

Carnegie Mellon
Department of Chemistry

Guide to Graduate Studies

For Incoming Students Fall 2010

Requirements approved May 2010

Guide to Graduate Studies in the Department of Chemistry

Excellence in graduate training is central to the research and teaching missions of our department. The success of our Ph.D. students is of paramount importance to us. This handbook, available online along with supplementary materials, is intended to provide a clear guide to the steps leading to the Ph.D. All Ph.D. students are responsible for familiarity with the requirements that are in place when they enter the program and should retain this handbook as an important reference. Note that students must complete the academic program requirements in place when they enter unless they elect to change to newer ones.

Our Ph.D. program emphasizes research training and productivity, original and creative thinking, and developing excellent communication skills to support a successful scientific career. The handbook describes:

- orientation information to help first-year students get settled and off to a quick start,
- formal requirements for the Ph.D. Degree in Chemistry, as well as an M.S. available to interested students,
- annual review procedures designed to promote steady, timely progress toward the degree, and
- departmental policies affecting finances and other student concerns.

All of the requirements in this handbook apply to students entering the program beginning in Fall 2010. Since some requirements differ from those that apply to students entering in previous semesters, new students should always check their own handbook to confirm requirements and inquire with us about any questions. Procedures and policies such as those on program oversight, financial matters and additional policies on pages 28-34 may be updated frequently and the new policies will apply to all current students at that time.

You can also find a copy of the Guide to Graduate Studies at <http://www.chem.cmu.edu/grad/guide/>. **Be sure to review your requirements at the beginning of each semester and feel free to discuss additional questions with us or Valerie Bridge at any time.**

Graduate Program Committee

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Requirements last revised May 2010

Table of Contents

Getting Oriented	4
Logistics	4
Key Contacts	5
Committees on Graduate Affairs	6
Introduction to Facilities	7
University Student Services	8
Teaching Support and Resources	9
Laboratory Safety	9
Important University and College Policies	10
Ph.D. Requirements	11
Attainment Examinations <i>(by the end of the third semester)</i>	11
Courses <i>(by end of fourth semester)</i>	12
Graduate Teaching	13
English Language Proficiency <i>(by beginning of third semester)</i>	14
Research Advisors <i>(by middle of second semester)</i>	15
Advisory Committees <i>(by third semester)</i>	16
Formal Seminar <i>(by third semester)</i>	16
Research Progress Report <i>(by fourth semester)</i>	17
Original Research Proposal <i>(by sixth semester)</i>	20
Advancement to Candidacy and All-But Dissertation Status	23
Dissertation Progress Meetings <i>(each fall for ABD students)</i>	23
Residency	24
Doctoral Dissertation	25
M.S. Requirements	26
Annual Reviews and Program Oversight	28
Role of the Graduate Program Committee	28
Annual Reviews	28
Petitions for Extension	29
Academic Actions and Appeals	30

Financial Matters	31
Tax implications of stipend support	31
Summer funding	31
Policies on outside employment	31
Written notice of changes in financial support	31
Additional Fellowships	32
Attendance at Conferences	32
Additional Department Policies Affecting Graduate Students	33
Ombudsperson and Grievances	33
Changing advisors	33
Leaves of Absence	34
Mellon College of Science Policy on Graduate Student Time off	34
Summary of Timeline for Completion of Ph.D. Requirements	35

Getting Oriented

Logistics

ID Cards: You can get your Carnegie Mellon photo ID card at the HUB. Your card will also give you access to Mellon Institute (MI) and the MI library after 5:00 PM. These ID cards have recently added features, including the ability to submit your ID photo online. For more information: <http://www.cmu.edu/idplus/>

Phones: Most Carnegie Mellon phone numbers begin with 268. When you are on campus, you dial simply 8 and the last four numbers. For off campus calls, dial 9+1 and the ten-digit number. Long distance calls are billed to you individually.

Parking and Transportation: If you want to purchase a parking permit (prices vary according to location), you need to contact the Parking Office immediately (x82052) since student spaces may run out. The university has an arrangement with the Pittsburgh bus system so that you can ride free in a large region with your Carnegie Mellon ID, <http://www.studentaffairs.cmu.edu/OIE/settlingguides/transportation.html>

Computer Accounts and Email: You should already have a computer account on the “Andrew” system when you arrive. More information is at: <http://www.cmu.edu/computing/freshstart/account.html>. You may want or need to have accounts on multiple machines but we recommend that you have your email forwarded to a single address. You should plan to **check your email at least twice a day**. Many important announcements and requirements will be sent to you only by email.

Mailboxes and Mailroom: The Mellon Institute mailroom is on the third floor near the freight elevator. You have been assigned a mailbox, typically shared with several other students. You should plan to check your physical mailbox at least 2-3 times per week. Jack Thorpe at x83170 manages the MI mailroom if you have questions.

Temporary desk and computing: You will be assigned a temporary desk in a lab where you will be able to work and get to know other students until you join a group. Until you have a temporary desk assignment (typically assigned on Friday of the first week of Orientation), your main access to computing will be through the wireless network in Mellon Institute.

University Center: The University Center houses a large variety of facilities, including recreational areas (pool, gymnasium, weight room, aerobics); dining options; the University Store (textbooks, clothing, gifts), Entropy (a convenience store), and Skibo Coffeehouse (one location of happy hours sponsored by the Graduate Student Assembly).

Photocopiers and Fax: The department photocopier/scanner in MI 400 may be used with the proper access code for your research group. You can also sign out journals for very brief periods (2 hours) to make copies on the department copier. Until you join a research group, please see Valerie about making copies. Teaching assistants will typically be responsible for course-related copying and should use the copier in the Doherty Hall undergraduate office for this purpose. A fax machine (412-268-1061) is available for faculty, students, and staff with an account number located in MI 400. Please record all transmissions.

Key Contacts

Hyung Kim, Professor and Department Head

Mellon Institute 510, x8-6489, kim@chem.cmu.edu

Responsible for the overall leadership and administration of the department. For appointments, contact Brenda Chambers x8-1062.

Rea Freeland, Associate Head and Graduate Program Committee Co-Chair; Associate Dean for Special Projects

Mellon Institute 440B, x8-7981, rf51@andrew.cmu.edu

Works with the department head on the overall administration of the department. Oversees graduate program, including advising first-year students about choice of advisor, attainment requirements, and courses. Serves as ombudsperson for graduate students to assist with difficult academic or personal situations where a confidential sounding board or referrals to additional resources can be helpful. For appointments, call X8-7981.

Linda Peteanu, Associate Professor

Mellon Institute 825C, x8-1327, peteanu@andrew.cmu.edu

Course instructor for Graduate Seminar.

Valerie Bridge, Senior Graduate Program Coordinator

Mellon Institute 404, x8-3150, vb0g@andrew.cmu.edu

Assists in the administration of graduate studies, including registration, enrollment, program requirements, stipend, etc. Coordinates graduate student recruitment efforts.

Karen Stump, Director of Undergraduate Studies and Laboratories; Teaching Professor

Doherty Hall 2120, x8-2340, ks01@andrew

Advises undergraduate students and oversees the undergraduate teaching curriculum. Responsible for the operation of the undergraduate laboratories and oversees the laboratory staff. Works closely with graduate students as Teaching Assistants by making TA assignments, providing training and overall supervision.

Georgene Wittig, Program Assistant for Undergraduate Studies

Doherty Hall 2114, x8-2318, gwittig@andrew.cmu.edu

Assists in administration of the undergraduate program. Handles scheduling undergraduate classes and reserving rooms for review sessions or office hours in Doherty.

Seth Miller, Principal Programmer/System Administrator

Mellon Institute 509B, x8-8255, esmiller@cmu.edu

Administers the department's computers and works with computing liaisons within each research group. Maintains helpful documentation for some common tasks at <http://support.chem.cmu.edu/>.

Tim Sager, Business Manager

Mellon Institute 440, x8-3343, ts1c@andrew.cmu.edu

Oversees the business functions of the Department, including personnel, payroll, and research contracts.

Brenda Chambers, Administrative Associate

Mellon Institute 412, x8-1062, brendac@andrew.cmu.edu

Coordinates key departmental activities such as faculty searches and reviews, as well as department social events.

Patsey Haddock, Fiscal Secretary

Mellon Institute, Room 509B, x8-1064, pw17@andrew.cmu.edu

Responsible for purchase orders, petty cash, work orders for building repairs, and property management.

Sara Wainer, Office Assistant

Mellon Institute, Room 408, x8-3272, swainer@andrew.cmu.edu

Responsible for keys, photocopier, fax, photo directory, and some assistance with graduate program issues.

Committees on Graduate Affairs

Graduate Program Committee (GPC)

The Graduate Program Committee will advise first-year students about courses, selecting an advisor, and other matters during the first year. The GPC also provides general oversight regarding the graduate program policies and procedures, including the annual review of progress for all graduate students. General questions or concerns regarding registration, grades, and program requirements should be directed to Valerie Bridge. Detailed questions and concerns you may have about your academic progress or upcoming program requirements should be directed to Rea Freeland. However, you should feel free to talk with any member of the committee about your questions or concerns. **Rea Freeland** also serves as graduate ombudsperson to assist with sensitive or confidential concerns. The ombudsperson's role is described at <http://www.chem.cmu.edu/groups/freeland/ombud.html>.

Chemistry Graduate Student Advisory Committee (GSAC)

The Graduate Student Advisory Committee provides input to the GPC on matters of concern to graduate students and the graduate program in general. For example, the GSAC has been involved in revisions to the graduate program requirements and in assessing the program. You can also talk with members of the GSAC to learn more about the graduate program and to share feedback about it. You can also address concerns to them and they can often help you determine how to get assistance. Membership of the committee currently includes: Lea Da Silva Veras, Saumya Saurabh, Allison Elder, Courtney Balliet, Steve Liu, Nathaniel Shank, Soumen Kundu, Halimatu Mohammed, Matthew Crawford, and Niti Garg.

MCS Graduate Student Advisory Committee (MCS GSAC)

Similar to the departmental GSAC above, the Mellon College of Science often has a group of graduate students (two from each department) to provide input to the Associate Dean for Faculty and Graduate Affairs. The MCS GSAC has organized past events such as the MCS Graduate Student Poster Session and panel discussions on careers in science. Noel Walkington, Associate Dean for Faculty and Graduate Affairs, convenes this committee.

Graduate Student Assembly (GSA)

The Graduate Student Assembly (GSA) serves as student governing body for graduate students at Carnegie Mellon. In addition to university services listed here, the GSA actively works on issues to improve the quality of life for graduate students and to provide varied social activities to enhance students' experience of graduate school. Departmental happy hours and the department's graduate student lounge are funded in large part by graduate students' activities fees. Steve Liu (shengpen@andrew.cmu.edu) is the current department representative to the GSA.

Introduction to Facilities and Resources

Center for Molecular Analysis (CMA)

The Center for Molecular Analysis provides training to faculty, graduate students and research staff in the operation of the various instruments there, including FTIR/NIR, UV/VIS/NIR, NMRs, MALDI/TOF mass spectrometer, Quadrupole field ion trap mass spectrometer, Diode Array UV-VIS, CD, and HPLC. Reservations for time on the CMA instruments can be at <http://www.chem.cmu.edu/cma/>.

Location: Mellon Institute 853

Contacts:

Mark Bier, Director, CMA

Telephone: x8-3540

Roberto Gil, Director of NMR Facility (MI 302)

Telephone: x8-4313

Environmental Health & Safety (EH&S)

EH&S provides expert training and overall guidance in safe management of chemicals and biological agents in research and teaching labs. Their URL is <http://www.cmu.edu/ehs/>. The department also has asked each research group to appoint a safety officer so you will have someone nearby who is familiar with the university and EPA expectations and safe lab practices. EH&S will provide the training you need for your research; **please ask your advisor about any specialized training you may need** (e.g. biological safety, radiation).

Mellon Institute Library

The MI Library has an excellent collection, particularly in journal holdings.

Location: Fourth floor of Mellon Institute

Contacts: Kathy Bossick, Carol Sanders

Telephone: x8-3172 and X8-3171

Mellon Institute Stores

This is the shipping and receiving area for MI and also stocks chemicals, electrical supplies, and hardware.

Location: Third floor, near the rear entrance/exit.

Contact: Ray Butko

Telephone: x8-3212

Mellon Institute Post Office and Mellon Institute Copy Center

The MI Post Office handles U.S., international, and campus mail during limited hours in the afternoon. Copying facilities are available for use with departmental account number.

Location: Third floor, near the rear entrance/exit, by the freight elevator.

Contact: Jack Thorpe

Telephone: x8-3170

Undergraduate Program Office

Many instructors use this as a common location where TAs pick up student papers.

Location: Doherty Hall 1317

Contact: Georgene Wittig

Telephone: x8-2318

Undergraduate Computer Cluster

These Macs and PCs are for chemistry major use and can be a place for you to check email conveniently when you are in Doherty.

Location: Doherty Hall 2300

Contact: Georgene Wittig

Telephone: x8-2318

Undergraduate Laboratories

The Doherty Hall labs are the location for the laboratory courses in which many graduate students work as TAs.

Locations: 1st, 2nd, and 3rd floors, enter at Doherty Hall south entrance

Contact: Karen Stump, Teaching Professor and Director of Undergraduate Studies and Laboratories

Telephone: x8-2340

University Student Services

The following brief summary of services will help you begin to get settled at Carnegie Mellon. For more detailed information regarding student services, please consult <http://www.cmu.edu/graduate/>.

Enrollment Services (“The Hub”): The Hub is the central location for obtaining your ID, course registration, and other enrollment services. It is located in Warner Hall, Room 28A. Please see the Enrollment Services website for <http://www.cmu.edu/hub/> for additional information such as the schedule of classes.

Housing Office: Located in Morewood Gardens E-Tower, the Housing Office (x8-2139) will furnish you with listings of rentals in the vicinity. Their web site is <http://www.housing.cmu.edu/CommunityHousing/>.

Payroll Office: Detailed questions regarding your paycheck (income tax, etc.) should be directed to personnel in this office, located at 4516 Henry St. Note that Tim Sager, Business Manager for the Chemistry Department, (x8-3343) should be consulted first.

Student Health Service: Located in the first floor of Morewood Gardens E-101 (x8-2157), this office can provide information regarding health insurance and a variety of basic medical care. Hours of operation are available at <http://www.studentaffairs.cmu.edu/HealthServices/>. When classes are in session the hours are as follows:

Monday, Tuesday and Wednesday	8:30 a.m. – 7:00 p.m.
Thursday	10:00 a.m. – 7:00 p.m.
Friday	8:30 a.m. – 5:00 p.m.
Saturday	11:00 a.m. – 3:00 p.m.
Sunday	Closed

Counseling and Psychological Services (CAPS): Located in Morewood Gardens E-Tower (x8-2922), CAPS provides short-term counseling for stress, depression, anxiety, and other personal concerns and referrals to local psychologists and psychiatrists for continuing care. For emergencies after hours, a staff member can be reached by calling 412-268-2922.

Campus Police (24 hr. service): The number to call in case of emergency is x8-2323. Blue phones are also available in strategic locations around campus in case of emergency. This office also coordinates an escort service for students working late to ensure your safety on campus. Call the Escort Service at 8-RIDE or 412-268-7433.

Graduate Programs Office (GPO): The GPO is responsible for support programs for graduate students including some small travel grants, professional development seminars, and events designed for women and students of color.

Office of International Education (OIE): The Foreign Student Advisors, on the third floor of Warner Hall, are important contacts to assist you with questions about visas. OIE also organizes the International Student Orientation held during the second week of August which international students are required to attend. You can contact them by email at gfsadv@andrew.cmu.edu.

Intercultural Communication Center (ICC): The ICC provides language training and testing for non-native speakers of English at Carnegie Mellon. Non-native English speakers (NNES) take the International TA Test as soon as the ICC recommends based of TOEFL scores. The ITA Test results determine whether the student is required to participate in ICC programs to meet either the departmental English proficiency requirement or to satisfy university requirements as a TA. Recommendations for training, where needed, are highly individualized and often combine workshops and/or tutoring. More details about ICC programs and policies are available at <http://www.cmu.edu/icc/>.

Teaching Support and Resources

Eberly Center for Teaching Excellence: The Eberly Center provides seminars and individual consultations to help graduate students who wish to improve their teaching or prepare for future careers as faculty members. For students who may wish to pursue academic careers at four-year colleges or many public universities, this is an invaluable opportunity. More resources are available at <http://www.cmu.edu/teaching>.

Intercultural Communication Center (ICC): The ICC's language training and testing for non-native speakers of English at Carnegie Mellon is designed to help students achieve the robust English fluency needed for teaching in the American classroom and giving professional-quality presentations. Students are strongly encouraged to take advantage of this resource even after passing the ITA test at the level required by the department in order to make their English fluency an asset in teaching, research communications, and their future careers. More details about ICC programs and policies are available at <http://www.cmu.edu/icc/>.

Laboratory Safety

Environmental Health and Safety

<http://ehs-alert.fms.bap.cmu.edu/>

EH&S provides a broad range of services to the university to promote the protection of its community. Their web site includes biological, chemical and lab safety information and MSDS links. Every graduate student should be aware of his/her responsibilities in handling an accident in lab, whether in the teaching labs or in your research lab, including how to pursue medical attention when needed and how to report an accident. **Your initial contact in any emergency should be Campus Police (x8-2323)** or if an incident doesn't require an immediate response, you can contact EH&S. The university does **not** recommend students calling 911; Campus Police will determine if that is needed and take care of that if appropriate.

Important University and College Policies

University Policies

A University Policy is a rule that has been officially sanctioned by the president of Carnegie Mellon University and senior university leadership, and that generally has university-wide applicability. Graduate students need to be aware of the policies listed below and to become familiar with the related expectations and options provided under these policies. Links to these and other policies are here: <http://www.cmu.edu/graduate/policies/index.html>.

Carnegie Mellon University Student Leave Policy – *relevant especially if you have medical or personal concerns that may cause you to consider a semester or more on leave of absence*

<http://www.cmu.edu/policies/documents/StLeave.html>

Carnegie Mellon University Policy on Cheating and Plagiarism – *important for TA responsibilities; of course, you are also expected to conduct your own academic work and research with high standards of integrity.*

<http://www.cmu.edu/policies/documents/Cheating.html>

Carnegie Mellon University Academic Disciplinary Actions Overview for Graduate Students – *describes general procedures for breaches of academic integrity including cheating and plagiarism*

<http://www.cmu.edu/policies/documents/GradDisc.html>

Carnegie Mellon University Computing Policy – *note that penalties related to inappropriate downloading include possibly losing internet access for a period of time.*

<http://www.cmu.edu/policies/documents/Computing.htm>

Carnegie Mellon University Student Health Insurance Policy – *note that you are personally responsible for maintaining health insurance and paying the related costs each year; otherwise, you may not be eligible to register, which in turn means you cannot receive a stipend.*

<http://www.cmu.edu/policies/documents/StudentInsurance.htm>

Carnegie Mellon University Policy Against Sexual Harassment – *online training about sexual harassment prevention is required both to help you as a student and as a teaching assistant; you will be contacted by the Graduate Program Coordinator with instructions regarding online training.*

<http://www.cmu.edu/policies/documents/SexHarass.html>

Carnegie Mellon University Doctoral Candidate Policies for All But Dissertation (ABD) – *this policy becomes important for students after completing the original proposal requirement (3rd year) to reach All But Dissertation status.*

<http://www.cmu.edu/policies/documents/ABD.html>

Mellon College of Science Policies Related to Graduate Students

MCS Doctoral Degree Policies – *includes important information about visiting members of dissertation committees*

http://www.cmu.edu/mcs/fac_staff/handbook/doctoral.html

MCS Grievance Procedure for Graduate Students – *consult Rea Freeland as ombudsperson as early as possible if you think you may have a concern that could possibly lead to a formal grievance.*

<http://www.cmu.edu/mcs/grad/grievance.html>

Ph.D. Requirements

This section describes the formal requirements for the Ph.D. Degree in Chemistry at Carnegie Mellon as well as the review procedures designed to ensure steady progress toward that degree. It is intended to provide a clear guide to the steps leading to the Ph.D. Degree in Chemistry. The requirements for the Ph.D. Degree have been formulated to aid the graduate student to develop the proficiency expected of a research scientist in chemistry. In the interests of both the students and the faculty, the requirements for the Ph.D. degree carry a schedule for their completion. The schedule and review procedures are intended to speed the student's progress toward Candidacy and provide consistent focus on the student's research progress. Although possible, extensions will not be considered the norm. The Department will regularly inform students of their progress toward the degree (see Annual Reviews, page 28). Failure to satisfy any requirement on a timely basis is cause for a dismissal from the graduate program following the procedures outlined below under Academic Actions. ***Note that an academic year comprises two semesters, with the summer not being construed as a semester.***

In the event that the requirements are changed, students may adopt the new requirements or remain under the requirements in effect on their matriculation, at their discretion.

Attainment Examinations

Expectations

By the end of the third semester, entering graduate students must pass an attainment requirement in each of three areas of chemistry: Organic, Inorganic, and Physical. The purpose of this requirement is to ensure sufficient background for graduate coursework and further research.

Students may meet this requirement by either:

- Passing an attainment examination in each area, or
- Passing graduate course work in the area, typically 12 units, as deemed appropriate by the Graduate Program Committee with a grade of at least a B in each course.

In order to receive credit toward passing an attainment exam, a student must earn at least B (3.0) in a full semester of GPC-approved coursework in that area (typically 12-units). For physical chemistry attainment credit based on performance in approved mini-courses (09-6xx), students must receive at least a B (3.0) in each of the physical chemistry mini-courses. Otherwise, they will need to retake and pass the physical chemistry attainment exam, or they may retake the mini-course with the lower grade or take a different GPC-approved course and earn B's in each of two mini-courses or a total of 12 units. Note that 09-603 Mathematical Analysis for Chemistry is recommended as preparation for physical chemistry graduate courses, but does not count toward the physical chemistry attainment requirement.

Normally, all students will take attainment examinations upon arrival in the department for the purpose of guiding advising on courses. Based on the results of the exam, the choice among the options above is determined by the Graduate Program Committee after consultation with the student and advisor (if one has been selected). Note that if a student does not have sufficient background to enter a graduate course in a given area, he/she will need to take (or audit) undergraduate coursework approved by the Graduate Program Committee, and then either retake and pass the attainment exam in that area or pass appropriate graduate course work by the end of the third semester in

residence. Attainment requirements must be satisfied before a student may complete the research progress report requirement.

Outcomes

Students may retake the attainment exam when it is administered to new students in January and/or the following August. Failure to pass the attainment requirements by the end of the third semester will lead to probation. Failure to meet this requirement by the end of the second year will lead to a delay in completing the research progress report and is grounds for termination from the program. With the agreement of the advisor, the student may petition the GPC in writing to request an extension beyond the third semester to complete the attainment requirement. (See Petitions for Extension)

Courses

The equivalent of at least four full-semester graduate-level lecture or laboratory courses in chemistry or closely related fields must be passed with a B or better in each course by the end of three semesters in residence. Students are encouraged to take at least one course outside of their research area. One relevant upper-level course (typically 500-level or higher) in another department may be considered for graduate credit; approval by the GPC for the course is required. The purpose of the course requirement is for students to display mastery of their field and in-depth knowledge appropriate for conducting research.

Students are also required to complete 09-700 Introduction to Research to become familiar with faculty and research in the department and 09-911 Graduate Seminar to develop skills in reading and presenting the chemistry literature. These units do not count toward the four full-semester graduate lecture and laboratory courses.

Students, in consultation with the GPC and their research advisors, may plan a program of courses both to fit their background and interests and to satisfy the Ph.D. requirements. While well-prepared students often take the minimum four full-semester courses, students are advised to take additional work as needed for their background and research area. NOTE: Students who are interested in completing the M.S. in Chemistry typically need additional coursework and an overall GPA of 3.0 (See M.S. Requirements for details:

<http://www.chem.cmu.edu/grd/guide/require-ms>.

If a student repeats a course, note that the first grade will continue to appear on the student's transcript and will be counted in the GPA used for the M.S. degree.

Courses may be taken in other departments or at the University of Pittsburgh (through cross-registration) with the approval of the Academic Advisor. The Department of Chemistry accepts the grading policy of other departments and the University of Pittsburgh for approved courses.

Students may request transfer of credit for up to two previous graduate courses from other institutions that are equivalent to courses offered at Carnegie Mellon. The student must provide a sufficient course description for such courses and obtain signatures from the Carnegie Mellon course instructor, his/her advisor, and the Graduate Program Committee. An approval form is available from the Graduate Program Assistant. A minimum grade of B is required to transfer credit for a course. Also, courses needed to meet the requirements of a previously received degree may not be transferred.

Expectations and Outcomes

Two grades of C or a single grade lower than C will lead to probation and to review of the student's standing by the GPC each semester until the course work requirement is satisfied. To continue in the Ph.D. program, the student must earn a B or better in each course for enough GPC-approved courses in the subsequent semester(s) to remain on track to satisfy the course work requirement by the end of the third semester. Note that advisors are strongly encouraged to review a student's grades before accepting him/her into their research groups and low grades may lead to an advisor's negative decision.

The course requirement normally must be completed before the student is eligible to complete the research progress report oral exam and is required to advance to Ph.D. candidacy. Failure to meet the course work requirement by the end of the third semester is grounds for termination from the program. With the agreement of the advisor, the student may petition the GPC in writing to request an extension beyond the third semester to complete the course requirement. (See Petitions for Extension) If terminated from the Ph.D. program, students who have not yet completed the M.S. degree may be eligible to transfer to the M.S. program for one semester as described under Academic Actions and Appeals.

SEE ONLINE GUIDE FOR: Form for Transfer of Graduate Course Credit

Graduate Teaching

Every student must teach for two semesters as a Teaching Assistant, either as a recitation TA, laboratory TA, or a grader/course assistant. The purpose of this requirement is to help students prepare for teaching and mentoring roles in academia and industry and to contribute to the quality and safety of instruction in the undergraduate program. This formal academic requirement is an important part of a graduate education and must be completed to the satisfaction of the instructor for that course.

The duties of a Teaching Assistant require approximately 15-20 hours per week. Note that TA duties are one of the primary sources of financial support and that renewal of an appointment as a TA is contingent on satisfactory performance as a Teaching Assistant. Therefore, the expectations below are important for all TAs.

Expectations. The Department provides TA training each August specific to the roles of recitation TAs, lab TAs, and graders for which attendance is required for the first two semesters in which the student serves in a particular role. Teaching assistants are expected to fulfill all of the responsibilities of their role in a timely fashion and to make appropriate arrangements with the instructor at least 1-2 weeks in advance if they anticipate any difficulties in doing so. For example, instructors need to be consulted in advance if a TA would like to arrange for someone to teach a class for him or her. Barring unforeseen emergencies, travel arrangements must be made far enough in advance that they do not conflict with TA training and teaching responsibilities.

Outcomes. Instructors determine the expectations for each graduate TA assignment. If a TA appears to be having difficulties meeting these expectations, instructors are expected to provide timely written feedback to let the TA know what type of changes or improvements are needed. The feedback should be sent to the TA, cc'ed to the Director of Undergraduate Studies, and the GPC Co-Chairs. If a student is informed of a significant deficiency, does not address the problem adequately, and cannot document reasonable efforts to improve, that semester will not count toward the two semesters required for the doctoral degree. An additional semester as a TA or an appropriate Independent Study will be required until the graduate teaching requirement is fully satisfied. If no written feedback suggests the need for changes, the TA can interpret that as an indication of satisfactory performance.

English Language Proficiency

Each student for whom English is not a native language must demonstrate fluency in spoken English by the end of the first year in residence. The Intercultural Communication Center (ICC) has been established by Carnegie Mellon University to teach this skill, and administer the required fluency test. The purpose of this requirement is to ensure every student's ability to communicate effectively with Department members and external colleagues about their research and to enhance their ability to contribute effectively to the Department's educational programs.

Expectations. Students are generally expected to rate in Category 3 or better on the International Teaching Assistant Test by the beginning of the third semester in residence and to continue working toward Category 1 or 2. Starting in the first semester in residence, the Department expects a consistent effort in working with the ICC and in speaking English regularly in departmental activities to achieve these goals in a timely manner. While the ICC may recommend different workshops for different individual needs, a student's total hours in workshops, tutoring and self-paced work at the ICC should be between 15-30 hours each semester until reaching Category 3 to be viewed as consistent effort. In addition, effort is required year-round, including 15-30 hours in the summer, until reaching Category 3. Students are expected to take the test at the earliest opportunity recommended by the ICC and the department. Note that all students who are rated in Categories 2 and 3 who are working as TAs are required by Carnegie Mellon policy and Pennsylvania law to work concurrently with the ICC to improve their English fluency, typically through the workshops and/or individual tutoring.

In addition, the Department strongly encourages students to use English day-to-day in discussing their research since non-technical conversations in English often do not improve fluency on scientific topics. Advisors are also encouraged to talk directly with students when problems with English appear to interfere with communication about research and to inform the GPC as early as possible when they have concerns in this area.

Outcomes. Good standing in the department may be jeopardized if a student neglects to work sufficiently on their English fluency, based on the ITA Monitoring reports recording participation in ICC activities. However, because the Department recognizes that language learning rates can vary substantially, the deadline of reaching Category 3 by the beginning of the third semester may be adjusted for individual students' needs as long as the student maintains appropriate, consistent efforts to improve. Failure to reach Category 3 by the beginning of the third semester may delay completion of the formal seminar requirement if the required effort at the ICC has not been made for one or more semesters or in the summer. Students are expected to make up the deficiency in hours of training as much as possible within the ICC's offerings before they can schedule the formal seminar.

Failure to make sufficient efforts in line with recommendations from the ICC and the Department may lead to probation after one semester. Students who have not reached Category 3 by the beginning of the fourth semester in residence and have not sustained consistent efforts to improve English fluency may not be allowed to complete the research progress report and are at risk for termination from the program.

SEE ONLINE GUIDE FOR: ITA Test Category Descriptions
<http://www.cmu.edu/icc/testing/ITA/ITAscoring.shtml>

Research Advisors

A Research Advisor is to be selected from the Chemistry faculty by mid-semester of the second semester in residence. This involves mutual agreement between the student and the faculty member, and requires approval by the Department Head. Selecting an advisor and joining a lab/group in the first semester is encouraged when the student is confident of his/her interests. The advisor (or co-advisors), the student and the department head must agree for a student to join a group officially.

Expectations

In general, students should actively seek out faculty during the first semester to discuss their research interests. In addition, students are encouraged to visit regular group meetings to learn more about the ongoing research and meet others in the group. A first-year student must join a research group prior to their first summer in the department in order to remain in the Ph.D. program. Students who have not secured an advisor by mid-semester of their first spring in the department are advised to consult the GPC Co-Chairs. More advanced students who lose an advisor may be eligible to change advisors (see Outcomes, below, and Changing Advisors).

Prior to selection of a Research Advisor, students are strongly encouraged to discuss their research interests with a minimum of three faculty members. Moreover, the students should get to know the faculty widely, get advice from students whose studies are further advanced, and visit with faculty in their offices. It must be understood that the chosen advisor will occasionally decline the relationship, either because of overload, lack of sufficient research support or lack of intellectual compatibility. A student without a Research Advisor typically is not eligible for financial support in the summer.

The Research Advisor becomes de facto the Academic Advisor to the student making the student aware of Ph.D. requirements in collaboration with the GPC, recommending coursework, and monitoring progress toward the Ph.D. The primary responsibility of the Research Advisor is directing the research for the dissertation, but he/she also provides guidance for meeting the other Ph.D. program requirements, general educational advice, career planning, and often job search assistance. The research advisor may set his/her own requirements for good standing in the group and has the responsibility to communicate in writing any deficiencies in an advisee's research activities that are significant enough to jeopardize their continuation in the group and/or in the Ph.D. program as described under Academic Actions and Appeals.

Outcomes

While the advising relationship typically lasts the duration of a student's Ph.D. studies, either the student or the Research Advisor may terminate their relationship according to the approved departmental procedures described under Academic Actions and Appeals. A student otherwise in good standing in the department may then select a new Research Advisor on mutual agreement between the student and the faculty member, and approval by the Department Head. Normally, for a new advisor to consider a student favorably, he/she must be in good standing and must be making timely progress on program requirements expected for their semester in the program. When requested, the student will have a 1–2 month grace period to search for a new advisor and will have the opportunity to be considered for a teaching assistant or other position, should one be available, although financial support cannot be guaranteed. A student who is changing groups typically needs to join a new group prior to summer in order to continue in the Ph.D. program. See additional information about changing advisors.

Advisory Committees

In consultation with the Graduate Program Committee and his/her advisor, a student will select a Research Advisory Committee by the beginning of the third semester in residence. The purpose of this Committee is to discuss and assess the student's progress and to provide additional guidance on research and overall professional development. This committee will comprise the membership of the examination committee for the research progress report and original research proposal, although the Graduate Program Committee may add another member if additional expertise is needed in a specific area. The Committee may also be called upon for input when there are questions about a student's ability to continue in the Ph.D. program. In addition, after the student reaches ABD status, the Advisory Committee will meet with the student annually in Dissertation Progress Meetings to support timely completion of their Ph.D.

A typical Advisory Committee will consist of the Research Advisor(s) and two other Chemistry faculty members, normally from the Tenure Track or Research Track. When it would be advantageous for the student's research, one of these members may be from outside the department. Note that each faculty member may serve on a limited number of these Advisory Committees to ensure that he/she can provide the appropriate amount of attention to each student. Therefore, students are typically advised to have committees with three faculty members; students with co-advisors should have four members. Note that advisory committees may need to change when a student plans his/her dissertation defense in order to conform to MCS Guidelines on Doctoral Thesis Committees which require a "visiting" member not affiliated with the department.

The student will also select a Chair of the committee, different from the Research Advisor(s), whose role is to oversee and provide feedback on the oral exams for the research progress report and original proposal, to provide general guidance regarding the original proposal, to help the student in preparing for dissertation progress meetings, and to provide a brief summary and written feedback to the ABD student and the GPC after dissertation progress meetings.

SEE WEBSITE FOR: MCS Policy on Doctoral Thesis Committees
http://www.cmu.edu/mcs/fac_staff/handbook/doctoral.html

Formal Seminar

Each student must present a formal seminar during the third semester of residence. The seminar may be given in an earlier semester if the student is ready.

The purpose of the seminar is to train students to speak to an audience of faculty and peers about chemistry and to read the research literature appropriately. Students will enroll in 09-911, Graduate Seminar, for their first four semesters, and receive course credit for delivering their seminar and providing constructive feedback to other students on their presentations.

Expectations

The topic may be chosen by the student with the approval of the student's advisor(s) and the course instructor. Students may choose a seminar topic to serve as a foundation for the original proposal. An extension to present the seminar in the fourth semester in residence may be requested by petitioning the Graduate Program Committee, explaining what makes the circumstances exceptional and proposing an alternate deadline.

The seminar must be based on published work done in other laboratories. In general, seminars should draw on many articles from the literature and represent a synthesis of ideas that goes beyond summarizing individual pieces of

research. An annotated bibliography should be submitted two weeks in advance of the presentation to the course instructor and student's advisor. Presentations are expected to be approximately 30-40 minutes in length, with 10-20 minutes of questions and discussion with peers and faculty. Students are advised to arrange a practice talk with their advisor and others to prepare. Additional guidelines are available in the supplemental materials section and through the course instructor.

If a student who is a non-native speaker of English has not yet reached Category 3 on the ITA test, he/she must seek written permission to proceed with the seminar from the GPC Co-Chairs. Permission will be granted based on a combination of his/her hours of training at the ICC, and faculty observations in the department. The formal seminar presentation may be delayed based on fewer than 15 hours/semester effort at the ICC in any semester or summer.

Outcomes

Formal evaluation will be by the course instructor, the student's advisor, and one other faculty member selected by the student (ideally a member of his/her Advisory Committee), and will include evaluation of responses to questions. The student will receive detailed feedback and constructive suggestions on the seminar from at least two faculty members, along with written feedback from the audience.

Should the seminar be determined to be deficient (recorded as failure), the advisor may allow the student to repeat the requirement before their Advisory Committee or in the Graduate Seminar setting. In this case, the deficiencies must be communicated in writing by the course instructor and advisor to the student and the Graduate Program Committee, along with a new deadline for re-presenting the seminar. The student may not proceed to defend the research progress report without a satisfactory performance on the formal seminar.

SEE WEBSITE FOR: Sample Seminar Feedback Form

Research Progress Report

Each student must write and present a detailed progress report on the proposed thesis project and present that to both the department and to the Advisory Committee in the fourth semester in residence. The purpose of the requirement is to demonstrate that the student:

- has achieved a substantial level of understanding of the theoretical and/or experimental background of the thesis project,
- is making appropriate progress in research indicating the abilities necessary to completing the Ph.D successfully,
- can substantively discuss his/her ongoing work, including near-term future research plans, possible future directions, and the goals and rationale of the research, and
- can write a report demonstrating scientific writing skills appropriate for Ph.D. work.

Passing the research progress report requirement is normally the last step leading to Ph.D. candidacy. Thus, the Ph.D. requirements expected in the first and second years normally must be completed before the student may complete the progress report orals and advance to candidacy. The report requirement includes a poster presentation to the entire department, a written report, and an oral exam by the Advisory Committee. While two semesters as a teaching assistant are required to advance to candidacy, exceptional circumstances may occasionally delay a student's completion of this requirement and this will not require a delay in completing the progress report requirement.

Poster Presentation

The report is to be presented as a formal poster presentation, following ACS format, with an accompanying research overview paper (details described below). The presentation must include the scientific objectives in the thesis research, an overview of the necessary background material, the theoretical and experimental techniques used, and representative results obtained to date. Students should expect to present their research in approximately 5-10 minutes, repeated 3-4 times to different small groups, during the day of the poster session and to answer questions from a wide variety of faculty members and graduate students. Attendance at the poster session portion of the progress report may be by any of the Chemistry Faculty, graduate students, or other interested members of the department or university. The purposes of the poster presentation are to expose the student to a wide range of questions in preparation for the oral exam, to develop scientific speaking skills, and to facilitate feedback from various members of the department.

Written Progress Report

In addition, a 15-18 page research overview (excluding reference pages), must be presented to members of the Advisory Committee and the Graduate Program Committee at least one week before the scheduled poster session. The purpose of the written report is to summarize the student's research progress to date, demonstrate scientific writing skills appropriate for Ph.D. work, and provide context for the work presented at the poster session and assessed at the oral exam. Therefore, the report should include the following sections:

- Title page, including title, author, advisor(s), committee members, date, and "In partial fulfillment of the Research Progress Report Requirement"
- Abstract of up to 200 words
- Introduction providing an overview of the relevant theoretical and/or experimental literature sufficient to demonstrate his/her mastery of the literature in the area of the intended thesis work, and explaining the goals and rationale of the project (3-4 pages)
- Experimental, or Theoretical Analysis
- Results and Discussion for work-to-date for each major project (10-12 pages total, including tables and figures), and
- Conclusions, including a discussion of immediate next steps over the next 6-12 months and how they fit into the overall goals of the project and long-term implications of the work (approximately 2-3 pages), and
- References.

Reports must be in a 12 pt font with 1.5 spacing and should follow ACS Style. Note that students with multiple projects who wish to submit a progress report longer than 15-18 pages, excluding front matter and references, need permission from their advisory committee. In general, the report should reflect the student's writing abilities after feedback/suggestions from the advisor on a small number of initial drafts. If a student does not submit a written report that the advisor agrees should be presented to the committee by the 12th week of the semester, an advisor may either (1) delay a student's oral exam until the end of that semester to allow for revisions, with the agreement of the GPC, or (2) if the deficiencies are serious, place the student on probation in the group with the possibility of termination from the group, and possibly from the Ph.D. program, pending the outcome of the oral exam.

Oral Exam

Within 2-6 weeks after the poster session, the student will meet with the Advisory Committee for a private oral exam on his/her research progress. It is recommended that the student organize a practice oral exam with other members of his/her group and of related research groups in order to prepare for the potential range of questions in the oral exam, including fundamental background critical for the student's Ph.D. work. Advisors are also encouraged to

suggest areas of study to the student and to share these topics/areas with the advisory committee to help them in preparing background questions for the oral exam. Attendance at the examination may be by any of the Chemistry Faculty, although they will be nonparticipating spectators. Note that members of the GPC may attend to assist with questions about requirements or procedure.

The purpose of the oral exam is to assess whether the student has the necessary background knowledge to conduct his/her research and to determine whether the student is on a trajectory to complete the Ph.D. successfully. The scope of the advisory committees' questions may include any subject matter tangential to material in the written report or oral presentation. During this oral examination, the student is expected, through a prepared presentation and responses to questions, to:

- Demonstrate a thorough understanding of the literature and methods relevant to the research, including fundamental theoretical or experimental concepts.
- Present and discuss substantively his/her current research and near-term future research plans, including the goals and rationale for the research, and
- Discuss possible future directions and long-term implications for the research.

Students will typically not be eligible to take the oral exam if they have not passed all attainment requirements, have not satisfied the graduate course requirement, or have not made the required consistent efforts with the ICC toward passing the English proficiency requirement. Students may petition the GPC for an exception to go ahead with the oral exam; documentation must be provided to show strong effort to date and extenuating circumstances.

Timeline

The written research progress report should be presented to the Advisory Committee at least one week before the scheduled poster session. When the paper is submitted, a date for the oral exam should be arranged that is acceptable to all committee members and falls within 2–6 weeks of the poster session. The student must receive oral feedback from the committee on the day of the exam and written feedback from the Advisory Committee Chair should follow in 1–3 days.

Any extension beyond the end of the fourth semester requires approval of a written petition from the student to the GPC and the agreement of the advisor. (See Petitions for Extension)

Outcomes

Note that a passing performance requires satisfactory performance on both the written report and oral exam. The poster presentation is required as preparation for the oral exam, but is not normally evaluated formally. There are four potential outcomes to the progress report requirement: pass, conditional pass, conditional pass with probation, or failure.

- A. **Pass** indicates clearly satisfactory knowledge of both fundamental background and research methods, along with satisfactory research progress that is on a trajectory to successful completion of the Ph.D. Both written report and oral exam are deemed satisfactory by the advisory committee.
- B. **Conditional pass** indicates that deficiencies, while deemed minor, must be addressed. The student is required either to revise the written report or otherwise address deficiencies as requested by the committee. Conditional pass generally indicates satisfactory research progress with minor deficiencies in

- knowledge, written report, and/or oral exam performance that the student should be able to address in 2-6 weeks, including potentially revising the report, or answering additional questions for the committee.
- C. **Conditional pass with probation** indicates that at least one deficiency is considered significant or that a combination of weaknesses will require 2+ months to address. Re-exam by the committee and revising the written report is normally required in this situation; advisory committees may assign additional written follow-up as appropriate. Any deficiencies need to be addressed in 2-3 months or no later than the end of the subsequent semester, with the specific deadline determined by the advisory committee, with goal of making the time as short as is reasonable for the required work. The advisor is responsible for providing summer support if there is an intervening summer. Inability to address the deficiencies and pass unconditionally by the stated deadline will be considered grounds for termination from the Ph.D. program.
 - D. **Failure** indicates grave concerns about a student's research progress, knowledge, written report, and/or oral exam performance such that the advisor and committee question the student's ability to complete a Ph.D. in this research area. The advisor may terminate the student from his/her group or, upon agreement of the advisor, advisory committee and GPC Co-Chairs, the student may be permitted to repeat the oral exam, including revisions to the written report, by no later than the end of the subsequent semester, with the specific deadline to be set by the advisory committee. The advisor is responsible for providing summer support if there is an intervening summer. If the student is terminated from the group and is not able to secure a new advisor within a 1-2 month grace period (see Research Advisors), he/she would be terminated from the Ph.D. program. If the student is permitted to repeat the oral exam and the student does not pass unconditionally on the second attempt, he/she would be terminated from the Ph.D. program.

In cases B, C and D, the deficiencies must be communicated in writing by the Advisory Committee Chair to the student and the Graduate Program Committee, along with a new deadline for re-defending the progress report, if a re-defense is required. Any requests for extensions beyond the agreed-upon date must be made and approved in writing by the GPC co-chairs; otherwise, the student will be on probation until the requirement is satisfied. In case D, the Advisory Committee Chair must also give the student and GPC a written document describing the deficiencies that warranted failure.

Normally, students will complete the research progress report in the fourth semester in residence. Students may petition the GPC for a one-semester extension, with their advisor's agreement, as described under Petitions for Extension. All students must pass the research progress report requirement by the end of the sixth semester in residence to remain in the Ph.D. program, unless there are documented exceptional circumstances.

SEE WEBSITE FOR: Guidelines for Research Progress Report,
Poster and Oral Exam
Agenda for Progress Report Orals

Original Research Proposal

Each student is expected to write and defend an original research proposal during the sixth semester of residence. The purpose of the proposal is to demonstrate that the student has the ability to generate ideas for original research and to defend the methods and importance of the research.

Topics. To ensure sufficient originality and promote feasibility within the desired timeline, topics must be approved by the student's Advisory Committee and at least one member of the Graduate Program Committee who is not on the student's advisory committee to ensure the topic is distinct from the student's thesis work (see Timeline below). The topic need not exclude the general field of the student's research but should use some primary sources outside his/her specific dissertation topic. In general, topics should go at least one step beyond what has been published. In addition,

to the student's knowledge, work on the same hypothesis should not have been proposed before. In order to produce work distinct from the thesis topic and to facilitate an oral exam of appropriate scope, depth and rigor, students are encouraged to propose work that could conceivably be done in their lab or group (however not restricted to the instrumentation currently available). Students who wish to pursue work relatively distant from their field of interest are advised to ensure that faculty members with relevant expertise are available to consult and/or serve as an additional examiner.

Topic Approval. Descriptions of topics (approximately 1-2 pages) are due the third week in November for students who are due to complete proposals in the spring semester. The topic descriptions must include (1) a statement of the problem to be addressed and the proposed approach, (2) several key references to show that the approach is viable, and (3) a discussion of similarities and differences compared with the student's thesis work to date and to related work reported in the literature. Written approval from the advisory committee and a member of the GPC who is not on the advisory committee is needed for final topic approval by December 15.

Each student should submit his/her proposed topics to the Advisory Committee and at least one member of the GPC at that time. If a student has not received his/her entire committee's approval and the approval of one member of the GPC by February 15, the student will need to have an Advisory Committee meeting within the next 1-2 weeks. The purpose of this meeting is to allow faculty to resolve directly any concerns or differences of opinion about the topic, or to advise a student in focusing or choosing topic if needed. Note that typical reasons for rejecting a topic would include insufficient chemical content involved in addressing the question, lack of feasibility, or lack of sufficient distinction from the student's dissertation research.-The committee chair must clarify their concerns to the student and to the GPC, in writing, at the end of the meeting. If the student is not able to address their Advisory Committee members' concerns successfully by February 28, the student will be put on probation. Subsequent failure to write and adequately defend the proposal by the end of the seventh semester would be grounds for termination from the program. Note that students entering in January will have their deadlines on third week of July for topic submissions and September 15 for final topic approval. All Advisory Committee members must agree that the proposed topic is acceptable. The GPC member will be a nonvoting participant present to anticipate potential concerns. Note that the GPC meeting to review petitions for extension will usually be held the 3rd week of the spring semester.

Written proposal. Like proposals submitted to a funding agency, students' original proposals will be expected to:

1. include an abstract,
2. state the idea and motivating scientific hypothesis,
3. justify the importance of the scientific problem,
4. review the relevant theoretical and/or experimental background literature,
5. propose the specific research, including details about the theoretical and/or experimental techniques and an estimate of capital costs if nonstandard or specialized equipment is required,
6. predict results, including discussing possible outcomes and demonstrating that the approach is feasible by calculation or reference to previous literature, and
7. discuss the significance of the research.

The format should follow NSF proposal guidelines. Proposals should be 15 pages of text, including figures but excluding references, in a font no smaller than 12 point Times with 1.5 spacing. The student is free to consult with anyone, including the advisor, in developing the proposal, but the advisor's role should be non-directive and the work should represent the student's own creative thinking. A final version of the proposal must be distributed to Advisory Committee members at least one week before the scheduled examination date.

Oral defense. The defense comprises a public seminar (approximately 30-45 minutes in length) and a private oral examination by the student's Advisory Committee. One more member may be added by the Graduate Program Committee if more expertise in a specific area is desirable. Attendance at the examination may be by any of the Chemistry Faculty, although they will be nonparticipating spectators. During this oral examination, the student is expected to demonstrate a thorough understanding of the literature and methods relevant to the proposal, including any material mentioned in the written proposal or oral presentation. While some of the questions may not have clear-cut answers, the Committee will evaluate the student's ability to reason effectively and draw appropriately on a broad range of knowledge to do so.

Pursuing guidance and feedback. While the original proposal should be produced largely independently, students are expected to pursue sufficient feedback to complete the proposal in a timely way. The student is responsible for seeking feedback and guidance from his/her committee chair in week 6 after the topic is approved and for additional follow-up with his/her advisor and the GPC Co-Chairs by week 11 if progress is not on track for an oral exam within the next 3-4 weeks. A significant change in topic at any point must be approved by the student's advisory committee and one member of the GPC. A student who does not submit a draft of a written proposal to his/her advisory by week 11 will typically be placed on probation until the proposal oral exam is completed, unless there are extenuating circumstances.

Outcomes. Passing the original proposal requirement typically leads to All-But-Dissertation status. Should the research proposal be determined to be deficient, the outcome should be recorded as conditional pass, conditional pass with probation, or failure. In each case, the deficiencies must be communicated in writing by the Advisory Committee Chair to the student and the Graduate Program Committee, along with conditions to be satisfied in order to pass and a new deadline for re-defending the proposal, if a re-defense is required, reported in writing by the Advisory Committee Chair to the student and the Graduate Program Committee by the next day. There are four potential outcomes to the original proposal: pass, conditional pass, conditional pass with probation, or failure.

- A. **Pass** indicates clearly satisfactory knowledge, along with a satisfactory original idea, written proposal and oral exam.
- B. If the deficiencies are deemed minor, the student's performance may be recorded as a **conditional pass** and the student required either to revise or otherwise address deficiencies as requested by the committee, with the deficiencies, conditions for passing, and a new deadline reported in writing by the Advisory Committee Chair to the student and the Graduate Program Committee by the next day.
- C. If the deficiencies are considered significant or major (e.g. fundamental errors in central background knowledge), the student's performance should be recorded as a **conditional pass with probation**. Re-defending the proposal to the committee and/or revising the proposal is normally required in this situation; advisory committees may assign other written follow-up as appropriate.
- D. If the concerns are grave and call into the question the student's ability to complete the Ph.D., the outcome should be recorded as **failure** and the Advisory Committee may terminate the student from his/her group or, upon agreement of the advisor and GPC Co-Chairs, may allow the student to submit and defend a revised proposal. Failure in the oral exam on a first or second attempt is grounds for termination from the Ph.D. program.

Approximately 1-2 months would be the typical time allotted for revising and re-defending after a conditional pass, conditional pass with probation, or failure, with the goal of making the time as short as is reasonable for the required work. The Advisory Committee sets the specific deadline using these guidelines.

A student may not achieve ABD status without a satisfactory performance on the original proposal. Failure to defend an original proposal successfully by the end of the seventh semester in residence is grounds for termination from the Ph.D. program.

SEE APPENDIX FOR: Guidelines for Original Research Proposals
Agenda for Original Proposal Oral Exam

Advancement to Candidacy and All-But-Dissertation Status

Students' status in the program will be reviewed each year (described below under Annual Reviews, page 25). During the first two years in the program, a student is referred to as a "Ph.D. student." Upon successful completion of the first two years of requirements through the research progress report and oral exam, listed below, a student advances to candidacy, which designates completing a major portion of the requirements for the Ph.D. listed below:

- Attainment examinations or approved coursework in the related areas
- Selection of a Research Advisor
- Selection of an Advisory Committee
- The equivalent of at least four full-semester graduate courses in chemistry or related fields with a grade of B in each course
- Formal Seminar
- Research Progress Report
- Satisfactory teaching for two semesters as a Teaching Assistant
- English Language Proficiency at the level of Category 3 on the ITA test (if a non-native speaker of English).

Completion of the Ph.D. candidacy requirements along with the original research proposal will mark attainment of the status designated **All But Dissertation (ABD)** by Carnegie Mellon.

In accordance with university policy, ABD students must complete the Doctoral Candidate form (36K pdf) to declare their intention to complete their dissertation in residence (on campus) or in absentia (off campus).

Students meeting the normally expected deadlines reach candidacy by the end of the second year and ABD status by the end of the third year. ABD students must complete their remaining degree requirement, namely produce and defend publicly an approved dissertation, within seven years of achieving ABD status. Extraordinary circumstances may necessitate the department to seek an extension of the candidacy status. An extension, however, requires approval by the Dean. Additional information about ABD policies, leaves of absence, and in absentia status is available in the Graduate Studies Office.

SEE WEBSITE FOR: Doctoral Candidate Policies for All But Dissertation (ABD)
<http://www.cmu.edu/policies/documents/ABD.html>

Dissertation Progress Meetings

Expectations. To ensure annual discussion of the student's progress after he/she reaches ABD status, the Advisory Committee Chair should work with the student to convene a meeting each year after the third year. In the fourth year, the meeting must be held by mid-semester of the seventh semester in residence unless an extension is granted by the GPC. The goal of the meeting (in most cases, though it may vary with the student's research group) would be to review the scope of a preliminary dissertation outline and very rough timeline for completing the needed work. In the

fall of the fifth year (and if needed, sixth year), the goal of the meeting would be to discuss progress on the earlier plan and to identify and deal constructively with obstacles to completing the plan within the year. In both cases, a written summary of the meeting should be prepared by the Committee Chair and shared with the student, Advisory Committee members, and the Graduate Program Committee, ideally with a copy of any thesis outline discussed during the meeting

Outcomes. If, at any of these meetings, the Advisory Committee finds the student's performance to be inadequate, the student's Research Advisor and/or Committee Chair should communicate these concerns to the Graduate Program Committee within one week. The Graduate Program Committee will review the student's standing in the program at the time of the last departmental review. In serious cases of little or no progress, the advisor, in consultation with the Advisory Committee and the GPC Co-Chairs, may also place a student on probation in the group if he/she is considering terminating the student from the group (see Academic Actions and Appeals, page 26). Probation in the group would normally last for 3-4 months during which the student would retain their level of financial support. The advisor is expected to notify the student in writing of the conditions for regaining good standing in the group and when those conditions have been satisfied. If an ABD student is on probation, he/she is strongly advised to consult the departmental ombudsperson regarding strategies to address the situation.

Residency

University regulations require one year of full-time residency.

SEE WEBSITE FOR: MCS Policies on Doctoral Degrees such as In Residence vs. In Absentia
http://www.cmu.edu/mcs/fac_staff/handbook/candidacy.html

Doctoral Dissertation

The student must write and publicly defend a Doctoral Dissertation. The University standard for the Ph.D. degree states that the thesis must embody the results of extended research, constitute an original contribution to knowledge, and include material worthy of publication. It must demonstrate the candidate's ability to conduct an independent investigation, to abstract principles from which predictions can be made, and to interpret in a logical manner facts and phenomena revealed by the research. This requirement must be satisfied within seven years of the attainment of ABD status, by regulations of the Mellon College of Science.

SEE WEBSITE FOR: MCS Policies on Doctoral Degrees such as Guidelines on Doctoral Thesis Committees
http://www.cmu.edu/mcs/fac_staff/handbook/doctoral.html

M.S. Requirements

Please note that the requirements for the M.S. in Chemistry are not a subset of the Ph.D. requirements. Interested students may need to complete additional work to receive the M.S.

M. S. in Chemistry

Students may earn the M.S. in Chemistry in the normal course of pursuing the Ph.D. by fulfilling the requirements below. Note that students are not admitted for the purpose of earning the M.S. degree and the department does not offer financial support for students wishing to pursue the M.S. as a terminal degree.

Candidates for the M.S. in Chemistry are assigned to an Academic Advisor for the M.S. Degree, who coordinates with the Chair(s) of the Graduate Program Committee and the Department Head. The Academic Advisor for the M.S. Degree meets with the student to formulate a course of studies, and annually thereafter to assess the progress of the student.

Candidates must complete at least 96 units of work, distributed with some flexibility but subject to the following constraints:

1. A minimum of 48 units must be in graduate lecture courses in Chemistry.
2. No more than 18 units may be in undergraduate courses in Chemistry. These must be in upper-level courses (400 level or above) and may include no course equivalent to one previously required to complete a degree in any other college or university.
3. Relevant upper-level undergraduate or graduate courses in other departments or at the University of Pittsburgh (through cross-registration policies) may be taken for credit toward the 96 units, with the approval of the Director of Graduate Studies.
4. To be used for credit, no grade shall be lower than C. The average grade of 96 units, of the first 120 units attempted, must be at least B. Graduate Teaching, 09-931/2 may not be applied as course credit toward the MS degree.
5. Graduate research credit - candidates who elect to apply units earned in graduate research toward the MS degree must complete not fewer than 20 units of 09-861 (Graduate Research). If more than 25 units of graduate research are to be credited, substantial evidence of research accomplishment or proficiency must be presented. Such evidence can be in the form of a dissertation, or in the significant authorship of scientific publications, or the equivalent, and must be approved by the Research Advisor and the Director of Graduate Studies.
6. If no more than 25 units of graduate research are to be credited toward the MS degree, evidence of research proficiency may be provided by the successful completion of the Formal Seminar requirement of the Ph.D Requirements.

M.S. in Polymer Science

Within the general requirements of the Master of Science in Chemistry, the Master of Science in Polymer Science provides the basic background for scientists and engineers to pursue technical careers in industries that manufacture, process and use polymeric materials. In consultation with an advisory committee, the student will arrange a course of studies designed to fit his or her background and career goals. Of the total 96 units, 36-48 units will be required in basic science. Students without prior research experience are encouraged to undertake a research project in collaboration with a faculty supervisor. Faculty members in this research area include Tomek Kowalewski, Krzysztof Matyjaszewski, Gary D. Patterson, and Newell Washburn.

M.S. in Colloids, Polymers and Surfaces

The Interdisciplinary M.S. in Colloids, Polymers and Surfaces (CPS) degree is a joint program with Chemical Engineering designed for professionals working in the polymer field. Participating faculty include Andrew Gellman, Tomek Kowalewski, Kris Matyjaszewski, Gary D. Patterson, Lynn Walker and Newell Washburn.

The program is open to students with a bachelor's degree in science or engineering. Courses are arranged to permit a part-time student to complete the degree work in two years by attending late afternoon and evening classes and by working on a research project during the summer.

Annual Reviews and Program Oversight

Role of the Graduate Program Committee

The Graduate Program Committee (GPC) serves the following functions:

- Advises first-year graduate students on course selection and other academic matters until a Research Advisor is selected,
- Works with students' Advisory Committees to review and approve topics for original research proposals,
- Monitors students' progress in annual reviews, based on input from the advisor, and provides written feedback to students,
- Reviews petitions for extensions on program requirements,
- Meets jointly with the Graduate Student Advisory Committee at least once per year to discuss student feedback and concerns about the program,
- Provides ongoing assessment and review of the graduate program, proposing changes as needed, and
- Approves formal academic actions, other than granting of degrees, such as placing a student on probation or terminating a student from the program.

When an immediate action is required, the Chair(s) of the Graduate Program Committee may act for the Committee. The Chairs are also available to advise students on matters that they may wish to bring to the GPC.

Annual Reviews

Each fall the Graduate Program Committee will solicit brief status reports from each student in the program, along with a written response from the student's advisor, to serve as the basis for an annual review of students' progress through the graduate program. The primary goals of the Annual Review are (1) to check for and address significant concerns of students and/or advisors that may significantly affect a student's timely progress to the Ph.D. and (2) to facilitate advisor feedback on issues or skills important for students' future career development, particularly those that may otherwise fall into the background during the year. The major components of the review process are:

- The status report, approximately 1-2 pages long, addressing specific questions distributed in advance.
- Advisors meet each student prior to submitting written feedback to both discuss the student's status report and to enable the student to ask questions about the advisor's written feedback.
- Upon agreement of the advisor, the brief status report, along with the advisor's written feedback and other relevant data such as grades and ICC work, will serve as the basis for review by the Graduate Program Committee.
- The GPC provides brief written feedback including the student's standing in the program, strengths, and suggestions for improvement.

Since students do not attend the annual review meeting, they are encouraged to meet with the GPC Co-Chairs prior to the review if they wish to share additional information with the committee relevant to the review. Advisors or students who have concerns that are difficult to express in the written status report or advisor feedback should consult with the GPC Co-Chairs to discuss how to best communicate their concerns.

SEE ONLINE GUIDE FOR: Sample Template for Student Status Report
Checklist for Faculty Feedback to Students
Descriptions of Standing in the Department

Petitions for Extension

An extension of any of the Department's program requirements above requires petitioning the Graduate Program Committee, explaining what makes the circumstances exceptional, proposing an alternate deadline, and providing a plan for satisfying the requirement. For example, serious illness or a death in the family would be exceptional circumstances, and the desire to finish a paper for publication would not be exceptional. Extensions may be given by the advisor, in consultation with the GPC Co-Chairs, only for health issues when circumstances are urgent or serious and do not allow time for a formal petition to the Graduate Program Committee. However, even in the urgent case, the advisor must provide some written record (e.g. a short email) to support an extension until discussion with the student can be reasonably arranged.

All petitions for extensions need to include a specific plan for satisfying the requirements. In addition, students on probation must offer a plan for gaining good standing. All plans must include a timeline with observable milestones in terms of courses, projected grades, TA assignment (if any is expected), and concrete evidence of research progress such as written research reports, posters or papers accepted at meetings, submitted publications, and/or patent applications. Supporting documents need to be attached with the petition as evidence of current research progress. A physician's or psychologist's note is needed to support a semester of extension based on ongoing personal/health issues, as opposed to a leave of absence which might also be considered for serious personal/health issues when the student would not be able to work full-time. The normal extension is one semester, with the possibility of an additional extension for students who have changed groups and need to establish research in the new group prior to the research progress report requirement or who have documented exceptional circumstances. As part of the petition review, the student, advisor or GPC may request formal input from the student and the advisory committee, and the advisor and GPC may place additional conditions on the continuation of the student in the Ph.D. program as a result of the review.

In general, petitions for extensions should be received four weeks before the start of the semester in which completion of the requirement is expected or as soon as possible, if the reason for the extension request is health or personal and cannot be foreseen. Note that extensions for the original research proposal will be granted only in rare cases.

If a potential extension is discussed with either of the GPC Co-Chairs in person, it is the student's responsibility to summarize any agreements made in writing for consideration by the GPC. Requests should not be considered approved until written approval comes from the GPC.

Academic Actions and Appeals

The department is committed to supporting students in meeting the standards set by their research advisors and to ensuring that all students maintain the high standards of performance that reflect Ph.D. quality work. The following procedures are designed to give students a reasonable opportunity to correct deficiencies in their work when needed and to make a transition to other future plans when some requirements by the advisor or department are not satisfied. For example, students who do not make satisfactory grades or do not complete other requirements at the expected time will receive letters from the GPC indicating when they are at risk for losing good standing in the Ph.D. program or for possible termination from the Ph.D. program.

Advisors ending research-advisor relationship with a student. Advisors may terminate a student from the group, for example, based on a student's inability to learn how to produce reliable results within a reasonable period of time and while using reasonable resources. Faculty members are strongly encouraged to consult the GPC when they observe early signs of concerns about a student's performance or progress. Difficulties that cause the advisor to consider terminating a student should be documented by the advisor in written feedback and discussed in person in a timely way, as discussed below. This is done formally each fall at the annual review and the GPC can assist advisors and students at other times when they may have concerns.

Faculty and departmental concerns will generally be expressed in two forms, warning letters or probation letters.

1. **Warning letter:** If an advisor is dissatisfied with one of his/her student's progress or efforts in research, he/she is strongly encouraged to provide both in person and in writing a warning to the student about the areas of concern and the criteria for continuing as a member of the group in good standing to assist in addressing the concerns promptly. Students may also receive a warning letter from the GPC for low grades or delays in working on program requirements. Normally, such a notice would specify a plan for monitoring the student's progress toward the desired performance or progress. If the concerns are serious enough that the student may be terminated from the group or Ph.D. program, the warning letter should provide, when possible, 6 months written notice of when financial support would be terminated if the concerns are not adequately addressed. The GPC Co-Chairs should receive a copy of any warning letters, ideally before they are sent.

2. **Probation letter:** If an advisor has serious concerns and may wish to terminate a student from his/her group, he/she should consult with the GPC Co-Chairs about the details of proceeding to put the student on probation in the group. In addition, failure to complete Ph.D. program requirements on the expected schedule can lead to probation. The minimum recommended probation is 3-4 months, during which time the student's financial support as a TA or RA will continue, and will be typically maintained by the advisor if the probation occurs in the summer. Probation letters must include a written notice of when financial support would be terminated if the concerns are not addressed; these letters must be approved by the GPC Co-Chairs. Students on temporary visas are advised to consult with OIE at the start of any probation to discuss visa implications in the event of potential termination that semester.

Note that Annual Review feedback may serve the purpose of a probation or warning letter.

Eligibility to change advisors.

If a student is on probation in one group but otherwise in good standing (as described under Research Advisors), he/she remains eligible to change advisors. If a student is on probation for lack of timely progress on departmental requirements and a new advisor is willing to consider the student for his/her group, the student may only be accepted in the group on a probationary basis and remains at risk for termination at the end of the semester in which he/she changed groups if the advisor's expectations are not satisfied.

If terminated from his/her group, a student may request a 1-2 month grace period to find another advisor before termination from the Ph.D. program, although financial support cannot be promised during this period. After this grace period, a student without an advisor cannot remain in the Ph.D. program. Where possible and appropriate, TA positions or other assignments may be offered, depending on availability of funds and positions. However, if a student is without an advisor, the department cannot guarantee funding.

Termination from Ph.D. program.

If a student is not making adequate and timely progress through the program requirements or on dissertation research and no exceptional circumstances have been documented in petitions approved by the Graduate Program Committee, the GPC may place a student on probation and state the criteria or conditions to regain good standing. If a student does not adequately address the concerns on the timeline specified in the annual review memo or the probation letter, the GPC may require the student to withdraw from the Ph.D. program.

With GPC and department head approval, the student may be eligible to transfer to the M.S. program for a terminal semester if there is a means of financial support. Note that students who have already completed the M.S. in Chemistry requirements will not be eligible to transfer to the M.S. program and typically are not eligible for TA support. A terminal semester in the M.S. program normally requires a double TA assignment; there needs to be an available TA position for which the student has suitable background in order for the student to receive a stipend as a TA.

A student will not normally be terminated from the Ph.D. program without the warning of three months of probation, nor will financial support normally be terminated without three months warning, normally in a probation letter from either the advisor or the department. Six months notice will be given when possible. Limited exceptions with less notice may occur. For example, serious misconduct covered under university policies, such as scientific misconduct, violations of academic integrity, misuse of computing resources, and workplace threats or violence, all include dismissal as a potential sanction. In addition, extended, unapproved absences may lead to termination by the department without three months warning or probation.

Appeals.

A student may appeal academic decisions (e.g. grade, probation, termination) by an instructor, the GPC, advisor, or advisory committee in writing to the Department Head. The student may also consult with any member of the GPC or the departmental graduate ombudsperson in an advisory capacity prior to an appeal. If a resolution cannot be reached within the department, the student may consult with the MCS graduate ombudsperson (currently the Associate Dean for Special Projects) about preparing a formal written grievance to the Dean. For more information, see the MCS grievance procedures for graduate students.

Financial Matters

Tax implications of stipend support

All stipends are federally taxable. Information about tax implications of funding can be obtained from Sharon McCarl, Associate Dean of MCS.

Summer funding

Graduate student stipends are for the academic year. Summer support normally is provided from research assistantships funded by grants, etc., awarded to the faculty or fellowships/awards received directly by the student from internal or external sources. Limited exceptions may be made for summer support from the Department under some circumstances by prior arrangement with the Department Head, dependent on the available resources. In all cases, a faculty member's decision not to support one of their students during the summer must be approved by the Department Head.

Policies on outside employment

Employment outside of the research assistantship or teaching assistantship is prohibited for full-time graduate students in the Department of Chemistry during the academic year. Exceptions can jeopardize the tax status of all graduate students, and thus any opportunity must be reviewed by the Research Advisor, the Graduate Program Committee, and the Associate Dean for Administrative and Financial Affairs.

Outside employment is prohibited if summer support is provided. If summer support is not available, the student may seek outside employment with permission of his/her Research Advisory Committee.

Written notice of changes in financial support

Every effort is made to provide continuous support to students in good standing, within the limits of the available resources. The Department places a high priority on maintaining continuous financial support for graduate students, and provides notice to students on changes in their financial support, with a 6 month written notification, where possible, in the event of a change in the funding. If a student's funding is lost or reduced or reduced unexpectedly and continuous funding proves difficult to arrange, the student should first consult the Department Head and, if needed, the Associate Dean for Special Projects.

If a student is terminated from the Ph.D. Program, the student's first notice of a possible change in financial support will be included when he/she is initially placed on probation. The probationary period will typically last 3-4 months. If conditions for reestablishing good standing are not met within that time, a student may, depending on departmental resources and available positions, receive a terminal semester in the department with funding through a TA position during the academic year or other employment during the summer.

Additional Fellowships

Students are strongly encouraged to pursue all fellowships for which they are eligible and competitive. For example, outstanding U.S. citizens are eligible for NSF Graduate Research Fellowships during their first year of a Ph.D. program. In addition, generous gifts from alumni and friends have made possible three departmental fellowships described online at: <http://www.chem.cmu.edu/grad/prosp/fin.html>. Announcements about these and additional opportunities are announced by email.

Attendance at Conferences

In most cases, decisions regarding the student's attendance at conferences and funding availability is at the discretion of the Research Advisor. The University provides additional sources of funding to support small travel grants from which students may apply through the Graduate Program Office.

Additional Policies Affecting Graduate Students

Ombudsperson and Grievances

Rea Freeland serves as ombudsperson for graduate students to assist with difficult academic or personal situations where a confidential sounding board and/or an intermediary can be helpful. Examples of situations where students are encouraged to seek advice or assistance include:

- Difficulty in communications with advisor, particularly when those difficulties may lead to potentially changing advisors or leaving the program
- Conflict with other group members that is difficult to resolve within the group
- Issues related to diversity or the departmental climate for those groups who are historically underrepresented in science
- Personal concerns that interfere significantly with the ability to make timely progress in research or program requirements. These might be due to health, family or financial challenges.

Upon the student's request, conversations will be kept in confidence. Should additional help be enlisted, the student would be asked before sharing information. More about departmental ombudspersons can be found on the MCS GSAC website at http://www.cmu.edu/mcs/fac_staff/handbook/ombud.html.

In the event that a difficulty cannot be resolved within the department, Rea Freeland in the capacity of ombudsperson for all MCS graduate students can also assist with following the MCS grievance procedures that enlist the Dean's office in resolving difficult matters.

Changing advisors

A student may change research advisors at any time in the program. Typical reasons for such changes are shifts in research interests away from the advisor's area or difficulties in advisor-student communication. The process of changing advisors will generally involve:

- soliciting a new advisor (typically done confidentially and with advice from the departmental ombudsperson),
- being accepted by that individual,
- determining how to discuss the desire for a change with the prior advisor,
- giving the prior advisor sufficient opportunity to discuss the situation (and potentially ways to address any concerns leading to the desire to change), and
- determining, with the prior advisor and the Department, what should be done to finish work in the former group and provide a smooth transition, similar to what would be expected leaving other types of jobs.

Students who are considering a change of advisors are encouraged to seek confidential advice on the details of these steps by consulting the Associate Head. Note that prospective advisors should generally keep discussions of change of advisor confidential until the student's decision is final and the Department Head has approved of the change.

Leaves of Absence

In certain circumstances such as health problems or changes in family circumstances, students may wish to consider a brief leave of absence from graduate study. Details about whether and how to pursue this option are available by consulting Valerie Bridge or the GPC Co-Chairs.

MCS Policy on Graduate Student Time Off

Students with graduate assistantships are expected to continue with their research during academic breaks (including summer months) with the exception of official University holidays. Paid time off for personal business or vacations generally is not included as part of a graduate's financial support. A supported graduate student who wants to take a short break (one or two weeks) must get approval for that break from his/her advisor and, if required by the terms of the student's support package, must make up the work.

Supported graduate students wishing to take longer periods of personal time off must do so without financial support. The advisor will notify the Department's Business Office of any such arrangements so that an appropriate adjustment in the student's support can be processed.

The timing and length of any time off must be approved in advance by the advisor before travel commitments are made. Before absences, the student must discuss with the supervising faculty member(s) ways to ensure that his/her progress is satisfactory and that research and/or teaching responsibilities can be met satisfactorily. Students with TA responsibilities are expected to be on campus to attend any department required TA training and at the end of the semester to finish grading or other duties assigned by the department.

Summary of Timeline for Completion of Ph.D. Requirements

This timeline shows the typical time to complete the Ph.D. in 5-5.5 years, given timely completion of these requirements along with good progress in research. Variations occur in exceptional circumstances.

<p>1ST SEMESTER Attainment examinations taken</p> <p>ICC work for 15-30 hours per semester is required to reach Category 3 and/or to satisfy ICC requirement of 15+ hours of training concurrent with a TA assignment for those in Category 2 or Category 3 (30 hours per semester is advisable for most students not yet in Category 3).</p>	<p>2ND SEMESTER ICC work for 15-30 hours required to reach Category 3 or concurrent with TA assignment for Category 2 or 3</p> <p>TA requirement typically completed (Students must continue to register for 12 units of Graduate Teaching whenever working as a teaching assistant.)</p> <p>Commitment to research advisor and joining a group due by mid-semester (<i>typically completed early in semester</i>)</p>
<p>3RD SEMESTER English Language Proficiency due by beginning of semester</p> <p>Advisory Committee due to be formed by beginning of semester</p> <p>Formal seminar due</p> <p>Attainment requirement due by end of semester</p> <p>Course requirement due by end of semester</p>	<p>4TH SEMESTER Research progress report completed, including poster presentation, written report, and oral exam</p> <p>Ph.D. Candidacy typically achieved</p>
<p>5TH SEMESTER Original proposal topics due</p>	<p>6TH SEMESTER Original research proposal due, including written proposal and oral exam</p> <p>ABD status typically achieved</p>
<p>7TH SEMESTER ABD committee meeting due, usually to review progress since 4th semester</p>	<p>8TH SEMESTER Dissertation research</p>
<p>9TH SEMESTER ABD committee meeting, typically to review tentative thesis outline and graduation plans</p>	<p>10th-11th SEMESTER Dissertation research and writing</p>

Quick Contact Information

Graduate Program

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Timothy Sager, MI 440, x8-3343, ts1c@andrew.cmu.edu

TA Responsibilities

Karen Stump, DH 1316, x8-2340, ks01@andrew.cmu.edu

Useful On-line Resources

Mellon College of Science Degree Policies (includes doctoral candidacy policies)

http://www.cmu.edu/mcs/fac_staff/handbook/degree.html

Graduate Education at Carnegie Mellon

<http://www.cmu.edu/graduate>

Graduate Programs Office (includes professional development and support for women and people of color)

<http://www.cmu.edu/adm/gpo>

Environmental Health & Safety (provides safety training and information for the University)

<http://www.cmu.edu/ehs>

Office of International Education (provides guidance on VISA issues)

<http://www.studentaffairs.cmu.edu/oie>

Intercultural Communication Center (helps international students develop English fluency for research and teaching)

<http://www.cmu.edu/icc>