

Graduate Student Handbook 2019-2020

DEPARTMENT OF CHEMISTRY
KENNETH P. DIETRICH SCHOOL OF ARTS AND SCIENCES
UNIVERSITY OF PITTSBURGH

GRADUATE PROGRAM AND DEPARTMENTAL REGULATIONS FOR
M.S. AND Ph.D. PROGRAMS IN CHEMISTRY

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The graduate program in chemistry at the University of Pittsburgh is designed to prepare students to distinguish themselves as MS and PhD chemists, through creativity, critical thought, articulate expression, and a keen understanding of the methodology and literature related to their chosen subfield of chemistry. In their first two years, students complete a combination of course-work and research requirements, and in their last two to three years they focus on research for completion of the PhD degree. As chemical research is a collaborative endeavor, students are expected to attend seminars and colloquia throughout their graduate career. Over time, students will find that seminars and colloquia provide an excellent mechanism for learning about the frontiers of chemical research and for identifying other scientists who have common, or synergistic, research interests.

The Department of Chemistry graduate program policies and procedures are based on University of Pittsburgh Dietrich School of Arts & Sciences graduate study policies. General requirements that apply to all students pursuing MS or PhD degrees in the Dietrich School of Arts & Sciences can be found at the following url sites:

Graduate Studies: <http://www.asgraduate.pitt.edu/forms-policies>

Regulations Governing Graduate Study, Revised 2008: <http://www.pitt.edu/~graduate/regtoc.html>

General Regulations: <http://www.bulletins.pitt.edu/graduate/regulations2.htm#Anchor-Regulations-14210>.

It is each student's responsibility to understand these policies, procedures, and regulations; please review them. Regulations and program details that are specific to the Department of Chemistry are provided in this handbook.

1. STUDENT ADVISING

Guidance to all new students is provided by the Graduate Student Advising Committee (GSAC). Members of this committee meet with each new student during orientation to plan a program of study and to assist with the course registration process. Additional meetings are held during the registration period for the student's second term classes. Each student is advised by GSAC until (s)he passes the Preliminary Examination, in the latter part of the first year. GSAC and the Director of Graduate Studies (DGS) will continue to monitor the progress of all students in the program so that the major milestones of the graduate program are completed on time (see below).

Minimum Progress Requirements: Meeting the scheduled milestones and course requirements listed below are a requirement for continuation in the graduate program. In addition, during each of the first two terms in residence (not including summers), each student must complete, for a letter grade, at least three credits of formal coursework and a total of at least 6 credits of course work and/or research work combined. Due to this requirement, during each of the first two terms in residence, students are required to receive GSAC approval for withdrawing from any courses or changing from taking a course for a letter grade to taking it as an audit.

2. THE PhD DEGREE

The path to the PhD degree has several milestones,

- 1) A student must join a research group and begin research by the end of the first 2 terms; see section 2.1.
- 2) Students must complete a total of 12 credits of graduate level coursework (2000 and 3000 level courses) that are sanctioned by the Graduate Curriculum Committee within the first five terms and with grades of B or better; see section 2.2.
- 3) The student must pass the Preliminary Exam before May 31 of their first academic year (first half of the 3rd term in residence). Depending on the strength of a student's passing performance in this exam, (s)he will be advised whether to proceed toward an MS or a PhD degree; see section 2.3.
- 4) The student must pass the Comprehensive exam (which also serves as the PhD candidacy exam) before the end of the 6th term in residence. If the student passes this exam, (s)he is expected to complete thesis research and pass the PhD defense by the end of the 5th year (15 terms). Under extenuating circumstances, a student can remain in the program for longer than 5 years, but (s)he must meet with the thesis committee biannually and can only receive a 6 month extension at each meeting; see section 2.4.
- 5) The student must prepare and defend her/his PhD dissertation; see section 2.5.

An overview of the milestones and a timeline for completing them is provided in Appendix II.

2.1. SELECTING A MAJOR ADVISOR AND JOINING A RESEARCH GROUP

2.1.a. Joining a Group: Each student must join a research group (or groups if choosing to have a Dual Advisor, see section 2.1.b). The faculty member directing that research group(s) will serve as the student's Major Advisor after the Preliminary Exam is completed. To assist with this decision,

- entering graduate students are required to take CHEM 2700, a seminar in which chemistry research faculty present overviews of their research programs.
- students may participate in a research ‘rotation’ program by enrolling in CHEM 2710. Students who elect this activity will spend 4 weeks each in three different research groups during the fall semester (months of September, October, and November). Students who enroll in CHEM 2710 will be placed in faculty/research groups during the new student orientation.
- students are required to meet individually with ≥ 3 faculty members to discuss research opportunities before the end of their first term. During these meetings, students must ask the faculty member to sign their “Selection of Research Problem and Director” form (‘Blue Form’). This ‘Blue Form’ is distributed at the last class meeting of CHEM 2700.

After meeting with faculty, students must submit their prioritized list of three potential research advisors and their ‘Blue Form’ to the Chemistry Department Graduate Program Administrator by a date that will be announced. Students who have not reached a decision on group preference by that date may continue to discuss their interests with relevant faculty, however, their assignment to a research group and their ability to begin research activities may be delayed. Students are required to submit their prioritized list of potential faculty advisors by the end of the first term.

After the deadline for the receipt of the ‘Blue Form’, the Graduate Program Administrator will notify individual faculty, identifying students who have placed them first on their lists. Faculty will then inform the Graduate Program Administrator which of these students they can accommodate and will accept into their group. If a student is not accepted into his/her first choice group, the Graduate Program Administrator will notify the student’s second choice faculty member. If there is no second round match, the iterative process continues until all students have been placed. After faculty have confirmed their student acceptances to the Graduate Program Administrator, students are informed of their research group assignments.

In the rare instance that a student does not get any of his/her first three choices, the Graduate Program Administrator will meet with the student to suggest groups that still have openings for new students. The graduate student is then encouraged to meet with faculty who have openings to complete the group selection process. Group selection for students entering in the fall term is finalized as early as possible in the spring term that follows.

2.1.b. Dual Advisors: A student may wish to have two collaborating professors as Major Advisors (Dual Advisors). In such cases, the student should discuss this possibility with both potential Dual Advisors before the formal selection process begins. If the faculty members agree to act jointly as advisors (a Dual Advisor arrangement), then the above-described formal selection process should be modified. The student should list the Dual Advisors as a single choice on the ‘Blue Form’. A brief letter to the Graduate Program Administrator should accompany the ‘Blue Form’, indicating that the first choice for Major Advisor is a Dual Advisor arrangement, and that the potential Dual Advisors have agreed to the plan.

The Graduate Program Administrator should be notified in writing by the potential Dual Advisors before the selection process deadline that a Dual Advisor arrangement is being considered. In the communication, the Dual Advisors should describe the plan for mentoring of the student, for lab and desk space, and for financial support. A copy of this letter will be placed in the student's file.

2.1.c. Changing research groups: Most students complete their graduate career in the group that they originally join. Students may, however, choose to move to another group. In these cases, students should seek the advice of the GSAC Chair or the Director of Graduate Studies to assist with the desired change. A student who decides to change groups must be accepted into another group in order to remain in the program. Note that dissertation research is often nontransferable and changing research focus may involve additional coursework; thus, switching groups often results in additional time in the program.

2.2 TWELVE CREDITS OF GRADUATE LEVEL COURSE WORK

Students must complete 12 credits of graduate level course work with grades of B or better. In the Dietrich School of Arts & Sciences, a grade of B is defined as adequate performance for graduate students (an A grade is considered outstanding performance and a C grade is considered deficient performance). The 12 credits must arise from courses contained in the menu provided below and/or approved by GSAC and the Graduate Curriculum Committee (GCC) before the start of the term. Note that at least 6 credits of coursework with a GPA of at least 3.0 must be completed before the Preliminary Exam at the end of the first year (see section 2.3), and all 12 credits

of coursework, with grades of B or better, must be completed in advance of the Comprehensive Exam (see section 2.4). Selection of core courses is done in consultation with GSAC before the Preliminary Exam, and it is done in consultation with the student's Preliminary Exam committee after that.

Table 1 lists 3 credit graduate level chemistry courses that are offered and have been approved to satisfy the requirement. Students who plan on specializing in an area of concentration, particular subdiscipline (Analytical, Biological, Inorganic/Materials, Organic, and Physical), may be required to take particular combinations of these courses; see Appendix V for a listing of the special requirements for an area of concentration. A schedule of courses is available at <https://www.registrar.pitt.edu/courseclass.html>.

Division	Course #	Title	Credits
Inorganic	2110	Chemical Symmetry	3
Inorganic	2120	Descriptive Inorganic Chemistry	3
Analytical	2210	Electroanalytical Chemistry	3
Analytical	2220	Chemical Separations	3
Analytical	2230	Analytical Spectroscopy	3
Organic	2310	Advanced Organic Chemistry 1	3
Organic	2320	Advanced Organic Chemistry 2	3
Physical	2430	Quantum Mechanics and Kinetics	3
Physical	2440	Thermodynamics and Statistical Mechanics	3
Biological	2810	Introduction to Biological Principles and Methodologies	3
Biological	2820	Applications of Chemical Tools to Biological Problems	3
Biological	2830	Synthetic Biology	3

In addition to these courses within the Department, students may request to take a course from outside the Department. Requests must be approved by GSAC (and the GCC) in advance of the term in which the course is taken. Some courses from other departments that have been approved are listed in Table 2.

Table 2: Courses Outside of Chemistry that are Pre-approved for the 12-Credit Requirement.

Department	Course #	Title	Credits
BIOSC	2940	Molecular Biology	3
BIOSC	2145	Protein Life History	3
MSCMBP	2885	Imaging Cell Biology in Living Systems	3
MSCMP	3790	Basics of Personalized Medicine	3
MSMVM	3410	Microbial Pathogenesis	3
PHARM	3032	Medicinal Chemistry	3
PHYS	3715	Solid State Physics	3
PHYS	3716	Adv. Solid State Physics	3

In addition to the courses listed in Tables 1 and 2, a wide range of graduate level courses are available; see Appendix VI and Appendix VII.

2.2.a. Students with advanced standing: Students who enter the graduate program with advanced standing (i.e., students who have a Master's Degree in chemistry or who have already taken graduate-level courses in chemistry) may request permission from GSAC to earn credit for a graduate level course by taking an examination. This 'credit by examination' option is only available to students who have previously taken a graduate-level course similar to one of the Chemistry department's offerings, as determined by the course instructor. Earning credit by examination involves the assignment of a letter grade for an existing Pitt course based on an oral or written examination, at the discretion of the course instructor. Students who wish to earn "Credit by Examination" must obtain the form from the Graduate Program Administrator, meet with the instructor of the course to determine the

nature of the examination, and provide the completed form to the Graduate Program Administrator. The student must register for the said course, and (s)he will receive a grade for it. A course passed by examination counts towards the 12 credit course requirement.

2.2.b. University-wide 12-credit and GPA requirement: The University and the Department require that a minimum of 12 credit hours of coursework at the 2000- or 3000-level (excluding Independent Study, Directed Study, Thesis, and Teaching credits) must be completed with an earned grade of B or better (Note: not a B average but rather a grade of B or better in courses totaling to 12 credits).

Successful completion of the 12 credit course program represents the minimum course preparation for a graduate career in chemistry. To provide additional opportunities, the Department offers a range of advanced courses in several branches of chemistry. Students who elect for an area-of-concentration (Analytical, Biological, Inorganic/Materials, Organic, and Physical) may be required to take particular sets of courses or additional courses beyond the minimum 12-credits. Additional requirements and guidelines for areas-of-concentration are provided in Appendix V.

Regulations Governing Graduate Study at the University of Pittsburgh: A grade average of at least B (GPA=3.0) is required in the courses which make up the program for any graduate degree. A student with full graduate status is automatically placed on probation whenever his or her cumulative GPA falls below 3.00. *A student on probation is not eligible for teaching support* and is not allowed to take the PhD preliminary examination, to take the MS or PhD comprehensive examination, or to graduate. If the GPA remains below 3.0 in two consecutive terms, the student faces dismissal from the program. Note: The GPA is the average of grade points earned in graduate level courses (2000 and 3000 level). Seminars, undergraduate courses, courses audited or taken for a satisfactory/unsatisfactory grade, teaching credits, etc., do not contribute to the GPA.

2.3. THE PRELIMINARY EXAMINATION

The student, in consultation with his/her advisor, must form a committee of three T/TS chemistry faculty including the advisor before the end of February in the second term in residence. The preliminary exam must occur in the period March - June of the student's first academic year; *i.e.*, in the last half of the student's 2nd term in residence or the first half of the student's 3rd term in residence. To pass this exam the student must demonstrate a strong likelihood for passing the comprehensive exam, which occurs in the last part of the student's second year in the program. In the preliminary exam, the student must demonstrate i) good progress in meeting the course requirement (*i.e.*, at least 6 credits with an average GPA of 3.0 or better), ii) an understanding of their research project (*i.e.*, an ability to articulate their project's goals and importance), and iii) basic skills and aptitude for chemistry research (*i.e.*, a basic understanding and experience in theory, literature, and methods that are core to their research).

The goals of the preliminary exam are to assess the student's progress and to advise the student on the best pathway forward in the graduate program. The preliminary exam is a 'closed door' meeting that includes the student, the student's advisor, and two other chemistry department T/TS faculty members. The student is required to provide the committee with a short (1 to 2 pages) description of their proposed dissertation research and a summary of her/his coursework progress at least 2 weeks in advance of the exam. The Preliminary Exam has three possible outcomes: i) the student is dismissed from the program because of having grades below the requirement, not completing the required number of courses, and/or not demonstrating sufficient understanding of chemistry to explain and discuss the general area of her/his research project, methods, and related literature; ii) the student is directed to the MS track if (s)he cannot adequately describe and defend, with reference to pertinent literature, the chosen research project and the methods that will be used to pursue it, and their progress to date; and iii) the student is directed to the PhD candidacy track if their coursework puts them in good standing and they have a substantial grasp of their project and its context.

2.4. COMPREHENSIVE EXAMINATION

2.4.a. The Comprehensive Exam Committee: As one of the requirements for the PhD degree, each graduate student must pass a Comprehensive Examination. This requires the selection of a Committee which will assess the student's preparation and aptitude for independent scholarship and research. This committee is selected by the student in consultation with the Major Advisor, and must consist of at least three members of the Graduate Faculty of the Chemistry Department, including the Major Advisor, who will serve as the committee chair.

Typically, this committee is the same as that in the Preliminary Exam and serves as the thesis committee; however, this is not a requirement.

2.4.b. The Examination: The Comprehensive Examination, which is an in-person meeting in front of the Comprehensive Exam committee, provides the candidate with an opportunity to demonstrate her/his potential for independent research and scholarship. The research problem, its theoretical background, and its current literature furnish a natural ground on which to conduct the exam. The Comprehensive Exam must take place before the end of the student's 6th term in residence.

In advance of the exam date, the candidate must provide a written report on the research problem. The report must be distributed to the committee members two weeks before the examination and should be informative enough so that the committee can, if it desires, dispense with the oral presentation by the candidate and begin the questioning immediately. Each student must confer with her/his Major Advisor to determine a reasonable length for the written summary; see Appendix V for guidelines that are particular to an area-of-concentration/division. During the exam, the student will be asked to report on the research he or she has accomplished and to support conclusions made in the document through the presentation of primary data and, if necessary, its documentation (e.g. notebook entries). In addition to answering questions on the research itself, the student should be prepared to answer questions on the theoretical and practical aspects of the general field in which the research problem lies. The student must demonstrate a command of graduate course work and its application to the research problem. The committee will examine the following three points: 1) the quality of the student's research and whether the reported research progress demonstrates that the student is on track for timely completion of the PhD, 2) the level of the student's knowledge of chemistry, and 3) the quality of the written document. Because this exam serves as admission to PhD candidacy, students must be prepared to describe their future research plans, and the description must be sufficiently detailed to serve as the dissertation prospectus.

2.4.c. Results of the Comprehensive Examination: This exam has three possible outcomes: i) the student is admitted to PhD candidacy, ii) the student is directed to complete an M.S. thesis before the end of the 7th term, or iii) the student is dismissed from the program. The results of the Comprehensive Examination are reported on the University of Pittsburgh *Report on Examinations for Doctoral Degree* card (UMC 78843-0711); and the card must be submitted to the Chemistry Department's Graduate Administrator.

Admission to PhD Candidacy: If the student demonstrates satisfactory performance, committee members sign the examination report card and check 'Pass'. The exam is complete. Committee members may provide additional advice, recommendations, and feedback for the student's consideration.

Admission to MS Candidacy: The committee may decide that a student be directed to complete an MS thesis. In this case, committee members sign the examination report card and check 'MS'. See section 3.0 for a description of the MS degree requirements.

Dismissal from the Program: If the student does not demonstrate satisfactory performance, committee members sign the examination report card and check 'Fail.' The committee, or a representative of the committee, most often the Major Advisor, will explain in detail why the student has failed the exam. The explanation will be summarized in a written statement, co-signed by all members of the committee, and provided to the student within one week of the examination.

2.5. ADMISSION TO CANDIDACY FOR THE PH.D. DEGREE

Admission to candidacy for the PhD degree constitutes a promotion of the student to the most advanced stage of graduate study and provides formal approval to devote exclusive attention to research and preparation of the doctoral dissertation. To qualify for admission to PhD candidacy, students must i) have full graduate status, ii) passed the preliminary evaluation, iii) completed all required formal course work with an average QPA ≥ 3.00 , iv) passed the comprehensive examination, and v) received approval of the proposed subject and plan of the dissertation from the doctoral committee following an overview or prospectus meeting of the committee. To apply for candidacy, the student must complete the *Application for Admission to Candidacy for Doctoral Degree* form and obtain the signatures of each member of the doctoral committee. When completed, this form must be given to the Chemistry Department's Graduate Administrator. Note that the form must be submitted to the Dean no less than eight months prior to the final oral defense date.

2.5.a. The doctoral committee: The doctoral committee is four or more persons, including the Major Advisor, at least two other faculty members of the Chemistry Department, and at least one other Graduate Faculty member

from another department in the University of Pittsburgh or from an appropriate graduate program at another academic institution. To verify qualifications, external faculty, or Pitt faculty not listed in the Graduate Faculty Roster (<https://ir.pitt.edu/graduate-faculty-roster/>), are required to submit a complete curriculum vita for approval by the Dean's office. The doctoral committee has the responsibility to advise the student during the progress of his/her research, the duty to maintain high quality research standards, and the authority to require the revision of any or all portions of the dissertation. The committee conducts the final oral examination and determines whether the dissertation meets accepted standards.

2.5.b. Overview or Prospectus Meeting: Meetings of the PhD candidate and the doctoral committee must occur at least annually from the time the student is admitted to candidacy. During these meetings, the committee should assess the student's progress toward the degree, discuss objectives for the upcoming year and confirm the timetable for completing degree requirements. A two-page document summarizing the dissertation prospectus and progress toward its completion, as well as an updated curriculum vita, must be distributed to the committee two weeks prior to each annual meeting. The doctoral committee must unanimously approve the dissertation topic and research plan. Approval of the topic and research plan does not imply either the acceptance of a dissertation or the restriction of the dissertation research to this original topic.

2.6. DISSERTATION AND FINAL EXAMINATION

An essential part of the training of a chemist is an introduction to independent study. The PhD dissertation is a report on investigations completed under the supervision of a member of the research faculty. It must represent an original contribution to knowledge and must show the relationship between what the student has discovered and the student's prior knowledge. The candidate's dissertation is defended in an oral examination before the Doctoral Committee (see section 2.5.a); and the candidate must register for the 'Seminar in Chemistry' course, CHEM 2090, in the term that (s)he defends.

Copies of the dissertation must be given to members of the dissertation committee at least two weeks prior to the defense date. For inclusion of collaborative research in a dissertation the following guidelines (taken from <http://bulletins.pitt.edu/archive/2010/graduate/regulations2.htm>) must be followed; namely

If the dissertation is the result of a collaborative research effort, the project should be structured in such a way that the student's dissertation results from one clearly identified piece of work in which the student has unquestionably supplied the major effort. The contributions of the student and the other collaborators must be clearly identified.

Published articles authored by the student and based on research conducted for the dissertation study may be included in the dissertation if the student's department and school have a written policy that this is acceptable. In any case, the published work must be logically connected and integrated into the dissertation in a coherent manner, and sufficient detail must be presented to satisfy the characteristics of a dissertation. The student should be the sole or primary author of the published work. If the published articles were coauthored, the contribution of the student must be clearly delineated in the introduction so the committee can ascertain that the student's own work satisfies the requirements of a dissertation.

The [ETD Format Guidelines](#) gives instructions on incorporating articles into the dissertation.

The student is required to present a public seminar on her (his) thesis dissertation. Typically, the public seminar immediately precedes the dissertation defense to the committee, which is a closed meeting. At least one month before the desired dissertation defense date, the PhD candidate must contact the Chemistry Facilities Coordinator to reserve the meeting room for the dissertation defense. The Facilities coordinator will notify the Graduate Program Administrator and they will request that the candidate submit the defense information using the form: <https://pitt.wufoo.com/forms/defense-information/>. The Graduate Program Administrator will use the information provided by the candidate to create the publication in the University Times and the postings within chemistry buildings. See Appendix IV for more details.

2.7. OTHER REQUIREMENTS

A student in the PhD program must also satisfy the following requirements.

2.7.a. Language Requirement: There is no foreign language requirement in the PhD program; however, students for whom English is not a native language must meet certain English language requirements.

The English Fluency in Higher Education Act of the Commonwealth of Pennsylvania requires the University to certify that all individuals who teach possess adequate English language fluency for effective communication with students in the classroom. The English Language Institute (ELI) at the University of Pittsburgh conducts testing of students who are non-native speakers of English, to ensure compliance with the legal requirements of the Commonwealth of Pennsylvania and to validate the English proficiency of non-native speakers of English who are matriculating in University programs. The University of Pittsburgh English Language Institute administers the [English Comprehensibility Test](#) to newly appointed teaching assistants (TAs) who are non-native English speakers during the incoming graduate student orientation period before classes begin in the fall. The test is scored from 1 (poor) to 5 (very good). A score of 3 is required for laboratory teaching assistants, while a score of 4 is required for recitation instructors. If a student receives a score ≤ 3 , then (s)he is required to register for tutoring and improve her (his) English language skills to at least a score of 4.

As English is the international language of scientific communication, obtaining a score of 4, or better, on the ELI exam within one year of admission to the program is required. The Department will monitor the student's progress toward demonstrating her (his) English proficiency. A student's score on the ELI examination must increase by at least one unit (e.g., from 2 to 3 or from 3 to 4) between the time of the first test and the next testing late in the fall term. Student's must continue taking courses and tutoring with ELI until they reach a score of 4. If the student score is still below a 4 at the end of the second term in residence, the student will be placed on academic probation. The inability to attain adequate performance on the Comprehensibility Test is grounds for nonrenewal of financial aid (TA, TF, GSR, GSA) and if a score of 4 or better on the ELI exam is not earned by the end of 3 terms in residence the student will be dismissed from the program.

2.7.b. Teaching Requirement: At least two calendar terms of teaching experience that includes student contact are required of all PhD candidates. The minimum teaching assignment will consist of one laboratory section or one recitation section per week for each of the two terms. The teaching requirement must be fulfilled within the student's first two calendar years in the graduate program. (Students who are non-native English speakers should review section 2.7.a.). See Appendix I for a more detailed description of expectations and duties for Teaching Assistants (TAs) and Teaching Fellows (TFs).

2.7.c. Residency Requirement: The minimum residency requirement for the PhD degree is met by six terms of registration as a graduate student for 12 or more credits per term, or the equivalent number of credits (72) in a reduced load. A term of full registration is defined as the satisfactory completion of four 3-credit courses or equivalent units of research.

No more than 30 credits may be accepted to meet the minimum credit requirement for students entering the graduate program with an MS degree (or its equivalent) awarded by another institution.

During any term that dissertation research is being conducted, a student must register for at least 3 credits, if total credits earned to date are less than 72. When total credits earned are 72 or greater, a student should register for zero credits of full-time dissertation study (FTDB 3999).

It is not possible to earn the PhD degree by evening study alone.

2.7.d. Divisional/Area-of-Concentration Requirements: In addition to the requirements specified above, graduate students in the PhD program who wish to have an area of concentration in a particular subdiscipline must satisfy supplemental requirements set forth by the various Divisions of the Department; see Appendix V.

2.7.e. Grades: A student with full graduate status is automatically placed on probation whenever her (or his) cumulative GPA falls below 3.00. Students whose cumulative GPA is less than 3.00, cannot pass the preliminary examination, are not eligible to take the comprehensive examination, cannot be admitted to candidacy for the PhD degree, and cannot graduate.

3. THE MS DEGREE

An overview of the milestones and a timeline for completing them may be found in Appendix III.

3.1. COURSE REQUIREMENTS

Each MS student must complete a minimum of 12 credits of 2000- or 3000-level chemistry courses with a grade of B or higher (this is a university-wide requirement); see Section 2.2. This course requirement serves as the student's Comprehensive Exam for the MS degree. In addition, students electing to present a non-research

thesis must take for credit one laboratory course (Chemistry 1250, 1430, 1440, 1600). In addition to classroom courses, the MS student will also register for MS Research (CHEM 2000).

3.2. MINIMUM PROGRESS REQUIREMENT IN THE MS PROGRAM

The student must maintain a cumulative GPA of 3.00 or higher: if the GPA is below 3.00 the student is placed on academic probation and is not eligible to take the Master's thesis exam. GSAC monitors the progress of all students to ensure that this minimum progress requirement is met.

3.3. RESEARCH AND THESIS

The thesis for the MS degree is written under the supervision of a Major Advisor who is chosen by the student. It may consist of either an original research study or a comprehensive literature survey of some topic of current interest in chemistry. In either case, the thesis must be defended in an oral examination before a Thesis Examination Committee consisting of the Major Advisor as chairperson and two other members of the Graduate Faculty chosen by the Major Advisor and approved by the Department Chair. Copies of the thesis must be in the hands of the thesis committee at least two weeks prior to the defense date.

3.5. OTHER REQUIREMENTS

Thirty credits of graduate coursework or research (2000 level or higher) are required to earn an MS degree in chemistry. No more than six credits may be granted toward the completion of the requirements for a MS degree for graduate work completed at another institution.

4.0. LEAVES OF ABSENCE

Under special conditions, graduate students may be granted one leave of absence. A maximum leave of two years may be granted to PhD students or one year to Master's students. The length and rationale for the leave of absence must be stated in advance, recommended to the Dean by the Major Advisor, by GSAC, or by the Administrative Officer, and approved by the Dean. If approved, the time of the leave shall not count against the total time allowed for the degree being sought by the student. Re-admission following an approved leave of absence requires notification by the student of his or her desire to return.

A leave of absence for medical reasons requires submission of a letter from the student's medical professional indicating the length of leave time requested, not to exceed two years. When a student wishes to return from medical leave, the medical professional must submit a letter to the Chemistry Department verifying that the student is released to return to full time active status.

Parental accommodation leave is available for eligible students. In the case of adoption or the birth of a child, six weeks of parental leave may be taken. For birth mothers, the time of leave is specified by the health care provider. A request for graduate student parental accommodation should be submitted to the Office of Graduate Studies prior to the anticipated child birth/ adoption date; forms for this purpose are available electronically at <http://www.asgraduate.pitt.edu/sites/default/files/Request%20for%20Graduate%20Student%20Parental%20Accommodatio%20form.pdf>). For more details on eligibility requirements, please see http://www.pitt.edu/~graduate/Grad_Parental_Accommodation_Guidlelines.pdf .

5.0. STATUTE OF LIMITATIONS

The purpose of the statute of limitations is to ensure that a graduate degree from the University of Pittsburgh represents mastery of current knowledge in the field of study. All requirements for the MS degree must be completed within a period of four consecutive years from the student's initial registration for graduate study. From the student's initial registration for graduate study, all requirements for the PhD degree must be completed within a period of ten years, or within eight years if the student has received credit for a master's degree. If a student is unable to complete all degree requirements within a seven-year period after passing the comprehensive examination, a comprehensive re-examination may be required.

6.0 POLICIES AND PRACTICES FOR RESEARCH

6.1 SAFETY AND CHEMICAL HYGIENE

The Environmental Health and Safety (EH&S) Department (<https://www.ehs.pitt.edu/>) oversees aspects of safety and chemical hygiene associated with research activities on campus. Their office should be consulted about proper use, storage, and disposal of hazardous materials, including bloodborne pathogens and other biohazardous materials. The Chemistry Department Safety Committee cooperates with EH&S to provide education, training, and guidance for safe laboratory practices and chemical hygiene. All students are required to undergo safety training and certification before they can begin research (or teaching) activities in the Department. Because education and learning are an ongoing enterprise, all faculty and students are required to participate in the Department's Safety seminars which occur each term during the academic year.

The University Radiation Safety Office (<http://www.radsafe.pitt.edu/>) oversees the safe use of radioactive isotopes and other sources of ionizing radiation. Application forms to be submitted for authorizations may be found at <http://www.radsafe.pitt.edu/forms/>.

Research involving biological specimens and organisms is governed by the Institutional Biosafety Committee (<http://www.ibr.pitt.edu/>) and includes work involving recombinant DNA or gene therapy.

6.1.a Department Policy on Safety Incident Reporting and Accountability

Purpose: It is the goal of the University of Pittsburgh, Department of Chemistry to provide a safe environment for all faculty, students, and staff in the Department. All members of the Department of Chemistry, including undergraduate students in laboratory courses, and anybody with laboratory access, have a responsibility to learn and follow safe laboratory practices and to meet accepted workplace safety standards.

Incident Reporting Procedures. Members of the Department are required to notify the immediately responsible party (supervisor, course coordinator, research director, *etc.*) or the Facilities Manager (Ms. Mary Beth Conroy) of all laboratory and workplace accidents, including but not limited to those involving any of the following circumstances:

- Chemical spills
- Incidents of exposure or release of hazardous materials
- Incidents resulting in an injury or near-injury
- Incidents resulting in damage to facilities or instrumentation

Any acute injury, fire, or hazardous material release requires the immediate notification of emergency responders. A written report of the incident must be sent to the Mr. Joshua Jones (Director of Chemistry Stockrooms) as soon as possible, but no later than 24-hours after the incident.

Safety Committee Review. Mr. Joshua Jones, upon receipt of a written incident report, shall forward the report to the Chair or designated members of the Safety Committee for review. The Chair of the Safety Committee will review the report, and decide on a course of action, when appropriate with the help of appropriate members or the entire Safety Committee. Typically, the Safety Committee will transmit their findings to the Chair of the Department or the full faculty and make recommendations to improve safety practices.

For more serious events, particularly for repeated incidents, the Safety Committee may choose to convene a meeting of the principals (*e.g.*: undergraduate student(s), graduate student(s), postdoc(s), TA(s), course coordinator, research director, and/or others) in order to understand the circumstances of the incident. Other persons who desire to bring information to the committee may do so at this time, and should contact the Chair of the Safety Committee. If the incident in question was not caused by failure to follow accepted, safe laboratory practices, no further action will be taken in regard to the incident, unless faulty equipment was deemed to be responsible, in which case the equipment will be repaired or decommissioned. If the committee determines that accepted, safe laboratory practices were not followed and that failure to follow said practices caused the incident in question, the following actions shall apply:

First Incident. If the incident in question is the first such involvement of the individual(s) in a safety infraction, he/she will be required to re-take specific safety training offered by the Department of Chemistry and/or EH&S. The incident and required actions will be documented by the Safety committee. Upon completion of the re-training, the individual(s) shall provide notice to the immediate supervisor, the Chair of the Safety Committee, and the Administrative Officer of the Department of Chemistry that the safety training has been completed.

Second Incident. If the incident in question is the second such incident, the individual(s) shall receive written notification requiring the following actions:

- Repeat training in all Department of Chemistry Safety Programs and/or appropriate EH&S training sessions.
- The individual(s) should prepare a written protocol for each experimental procedure to be performed. Each written protocol shall be reviewed and approved by the immediate supervisor prior to the start of any work in the laboratory/workplace and will continue for a time defined by the Safety Committee. The laboratory might need to establish specific standard operating procedures (SOPs) in collaboration with EH&S.
- The incident and required actions will be documented. Upon completion of the re-training, the individual(s) shall provide notice to the supervisor, the Chair of the Safety Committee, and the Administrative Officer of the Department of Chemistry that the safety training has been completed.

Other Incidents. In the event that more than two incidents occur within the same laboratory, the Safety Committee may require adjustments to the term of the safety probation or written protocols or any other requirement designed to ensure that the individual(s) and the laboratory follow accepted, safe laboratory/workplace practices. EH&S will be involved in these discussions to facilitate Campus-wide uniform regulations.

For individuals who chronically fail to demonstrate appropriate safety practices, the Safety Committee may decide to recommend more severe sanctions, including a ban on specific experimental work, dismissal from the program, and/or termination of employment, in consultation with the university legal counsel.

Additional information about good safety and chemical hygiene practices, as well as Departmental procedures can be found at <https://www.intranet.chem.pitt.edu/safety/>.

6.2 PATENT RIGHTS AND TECHNOLOGY TRANSFER POLICY

Investigators may have occasion to protect their research findings, both for themselves and for the University, through copyrights or patents. The University's Innovation Institute (<https://www.innovation.pitt.edu/>) assists faculty and students in evaluating discoveries or inventions for this type of legal protection and in applying for copyrights or patents. Investigators should also consult the Innovation Institute if they are considering or are involved in commercialization of an invention or other intellectual property through a start-up company, an established company, or any other business venture. The University's policy that establishes ownership rights and responsibilities on inventions and intellectual property (policy 11-02-01) can be found on the University website at <https://www.policy.pitt.edu/patent-rights-and-technology-transfer-11-02-01>.

6.3 GUIDELINES ON ACADEMIC INTEGRITY

Academic integrity is extremely important to the University's mission. The University provides a set of guidelines, defines faculty and student obligations, and delineates procedures for addressing questions of academic integrity; see https://www.provost.pitt.edu/sites/default/files/academic_integrity_guidelines.pdf. The specific procedures of the Dietrich School of Arts and Sciences govern the Chemistry Department, and can be found at <https://as.pitt.edu/faculty/policies-and-procedures/academic-integrity-code>.

6.4 GUIDELINES FOR RESPONSIBLE CONDUCT OF RESEARCH

The Research Conduct and Compliance Office (<http://rcco.pitt.edu/>) encompasses various units that oversee and facilitate the conduct of ethical and regulation-compliant research. The Provost's office provides a set of guidelines for the conduct of research at the University, and they can be found in the pdf file: <http://www.provost.pitt.edu/documents/GUIDELINES%20FOR%20ETHICAL%20PRACTICES%20IN%20RESEARCH-FINALrevised2-March%202011.pdf>

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6.5 INCLUSION AND DIVERSITY

The Department of Chemistry strives to create an open and supportive research and learning environment for persons of all backgrounds and life choices. The Department follows the principles of the University's Office of Diversity and Inclusion (ODI), which is 'committed to fostering diversity and celebrating differences, educating the community on the benefits of diversity, promoting equity, eliminating discrimination, and advancing equal access to all opportunities at the University.' For more details, please visit <https://www.diversity.pitt.edu/about>.

6.6 OTHER POLICY STATEMENTS

The University's GSR policy statement: <http://www.pitt.edu/~graduate/GSRPolicyStatement.pdf> .

The University's TA/TF policy statement: <http://www.pitt.edu/~graduate/TATFGSAPolicyStatement.pdf> .

Academic Appeals process. A student who has concerns relating to a grade or other academic matter can appeal the decision. The proper sequence for reconsideration is to appeal first to the instructor (or examination committee); then if dissatisfied, appeal to the Director of Graduate Studies and/or the Department Chair. If dissatisfied with the Department decision on the appeal, the student should then approach the Dean of Graduate Studies.

Other Appeal/Grievance processes. Students who have concerns or grievances on other aspects of programmatic matters may consult with the Director of Graduate Studies and/or the Department Chair. If dissatisfied with the Department decision, the student should then approach the Dean of Graduate Studies.

APPENDIX I: TEACHING ASSISTANTSHIPS AND TEACHING FELLOWSHIPS

Upon selection for admission to the chemistry graduate program by the Admissions Committee, teaching Assistantships are awarded on a two- or three-term basis to qualified applicants. First-year students who do not receive Teaching Assistantships initially may be considered for appointment at a later time, if qualified. Participation in Department of Chemistry teacher training activities is required to hold teaching assistantships or teaching fellowships. Teacher training sessions are held prior to each fall term during new graduate student orientation.

At the end of the first term of teaching, each Teaching Assistant's performance will be reviewed by the faculty member in charge of the course. If the student's performance is not satisfactory, the student will be advised that his or her appointment may not be renewed. Should the performance not improve by the end of the second term, the appointment will not be renewed.

Teaching Assistantships (TA) and Teaching Fellowships (TF) will not be awarded to those who fail to satisfy the Minimum Progress Requirement or who fail to maintain a cumulative 3.00 GPA. All students who hold TA or TF appointments must be in compliance with the general regulations for graduate students in the Dietrich School of Arts and Sciences. Appointments from the existing graduate student body will be made by the Administrative Officer in consultation with the faculty. The number of appointments will be dependent upon the Department's undergraduate teaching schedule, the projected enrollment in undergraduate chemistry courses and laboratories, and the TA/TF allocation received from the Graduate Dean.

POLICIES FOR TEACHING ASSISTANTS AND TEACHING FELLOWS

The teaching of chemistry by Teaching Assistants (TAs) and Teaching Fellows (TFs) is both a responsibility and a privilege. Students are appointed to these positions because the Department believes they have the ability necessary to pursue graduate studies and at the same time to assist in the education of undergraduate students. It is expected that the latter activity will deepen the graduate student's own knowledge of chemistry.

Several handbooks which provide more information on the role of teaching assistants and on becoming a more effective TA are available. These are *The Teaching Assistant Experience* published by University Center for Teaching and Learning (UCTL) at the University of Pittsburgh and the *Handbook for Teaching Assistants*, specifically designed for TAs in chemistry, by the American Chemical Society. In addition, the *Manual for Foreign Teaching Assistants* published by the University of Iowa, is especially helpful to TAs who are not familiar with customs and practices in American universities. Each TA is mentored by a teaching supervisor who will guide and assist them in their duties.

Teaching assistants/fellows are expected to convey concepts and skills clearly, accurately, and enthusiastically. In addition, they should promote a positive atmosphere for the class and encourage active participation by all of the students. A good learning atmosphere is cordial and respectful, as well as effective. A professional and clear teacher-student relationship is expected; for example, disparaging comments about the course or other instructors is not appropriate. Lastly, the Department and the University are against classifying students' abilities by nationality, sex, or race; each student is an individual person of worth and should be treated as such. Moreover, sexist and racist comments, jokes, slurs, and the like have no place in the classroom.

The following sections describe: (A) Awards for excellence in teaching; (B) Duties of Teaching Assistants and Teaching Fellows; (C) Recommended teaching workloads; (D) Procedures for evaluation of teaching; (E) Other considerations; and (F) Safety Obligations.

A. Safford Fellowship and Safford Awards for Excellence in Teaching: The Department of Chemistry has established the Safford Fellowship and Safford Awards to recognize graduate student TA/TFs for outstanding contributions to the Department's undergraduate teaching mission. Each year one person is chosen to receive the Safford Fellowship, which provides a term of stipend support, and a few others are chosen to receive Safford Awards. All TAs are expected to strive for the excellence in teaching that these awards represent.

B. Duties of Teaching Assistants (TAs) and Teaching Fellows (TFs): Duties of TAs and TFs are essentially the same. TFs are more experienced graduate students (having served at least two terms as a TA in the past) who may be expected to handle more challenging assignments. [First year students with Teaching Assistantship awards do serve a third term as a TA rather than a TF if they teach during the summer term of their first year.]

Both TAs and TFs are expected to
attend all scheduled TA/TF lab instruction meetings.
be prepared and meet all assigned classes promptly at the scheduled time and place.
demonstrate principles of good laboratory safety.
supervise their assigned laboratory sections responsibly, at all times.
meet individually students when they need help.
proctor and grade.
register for CHEM 2970.

Infractions of laboratory safety policy by TAs/TFs, unexcused absences from TA meetings, or other inappropriate conduct will be addressed by the Laboratory Coordinator and will be reported to the Department of Chemistry Administrative Officer, the Professor in charge of the course, the Course Coordinator, and the Safety Committee for appropriate disciplinary action.

C. TA/TF Workloads and Time Management: Required duties for TAs and TFs vary with the course; however a graduate student assistant **must not** spend more than 20 hours per week on her/his teaching duties. Students who find that they are spending more than 20 hours per week on teaching duties should seek advice from the course instructor and/or their Faculty Mentor on how to adjust their time management or have their assignment adjusted appropriately.

D. Evaluation: Teaching performance will be evaluated in a number of ways during the term.

1. During the term your class may be visited at various times by the person in charge and, possibly, by other faculty members. Try not to be disconcerted by these visits. Their purpose is to observe the class, to check on the accuracy of student comments and evaluations, and to see if there are any ways to help improve your teaching and student learning.
2. At the end of term (and at mid-term in some lab courses such as General Chemistry) students will complete questionnaires on TA performance. The results will be shared and discussed with the lab coordinator.
3. At the end of the term the person in charge of the course will fill out a teaching evaluation that includes evaluations by the students and an overall performance assessment.

Lack of acceptable performance in key teaching responsibilities can lead to loss of the teaching assistantship for one year. Such issues include failure to apply basic safety rules (including negligence to wear or instruct students to wear safety goggles), failure to meet with the class punctually, or failure to attend TA meetings. In all cases, warnings will be given before any action is taken, and discussions about the situation will be held with the lab coordinator and others within the Chemistry Department. First and second warning letters will go to the TA/TF, the lab coordinator, and the research advisor (or the GSAC chair for students who have not joined a research group). After the third incident, the TA position will automatically be withdrawn for a period of one year. The student and/or advisor can appeal to the Chair if (s)he disagrees with the decision.

E. Other Considerations.

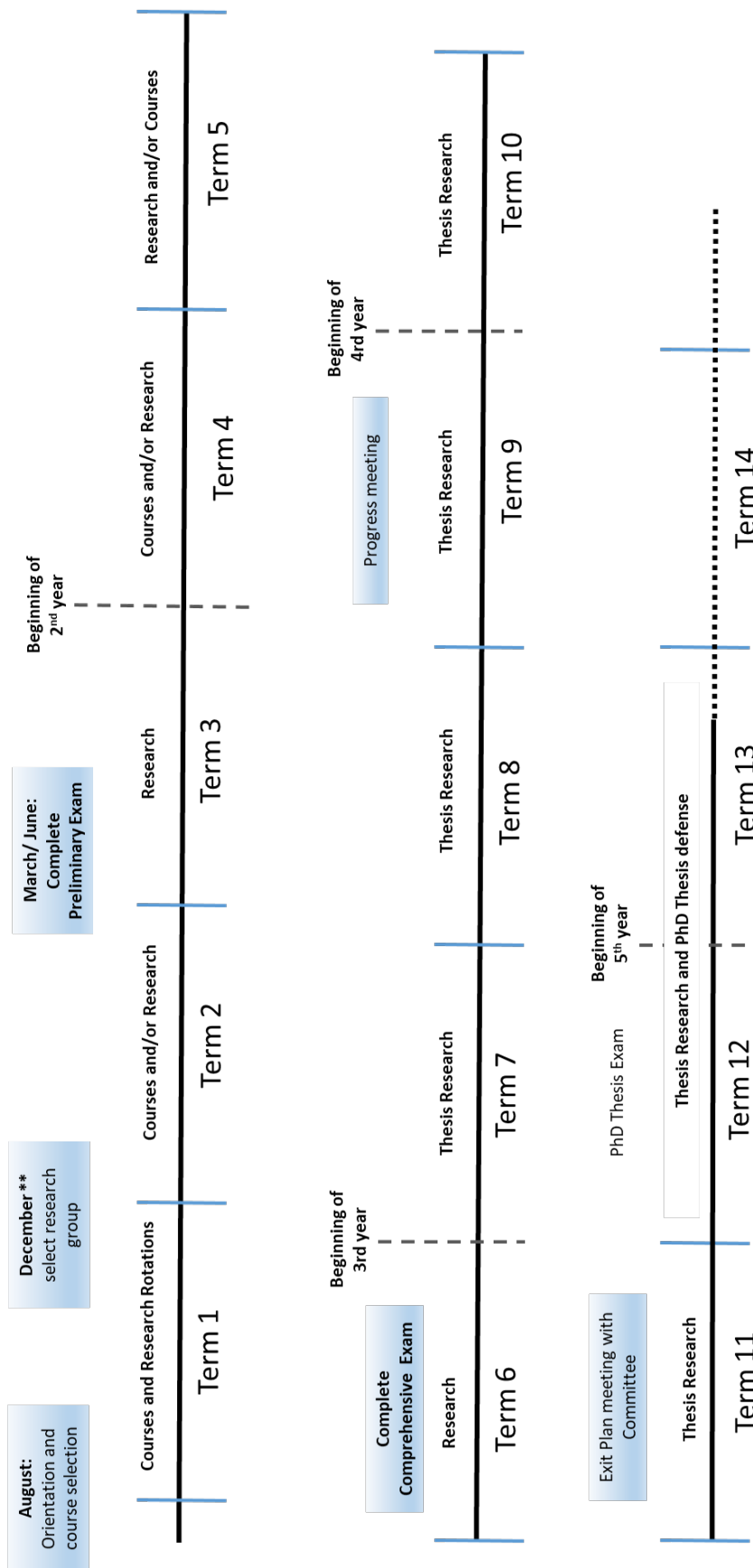
Academic Integrity: The University's *Guidelines on Academic Integrity*, which describes academic classroom situations and behaviors that are unacceptable, are shared with TAs during their initial training. If you suspect a student of cheating or plagiarism, first discuss the matter with the person in charge of the course to determine the best manner in which to approach and (if necessary) correct the problem.

Problem Resolution: Any TA or TF who experiences a problem connected with his/her teaching duties should try first to resolve it by talking with the person in charge of the course. If the problem cannot be resolved in this way, the TA or TF can appeal to the Director of Graduate Studies.

F. Safety Obligations: Proper lab safety is of paramount importance to all members of the Department of Chemistry. As a TA/TF, you are an appointed representative of the department and are therefore an integral part of maintaining a safe working environment. TAs and TFs are required to follow proper lab safety protocols and to ensure that students follow proper lab safety protocols. Failure to follow lab safety protocols on the part of the TA/TF or students under the direction of the TA/TF can result in disciplinary action.

APPENDIX II: THE PHD PROGRAM TIMELINE, MILESTONES, & CHECKLIST

Example of Timeline for PhD Student



PhD Program Checklist

- _____ Satisfactory completion of 12 credits of approved graduate level courses.
- _____ Complete preliminary exam before the end of the third term in residence.
- _____ Complete comprehensive exam before end of sixth term in residence; obtain committee signatures on Comprehensive Exam card and submit to the Chemistry Department Graduate Administrator (Ms. Christie Hay).
- _____ Obtain committee signatures on the 'Application for Candidacy' form and submit the form to the Chemistry Department Graduate Administrator (Ms. Christie Hay). The form must be submitted and approved at least 8 months before the PhD dissertation defense. The PhD dissertation committee must include three graduate faculty members from the department and one outside member. The outside member must either be a University of Pittsburgh Graduate Faculty member (<http://www.ir.pitt.edu/gradfac/homepg.htm>), or the "outside" committee member must provide a full CV to attach to the 'Application for Candidacy' form, before it can be submitted to the Dean's office for approval.
- _____ Apply for graduation at the Graduate Dean's office (5141 Sennott Square) in the term in which the defense will occur and the degree will be completed. (At the beginning of each term, all Chemistry graduate students will receive notification when graduation application documents are available for pickup at the Dean's office.) If all the requirements are not met in that term, the candidate must apply again in the subsequent term in order to graduate.

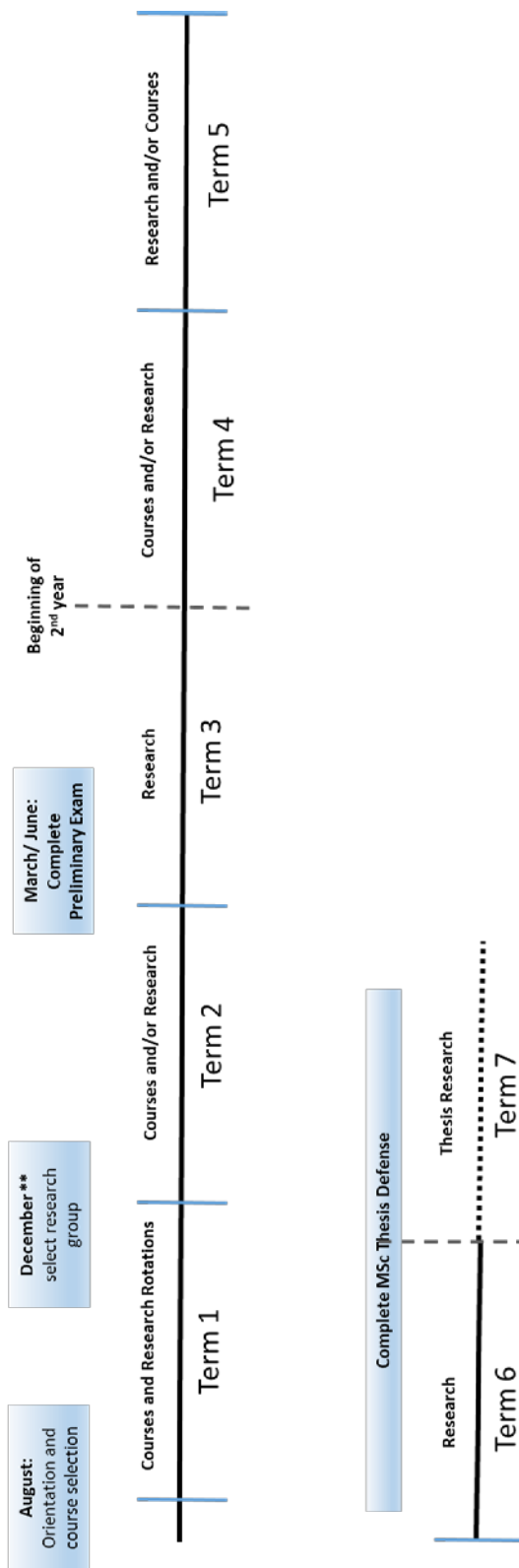
The PhD Defense

- _____ Register for at least 1 credit (or FTDB 3999 – 0 credits) in the term for graduation.
- _____ Register for the seminar course, CHEM 2090 Seminar in Chemistry, in the term that the PhD defense occurs.
- _____ Contact the Chemistry Department Facilities Coordinator (Ms. Mary Beth Conroy, at chembldg@pitt.edu or 412-624-5521) to reserve a room for the defense.
- _____ Announce the thesis defense within the Department. Contact the graduate administrator, Ms. Christie Hay, in the main office to give the information for posting and to notify the University Times and the Dean's office.
- _____ Prepare PhD dissertation and submit an electronic version of the document to the PITT ETD website: <https://d-scholarship.pitt.edu/>.
- _____ Upon satisfactory completion of the PhD dissertation defense, obtain signatures on the PhD Defense card and ETD paperwork. Submit the signed card to the graduate administrator, Ms. Christie Hay, and the ETD paperwork to Sennott Square.

Note: If a change to the members of the dissertation committee is needed, complete a Change of Committee form before the defense. See the Chemistry Department Graduate Administrator, Ms. Christie Hay, to obtain the form.

APPENDIX III: THE MS PROGRAM TIMELINE, MILESTONES, & CHECKLIST

Example of Timeline for MSc Student



MS Program Checklist

- _____ Satisfactory completion of 12 credits of 2000- or 3000-level chemistry courses, with a grade of B or higher, is required; at least 6 credits must be from sanctioned chemistry courses; see Table 1 in Section 2.2.
- _____ For MS candidates who elect to complete a non-research literature thesis, one additional laboratory course (CHEM 1250, 1430, 1440 or 1600) is required.
- _____ Conduct research or comprehensive literature survey, select Thesis committee members. MS thesis committee must include the Thesis Advisor and two other members of the University of Pittsburgh Graduate Faculty (<http://www.ir.pitt.edu/gradfac/homepg.htm>). Note that you must meet with your Thesis Committee at least once per year to review your research objective and your plan of study.

MS Defense

- _____ Apply for graduation at the Graduate Dean's office (5141 Sennott Square) in the term you plan to complete your degree. (At the beginning of each term, all Chemistry graduate students will receive notification when graduation application documents are available for pickup at the Dean's office.) If you do not complete the requirements in that term, you will be required to apply again in the term in which you graduate.
- _____ You must register for at least 1 credit in the term in which you will graduate. Contact the Chemistry Department Facilities Coordinator (Ms. Mary Beth Conroy, chembldg@pitt.edu or 412-624-5521) to reserve a room for the defense.
- _____ Announce your presentation within the department. Contact Chemistry Department Graduate Administrator (Ms. Christie Hay) in the main office to give the information for posting and to notify the University Times and the dean's office.
- _____ Prepare MS thesis and submit an electronic version of the thesis to the PITT ETD website: <https://d-scholarship.pitt.edu/>.
- _____ Upon satisfactory completion of your MS defense and revisions to your thesis and ETD, obtain signatures on the Thesis Defense card and ETD paperwork. Submit the signed card to the graduate administrator, Ms. Christie Hay, and the ETD paperwork to Sennott Square.

APPENDIX IV: DEFENSE OF DISSERTATION OR THESIS LOGISTICS

All students preparing for an MS Thesis or PhD Dissertation Defense are responsible for reserving a room in which to hold the event and for ensuring that the Thesis or Dissertation Defense is adequately publicized. To arrange a room and the publicity for the defense, the candidate should contact the Department of Chemistry facilities coordinator, at least one month prior to the defense date. Requests should be emailed to chembldg@pitt.edu. In order to request a room, please provide the following information in your request:

1. Reason for request
2. Room/space that you are requesting
3. Date and time of event
4. Duration of event

University Times and Pitt Chronicle Announcement of PhD Defense: All PhD defenses must be announced in the University Times. MS and PhD defense meetings should also be publicized on announcement boards posted throughout the Department of Chemistry. The requested information must be submitted to the graduate administrator no less than one month prior to the actual defense date. Once you make room arrangements with the facilities coordinator, the graduate administrator will have you complete a form with the required information for the postings; see <https://pitt.wufoo.com/forms/defense-information/>. The graduate administrator will also forward these details to the University Times and the Graduate Dean's office.

APPENDIX V: PHD GUIDELINES AND REQUIREMENTS FOR DIVISIONAL AREAS-OF-CONCENTRATION

General regulations are listed in the Bulletin of the Faculty of Arts and Sciences and in the section “The Ph.D. Degree” in this handbook. The information below applies specifically to students planning to emphasize a particular subdiscipline of Chemistry.

Doctoral Program in Analytical Chemistry

COURSE REQUIREMENTS: Students with a concentration in Analytical Chemistry are required to take at least two out of these three courses: Electrochemistry (Chem 2210), Chemical Separations (Chem 2220), and Analytical Spectroscopy (Chem 2230) for 6 credits toward the 12-credit course requirement. The other 6 credits may be chosen based on the student’s own interests, the advice of the Graduate Student Advising Committee, or the recommendation of the Major Advisor.

Doctoral Program in Biological Chemistry

COURSE REQUIREMENTS: Biological Chemistry doctoral students will take four 3-credit courses. Biological Chemistry 1 (CHEM 2810) and Biological Chemistry 2 (CHEM 2820) will serve as required courses. The research advisor will recommend remaining courses that include (but are not limited to) Advanced Organic Chemistry 1 and 2 (CHEM 2310 and CHEM2320, respectively), Chemical Separations (CHEM 2220), and Synthetic Biology (CHEM 2830), as well as courses offered by the Biological Sciences Department and the Pitt Medical School. These outside courses, each 3-credit, may include the following pre-approved courses: Molecular Biology (BIOSC 2940), Imaging Cell Biology in Living Systems (MSCMBP 2885), Microbial Pathogenesis (MSMVM 3410), and Medicinal Chemistry (PHARM 3032). Other courses will need approval by the Graduate Curriculum Committee.

COMPREHENSIVE EXAMINATION: Students will submit a single-spaced, 12-page document describing the dissertation research problem and background information (~4 pages), as well as work to date carried out by the student and future research plans (~8 pages). The list of bibliography and the experimental section are excluded from the 12-page limit. In the experimental section, students will describe only the key experiments leading to novel and publishable findings. The document should be submitted to each member of the Comprehensive Examination Committee at least two weeks prior to the scheduled oral examination. The comprehensive examination will be a two-step process: an ‘open to all’ research presentation (typically, 30 minutes) followed by a closed-door question-and-answer session. The committee may wave the open presentation format under special circumstances.

Doctoral Program in Inorganic and Materials Chemistry

COURSE REQUIREMENTS: Students are required to take both inorganic core courses, Chem 2110 and 2120, as well as six other credits of graduate level classes. In addition to the 12 credits of graduate level courses, students are also required to take one additional graduate course (2 or 3 credits) approved by the Major Advisor. With the approval of the Major Advisor, a student may elect to take two 1-credit graduate mini-courses, if they are offered, instead of the additional 2- or 3-credit graduate course.

COMPREHENSIVE EXAMINATION: A written summary of the student’s dissertation research problem, including background material and literature references, the work to date carried out by the student, and future research plans, should be submitted to each member of the Comprehensive Examination Committee at least two weeks before the scheduled oral examination. The Inorganic and Materials division suggests these be ten pages in length, single-spaced, or twenty pages in length double-spaced, ignoring the list of references/bibliography and experimental section. No more than three pages, single-spaced text or five to six pages double-spaced should be devoted to the introduction, so that the student will focus primarily on their research results and discussion.

SEMINAR REQUIREMENT: Each student is required to present one public seminar about his or her dissertation research. He or she should register for Chem 2190 during the term in which the seminar is to be presented.

Doctoral Program in Organic Chemistry

COURSES REQUIREMENTS: Organic students are required to take both organic core courses (Chemistry 2310 and 2320) and Chemistry 1380/2380 (Techniques of Organic Research). Advanced courses in the Division are treated in a two-year cycle of one month, one credit modular units (Minicourses) on Special Topics (Chemistry 3300, 3310, 3320). This program is designed to give advanced students exposure to new developments outside their area of concentration. Each doctoral candidate is required to take for credit a total of three credits of advanced-level minicourses during his or her residence but is encouraged to audit others. No single course can be used to account for all 3 credits, and a GPA of 3.00 or greater is required. In order to ensure maximum freedom of choice, students are advised to register for all three courses (3300, 3310, 3320) during any term in which he or she plans to take one minicourse for credit; before the final examination in the course, the student informs the instructor whether he or she wishes to take the course for credit or audit.

COMPREHENSIVE EXAMINATION: The Organic Division requires that the written report include a discussion of the background of the research problem and of the experimental results to date. In addition, positive results should be described in as full experimental detail as that required for a thesis. A manuscript that is published, submitted, or in preparation for submission to the peer-reviewed literature may be used as the written report with the consent of the Major Advisor and Comprehensive Exam Committee. If a manuscript is to be used in this way, it should be supplemented with a document detailing the contributions of the student to the work, both research and writing, as well as a discussion of future plans.

Doctoral Program in Physical Chemistry

COURSE REQUIREMENTS: Physical Chemistry doctoral students are required to take both Physical Chemistry core courses: CHEM 2430 and CHEM 2440. The Graduate Student Advising Committee, Preliminary Examination Committee, and/or the Research Advisor will recommend additional courses.

COMPREHENSIVE EXAMINATION: While the main emphasis of the examination is the presentation and defense of the student's thesis problem, the student will be expected to show a command of the more general material in physical chemistry and other relevant graduate courses that (s)he has taken.

The written document: A written summary of the student's dissertation research problem, including background material and literature references, the work to date carried out by the student, and future research plans, must be submitted to each member of the Comprehensive Examination Committee at least two weeks before the scheduled oral examination. The written summary should be in the same form as a publication quality document, such as a JACS Communication or JPC Letters manuscript. As such the document should be concise and not exceed 2500 words. The document should include an abstract, a main text, and graphics, as necessary, to efficiently convey the major findings and ideas. As with a JACS communication, 'it is desirable that the principal conclusions be stated in the opening sentences of the manuscript.' While the document should define the student's research problem and elucidate its importance in the more general context of the student's subfield of physical chemistry, this part of the document should not exceed 600 words. References and Experimental details are not part of the 2500 word count.

APPENDIX VI: ADVANCED UNDERGRADUATE/GRADUATE COURSES

The following chemistry courses are cross-listed and should be taken for graduate credit (2000 level) in order for the course to count toward graduate degree requirements.

- CHEM 1130/2180 Inorganic Chemistry
- CHEM 1260/2260 Intermediate Analytical Chemistry
- CHEM 1310/2370 Synthetic Organic Chemistry
- CHEM 1380/2380 Techniques of Organic Research
- CHEM 1450/2450 Molecular Modeling & Computer Graphics
- CHEM 1460/2460 Numerical Methods in Chemistry
- CHEM 1600/2600 Synthesis & Characterization of Polymers
- CHEM 1605/2610 Synthesis & Characterization of Polymers (lab)
- CHEM 1620/2620 Atoms, Molecules, and Materials

Descriptions of the courses and their availability can be found on the Department and University webpages.

APPENDIX VII: SUBJECT AREA GRADUATE LEVEL COURSES

Analytical

- CHEM 2210 Electroanalytical Chemistry
- CHEM 2220 Chemical Separations
- CHEM 2230 Analytical Spectroscopy
- CHEM 2290 Seminar in Analytical Chemistry
- CHEM 3200, 3240 Advanced Topics in Analytical Chemistry
- CHEM 3230 Chemometrics

Biological

- CHEM 2810 Biological Chemistry 1
- CHEM 2820 Biological Chemistry 2
- CHEM 2830 Synthetic Biology
- CHEM 2890 Seminar in Biological Chemistry

Inorganic

- CHEM 2110 Chemical Symmetry: Applications in Spectroscopy and Bonding
- CHEM 2120 Descriptive Inorganic Chemistry
- CHEM 2190 Seminar in Inorganic Chemistry
- CHEM 3100, 3110, & 3120 Advanced Topics in Inorganic Chemistry

Organic

- CHEM 2310 Advanced Organic Chemistry 1
- CHEM 2320 Advanced Organic Chemistry 2
- CHEM 2330 Organometallic Chemistry (2 cr)
- CHEM 2390 Seminar in Organic Chemistry
- CHEM 3300, 3310, 3320, & 3330 Advanced Topics in Organic Chemistry
- CHEM 3380 Organic Group Meeting
- CHEM 3390 Synthetic Organic Colloquium

Physical

- CHEM 2430 Quantum Mechanics & Kinetics
- CHEM 2440 Thermodynamics & Statistical Mechanics
- CHEM 2490 Seminar in Physical Chemistry
- CHEM 2530 Molecular Spectroscopy
- CHEM 2550 Magnetic Resonance Spectroscopy
- CHEM 3400, 3410, 3430, & 3520 Advanced Topics in Physical Chemistry
- CHEM 3430 Advanced Quantum Chemistry
- CHEM 3440 Time-dependent Quantum Dynamics
- CHEM 3460 Introduction to Modern Computational Science
- CHEM 3470 Statistical Mechanics
- CHEM 3480 Kinetics and Motion in Chemical Reactions
- CHEM 3490 Molecular Collision Dynamics
- CHEM 3530 Advanced Topics in Reaction Dynamics
- CHEM 3580 Advanced Topics in Material Science
- CHEM 3590 Biomolecular Thermodynamics & Kinetics

General Courses

- CHEM 2000 Research & Thesis for the Master's Degree
- CHEM 2090 Seminar in Chemistry
- CHEM 2700 Graduate Research Seminar
- CHEM 2710 Chemistry Research Rotation Experience

- CHEM 2970 Teaching of Chemistry
- CHEM 2990 Independent Study
- CHEM 3000 Research & Dissertation for the PhD Degree
- CHEM 3001 Preparation for the STEM Classroom
- CHEM 3002 Adv. Learning Evidence-Based STEM Teaching
- CHEM 3700 Scientific Proposal Writing
- CHEM 3902 Directed Study

Descriptions of the courses and their availability can be found on the Department and University webpages.