second semester in the program. The reason for this is two-fold. First, as outlined in the program description, in order to qualify for available financial support beyond the first year, a doctoral student must be an active member of a research team. Second, because the primary component of graduate study in Chemistry is the research project, in almost all circumstances academic progress towards a degree cannot be made without participation in such a group.

Research

The research project is the primary component of graduate study in chemistry. While a first year student may take courses during the second semester of the first year of study, it is also a time to begin preliminary experiments in the laboratory. A research project usually begins with a significant amount of library research, and this work should be pursued during the first and second semesters, even for students with full-time teaching and course loads. All students should become familiar with the research laboratory in which they will work so that when classes terminate in May, full-time experimental work can begin in an efficient manner.

Ph.D. Program - YEAR 2

As the second academic year begins, it is important for the graduate student to maintain acceptable progress in the research/experimental component of the graduate program. This work is by far the most time intensive, but it is also the most important factor in determining the timetable for completion of the Ph.D. degree. With the beginning of the second year, course work and/or commitments to undergraduate teaching will compete with a student's time to work in the laboratory. *Time management* at this point in the program is *essential* for successful progress toward the Ph.D. degree.

Financial Support for Students

Most second year students are half-time and, in some cases, full-time TAs. Teaching is an important activity of the department, but students working as teaching assistants must budget their time effectively so that they can still maintain adequate progress in their experimental work.

Research Assistantships (RAs) are stipends offered to successful graduate students and allows them to work in the lab full-time to focus on their research projects. Funds for RAs come from externally awarded grants to individual faculty members. These funds, which come from the federal government or other, sometimes private, sources, are difficult to obtain and are typically awarded for a short period of time (*ca.* three years). The renewal of three to five year grant awards is largely dependent on the success of the work accomplished during the initial award period. Therefore, a research advisor usually offers such positions to those students likely to have a strong commitment to their work and who can contribute to the successful awarding of additional funds.

Because of the competitive nature of external funding, students who receive an RA should not assume that they will automatically receive such support for the entire time of their study. Thus, students supported as RAs should make the most of their time in order to finish their degree program as rapidly as possible, while contributing to the overall success of the research group by providing the results necessary to continue externally supported research projects.

RA/TA split positions are especially common for second-year students. In this appointment, the student is a half-time RA and a half-time TA. A half-time TA usually involves the teaching of one laboratory period each week (full-time involves two laboratories) or two discussion sections. If a second-year student budgets time well, most of the TA-related work can be done in an effective and efficient manner on the evening before and the day of the laboratory or discussion sections. With this approach, the student can still devote a majority of their time during the week plus weekends to the Ph.D. project and make sufficient progress.

Courses

Students who have not completed their course requirements by the end of their first year should take the remaining courses in the third or fourth semester, depending on course scheduling.

Cumulative Exams

Each Ph.D. candidate must pass six or eight cumulative exams in his/her area from 20 possible. A grade of "half pass" can be awarded by the examiner for exam performances that are considered close to passing. Two half pass grades will count as the equivalent of one full passing grade, but no more than four half passes can be counted toward satisfaction of the cumulative exam requirement.

Students must accumulate at least four passes in their primary field of research. The advisor and the student can decide that any particular cume in another discipline is relevant for the students' education. A maximum of four such cumes may be passed without department approval.

These exams are offered monthly, usually the last Wednesday evening of the month during the academic year, and cover topics announced in advance. It is advisable for first year students to take these exams. During the first year any passing grades will count towards the eight needed; any failures will not be counted in the student's record. Students are expected to pass a minimum of three cumulative exams by the end of their second year in the program in order to maintain satisfactory performance toward fulfillment of the cumulative exam requirement.

Second Year Oral Exam (Doctoral Comprehensive Exam)

Each Ph.D. candidate must take an oral exam that covers fundamental concepts in chemistry as well as advanced areas of chemistry critical to his/her research project. This exam is usually taken during May, June or July of the second year. In preparation for this exam, a student should meet with his/her research advisor before the end of his/her third semester in the program and organize a group of topics and a reading list to make sure the student knows what material must be mastered for this exam. Questions will be asked relating to this chemistry and ultimately will cover topics the examiners believe the student should know about, including but not limited to, topics from recent seminars, cumulative exams, and coursework. In addition, the students should become familiar with the discipline specific requirements for the oral exams, as noted by their research advisor. A core thesis committee is also established at this time, although these members may change by the time of the actual Ph.D. defense.

At the oral exam, the committee also judges the candidate's research and academic progress. A 3.0 GPA and three passed cumulative exams are typically minimum requirements. After passing this exam, the student is recommended as a candidate for the Ph.D. degree. Students who have not mastered the necessary material at this time and/or have not made significant progress in the research component of their program may be asked to do one of the following; repeat the oral exam (for a final time), complete the requirements for an M.S. degree or withdraw from the program.

Ph.D. Program - YEAR 3 and BEYOND

Financial Support for Students

It is typical that as a student becomes more adept and more successful in the laboratory, he/she will be supported as a full-time RA. By the third year, the student's financial support is normally the responsibility of the faculty advisor.

Ph.D. candidates who have completed their dissertation defense, but have not submitted a signed final copy of it to the Department and the Graduate School of Arts & Sciences must register for Doctoral Continuation (1 credit- CH99901) for each academic term prior to graduating. **If the student does not complete their dissertation during the semester following the defense, payment of this credit may be the student's responsibility during any additional terms.**

Cumulative Exams

Cumulative exams may continue into the third year or until eight are passed or the 20 possible exams have been taken.

Original Research Proposal

Students may choose to complete an original research proposal, which if successfully completed, will be counted as two passed cumulative exams. These proposals are typically completed in the student's third program year or beyond. Written proposals are submitted to the student's thesis committee as well as presented to them orally. Original research proposals should not exceed six pages and contain a statement of the research objective, significance of the problem, ideas for developing a research plan, a summary and references.

Yearly Research Progress Reports

Annual written research progress reports are due in the spring of each year. All students who have passed their Ph.D. oral comprehensive exam more than six months prior to the due date are required to submit reports, unless they are scheduled to defend their dissertation before the end of the current academic term. These reports are limited in length to three pages and require that students learn to write effectively and concisely. Students are required to submit three complete hard copies of the report plus an electronic copy of the report in .pdf format. The three hard copies will be distributed as follows: (1) to the advisor, (2) to the student's file in the department office, and (3) to a member of the student's oral exam committee (not the advisor) who will also serve on the student's Ph.D. defense committee and is designated as the primary reader. The primary reader will receive all subsequent annual progress reports from that student and will meet with the student after receiving the report to discuss the student's progress toward the Ph.D. degree. If the reader and advisor have serious concerns regarding the student's progress towards achieving a Ph.D., a faculty committee may be convened for further evaluation and consideration of the student's academic status.

DISSERTATION DEFENSE

The preparation and defense of a thesis is the last step in obtaining a Ph.D. degree. The defense consists of two parts: a public defense (a formal seminar open to the entire community) and a private defense open to members of the thesis committee.

In the private defense, the student typically gives a short summation of his/her work and is then required to answer questions about the work and defend the conclusions reached.

The public defense can be scheduled during the last semester of work, before the private defense. Alternatively, it can be scheduled to occur shortly after the private defense has been completed and the thesis submitted.

With the completion of both defenses, and the submission of the approved thesis to the graduate school, the Ph.D. degree will be granted at the next graduation date provided the Graduate School of Arts and Sciences deadlines are met.

Thesis Committee

The thesis committee will be constituted as follows:

- a) The Ph.D. thesis examination committee shall consist of at least five Ph.D. panelists, of whom at least three must be tenure track members of the Boston College chemistry faculty. All five members of the committee are expected to read and vote on the acceptability of the thesis.
- b) At least four of the thesis readers shall be present and participate in the oral defense of the thesis. At least three of those involved in the oral defense must be tenure track members of the Boston College chemistry faculty.
- c) At least three members of the thesis examining committee who are tenure track members of the Boston College chemistry faculty must approve the thesis in order for it to be acceptable to the graduate school.
- d) In the event of extenuating circumstances, the chemistry department chairperson has the authority to grant exceptions to policy points (a) and/or (b) above, but point (c) is a university regulation and not subject to variance.

Dissertation Submission

The formatted dissertation and the signed Signature Page should be submitted by December 1 in Fall, by August 1 in Summer, and by the date posted on the Academic Calendar <http://www.bc.edu/offices/stserv/academic/current/calendar/> in Spring.

In order to graduate, your graduation date must match your graduation date listed in Agora. If not, you must contact the Dean's Office at 617-552-3268 or gsasinfo@bc.edu to have this corrected.

Refer to the Graduate School of Arts & Sciences dissertation checklist (<http://www.bc.edu/schools/gsas/academics/disser-guid/disser-cklist.html>) for submission and format guidelines.

MASTERS OF SCIENCE DEGREE

In those cases where a student is completing an M.S. degree, a minimum of 18 graduate credits must be completed to fulfill university requirements. Providing that a student has taken the recommended core curriculum in the first year, a minimum of twelve credits should have been amassed by the end of the first year. By the end of the second year, at the time of the oral exam, a student should have completed the core curriculum and taken at least one advance course. The last remaining credits can be obtained during the summer and fall semester of the third year. Often the M.S. lab work can be finished during the summer or during the first portion of the fall semester of the third year, and the thesis can be written and defended by the end of the fall semester. Students who have not amassed the necessary credits after two years of study, and who are working toward a master's degree, may have difficulty in obtaining the necessary credits during the fall semester and may not complete their degree requirements until the spring semester of the third year. Master's degree candidates are not guaranteed financial support, either TA, RA or tuition remission. Students completing the master's degree should discuss their funding status with their faculty advisor.

The M.S. degree requires a thesis and a private oral defense.

Thesis Guidelines

If you are in a Master's degree program that requires a thesis, you must deposit your completed thesis with the University by the date indicated on the [University Academic Calendar](#) in order to qualify for graduation.

Your graduation date listed in Agora must match the semester you plan to graduate. If not, contact the Dean's Office at 617-552-3268 or gsasinfo@bc.edu to have this corrected.

Follow the [Thesis Checklist](#) to ensure you have completed all requirements.

ACADEMIC INTEGRITY

The chemistry department upholds the Boston College policy on academic integrity (*see* <http://www.bc.edu/content/bc/schools/gsas/policies.html#integrity>). The following are examples of violations of academic integrity:

Plagiarism. (a) Verbatim copying of material without stating sources; (b) blatant paraphrasing in major portions of a paper or other written work (e.g., Dissertation, book) without identifying sources; (c) having someone else write the work (either on a paid or unpaid basis).

Cheating on examinations. (a) use of any source (e.g., notebooks, crib notes, etc.) which is prohibited in that particular examination; (b) copying from another person's examination.

Falsifying data. Blatant falsifying of data, such as inventing data or misrepresenting sample size.

Opinions differ among various faculty members regarding the propriety of the same or similar paper (or parts of the same paper) being submitted to more than one course. Graduate students must consult the faculty members involved prior to the submission of such papers.

In the unlikely event that a faculty member accuses a student of a violation of academic integrity, the following review process will take place:

- The individual professor or individual student who is making a formal accusation of cheating will bring the case to the attention of the Graduate School which will have responsibility for adjudicating the case. The Department Chair and Graduate Program Director would also be notified.
- In adjudicating the process, the Graduate School will normally involve the student's principal advisor and other Chemistry Department representatives as appropriate.
- The Graduate School has a grievance procedure available if the student feels s/he has been unfairly treated. *See* <http://www.bc.edu/schools/gsas/policies.html#academic%20grievances>.

HARASSMENT

Students should familiarize themselves with the University Policy on Discriminatory Harassment, both with regard to their roles as student and as teacher. For further information, go to <http://www.bc.edu/offices/diversity/compliance/harassment.html>.

CONFERENCE TRAVEL EXPENSES

The Graduate School of Arts and Sciences provides partial funding for graduate students to travel to **one conference per year** with the authorization of the GSAS Dean. Details and forms are available on line at <http://www.bc.edu/schools/gsas/currentstudents/conference.html>.

LEAVE OF ABSENCE

Doctoral and Master's students in the Graduate School of Arts & Sciences who do not register for course work, Doctoral Continuation or Interim Study in any given semester must request a leave of absence for that semester. Leaves of absence are not usually granted for more than two semesters at a time. Students may obtain the Leave of Absence Form online at <http://www.bc.edu/offices/stserv/forms.html> and submit it for the Associate Dean's approval.

Leave time will normally be considered a portion of the total time limit for the degree unless the contrary is decided upon initially between the student and the Associate Dean.

Students wishing to return from a leave must apply to the Associate Dean's Office at least six weeks prior to the semester in which they expect to re-enroll. Decisions for readmissions will be based on a consideration of the best interests of both the student and the University. Leaves of absence for students on Doctoral Continuation are rarely granted.

TIME LIMIT

All requirements for the Doctoral degree must be completed within eight consecutive years from the beginning of doctoral studies. Extensions beyond this limit may be made only with departmental recommendation and the approval of the Dean.

INTERDISCIPLINARY DOCTORAL PROGRAM

Where departmental doctoral programs are unable to satisfy the interests of the student, an interdisciplinary doctoral program remains a possibility; however, students must first be admitted to a departmental program. A student interested in exploring such a possibility should first make an inquiry to the Graduate School Dean's Office.

ACADEMIC GRIEVANCES

A student who believes he/she has been treated unfairly in academic matters should review the Graduate School of Arts & Sciences Grievance Procedures, <http://www.bc.edu/schools/gsas/policies.html>, prior to consulting with the Associate Dean.

INCOMPETE POLICY

All required work in any course must be completed by the date set for the course examination. A student who has not completed the research or written work for a course taken in the fall or spring semester or is absent from the course examination in either semester, may, with adequate reason and at the discretion of the instructor, receive a temporary grade of Incomplete (I). All such I grades will automatically be changed to F on March 1 for the fall, August 1 for the spring, and October 1 for the summer.