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# CHEMISTRY DEPARTMENT GUIDELINES FOR GRADUATE STUDENTS

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# FORMAL REQUIREMENTS AND PROCEDURES FOR ADVANCED DEGREES

## *A. UNIVERSITY-WIDE REQUIREMENTS*

Requirements for advanced degrees, together with regulations of the Graduate School, are described in the publications:

(1) *Graduate Degree Programs Bulletin*

(2) *Thesis Guide*

These are available at the Graduate School office, 114 Kern Graduate Building or on the Graduate School web page – http:// www.gradsch.psu.edu. ***All graduate students are expected to assume full responsibility for knowing these requirements and procedures***

## *B. DEPARTMENT REQUIREMENTS*

Candidates for advanced degrees in Chemistry must meet the following requirements established by the Chemistry Department faculty.

### 1. Area Qualifying Requirements

Placement exams in analytical, biochemical, inorganic, organic and physical chemistry are given to all new students. The qualifying requirement for certification as a Ph.D. candidate is that a student must demonstrate proficiency in physical chemistry, as well as two additional areas. For certification as a M.S. candidate, proficiency in physical chemistry, as well as one additional area. Proficiency may be demonstrated by either:

**a.** passing the area examination upon entrance

**b.** obtaining a grade point equivalent of 3.0 in at least three credits of approved course work in the area. The courses will be designated by the Graduate Counseling Committee (GCC). Course work used to establish proficiency must be completed during the student's first two semesters of residence.

The GCC meets with each new graduate student after the qualifying examinations to help plan a course schedule. Courses are chosen first to make up any deficiencies revealed by the examinations, and second to give the student advanced training in their area(s) of interest. The Chemistry Department provides chemistry course syllabi of all the graduate and upper-level undergraduate courses that will be offered during the academic year.

The GCC examines the transcript of each first-year student at the end of spring semester to review the progress in order to recommend whether the student should be certified as a candidate for an advanced degree. The Chemistry Department requires a grade point average of 3.0 in all course work for admission to Ph.D. candidacy. Chemistry 602 is <u>not</u> used in computing this average. Students who have not met the area qualifying and GPA requirements will be either admitted to M.S. candidacy or dropped from the graduate program. At the discretion of the GCC, those students admitted to the M.S. candidacy may be permitted to petition for readmission to Ph.D. program.

## 2. Course Requirements

A Ph.D. candidate is required to take a minimum of five 3-credit graduate-level courses. The only 400 level courses that may be used to satisfy requirements are CHEM 408, 439, 448 and 455. A candidate's doctoral committee may also require additional specific courses. Many other courses may be appropriate but please consult with your advisor and/or the Graduate Program staff

## 3. Chemistry 500 Seminar in Chemistry

All graduate students are required to enroll for 1 credit of CHEM 500, *Seminar in Chemistry*, during each semester of their first and second years in residency. You will receive detailed information concerning CHEM 500 during orientation.

## 4. Safety Examination Requirement

Before beginning laboratory research, a student must pass the safety examination administered by the department's Safety Committee. Work in any laboratory is contingent on this prerequisite, which is strictly enforced. Safety examinations will be offered during orientation. Arrangements for those students failing the exam will be made by the Graduate Program Office.

## 5. Chemical Storage and Waste Management

All graduate students working in a lab are required to receive training on handling of chemicals and chemical wastes. Individuals must be trained within 90 days of arriving at Penn State.

## 6. Teaching Requirement

All graduate students must serve as a teaching assistant for at least one semester. During at least one semester that you are a teaching assistant, you must be registered for 1 credit of Chemistry 602, "Supervised Experience in College Teaching."

## 7. English Requirement for International Students

All entering international students are required to take an American English Oral Communicative Proficiency Test. The test is administered by the university's Linguistics and Applied Language Studies Department.

The oral proficiency test is given **only** at the beginning of fall and spring semesters. Students are required to pre-register for the test. The test scores are available through the Chemistry Department Graduate Office.

**a.** Those students who achieve a score of 250 or above on the exam will may be approved for teaching.

**b.** Those students whose score below 250 will be required to enroll and pass classes designated by the university's Linguistics and Applied Language Studies Department. Students need to pass all courses with an “A”. **Completion of ESL 118G is mandatory before a student will be allowed to teach.**

**c.** Students, who are required to enroll in ESL courses, must satisfy the requirements within the stated time limits:

i. ESL 115G – end of fourth semester

ii. ESL 116G – end of third semester

iii. ESL 117G – end of second semester

iv. ESL 118G – end of second semester

Students who fail to satisfy the requirements within the stated time frame will be ***required*** to enroll in ESL classes during the summer semester, with the possibility of being responsible for paying the tuition and fees. Although students may be certified for an advanced degree, provided they have satisfactorily met ***all*** other requirements, the Oral Comprehensive Examination will not be administered until the oral proficiency requirement has been fulfilled.

## 8. Doctoral Committee/First-Year Report/Committee Meeting

**a. Doctoral Committee.** A committee is chosen at the end of the student's second semester based on the Chemistry Department certification that the student is a candidate for the Ph.D. degree. The student and their preceptor will select a Doctoral Committee consisting of the preceptor, two other members of the Chemistry Department, and one faculty member from another department.

The Committee as a whole is responsible for guiding the academic program and monitoring the progress of a student throughout their graduate career. Discussions of research (or other matters) with them can often provide important perspectives and insights from direct involvement in the research. The closer the connection to these faculty members over the years, the more beneficial it will be to you when they are called upon to write recommendation letters to future employers.

**b. First-Year Report and Committee Meeting.** Each student is required to meet briefly (~15 minutes) with their newly established Doctoral Committee as a group by the end of the twelfth month of residence. At least one week prior to this meeting, a short written report (less than 5 double-spaced pages) outlining plans for the initial stages of the students thesis research must be distributed to the committee. Students are responsible for scheduling the committee meeting. The purpose of this meeting is to obtain feedback on the report, guidance in the direction of future research, and to familiarize each student with their committee. The 1st year committee form and report need to be completed and returned to the Graduate Program Office before the end of the twelfth month of residence. *This meeting is not an examination.*

**c.** Your doctoral committee is formed after consultation with your research advisor. The composition of this committee is made to enhance your graduate experience. Any changes to the committee, substitution of committee members, or participation by committee members at a distance must follow university guidelines.

## 9. Seminar Requirements

**Two seminars** are required of every student.

**a.** The first seminar is part of your Chemistry 500 requirement. This must be given prior to taking the oral comprehensive exam and during the first two years in residence. This seminar is to be given in one of the area seminar series on a topic not closely tied to research being done within the department. A written report must be prepared as a part of the overall requirement. You will receive detailed information about this seminar during orientation.

**b.** The second seminar will sum up the research done by the student during their graduate career. The seminar should be given during the 6 months preceding the thesis defense. Requests for any deviation from this time-line MUST be presented in writing to the head of the Graduate Counseling Committee (GCC). The seminar must be given during the semester prior to the date of your thesis defense and be presented in one of the regularly scheduled area seminar series.

## 10. Oral Comprehensive Examination Requirement

A Ph.D. candidate may take the comprehensive examination any time after meeting the qualifying, course, and seminar requirements. It must be taken within a student's first two and one-half years of residency (or within one year after receiving a Penn State M.S. degree in Chemistry). The examination must be scheduled at least three weeks in advance through the Chemistry Department Graduate Program Office.

The Doctoral Committee administers the comprehensive examination. During the examination, the committee will review the candidate's progress and may question them on any topic about which the committee feels the candidate should be knowledgeable. However, to provide a framework for the examination, the candidate is required to:

**a.** Prepare and distribute to the Committee at least **one week** in advance a 3-5 page report on their thesis research, outlining the progress to date and proposing plans for future work. The candidate may also be asked to provide a 15 minute synopsis of this report in the form of an oral presentation.

**b.** Prepare and distribute an original research proposal to the committee at least one week in advance. The proposal may be on any chemical (or chemically related) topic except that it may ***not*** be directly related to the candidate's thesis research or to work being done by others at Penn State. The proposal should also be between 3-5 pages in length. The candidate should be prepared to present a 15 minute oral presentation of the proposal.

**c.** Distribute the three CHEM 500 second year proposals to the committee at least one week in advance of your scheduled oral exam.

The format of the comprehensive examination will typically be as follows. Immediately prior to the examination the committee will meet in the absence of the student in order to discuss issues related to the student's exam. The first half-hour of the exam will consist of open questions used to judge the candidate's general background knowledge in areas the committee feels appropriately related to the student's course of research and study. The committee will then usually choose to have the student present one of the two proposal talks (but may also choose to hear both talks or neither talk). Further questioning will generally be tied more to the specifics of the proposals. Following the questioning, the candidate will be asked to leave the room briefly while the committee discusses his or her performance. The candidate will then be called back to the committee to be informed of its decision (pass or fail) and to discuss the committee's perceptions of the candidate's areas of strength and weakness and its recommendations for future scientific growth.

## 11. Post-Comprehensive Progress Reports

Subsequent to the comprehensive examination, a student is required to provide their Doctoral Committee with a yearly progress report to be delivered prior to the

anniversary date of the comprehensive exam. The report is to consist of a brief (1-2 pages) summary of progress made during the last year and a prospectus of upcoming work. This report is to be discussed with the committee members either on an individual basis or, if the student so desires, by a meeting of the entire committee. Students must submit to the Graduate Program Office copies of their reports as well as a signature page documenting the fact that they have discussed the report with all members of their committee within three weeks of the anniversary date of their comprehensive exam.

## 12. Final Thesis Defense

The final thesis examination needs to be scheduled in the Chemistry Department Graduate Program Office **three weeks in advance**.

**a.** Each member of the Doctoral Committee is to be given a copy of the thesis at least one week in advance of the defense.

**b**. This defense is given in conjunction with the oral seminar given the semester prior to this defense**. See seminar requirement 9b**.

## 13. Thesis Requirement

In addition to the Graduate School requirements, described in the *Thesis Information Bulletin*, the Ph.D. and Masters candidate is expected to furnish their preceptor with one bound, high-quality copy of the thesis.

## 14. M.S. Requirements

M.S. candidates, whether or not they intend to proceed to the Ph.D. degree, should obtain a copy of the Chemistry Department's guidelines for "Requirements for the Degree of Master of Science." Beyond the qualifying examinations, the only formal testing to which M.S. candidates are subjected is a final oral examination. This examination, which is held only after the M.S. thesis has been completed, is administered by a committee consisting of the student's research preceptor and two other faculty members. The signature page is generated by the Graduate Program Office.

## 15. Penn State Policies Regarding Termination of a Teaching Assistantship

All graduate students on an assistantship at Penn State University sign a contact entitled "Terms of Offer of a Graduate Assistantship and General Conditions of Graduate Assistantship Appointments". This document stipulates that, "Satisfactory performance of both assistantship duties and academic duties is a condition of the appointment. A graduate assistantship may be terminated if a graduate student fails to meet departmental standards."

The Graduate School at Penn State University sets the policies for termination of assistantships due to inadequate performance. These policies are given in Appendix IV of the Graduate School Policies **(http://www.gradsch.psu.edu/about/appendix4.html)**. These policies are listed below.

*A Performance Improvement Meeting* - This is a meeting between the supervisor and the graduate assistant. At this meeting the supervisor is expected to identify the areas in which the performance is substandard, and establish a time-table by which the graduate student must improve his/her performance or termination will result.

*Termination of Assistantship* - If a graduate assistant fails to meet acceptable standards of performance as prescribed in the performance improvement meeting, then the supervisor will notify the administrator of the unit. The unit administrator will schedule a meeting with the supervisor and the graduate student as soon as possible, generally within three days. At that meeting, the graduate assistant's performance will again be reviewed. If it is concluded that the graduate assistant has failed to meet acceptable performance standards, the administrator may terminate the appointment.

An alternate procedure may be followed in cases in which substandard performance is "disruptive of the educational process". One example of this would be failure to appear for a teaching assignment class. In such cases, the graduate student will be advised at the Performance Improvement Meeting that any subsequent failure to meet acceptable standards may result in immediate termination. In other words, the second meeting described above ("Termination of Assistantship") is not required in these cases.

If a graduate student wishes to appeal a termination decision, he/she may follow the grievance policy entitled, "Resolution of Problems - Outside the Classroom" **(http://www.gradsch.psu.edu/about/appendix2.html)**.

## 16. CHEM 500 – Seminar in Chemistry

**a. Chemistry 500 Seminar in Chemistry:** All graduate students are required to enroll for 1 credit of CHEM 500, *Seminar in Chemistry*, during each semester of their first and second years in residency. You will receive detailed information concerning CHEM 500 during orientation.

**b. Chemistry 500 Reports:** During your first year of graduate study you are asked to write short reports on a number of the seminars you attend as part of Chemistry 500. These reports are intended to accomplish three main goals. In order of decreasing importance, the goals are to:

1. help develop critical judgment concerning research presented by others
2. practice and thereby improve writing skills
3. institute regular attendance and participation in departmental seminars

A total of 5 reports are required, with at least 2 being completed in the 1st semester and the remainder by the end of the 2nd semester of residence. You may report on seminars by outside speakers only (i.e. not student or PSU Chemistry Faculty members) in any of the departmental area seminar series and the departmental colloquia. Some seminars from other departmental series are also eligible (for example, Neuroscience seminars) *but only when a Chemistry Department Faculty*

*member is hosting the speaker*. During spring semester the number of seminars used for reports has been historically more limited than fall semester.

***REPORTS ARE DUE NO LATER THAN 2 WEEKS AFTER THE DATE OF THE SEMINAR.***

Cover sheets like the sample provided are to be used for all reports. Cover sheets are available on the web page or in our orientation packet.

**A grade of 3.0 (B) or better is required on the cumulative total of 3 credits for Chem 500.**

Reports will be graded by the faculty member who hosted the seminar speaker. They should be graded and returned to you within one month of the seminar date. Grades will be based mainly on scientific accuracy, organization and writing quality (see attached grading sheet). Your overall grade for 2 credits of CHEM 500 will be assigned at the end of the spring semester and the following fall semester. It will be a qualitative grade (A,
A-, , F) based on the average of the best 4 report grades received.

Reports should be no more than two double-spaced pages in length. An additional page may be used for figures, descriptions of molecular structures, or references if needed, but the body of the text should not exceed the two-page limit.

A summary of suggested report contents follows:

<u>Introduction</u>

- Introduce the speaker by name and title.
- Efficiently set the scientific context for the talk, establishing the problem being studied and summarizing current knowledge about the problem.
- State the speaker's expressed research objective.

<u>Body</u>

- Summarize the methods applied to the research problem.
- Describe the research results and interpretation offered by the speaker.
- Summarize the methods applied to the research problem.
- Provide critical commentary on the research through the use of sources, figures, tables, or equations, scrupulously citing any sources you use with a superscripted number.
- Consider the use of section headings to organize the body of the report, using organizing principles of either the various facets of the research problem or the speaker's methods, results, and interpretation.

<u>Conclusion and Critical Commentary</u>

- Briefly summarize the conclusions drawn by the speaker.
- Offer your opinions and insights into the speaker's work, paying particular attention to the quality of the data or analysis and the significance of the research.

- Provide brief commentary on the actual or potential applications of the research.
- Append any figures, tables, or equations used, and provide complete bibliographic information about any sources cited.

**Report References:** To write an effective report you will find it helpful to refer to sources other than simply the notes you take during the seminar. It is recommended that you obtain one or two key references cited by the speaker and review papers in order to increase your understanding of the topic. Reviewing these materials before the talk is best, since it will enable you to get more out of the presentation and hopefully take an active part in the questioning afterward. Some references will be provided on the CHEM 500 web page, but it is mainly up to you to locate additional materials.

**Chemistry 500 Proposals:** The second year proposal requirement is an exercise in idea generation and in preparation for the more formal proposal to be given at the oral exam. Students are required to write **three** proposals for research projects loosely based on some aspect of a seminar or colloquium attended. Only one proposal can be written for any given seminar or colloquia. You will receive detailed information concerning CHEM 500 during orientation.

**Guidelines for Preparing Seminar Proposals**

Seminar-based proposals are meant to be original ideas for research projects that derive (loosely) from topics discussed in departmental seminars and colloquia (They should not be merely statements of how to extend the speaker's research the next logical step.) These written exercises are intended to help you learn to produce ideas for viable research projects. They should provide useful practice for the original proposal you will defend in your comprehensive exam. The proposals are to be short -- no more than two pages all inclusive*****. A format such as the following should be used:

1) Each proposal should list the title, speaker, and date of the seminar or colloquium with which it is associated. It should briefly describe how the proposed work is related to the content of the seminar. (The connection need not be very direct - you can use seminars merely as a springboard for idea generation.)

2) Next should be a statement of the proposed project, stating why the results obtained would be significant, along with a brief description of any background needed to provide an adequate explanation of the significance.

3) Then describe what instrumentation, stating materials, computer time, etc. would be required in order to carry out the research proposed. Include some discussion of the estimated difficulty (in terms of time and expense) involved in such a project).

4) Finally, most new ideas have potential obstacles to success that may be more or less evident from the beginning. Some discussion of what these obstacles might be should be part of the proposal. Even better, discuss possible alternatives to circumvent the more obvious difficulties that might arise.

*****This page limit includes single-spaced text (12 point or greater font), figures, and references. (Size 10 font is permissible for figure captions and references, but there should be no more than 5

references for any proposal.) One extra page of structures and chemical equations will be allowed for synthetic proposals.

## 2nd Year CHEM 500 Seminar Guidelines

The first seminar must be given prior to taking the oral comprehensive exam and during the first two years in residence. This seminar is to be given in one of the area seminar series on a topic not closely tied to research being done within the department. A written report on the subject of the seminar must also be prepared as a part of the overall requirement. The text of this report will be limited to no less than nine and no more than twelve double spaced pages in length. The student will be formally evaluated on both the seminar and written report by three members of the student's doctoral committee (Chemistry) faculty. (If one or more of the Doctoral Committee is unable to attend the seminar another member of the Chemistry Department can serve as a substitute.) Written reports are due to the graders one-week prior to the seminar date. The overall grade achieved on the combination of the oral seminar and written report will be officially recorded as the grade for 1 credit of CHEM 500. A grade of 3.0 or better is required before a student can schedule his or her oral comprehensive exam. Students failing to obtain the minimum grade must repeat the entire seminar requirement until the minimum grade is achieved (up to a maximum of three times).