

Drexel University

Department of Chemistry

Graduate Student Handbook

2015-2016

Graduate Student Handbook
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I. Department of Chemistry Graduate Program Overview

A. Welcome

On behalf of the Chemistry Department at Drexel University, I extend to you a warm welcome. From our beginning as a part of the Chemistry and Chemical Engineering Department of Drexel Institute of Technology (which became Drexel University in 1971), we have evolved into a separate department in the College of Arts & Sciences awarding both Masters and Doctoral degrees (the first Ph.D. in 1968) in all major areas of chemistry.

At Drexel we have strong nationally and internationally recognized programs in the areas of analytical, atmospheric, inorganic, organic, physical, and polymer chemistry. In addition, Drexel encourages interdisciplinary activities. Several of our faculty actively collaborate with scientists in areas such as computational science, biological chemistry, and materials science.

Two of our department's most important goals are to increase basic chemical knowledge and its application to fundamental basic research. At the same time, we want graduate students to appreciate practical applications of chemistry in solving the problems that we all face in the modern world. Our department is small enough to provide each student with individual attention while maintaining a community of scholars (faculty, postdoctoral associates, graduate and undergraduate students). The relatively small research groups enable close interaction between students and their Research Advisors. We regard such attention and interaction as important positive features of our program.

Within our department, students and faculty are investigating diverse and exciting research problems ([Department of Chemistry Web Site](#)). The wide range of faculty interests ensures that we can stimulate the interest of students.

This handbook contains some important information with respect to your graduate career; please read it carefully and review the information, if necessary, with your Faculty Advisor. Of particular help is the checklist at the end of the handbook (Appendix B).

You should also download from the chemistry website the department and university forms ([Graduate College Resources](#)) that are pertinent to the graduate degree(s) you wish to pursue. Departmental forms C2-C3a and C5 are also included at the back of this handbook.

Good luck and best wishes for your future in chemistry!

Fraser Fleming
Head of Department

B. Advanced Degree Programs in Chemistry

The Chemistry Department offers Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in Chemistry with specialization in the areas of:

Analytical Chemistry
Atmospheric Chemistry
Chemical Education
Inorganic Chemistry
Materials Chemistry
Organic Chemistry
Physical Chemistry
Polymer Chemistry

Several of the above areas have a biological component, *e.g.*, bioanalytical, bioinorganic, bioorganic, and biophysical. While students are free to conduct research in any of the above areas, the cumulative qualifying examinations are limited to the following areas: analytical, biological, chemical education, inorganic, organic, physical, and polymer. Consult the Graduate Advisor or the Graduate Program Committee (GPC) if you have questions or requests about the cumulative exam subjects.

The M.S. degree is awarded to students who show competency at the advanced level in the major areas of chemistry. Both a thesis and non-thesis M.S. option is available. Most full-time students complete the M.S. degree within two academic years.

The Ph.D. degree is different from coursework-driven B.S. and M.S. degrees, in that it is self-driven, creative in nature and essentially research-based. The Ph.D. degree is conferred in recognition of breadth of scholarship and scientific attainment plus demonstrated ability to investigate significant scientific problems independently and with insight. It is not earned through completion of courses, by accumulation of credits, or by the time spent in residency, which are secondary requirements. The role of the Research Advisor is to offer guidance and advice to the student, but it's ultimately the responsibility of the student to prosecute the research, develop original contributions to it, and obtain original results of significance suitable for presentation in a Ph.D. thesis, itself written with an appropriately high degree of literary skill. A typical time for the completion of a Ph.D. by a full-time student is 5 years after completing the baccalaureate degree.

C. Admissions Requirements

1. Graduate School requirements

Refer to the section dealing with Admission to Graduate School in the Drexel University Graduate Catalog ([Graduate College Resources](#)) and the attendant "Chemistry Factsheet" on the same web page. These discuss the recommended grade point average for undergraduate

preparation, admission as a probationary non-matriculated student or as a non-degree student, and demonstration of competence in English for students whose native language is not English. The term “graduate” in this handbook conveys the same meaning as “post-graduate” does in some other countries.

2. Departmental Requirements

Both full-time and part-time students are required to have a B.S. in chemistry or the equivalent. In other words, there must be evidence of adequate undergraduate preparation in chemistry, physics, and mathematics. Undergraduate chemistry coursework would typically include 34 semester (or 51 quarter) credits divided among general and inorganic chemistry (8-10 semester credits), analytical (6-8 semester credits), organic (6-8 semester credits), physical (6-8 semester credits) and unspecified chemistry electives (0-8). One to two semesters of college physics is also expected, along with differential and integral calculus. If some of the requirements are not met, you may still be admitted but required to make up any significant deficiencies as determined by the Department.

For admission, it is strongly recommended that you take and report to the department results of the Graduate Record Examination (GRE) administered by Educational Testing Services, Inc. (Princeton, NJ). GRE scores are helpful to the department and Office of Admissions, and are required if you are requesting financial support, i.e., a teaching assistantship (TA) and/or you want to be considered for a Dean’s Fellowship or a Provost’s Fellowship (see section IV. Graduate Support).

D. Advanced Status

1. Post-Masters status

Students who have previously obtained an M.S. degree in chemistry may be eligible for post-M.S. status in Drexel’s graduate program. Given that the graduate course sequence in your major area (analytical, inorganic, organic, physical, and polymer) is usually helpful in preparing for the cumulative exams (cumes), students may prefer to apply for transfer credits from prior graduate coursework rather than post-M.S. status, since the transferring of credits does not accelerate Ph.D. Candidacy requirements.

2. Transfer Credit

Up to 15 credits of graduate coursework at another university may be transferred for graduate credit at Drexel, in accord with the description in the "Transfer Credit" section in the University’s Graduate Catalog ([Graduate College Resources](#)) and with the approval of the Graduate Advisor and the GPC. Credit transfer is initiated by consulting with the departmental Graduate Advisor or with the GPC Chairman, who will normally be prepared to consider such requests only after you have progressed through your third quarter of study in good academic standing. The granting of transfer credit usually necessitates some evaluation of the content of the prior coursework, and the results of your registration exams are also taken into consideration in this regard. Naturally, any course that is counted toward a post-M.S. admission status cannot also be transferred in for the additional credits required for a Drexel degree.

II. Advanced Degree Requirements

A. All Graduate Students

A section of the Drexel University Graduate Catalog entitled "Graduate Regulations" contains a number of general requirements of Drexel's Graduate Studies for any M.S. and Ph.D. candidate ([Graduate College Resources](#)). These are in such areas as maximum study and workload for teaching or research assistants, registration, plan of study, transfer credit, time limitations, and graduate degree requirements such as residency of at least one academic year. In addition to those requirements listed below, your Research Advisor may make additional requirements in the best interests of the student. The University requires all graduate students to maintain a cumulative GPA of at least 3.0 (B average).

1. Registration Exams

All graduate students, upon entering the program, are required to take a series of two hour written exams in analytical, inorganic, organic, and physical chemistry. The purpose of these exams is to help assess a student's preparation in chemistry to provide a basis for advice on which courses to take. You will be required to make up any deficiency revealed by these exams. If you obtain a score lower than the 25th percentile (statistics provided by the American Chemical Society), you will be required to take an additional core course in that area. Similarly, scoring at or above the 67th percentile will exempt you from the single core course requirement in that area. Exams are given in the week preceding the start of the fall term. If you enter the program during other terms, you will be required to begin taking the registration exams on the first Saturday of the month following your entrance/admission to the program. If, after eight offered dates, you have not taken all four exams, you will then be required to do the complete graduate sequence (3 courses) in the unexamined area(s).

Non-matriculated students planning to take only one or a few courses for credit in a particular area will generally be required to take the registration exam in that area. For these and all other exams, active cell phones are not permitted in the exam room.

2. Course Requirements

Although specific credit hour totals for advanced degrees are given in subsequent sections, some general requirements for all chemistry students include:

- At least 30 credit hours of graduate study must be done at Drexel.
- At least one complete sequence in the student's major area of interest (or other area chosen in consultation with your Research Advisor) must be taken from

CHEM522/523/(771 or 772¹) (inorganic core sequence)

CHEM530/531/755 (analytical core sequence)

¹or other inorganic course (e.g., 774) with Graduate Advisor permission

CHEM541/542/543 (organic core sequence)

CHEM561/562/563 (polymer core sequence)

CHEM557/558/(554, 555, or 752) (physical core sequence)

- At least one course from each of the following areas: analytical, inorganic, organic, physical, and polymer chemistry (unless exempted by a registration exam score at or above the 67th percentile.
- The minimum enrollment for Ph.D. Candidates is one credit per term.

In the event that a required course is not offered for a protracted period of time due to low enrollment, the Graduate Advisor may make special allowances.

3. Plan of Study

At the point of choosing your Research Advisor you should file a Plan of Study in consultation with the Graduate Advisor and your Research Advisor. A Plan of Study form (Form D-1) is available from the Office of Graduate Studies ([Graduate College Forms](#)). You should list courses (i) already taken, (ii) courses to be taken, and also (iii) provide tentative dates for your oral candidacy exam and Ph.D. defense. The Plan of Study must then be approved by the Research Advisor, the Graduate Advisor, and the Graduate Studies Office. Changes in the Plan of Study after submission must have the approval of the GPC.

4. Academic Honesty

All students are expected to maintain the highest professional and academic ethics in all of their efforts, whether these efforts involve research or coursework assignments. It is expected that Chemistry graduate students (and faculty) will follow the American Chemical Society's Academic Professional Guidelines ([ACS Professional Guidelines](#)), the "Academic Employment Guidelines for Graduate Students and Postdoctoral Associates" ([ACS Academic Employment Guidelines](#)) & "The Chemical Professional's Code of Conduct" ([ACS Professional Rules of Conduct](#)). The University's information about its policies is at [Drexel's Academic Dishonesty](#) web site. Of note, is the sometimes-hazy distinction between fair quotation and plagiarism. In general, when one uses the actual wording of a source, it must be placed between quotation marks. Students are expected to abide by the guidelines at:

<http://www.library.drexel.edu/resources/tutorials/plagiarism/plagiarism.html> and can find additional details at [Duke University Citation and Avoiding Plagiarism Guidelines](#).

During 2007-2008, the Associate Vice-Provost for Graduate Studies put in place a procedure through which a student may appeal a decision made by the student's department. The final arbiter in this appeal process will be the Provost. In any case, the chain of responsibility for such matters is: Graduate Advisor & Grad. Curriculum Committee → Head of Dept. → CoAS Associate Dean for Graduate Studies → Dean of College of Arts & Sciences → Dean of Graduate College → Provost.

5. Departmental Seminar

All full-time Ph.D. students past their first year of study must enroll in CHEM 865, Chemistry Research Seminar, at least once per year. The outside speakers that we bring in provide you with an opportunity to obtain a broader perspective of research activities in your own and other fields of chemistry. All full-time students are encouraged to attend all departmental seminars unless it conflicts with a regularly scheduled teaching assignment.

First-year, full-time students (both M.S. and Ph.D.) must attend 9 seminars per academic year (AY), and first-year, part-time students must attend 6 seminars per AY. However, when a full-time PhD student is enrolled in CHEM 865 for one term during a given AY (currently a requirement for full-time students past their first year), then the attendance requirements outside of those required for CHEM 865 is 6 additional seminars per AY. Non-thesis M.S. students should never register for CHEM 865 more than once because additional enrollments will not be counted toward the 45 credits needed for the degree.

Full-time students are required to document their registration in CHEM 865 in their annual reports to their Dissertation Advisory Committee (C4); failure to do so and/or insufficient attendance when not registered for CHEM 865 as noted by the seminar coordinator will result in a less than satisfactory annual evaluation. Attending the chemistry minisymposia that are usually scheduled during the winter term does not count towards the required number of seminars, but all students that have not yet joined a group should attend the minisymposia to learn about faculty research in the department.

Part-time students never need to register for CHEM 865 but are instead required to attend two seminars during each of the three seminar-active terms (fall, winter, spring); this requirement, however, can be waived if the student can confirm her/his attendance at chemistry-relevant seminars outside Drexel, including talks at regularly scheduled meetings of a professional society. Full-time students who become part-time after their fifth year and who continue to work in the department have to attend the same number of seminars as full-time students. As with full-time students, insufficient attendance at seminars by part-time students will result in a less than satisfactory annual evaluation.

6. Thesis

All full-time students who have received financial assistance from the department are required to write a thesis on original chemical research for their terminal degree (see the appropriate degree requirements below for more information).

As of June 30, 2005, the process for thesis submission is as follows:

1. Format your thesis according to the standards in The Thesis Manual which includes directions and examples for referencing the primary scientific literature (i.e., peer-reviewed, scientific journal articles—a preferred source of information for your thesis), but does not provide examples for referencing either the secondary literature (books, monographs, edited books, handbooks, etc.) or information obtained from the internet (much less desirable except for peer-reviewed, on-line journals). Examples for

referencing the secondary literature may be found in the instructions for authors of various peer-reviewed journals in your discipline (such as those published by the American Chemical Society); in addition to the book title, author/editor, and page numbers, it is generally a good idea to specify the chapter title and author when applicable.

2. Submit the final copy of your thesis to your mentoring professor for final review and approval. The supervising professor and Department Head will acknowledge their approval of your final thesis by signing the Completion form.
3. Submit your thesis to the library in both hard and electronic copy. The archivist and library representative will sign the appropriate lines on the Completion form once library standards have been met ([Drexel University Library Thesis and Dissertation Binding](#)).
4. Submit the Completion form to the Office of Graduate Studies for final degree clearance.

7. Time limit for the M.S. and/or Ph.D. degree

As described on the website of the [Graduate College, Forms and Policies](#): “[All] students who enter graduate study at the post-master's or post-baccalaureate level must complete their studies for their graduate degree(s) *within seven years* after initial graduate registration. Those who receive a Master's degree from Drexel University and then transfer to a doctoral program are permitted *five years after registration at the doctoral level* to complete the Ph.D. degree.

In unusual circumstances, a student who finds that these time requirements are inadequate due to special circumstances must discuss this with his or her advisors. Together they may request an extension before the end of a student's stated time limit (either seven or five years). A student requesting an extension should work with his or her advisors to develop a plan of study and a time line for completion that is reasonable for the student. All formal extension requests must give a reasonable time for completion with an accompanying revised plan of study. Should an extension be required, please be aware that all courses will be reviewed for timeliness; some earlier coursework may have to be repeated.

Extension requests for master's students must be forwarded after approval by the mentoring professor (if on a research track) to the department's Graduate Advisor, who will make the final decision. Extension requests for doctoral students must be forwarded, after approval by the supervising professor and the department's Graduate Advisor, to the Office of Graduate Studies, which will make the final decision.”

B. Master of Science Degree

1. Course Requirements

The M.S. degree is awarded after satisfactory completion of a minimum of 45 credit hours in Chemistry and related fields. Several general requirements are listed above in Section IIA2. The remaining credits may be chosen from approved graduate courses within the department or from other departments offering courses related to your major area. These courses should be approved in advance by your Research Advisor or the departmental Graduate Advisor. Thesis MS students should take the graduate course in Chemical Information Retrieval (CHEM 767).

2. Thesis Option

The chemistry faculty strongly recommends the Master's thesis option, but realize it is not always possible or necessary for all part-time graduate students. M.S. candidates who receive financial aid in the form of a teaching assistantship or tuition fellowship are required to enroll in CHEM 898 (M.S. Thesis) and submit a M.S. research thesis or equivalent report. Within this option, Drexel's rule is that up to nine credits of coursework may be replaced by CHEM 898 (master's thesis); note that research credits (CHEM 997) are not limited so long as the student completes all course requirements described above. During the first quarter of course work a student should choose a Research Advisor with whom to collaborate in carrying out an original investigation in chemistry. The results will be written up in thesis form and submitted to a M.S. Thesis Review Committee consisting of the Research Advisor and two other departmental faculty suggested by the Research Advisor and approved by the GPC (See the C-5 form at the back of this Handbook). The acceptance by this committee of the M.S. thesis completes the thesis option requirements for the M.S. degree. Both the Thesis Review Manual, which describes the preparation and required format of the thesis, and the library binding requirements are available online as described above in section II.A.6. Note also Office of Graduate Studies requirements: if you take a Drexel M.S. degree (3.0 GPA required), you need to apply for readmission to the graduate program (i.e., as a Ph.D. Applicant), and for this, a cumulative grade point average of 3.50 is required.

3. Research Credits for Non-Thesis M.S.

You may count up to nine credits of CHEM 997 towards a terminal non-thesis M.S. degree. However, you must submit a written report on the work that satisfies your Research Advisor. Students continuing without break toward the Ph.D. degree may count up to 9 credits of thesis and/or research toward the M.S. degree, as long as they have at the point of graduation with their M.S. successfully passed their cumulative exams; three credits may be counted, if cumes have been commenced and at least two passed. Note that the requirements are different for students in the B.S./M.S. program; consult the Graduate Advisor or Department Head.

C. Doctor of Philosophy Degree

This degree is awarded in chemistry and earned in one of the areas of chemistry specified in section IB. The degree recipient must demonstrate scholastic breadth in chemistry as well as contribute significantly to scientific advancement in a chosen major area. Requirements of the program include general coursework; a thesis proposal; a candidacy exam procedure; a course on searching the chemical literature or technical writing (if the latter is approved by the Research Advisor) (see II.C.7); the first-authorship on a peer-reviewed paper (see II.C.9) and successful publication of a Ph.D. thesis (dissertation).

1. Course Requirements

Drexel University requires that 90 credits of graduate level work must be completed for the Ph.D. degree. Excluding research credits, the Chemistry Department requires a minimum of 30 credits of coursework in chemistry, which can include the fulfillment of the core course requirements outlined in Section II.A.2. The remaining coursework will consist of more advanced graduate chemistry electives and special topics courses that are mutually agreed upon

by the student and the Research Advisor; ideally, these courses should be specified when a Plan of Study (D-1 form) is submitted. Note that the Chemistry Department requires students to maintain a cumulative GPA of at least 3.0 in lecture courses offered by the department or the GPC may recommend that the student not move forward to Candidacy.

Transfer of core course or elective credits from other institutions is possible, under conditions similar to those for the M.S. degree.

The minimum requirement of 30 Drexel graduate-level chemistry course credits may often be exceeded, depending on the number of core courses needed (as determined by the registration exams, see section II.A.2), the number of electives in the Plan of Study, or pre-Candidacy registration requirements.

As of 2007-2008, the Graduate College will not normally permit a Ph.D. student to take coursework toward an additional degree (*e.g.*, M.B.A.). However, individual courses of interest or of relevance to your Ph.D. may indeed be permitted. You should use a Drop/Add form for this purpose, obtaining first the approval of your Research Advisor, and then of the Graduate Advisor, who will inform the Graduate Office of this.

2. Thesis Proposal Seminar

All Ph.D. students are required to give a 30-45 minute Thesis Proposal Seminar presentation related to their research. The seminar should be accompanied by a research report; the content and format is described below. The student's presentation will be followed by a question and answer session during which the student should demonstrate proficiency with regard to the broader context of his research project. Altogether, the student's presentation and the subsequent examination shall not last longer than two hours. The purpose of the Thesis Proposal is to promote a greater fundamental understanding about the student's own specific research project. This will also provide context and perspective about previous accomplishments in the field by other research groups as well as her/his own. This will help the student become more knowledgeable about her/his research project by (i) promoting a greater fundamental understanding about the student's own specific research project and (ii) providing context and perspective about previous accomplishments in the field by other research groups as well as her/his own. The Research Advisor is expected to provide considerable input to the student about the breadth and depth of the literature review, the essential papers to read (and comprehend), the historical and current topics to include and/or emphasize in the seminar, and of course the details of the research project. Three results are possible: pass, fail, or conditional pass with additional work required or further examination at a later date. The outcome of the Thesis Proposal Seminar will be adjudicated by a Thesis Proposal Committee comprised of 5-6 faculty whose composition is further specified below and must be approved by the Graduate Advisor in advance. The student's Research Advisor is not allowed to serve on the Committee, but may be present during any confidential questioning and/or deliberation by the Committee following the student's presentation and answering of questions from the general audience.

For the Thesis Proposal Seminar and the accompanying paper the following rules apply:

- Both must include a review of the essential literature (30-50% of seminar and paper)
- Students must distinguish between essential and non-essential background literature (they should not include everything that is vaguely relevant)
- Both must identify the gap in the knowledge base (or an interesting question or a new application) that your research aims to address in the future, and discuss the initial steps towards addressing this gap. Explain the significance thereof. (20-50% of seminar and paper).
- Both must describe their research progress thus far (even if preliminary) (10-30% of seminar and paper)
- The style of the paper should be similar to a research grant proposal or a targeted review article, but content should be as described above.
- References should be in proper and consistent format, see notes above about avoiding plagiarism and citation of sources. In your talk, references on each slide are preferable, so the audience knows which reference goes with which idea.

The Thesis Proposal shall include a written report submitted to the committee two weeks in advance of the seminar. The report shall be no more than 10 pages in length including the text, reaction schemes, figures, and tables; references are not included in the page count. The format for the body of the text is as follows: 1-inch margins, single-spaced, with a 12-point font such as Arial, Helvetica, Times, or Times New Roman. The content is described above, and the student should also seek input from her/his Research Advisor throughout the writing process.

Full-time Ph.D. students are required to complete the Thesis Proposal requirement by the end of the Spring Quarter of their second year or, if they did not start in the fall term, at the end of the Summer Quarter of their second year in the graduate program. Part-time Ph.D. students are required to complete the Thesis Proposal requirement by the end of the Summer Quarter of their second year or, if they did not start in the fall term, at the end of the Fall quarter of their third year in the graduate program. This is a firm deadline for both full- and part-time Ph.D. students, i.e., there are no extensions. Note that to facilitate coordination with chemistry seminars by external speakers, the Thesis Proposal must be scheduled at least 3 weeks in advance (preferably more) via a C-3 form submitted to the Graduate Advisor, meaning that the C-3 form must be submitted by the end week 6 of the term in which the Thesis Proposal is due.

Students who do not meet the above deadline will be required to present both the **first** Thesis Proposal Seminar and a **second** literature seminar within 3 months of the original deadline for the first Thesis Proposal Seminar, with the second seminar in an area outside the area(s) of the research group in which the student resides. Students who fail to meet the deadline for the second (penalty) literature seminar will be dismissed from the graduate program.

The Thesis Proposal Seminar Committee members will ask questions specific to the research seminar, as well as general questions related to the candidate's intellectual preparedness for the remaining graduate program experience. Combined with the student's presentation, the time for questioning of the student by the committee shall not exceed two hours. Following the committee's questioning, the student will be excused and the committee will reach a decision, which will then be conveyed immediately by the Chairperson to the student. A satisfactory

outcome enables the student to continue toward the Ph.D. degree (begin taking or continue taking cumulative exams, etc.).

In the event that a student's Thesis Proposal Seminar is not completely satisfactory, the Committee may require supplementary written material and a short additional presentation or a second full-length Thesis Proposal Seminar, whichever is more appropriate as determined by the Thesis Proposal Seminar Committee in consultation with her/his Research Advisor. Any additional requirements must be completed within one month of the original seminar. The Committee Chairperson (Chair) will notify the student of the final outcome in two weeks or less via a departmental C-3a form.

The Ph.D. student presenting the seminar, in consultation with his/her Research Advisor, selects the Chair and members of the Thesis Proposal Seminar Committee, in accordance with the university's general rules for the selection of doctoral student committees:

- The Ph.D. student's Research Advisor may not be a member of the Committee, and may contribute to the proceedings only if permitted by the Chair.
- The Committee **must** include one member from **outside the Department**, who may be from another university, and must be a tenured or tenure-track faculty member from an appropriate discipline in a Ph.D.-granting institution. The external member should be an expert in the field of the student's research.
- All members of the committee should be research active. Research active is someone who has published in the primary literature within the last 3 years, or is currently advising graduate students. Ideally a majority (3 out of 5 committee members) should publish in the field of the student's research. In the case that sufficient expertise is not present in the department a suitable solution is the use of 2 external members that are experts in the field of the student's research. Personality conflict is generally not a valid reason for excluding a faculty member in our department from your committee, when that faculty member is an expert in your field of research.
- The Committee must include at least one member of the departmental GPC.
- One voting member of the examining Committee who is of emeritus/retired status from Drexel (as an "internal" member) or another chemistry graduate program is permissible.
- Note that although a total of five committee members is required by Drexel, a sixth is strongly recommended in case of some unavoidable absence. Additional members not fulfilling the above requirements may serve, but have no vote.
- The Graduate Advisor has been asked by the faculty to make sure all committees are in line with the above rules. In some ambiguous cases, the Graduate Advisor will consult with the Chair of the GPC prior to making a decision. The Graduate Advisor can refuse to sign if the committee does not meet the above criteria, keeping in mind that committee members that are experts in the field of the student's research should be used unless such experts do not exist in the region.
- Ideally, one should use the same committee for all Drexel PhD hurdles (or a subset thereof)

Further details worth noting regarding the Thesis Proposal Seminar are:

- A departmental C-3 form is required for scheduling of the Thesis Proposal Seminar and the appointment of the committee members. The Thesis Proposal Seminar must be scheduled at least 3 weeks in advance (preferably more) for coordination with chemistry seminars by external speakers.
- You may be required to use a sign-up sheet, to ensure that student seminars are spaced out evenly throughout the term, and that seminars do not occur during finals week.
- The Research Advisor will advise the student on the suitability of her/his Thesis Proposal Seminar (breadth and depth of the literature search, the essential papers to read, the historical and current topics to include and/or emphasize, etc.), as well as the title and abstract that must be distributed at least 1 week in advance to the Chemistry Department for announcement/publicity purposes.
- You must ensure that all the members of your Thesis Proposal Seminar Committee know in advance the date, location and time of the Seminar.
- The title, abstract, date, time and location of the Thesis Proposal Seminar must be advertised in writing in the Department and on the departmental web site at least a week in advance.

3. Ph.D. Candidacy

The University considers students “Ph.D. Applicants” until they have passed into Ph.D. Candidacy status. In order to formally become a “Ph.D. Candidate” in Chemistry, you must have (a) passed five cumulative exams, (b) completed 45 credits of graduate work (or 15 credits at Drexel, if you entered with “post-Masters’s” status) and (c) passed the Thesis Proposal Seminar.

Once these conditions are met the University D-2/2a forms have to be submitted to the Graduate Advisor (along with a copy of your M.S. transcript if you entered post-M.S.).

4. Written (Cumulative) Exams

Written exams designed to evaluate your chemical knowledge (normally in your major area of interest) are given monthly during the academic year and occasionally during the summer at the discretion of the faculty. They are normally held on the first Saturday of each month, in Disque 307 at 10:00 am; the exact dates and times are posted on the Departmental website.

All Ph.D. students must begin taking cumulative exams no later than the beginning of their second year in the program. Cumulative exams must be taken sequentially, with one unexcused absence allowed, until **five are passed or six are failed**. Six failures are a basis for dismissal from the Ph.D. program. The Department requires that you be registered for at least one course during the term in which you take your first cume.

First year cume options: Prior to the beginning of the second year in the PhD program, a student can elect to take **one** cumulative exam on the topic of her/his choosing² with no requirement to take a second cumulative exam in the first year. If a first-year student elects to take a **second** cumulative exam, however, then **that student must begin taking cumulative exams once a**

²from among the topics announced by the faculty members who are writing cumulative exams that month.

month without interruption except for the summer period when no exams in the relevant sub-discipline are offered (August, September, and possibly July).

The topic(s) of the cumulative exams may, or may not, be announced prior to the exam, depending on the sub-discipline. It is your responsibility to make sure that the appropriate faculty member(s) is/are aware of the need to provide a cumulative exam for you to take in any given month. This is particularly so if you are taking an exam outside the chemistry sub-discipline specified on your C-2 form. At least three of the five passes must be in the student's selected area of specialization; it is therefore important that your area of specialization be chosen carefully in consultation with your Research Advisor.

5. Thesis Advisory Committee

Following the completion of the cumulative exams, the Ph.D. Candidate must select, in consultation with her/his Research Advisor, a Dissertation Advisory Committee (Form D-3). The DAC shall have at least five members, two of whom shall represent an area outside of the candidate's area of specialization. At least one of committee members shall come from outside of the Chemistry Department. The student's research advisor can be a member of the committee. It is desirable that non-Chemistry faculty who served on the Thesis Proposal Committee also serve on the DAC. The tasks of the DAC are described in section II.C.6. Assembling the committee and obtaining approval from the Graduate Advisor is the obligation of the student, who has to submit a D3 form. The Final Oral Defense Committee shall contain all members of the candidate's DAC with the exception of the student's Research Advisor. In addition, a tenured or tenure-track faculty member from another PhD-awarding institution shall join the committee as an additional outside member. This outside member must be an expert in the field in which the candidate has worked for his/her thesis. He/she should be a research-active member of his/her faculty. The choice of the outside member has to be approved by the GPC Chair and by the College of Graduate Studies (as stipulated in the Graduate College's handbook).

6. Annual Check of Progress

After having passed their Thesis Proposal Exams, all full-time and part-time research students are required to meet at least three members of their Dissertation Advisory Committee (DAC, section II.C.5) during the spring term of their third year. If possible one of the outside members of the DAC shall be present. Students have to arrange for this meeting and inform the Graduate Advisor and the GPC chair once the meeting has been scheduled. They should send a three-page report about their research progress one week before their meeting with the committee. That report summarizes their accomplishments and lists their publications and conference presentations. At the meeting the student will present his or her research to his/her DAC, which will discuss with him/her the content of the presentation and the progress of his/her research. The annual review should be comprised of a 20-minute presentation and 30 minutes of questions or of a combination not to exceed 50 minutes. After the meeting the DAC will meet and discuss the performance. The latter can be judged as either 'satisfactory', 'needs improvement' or 'unsatisfactory'. If the verdict is 'needs improvements' or 'unsatisfactory' the DAC will stipulate corrective actions and expectations with regard to future performance. In the case of unsatisfactory performance the student will be asked to convene another meeting after 6 months, at which his/her progress and his/her compliance with suggestions will be checked by the committee. If the latter deems the performance still as 'unsatisfactory', the DAC will recommend to the GPC to dismiss the student from the graduate program. In the case of a 'needs

improvement' judgment at the end of a regular annual meeting the student has to obtain a 'satisfactory' on his/her performance at his/her next annual meeting. Two consecutive 'needs improvement' judgments will be considered as 'unsatisfactory' and will trigger another review after 6 months as described above. All decisions of the DAC will be documented by minutes and by the D3b form.

7. Communication Requirement.

The communication or language requirement may be satisfied by completing a graduate course in Chemical Information Retrieval (CHEM 767) or Technical Writing (e.g., COM 510) if the latter is approved by the Research Advisor.

8. Ph.D. Thesis

A Ph.D. thesis, the heart of the Ph.D. degree, must be written and correctly formatted by the student, accepted by the Research Advisor, presented to the Ph.D. Final Oral Defense Committee (Form D-4), and defended orally. A copy of the Thesis Style Manual may be downloaded from the Hagerty Library website, <http://www.library.drexel.edu/servicesdocs/thesis/thesismanual.pdf>. According to university requirements (Form D-4), the presentation and oral defense must be scheduled "at least four (4) weeks prior to the final defense."

Members of the student's Ph.D. Final Oral Defense Committee should be selected in mutual consultation with the student's Research Advisor as the student nears completion of her/his dissertation, but no later than four (4) weeks prior to her/his final defense (Form D-6).

The Committee is normally composed similarly to (and is often the same as) the Dissertation Advisory Committee. The Ph.D. Candidate's Research Advisor, the Graduate Advisor, and the Graduate Studies Office must approve the composition of the Ph.D. Final Oral Defense Committee. Other specific rules governing the composition of the committee are as follows:

- The candidate's Research Advisor may not be a member of the Committee, and many contribute to the proceedings only if permitted by the Chair. The Committee *must* include one member from *outside the University*, who must be a tenured or tenure-track faculty member from a Ph.D. granting institution and from an appropriate discipline. The external member should be an expert in the field of the student's research. All members of the committee should be research active. Research active is someone who has published in the primary literature within the last 3 years, or is currently advising graduate students. Ideally a majority (3 out of 5 committee members) should publish in the field of the student's research. In the case that sufficient expertise is not present in the department, a suitable solution is the use of 2 external members that are experts in the field of the student's research. Personality conflict is generally not a valid reason for excluding a faculty member in our department from your committee, especially when that faculty member is an expert in your field of research.
- The Committee must include at least one member of the departmental GPC.
- One voting member of the Committee who is of emeritus/retired status from Drexel or another chemistry graduate program is permissible. Note that a total of five committee members is required by Drexel – a sixth is strongly recommended in case of some

unavoidable absence. Additional members not fulfilling the above requirements may serve, but have no vote.

- The Graduate Advisor has been asked by the faculty to make sure all committees are in line with the above rules. In some ambiguous cases, the Graduate Advisor will consult with the Chair of the GPC prior to making a decision. The Graduate Advisor can refuse to sign if your committee does not meet the above criteria, keeping in mind that committee members that are experts in the field of the student's research should be used unless such experts do not exist in the region.

It is the responsibility of the student, not his/her Research Advisor, to submit an acceptable Ph.D. thesis. However, the final defense is not to be scheduled until (i) the Research Advisor *and* the Graduate Advisor have approved the Ph.D. Final Oral Defense Committee, as indicated by their signatures on Graduate Studies Form D-6 (Final Oral Exam); and (ii) the student has published at least one peer-reviewed article in a scientific journal that is part of her/his PhD research (see section II.C.9).

One or more members of the examining committee will often be willing to read and comment on at least one draft of the thesis before presentation of the finished version to the committee for the defense. However, a copy of the finished thesis must be received by each member of the examining committee no later than two weeks prior to the final defense. The date, time, location and title of the final defense must be announced publicly in writing and on the departmental web site at least one week prior to the date of the oral presentation. Inclusion of a brief abstract with the announcement is encouraged. When scheduling your final defense, once you have confirmed that *every* member of your committee is available on the proposed day and time of your defense, you should then ask the department secretary to reserve a suitable room. The final defense of the Ph.D. thesis consists of two parts:

- A public 40-60 minute seminar on the thesis research followed by general questions from the audience with the committee in attendance.
- A private (candidate plus committee) question/answer session (Final Oral Exam), convening shortly after the public seminar.
- For the Ph.D. thesis exam, you need an Exam Report Form, D-5. The "Adviser" signature is that of the research adviser. The Thesis Approval Form can be brought to the exam for the approving extra-departmental committee members, if it would be inconvenient for them to sign their acceptance at a later date. The signatures of the Chair and the Adviser will be withheld until any required thesis corrections have been made. After the exam, the committee members should provide the candidate with clear indication of what corrections are required in the thesis. Some committee members may wish to check the edits, but the Chair or Adviser otherwise assumes final responsibility for verifying the edits.

9. Publication requirement

The publication of scientific articles in discipline-appropriate, peer-reviewed journals is the primary method for disseminating research results to the broader scientific community. Given that the dissemination of such results is essential for the advancement of science as well as an essential skill for the individual scientist, every Ph.D. Candidate must submit to the Graduate

Advisor, at least four (4) weeks in advance of the Final Defense, evidence of at least one (1) peer-reviewed publication in a scientific journal that is part of her/his PhD research and on which he/she is the first author, which documents that he/she contributed the majority of the experimental and/or theoretical results. Acceptable evidence is either (i) an electronic copy (pdf) of the published article or (ii) a DOI number that enables the access to a copy of the paper or (iii) a letter (or email) from the journal editor confirming that the article has been accepted. Importantly, the submission of a manuscript for publication in a peer-reviewed journal without its subsequent acceptance does not fulfill the publication requirement. In cases where the fulfillment of the requirement is ambiguous for whatever reason, the issue will be adjudicated by the GPC. Students shall be advised that this paragraph stipulates a minimal requirement. The Research Advisor has the right to expect a higher productivity for graduation. Without his/her approval, no student can move towards his/her final defense¹.

III. Graduate Advising

Students who have selected a Research Advisor should consult that person for information and advice on the graduate program in chemistry. For more general or procedural information, full time students should consult with the departmental Graduate Advisor, while part-time students should confer with either the departmental Graduate Advisor or the Chair of the GPC.

In the case of some irresolvable disagreement between the student and the Research Advisor, the student should consult with the Graduate Advisor and the Department Head. The next four levels of appeal are (i) the Associate Dean for Graduate Studies in the College of Arts & Sciences (CoAS), (ii) the Dean of CoAS, (iii) the Vice-Provost for Graduate Studies, and (iv) the Provost of the University, the latter being the final arbiter. Please check the Graduate Studies' and/or Provost's website(s) for a formal appeals procedure.

IV. Graduate Support

Financial aid is typically available in the form of a teaching assistantship (TA), research fellowship (RF), and/or tuition remission. Exceptional applicants will also be nominated for a supplemental Dean's Fellowship (\$3,000/year) or Provost's Fellowship (\$5,000/year). Teaching assistantships and tuition remission are available from the department on a competitive basis and are therefore not automatically given to every student who is admitted into our graduate program. Both incoming and resident graduate students are considered by request for a departmental TA/tuition remission. RFs are available from individual faculty members via their research grant funds. Please note that the university does not allow you to hold any other employment in addition to a full teaching or research assistantship.

New and full-time M.S. & Ph.D. students who are self-supporting (don't have a TA) and have GPA's of 3.5 or greater are eligible to apply for a one-time \$3,000 Dean's Fellowship offered by the Vice-President of Enrollment Management. This Fellowship is applied as an offset against the student's tuition bill.

A. Teaching Assistantship (TA)

The current standard Teaching Assistantship (TA) is a 12-month, October-September appointment. Teaching Assistants are required to teach for three out of the four quarters (normally Fall-Winter-Spring); the possibility of not teaching during a quarter other than Summer is dependent on Departmental teaching needs. Students with TAs and RFs usually also receive tuition remission for the (substantial) costs of graduate tuition. M.S. students are not eligible for TA support at Drexel, and tuition remission is normally not awarded without an accompanying TA or RF appointment.

In return for departmental support (TA and tuition remission), the chemistry department expects each teaching assistant to carry out his or her duties conscientiously and responsibly. Failure to do so (*e.g.*, not enforcing the eye protection or other safety requirements in lab classes) can result in the loss of the assistantship. If, because of some emergency (such as illness or getting snowed-in during winter), the TA is unable to attend a class, he/she has to make sure that he/she has made a mutual "back-up" agreement with another instructor, so that one can take the other's place at short notice. The faculty generally does likewise.

The duties of a teaching assistant are somewhat similar to those of the other teaching staff in the department, generally involving the instruction and guidance of undergraduates in laboratory and recitation classes, most frequently in freshman chemistry courses (CHEM101-CHEM167). Each teaching assistant works in conjunction with, and under the guidance of one of the chemistry faculty, who has responsibility for the design and execution of the course sequence, and for giving the lectures in the course. When assigned to a course, the TA should therefore consult with the faculty member who is in charge of the course to determine what your duties will be for the coming quarter.

The types of activities in which one will find oneself involved include: running labs and recitations; grading of students' lab reports, recitation quizzes and exams; and helping faculty to develop and prepare materials for labs and exams. This translates into an average of 6-8 hours per week of classroom activity (22 quarter contact hours per year), plus roughly twice that number of hours per week of related work outside the classroom.

New teaching assistants are usually assigned to one of the freshman sequences. Because these are large courses, there are often substantial numbers of recitation and/or lab instructors involved, so that it is necessary to hold informational/organizational meetings weekly; attendance at these meetings is mandatory unless the instructor in charge specifies otherwise.

B. Tuition Remission

Remission of graduate tuition is generally awarded only in conjunction with graduate teaching assistantships. It covers the flat tuition rate to be paid for a full time student as set by the College of Arts and Sciences. The respective amount is currently \$ 5,000, but it will increase over the next few years. Contingent on his/her performance in teaching and research, a PhD-level student can generally expect TA support for a period of five years. After these five years, students will

receive 100% tuition remission for their next quarter. Afterwards, the tuition remission will be reduced in increments of 20% per quarter.

C. Research Fellowship (RF)

A Research Fellowship (RF) may be arranged with the Research Advisor if sufficient grant funds are available; the stipend is determined by the Research Advisor. Part of the working relationship between a Research Advisor and a research student is that there must be a mutual agreement as to what tasks and responsibilities are involved in a particular RA. When one becomes interested in doing research work with a given faculty member, one may want to inquire about the possibility of a Research Assistantship. M.S. students are eligible for RA support at Drexel.

D. Satisfactory Progress

Continuation of any of the above forms of financial aid is contingent on satisfactory academic and research performance. Performance is evaluated annually by the Graduate Program Committee and based upon the student's academic transcript and research progress reports (see section II.C.6). The department generally supports Ph.D. students (via stipend and/or tuition remission) for no more than 20 quarters of graduate work from the date in which they entered the graduate program, except in the case of a department-approved leave of absence. Support beyond the first 20 quarters is strictly at the discretion of the department and/or the Research Advisor if the latter has funds to support a graduate student. M.S. students are not eligible for teaching assistantships (section IV.A), but may receive financial aid from the university for their first 8 quarters of graduate study. M.S. students may also apply for a one-time Dean's Fellowship of \$3000 (see section IV. Graduate Support) if their GPA is 3.5 or higher.

E. Taxes on Fellowships

Some foreign student holders of graduate fellowships (*e.g.*, the P.R.C., Poland) find that tax treaties between their home country and the U.S. hold advantages for them with respect to Federal income taxes, which U.S. Residents rarely escape. City of Philadelphia and Pennsylvania state income taxes on Fellowship stipends are difficult to avoid. Tuition remission is usually not taxed.

V. Course Selection

A. Core Courses

1. Analytical Chemistry

CHEM 530, Spectroscopic Methods, Fall: Introduction to optics, interaction of electromagnetic radiation with matter, design of optical instruments, survey of spectroscopic methods of analysis.

CHEM 531, Chromatographic Methods, Winter: Principles of separation, resolution theory, pressure- and voltage-driven flow, separative and dispersive transport, survey of chromatographic instrumentation (pumps, injectors, columns, detectors), survey of chromatographic separation modes and applications

CHEM 755, Mass Spectrometry, Spring: Basic interpretive skills for organic & biochemical analysis; survey of ionization methods, ion selection or separation techniques and detection; applications in chemistry & biology.

2. Inorganic Chemistry

CHEM 521, Inorganic Chemistry I, Fall: Review of electron-counting rules (including 18-e Rule) & their correlation with structure. Molecular symmetry. Coordination complexes: structure, constitution, isomerism & chirality; complexation in solution, the chelate effect; HSAB concept. X-Ray diffraction applied to inorganic molecules: utilization of CIF files; Bond Valence Sum; lattice types. Qualitative MO approach for homonuclear systems.

CHEM 522, Inorganic Chemistry II, Winter: Group theory with applications to the bonding, magnetic and optical properties of inorganic molecules. Transition metal cations in crystal fields of various symmetries, crystal field stabilization energy. Molecular orbital construction for polyatomic and centric molecules. Spectroscopy/structure relationships for inorganic molecules (first part).

CHEM 523, Inorganic Chemistry III, Spring: Redox potentials and basic electrochemical methods; inorganic spectroscopy and structure (continued); reaction kinetics; metalloprotein examples.

CHEM 772, Bioinorganic Chemistry: Metal transport and storage in biological systems, structure and function of metalloenzymes, reaction mechanisms, synthetic systems for metalloenzyme modeling.

CHEM 771, Organometallic Chemistry: Structures, reactivity, mechanisms of important organometallic complexes and reactions. Applications in organic synthesis and polymer chemistry.

3. Organic Chemistry

CHEM 541, Organic Chemistry I, Fall: Spectroscopic methods of analysis, including mass spectrometry (MS, principles of MS, the mass spectrum, fragmentation mechanisms, special topics), Infrared (IR, principles of IR spectroscopy, the infrared spectra of functional groups), Ultraviolet Spectroscopy (UV, principles of UV, UV absorption by organic functional groups, special topics); Nuclear Magnetic Resonance (NMR, theory of NMR, Proton NMR (chemical shifts, coupling constants, structural determination using NMR, shift reagents and Chiral solvating agents), Carbon NMR (FT-NMR, chemical shifts, special topics).

CHEM 542, Organic Chemistry II, Winter: Static or "Classical" Stereochemistry (stereoisomerism, chirality, stereogenic and chirotopic atoms, internal stereocomparisons [homotopic and heterotopic groups and faces, prochirality, applications to NMR, asymmetric syntheses, biochemical problems such as enzyme reactions and configurational determinations], conformational analysis of cyclic and acyclic molecules. Dynamic Stereochemistry (relationships between structure, geometry and reactivity, physical methods of conformational determinations, use of stereochemistry in mechanistic studies.

CHEM 543, Organic Chemistry III, Spring: Mechanisms of organic reactions and the techniques of studying them: acyl and alkyl substitution, carbocations, carbanions, free radicals, carbenes, nitrenes, ylides, simple kinetics, isotopic labeling, cross-over experiments, acidity concepts, substituent effects, Hammett equation.

4. Physical Chemistry

CHEM 557, Physical Chemistry I, Fall: Schrödinger's equation and particle-wave duality, atomic structure and spectra, optical spectroscopy on molecules (rotational, vibrational and electronic spectra) molecular symmetry, design of modern spectrometers, magnetic resonance spectroscopy.

CHEM 555, Quantum Chemistry Of Molecules I, Spring: Covers general properties of operators; Schrödinger's equation and its solutions for a particle in a box; harmonic oscillator, tunneling problems, rigid rotor, and the hydrogen atom; approximation methods; and absorption of radiation and selection rules.

CHEM 558, Physical Chemistry II, Winter: Covers statistical mechanics of distinguishable and indistinguishable particle systems, and thermodynamic functions for both systems and chemical equilibrium.

CHEM 752, Biophysical Chemistry, Spring: peptide conformation, protein structure, peptide and protein folding, heme proteins, electron transfer proteins, enzyme kinetics, biophysical techniques including EPR and NMR.

CHEM 554, Chemical Kinetics, Spring: Focuses on experimental and theoretical considerations of chemical reaction rates

5. Polymer Chemistry

CHEM 561, Polymer Chemistry I, Fall: Scope of polymer chemistry & science; structure/property relations; step (condensation), free-radical, cationic anionic, group-transfer, ring-opening polymerization; stereochemistry of polymerization; coordination and metathesis polymerization; non-classical chain polymerization; inorganic polymers; reactions and degradation of polymers; template polymerization; biological polymers.

CHEM 562, Polymer Chemistry II, Winter: Kinetics and thermodynamics of polymerization; theories for and control of step-polymerization and gelation; copolymerization composition; polymerization-depolymerization equilibria; polymer characterization; determination of molecular weight and its distribution by end-group analysis, membrane osmometry, vapor-phase osmometry, light-scattering, solution viscosity, and gel-permeation chromatography.

CHEM 563, Polymer Chemistry III, Spring: Basic concepts on the properties of materials; rubber elasticity; morphology; viscoelasticity; T_g and T_m theories; thermal analysis; dynamic mechanical analysis; X-ray diffraction; spectroscopic techniques; thermodynamics of polymer solutions; conformational analysis and computational methods; basic testing, fabrication and processing; electrical, optical and magnetic properties; frontiers in polymer research.

B. Special Topics Courses

In addition to the 'permanent' graduate courses listed in the Graduate Catalog, each quarter the graduate faculty offer a variety of special topics courses (CHEM 680-0XX & other CHEM 700-CHEM 800 level courses) worth 3 credits each. A listing of both permanent elective and special topics elective courses is given below. These courses are not usually taken during the first couple of quarters of study, because they usually have content more specialized than that of the core courses and are often more research-oriented. Consult the Graduate Catalog and the quarterly class listing schedule for more information.

Several elective courses are seminar-style courses in the various areas of Chemistry. Not all courses are offered every year, so if a student is interested in a particular course he/she should contact the listed faculty member for course schedule information. Note that the number of these course credits that can be counted toward the requirements for the M.S. or Ph.D. is not unlimited (particularly for seminar-type courses); students should consult the Graduate Advisor regarding this issue. This also applies to CHEM 865 (Chemical Research Seminar), credit for which can be counted once toward the M.S. degree.

Course	Course Title	Usual Instructor	Notes
CHEM 571	Chemistry of Biomolecules		
CHEM 680	Special Topics (general)		
CHEM 751	Magnetic Resonance in Chemistry		
CHEM 752	Biophysical Chemistry	Schweitzer-Stenner	1
CHEM 753	Chemical Instrumentation Lab	Owens	1,3
CHEM 767	Chemical Information Retrieval	Sohlberg	1
CHEM 772	Inorganic Biochemistry	Addison	1
CHEM 774	Electrochemistry for Chemists	Addison	1
CHEM 780	Experimental NMR Lab	Wade	2
CHEM 788	Atmospheric Chemistry	DeCarlo	
CHEM 789	Experimental Design & Statistics in Chemistry	Owens	1
CHEM 792	Advanced Organic Synthesis I	Wade	1
CHEM 793	Advanced Organic Synthesis II	Wade	1
CHEM 794	Organic Reaction Mechanisms	Wade	
CHEM 862	Topics in Inorganic Chemistry. Most recently, "Magnetism & Paramagnetic Resonance"	Addison	1
CHEM 865	Chemistry Research Seminar	Ji	4
CHEM 866	Topics in Polymer Chemistry	Penn	

CHEM 868	Topics in Analytical Chemistry Examples: Modern Liquid Chromatography, Chromatographic Data Acquisition & Interpretation, Capillary Electrophoresis	Foley	1
CHEM 997	Research		
CHEM 898	M.S. Thesis		5
CHEM 998	Ph.D. Dissertation		6

Notes:

- (1) These courses have been offered recently.
- (2) This course has CHEM541 as prerequisite/co-requisite.
- (3) Should not be taken for more than 6 credits total.
- (4) This course is normally scheduled to meet almost weekly during the fall, winter, and spring quarters. All full-time graduate students are expected to attend department seminars every term unless they have a teaching or class conflict.
- (5) For M.S.- thesis option candidates only.
- (6) Enrollment for "Ph.D. Candidates" only.

VI. Selection of Research Advisor

All graduate students wishing to engage in research are required to select a Research Advisor who is a full-time, tenure-track faculty member in the department. It is possible to perform graduate research under the direction of one of the research faculty associated with the department as a co-advisor, but the Research Advisor must be in full agreement with the arrangement.

After arriving at Drexel, a Ph.D. student should speak with as many of the faculty as possible, including all those in the student's major area of interest, about present and future research plans. It is required (see Departmental C-2 form) that you interview at least six faculty members about research. Indeed, before commencing any research in association with a faculty member, you must submit the Departmental C-2 form signed by those faculty members interviewed before the choice of Research Advisor is approved by the Department. On the C-2 form you must list your top three choices for Research Advisor in order of preference; the department will place you with the first eligible faculty member after confirming her/his interest in serving as Research Advisor and the presence of an available TA or RA position in that group. You and your Research Advisor will then jointly designate the area(s) in which you will do your cumulative exams.

Both full- and part-time Ph.D. students must choose their Research Advisor no later than the end of the *first* quarter of the first year. When talking to faculty members about their research, feel free to ask for reprints of recent papers, preprints of papers in press, and planned research as reflected in submitted research proposals. When both you and the faculty member reach

agreement regarding the general area of research to be done for the Ph.D. thesis, you should fill out Graduate Studies Form D-1. Thus, you will be expected to start research at the beginning of your second quarter of residence at Drexel. If you intend to obtain a thesis-option M.S. degree, it's advisable to commence that research as soon as possible as well.

All C-2 forms will be processed by the graduate faculty after the fall term concludes and the ***firm deadline*** for submitting the C-2 form will be the last business day of final exams week for the fall term.

Even with the best planning it sometimes becomes necessary for a student to switch Research Advisors. It is recommended that the student discuss the situation with either the Graduate Advisor or Department Head prior to completing and submitting a new C-2 form. Students may switch Research Advisors ***once*** during their graduate program, and the new C-2 form must be submitted to the Graduate Advisor within 4 weeks after leaving the original Research Advisor's group. Except under exceptional circumstances approved by the GPC and Department Head, switching Research Advisors for a ***second*** time is ***not*** permitted.

VII. Appendices

A. Department Directory

1. Chemistry Department Personnel

Head of Department

Dr. Fraser Fleming

Graduate Advisor

Dr. Anthony W. Addison

Graduate Program Committee

Dr. Reinhard Schweitzer-Stenner, Chair

Dr. Anthony W. Addison

Dr. Haifeng (Frank) Ji

Ms. Janna Domenico, Graduate Student Representative

Safety Committee

Dr. Peter Wade, Chair

Dr. Anthony Addison

Dr. Alyssa Bohan

Dr. Anthony Wambsgans

Ms. Erin Ennis, Graduate Student Representative

Undergraduate Affairs Committee

Dr. Daniel King, Chair

Dr. Monica Ilies

Dr. Kevin Owens

Dr. Peter Wade

Undergraduate Student Representative (TBA)

Information current as of 12/15/15

2. Chemistry Department Faculty

Name	Office	Office phone	Lab phone	Title	Area
Dr. Tony Addison	12-418	895-2646	895-1697	Professor	Inorganic
Dr. Jason Cross	12-506	895-2641		Assistant Teaching Professor	
Dr. Peter DeCarlo	AEL 280-C	895-2345	895-2345	Assistant Professor	Atmospheric/ Analytical
Dr. Fraser Fleming	12-307	895-2644		Professor & Head	Organic
Dr. Joe Foley	12-212	895-6218	895-1702	Professor	Analytical
Dr. Lee Hoffman	12-403	895-1784		Assistant Teaching Professor	
Dr. Monica Ilies	12-224	895-2642		Assistant Teaching Professor	
Dr. Haifeng (Frank) Ji	12-507	895-2562	571-3648	Associate Professor	Materials/Analytical
Dr. Daniel King	12-509	895-0571	895-0571	Associate Professor	Chemical Education
Dr. Daniel Kleier	5-414	895-1861		Associate Teaching Professor	
Dr. Molly O'Connor	5-410	895-2666		Assistant Teaching Professor	
Dr. Kevin Owens	5-415	895-2621	895-6276	Associate Professor	Analytical
Dr. Lynn S. Penn	12-211	895-4970	895-2976	Professor	Polymer/Materials
Dr. Susan Rutkowsky	5-412	895-1509		Associate Teaching Professor	
Dr. Louis Scerbo	5-413	895-2647		Professor	Organic

Dr. Reinhard Schweitzer-Stenner	12-606	895-2268	895-2654	Professor	Physical/Biophysical
Dr. Karl Sohlberg	12-222	895-2653	895-6951	Associate Professor	Computational/ Physical
Dr. Peter Wade	12-508	895-2652	895-1699	Associate Professor	Organic
Dr. Anthony Wambsgans	5-409	895-1585		Associate Teaching Professor	
Dr. Jun Xi	12-218	895-2648	895-2655	Associate Teaching Professor	Organic/Biochem.

3. Associated Research Faculty (courtesy appointments in Chemistry)

Name	Office	Office phone	Lab phone	Title	Area
Dr. Aaron Fafarman	CAT 486	895-5818		Assistant Professor	Materials/Physical
Dr. Jian-Min Yuan	12-819B	895-2722		Professor	Physics

4. Chemistry Department Staff

Name	Office	Phone	Title
Dr. Alyssa Bohlen	PISB 501	571-4204	Laboratory Manager
Mr. Thomas Cachaza	12-113	895-2661	Glassblower II
Mr. Kyle Hess	12-316	895-1331	Laboratory Technician
Ms. Tina Lewinski	12-315	895-0567	Department Administrator
Ms. Virginia Nesmith	12-305	895-2638/2639	Office Services Coordinator
Dr. Jonathan Soffer	5-405	895-1980	Instrumentation Specialist
Ms. Sue Tang	12-314	895-2660	Operations Manager

Mr. Timothy P. Wade	5-406	895-1576	Electronic Instrumentation Specialist
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5. College and University Personnel

Name	Office	Phone	Title
Dr. Donna Murasko	McAlister-4020	895-2620	Dean, College of Arts & Sciences
Mr. Taz Kwok	Randell-240	895-2498	Coordinator of Graduate Studies

Notes:

All telephone numbers are in area code 215.

Building Information: 1 - Main Building, 5 - Stratton Hall, 9b - MacAlister Hall, 12 - Disqué Hall, PISB – Papadakis Integrated Science Building

B. Timeline Checklist

Attendant to several of the items documented in this handbook there are formalities that must be observed. You may obtain the necessary forms online from the chemistry department's website (<http://www.drexel.edu/coas/chemistry/>) and the Provost's website at <http://www.drexel.edu/provost/graduatestudies/forms.html>; these forms should be filed at the appropriate times. **It is very important for you to attend to the timely filing of each form since you will be held responsible for meeting various deadlines (see table below).** For full-time students who typically enter our program in the fall quarter, the second quarter on this checklist will be the winter quarter. For some requirements (e.g., the Thesis Proposal Seminar) it is understood that part-time students are expected to progress at a slower rate than full-time students. You are considered to be full-time in the program if you register as a full-time student or receive any stipend from the University while enrolled in any graduate courses.

Deadline	Form (1)	Action
Weeks 3-10 of first term		Interview prospective Research Advisors
End of first term	C-2	File <i>Graduate Research Advisor Interview Form</i>
End of first term /Beginning of 2 nd term	D-1	File <i>Plan of Study (2,3)</i> and <i>Supervising Professor Appointment Form</i>
<i>Before thesis research can begin</i>	C-2	<i>Must be submitted to Graduate Advisor and <u>approved</u></i>
Beginning of second term		Start conducting research

Start of second year (5 th term) or earlier at student's option—see section II.D.3.a)		Start taking cumulative exams
End of second week of given term		Apply for M.S. degree if appropriate
≥ Four weeks prior to Thesis Proposal	D-3	File <i>Dissertation Advisory Committee Appointment request form</i>
Week 6 of 6 th term for <i>full-time</i> students, week 6 of 7 th term for <i>part-time</i> students	C-3, C-3a	Schedule and give the <i>Dissertation Proposal Seminar</i> on or preferably earlier than the end of week 6. The C-3 and C-3a forms are always due at least 3 weeks prior to the actual seminar. This is a firm deadline, see section II.C.2 for more information. You may need to do these earlier, based on the sign up sheet.
Week 6 of 6 th term for <i>full-time</i> students, week 6 of 7 th term for <i>part-time</i> students	D-3A	Submission of <i>Dissertation Proposal Form</i> (outcome of oral exam)
After passing Candidacy Exam (4), typically after 6 th term for full-time students	D-2, D-2A	File <i>Doctoral Candidacy Examination Report (D-2)</i> and <i>Member Report (D-2A)</i>
≥ Four weeks prior to Ph.D. exam	D-4	File <i>Final Oral Defense Committee Appointment & Schedule Form</i>
≥ Four weeks prior to Ph.D. exam		Submit an electronic copy of a peer-reviewed publication on which you are a principal author, to the Graduate Advisor
Four weeks prior to Ph.D. exam		Submit Ph.D. thesis to format checker
≥ Two weeks prior to Ph.D. exam		Deliver printed copy of dissertation to each member of the Final Oral Defense Committee (5)
Day of Ph.D. exam	D-5	Bring <i>Report of Ph.D. Final Oral Defense Committee Form</i> to exam and also <i>Thesis Completion Form</i> .
When thesis corrections finished		File <i>Completion Form</i>
One month prior to commencement		File <i>Application for Ph.D. Degree Form</i>
Before leaving Drexel		Return all keys and other borrowed items

Notes: Further detailed information is contained on the forms themselves.

- (1) After obtaining the appropriate signatures from your Research Advisor and/or committee members, all University forms (D-1 through D-5 and the Completion Form) must be submitted to the Graduate Advisor, who will forward them to the Graduate Studies Office; Department forms (C-2, C-3, and C-3a) must be submitted to the Graduate Advisor (with the necessary signatures).
- (2) Ph.D. students & thesis-M.S. students.

- (3) The Graduate Advisor or Chair of the Graduate Program Committee can check over your coursework with you, although you should first consult with your Research Advisor.
- (4) Deadline strongly recommended by the chemistry department; ***university deadline*** is “at least three months prior to the final defense.”
- (5) An electronic copy may be substituted for the printed dissertation if it is acceptable to the committee member.

C. Department Forms

- 1. Graduate Research Advisor Interview Form (Form C-2, revised 12/14/11)**
- 2. Ph.D. Thesis Proposal Seminar Scheduling and Committee Form (Form C-3)**
- 3. Ph.D. Thesis Proposal Seminar Evaluation Form (Form C-3a)**
- 4. Masters Thesis Review Committee Form (Form C-5)**

CHEMISTRY DEPARTMENT

Form C-2

GRADUATE RESEARCH ADVISOR INTERVIEW FORM

STUDENT NAME: _____

I am interested in starting my _____ M.S. thesis or non-thesis research or _____ Ph.D. thesis research

Interviewed faculty signatures (below)*:

Date:

Having interviewed the above faculty members (at least 3), I submit my choices of faculty advisor as

_____ (first choice)

_____ (second choice)

_____ (third choice)

Based on faculty eligibility and pending his/her agreement, _____ is named as your Research Advisor.

Departmental full-time Graduate Advisor or Department Head signature:

_____ Date: _____

I agree to act as research advisor to the above student. The student's "specialty area" for Ph.D.

Cumulative exams will be: _____.

Research Advisor signature _____ Date: _____

If a co-advisor is also selected, this person is _____

Co- Advisor signature _____ Date: _____

Submit completed form to the Graduate Advisor. Ph.D. students must also submit Drexel forms D1.

* Students who finalized their choice of research advisor as a prospective student should simply enter that faculty member's name on the first line. Otherwise, students should re-interview the faculty member(s) whose research is of interest to them, in addition to any new faculty appointed during the last four years. A complete list of chemistry faculty may be found at <http://drexel.edu/chemistry/contact/facultyDirectory/>.

**CHEMISTRY DEPARTMENT
Form C-3**

Ph.D. THESIS PROPOSAL SEMINAR SCHEDULING & COMMITTEE FORM

STUDENT NAME: _____

Research Advisor: _____

Date/time of Thesis Proposal Seminar: _____

Location of Thesis Proposal Seminar: _____

Title of Thesis Proposal Seminar:

Seminar **Abstract** (≤ 250 words):

Proposed Seminar **Committee**: _____ Chairperson

_____ (external department member)

Research Advisor signature _____ Date: _____

Graduate Advisor signature _____ Date: _____

Submit completed form to Departmental Graduate Advisor.

cc: File, Research Advisor

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CHEMISTRY DEPARTMENT

Form C-3a

Ph.D. THESIS PROPOSAL SEMINAR EVALUATION FORM

STUDENT NAME: _____ Research Advisor: _____

Title of Thesis Proposal Seminar:

Thesis Proposal Seminar Results

We have examined the above named student on _____ (date) at _____ (time).

Based on the student's presentation and answering of questions:

_____ We recommend that the student has satisfactorily met the Thesis Proposal Seminar requirement.

_____ We recommend that the student has not satisfactorily met the Thesis Proposal Seminar requirement, and suggest the following course of action on her/his part:

_____.

Thesis Proposal Seminar Committee

Each committee member must sign below to show either agreement or dissent with the overall result.

Agree:

Chair _____	Signature _____
Name _____	Signature _____
Name _____	Signature _____
Name _____	Signature _____
Name _____	Signature _____
Name _____	Signature _____

Dissent:

Name _____	Signature _____
Name _____	Signature _____
Name _____	Signature _____

Research Advisor signature _____ Date: _____

Graduate Advisor signature _____ Date: _____

Submit completed form to Departmental Graduate Advisor.

cc: File, Research Advisor

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CHEMISTRY DEPARTMENT
Form C-5

MASTERS THESIS REVIEW COMMITTEE

STUDENT NAME: _____ Research Advisor: _____

Title of Masters Thesis: _____

Expected Completion Term/Date: _____

Suggested Thesis Reviewers:

Research Advisor signature _____ Date: _____

Graduate Advisor signature: _____ Date: _____

Submit completed form to Graduate Advisor.

cc: File, Research Advisor

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