

Graduate Manual

Department of Chemistry

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OF SCIENCE AND TECHNOLOGY

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GRADUATE MANUAL

Preface

This document is a compilation of the policies and practices of the Department of Chemistry and the Graduate College. It has been prepared to guide graduate students through the program. Few of the policies stated are so inflexible; however, that an exception cannot be made if circumstances warrant.

The Graduate Activities Committee (GAC) is charged by the faculty with administration of the Chemistry Graduate Program. The committee, which consists of four or five professors appointed by the Department Chair, monitors the progress of all chemistry graduate students throughout their graduate careers and periodically updates this manual. The Graduate Student Liaison Committee (GSLC) is a Subcommittee of the Graduate Activities Committee. The GSLC, whose charge is to address graduate student concerns, is composed of the faculty members of the GAC, plus 4-6 graduate students. The graduate student members of the GSLC are elected by the Chemistry graduate students at large. The center of operations of the Graduate Activities Committee is at the desk of the Graduate Records Secretary, located in the Department of Chemistry Office, 1605 Gilman Hall. Students may obtain the required Chemistry and Graduate College forms from the Graduate Records Secretary or you may access the Graduate College forms at www.grad-college.iastate.edu/forms/forms.html and the Department of Chemistry forms at www.chem.iastate.edu/Dept/FStudent.html.

ALL forms should be submitted to the Chemistry Graduate Records Secretary for processing.

The Graduate Bulletin Board is located immediately outside the Department of Chemistry Office, next to the graduate student mailboxes. This Bulletin Board displays notices of general interest.

The faculty has defined standards as to the length of time that students may receive full assistantship support (please see Section 9). Diligent effort on the part of the student in the early stages of graduate work is the best way to avoid a prolonged stay in graduate school.

Graduate students are invited to consult any member of the Graduate Activities Committee when that would be helpful. A list of the current members of the Graduate Activities Committee can be obtained from the Chemistry Graduate Records Secretary.

Quite aside from the formal policies, the members of the faculty would like to wish each graduate student in the Department the greatest possible measure of success. The years that you spend here will be, we hope, ones that you will look back on with fondness; may you inherit the joy of scientific inquiry which graduate study is intended to instill in every participant.

1.PROFICIENCY REQUIREMENTS

1.1. Proficiency in Chemistry

1.1.1. Diagnostic examinations. All entering graduate students take diagnostic exams in four areas: analytical, inorganic, organic, and physical. The exams are offered immediately prior to the first semester, and may not be delayed. The results are used to counsel students into suitable courses.

Each exam is scored as "P" or "NP". A "P" signifies that the student is familiar with the material at the undergraduate level (Chem 211, 316; 301, 402; 331, 332; 321, 322) corresponding to a grade of "B" or better.

An "NP" represents a deficiency that must be removed as discussed in Section 1.1.2. Ph.D. candidates must demonstrate proficiency in four areas, M.S. candidates in three, including the major.

1.1.2. Demonstrating proficiency. Students must demonstrate chemistry proficiency for each discipline in which a deficiency was found by the end of the third semester in residence to remain in good standing in the Chemistry Graduate Program.

A. Clearing deficiencies. This can be accomplished in any one of the following ways listed below. This choice should be made with the advice of the temporary advisor and/or major professor:

1) A student could demonstrate proficiency in the area(s) in which they did not pass the diagnostic examination by retaking the diagnostic examination(s) in January and again, if necessary, in the following August. This can be accomplished by self-studying or by auditing or sitting in on courses.

2) A student could enroll in an approved graduate course in the deficient area and earn a grade of B- or better. The current list of acceptable courses follows:

Analytical: Chem 511, 512, 513, 516, 577 (576 is acceptable for EITHER analytical or Physical, but not both)

Inorganic: Chem 503, 505, 506, 571, 574, 578

Organic: Chem 531, 537

Physical: Chem 561, 562, 563, 564, 575, 576, 580

3) A student could enroll in an appropriate undergraduate course and earn a grade of B- or better. This might be appropriate for a student who fared very poorly in the corresponding diagnostic. Such action by the student would be acceptable insofar as registration in an undergraduate course does not count for graduate credit. The appropriate undergraduate courses are:

Analytical: Chem 316
Inorganic: Chem 402
Organic: Chem 332
Physical: Chem 321 or 322

All deficiencies must be erased using one or more of these mechanisms by the end of the third semester in residence.

- B. Should a student fail to clear a deficiency on the third attempt to pass a diagnostic exam, he or she must remove the deficiency by taking an appropriate course (as outlined in point A above) during the third semester in residence.
- C. Some outcomes of unresolved deficiencies could be:
 - a. Pass 4 diagnostics by any option under “A” above (and have acceptable grades): remain on Ph.D. track
 - b. Pass 3 diagnostics by any option under “A” above (and have acceptable grades): MST (M.S. terminal) track

1.2. Proficiency in English

1.2.1 Examination. All international graduate students are to take a qualifying exam in English before 12 credit hours have been completed. Students who fail the required tests are to take the specified remedial actions.

Students whose native language is not English must take the ISU English Placement Test for International Students. Furthermore, TA's must take the SPEAK/TEACH Test.

1.2.2. Remedial courses. Courses required to satisfy the English requirement are to be taken within the first year; students must enroll for credit and not pass/fail. Fulfillment of the required remedial courses in English is a prerequisite for advancement to RA-II status and to take the oral prelim exam.

The stipend of students who have not demonstrated proficiency in English and/or TA's not fully certified by the SPEAK/TEACH test, will be reduced according to the schedule shown in Section 9.

2. ADVISING AND REGISTRATION

2.1. At the Start

An explicit time schedule of events will be provided for new graduate students.

2.1.1. Entrance review. New graduate students' application materials will be reviewed individually by the Graduate Activities Committee to determine each student's area(s) of interest for assignment of a temporary advisor(s).

2.1.2. Temporary advisor. A list of temporary advisers will be posted on the Graduate Bulletin Board and distributed to the professors and the students. The advisers will counsel students on academic matters until the assignment of a Major Professor is made in mid to late November.

2.1.3. Initial counseling and registration. Students will meet with their temporary advisers to review the results of the diagnostic exams, to discuss their first semester's course work, and to fill in the registration form. The temporary advisor must sign the registration form. The following are the steps to follow to complete registration for courses:

Step 1: The completed registration form must be taken by the student to the Graduate Chemistry Office, 1605 Gilman. The registration form will be reviewed by the Graduate Records Secretary and will then give you a 4-digit number to gain access to AccessPlus to complete your registration on-line.

Step 2: The student completes the Availability for Teaching Card and gives this form to the Graduate Records Secretary.

Step 3: The final step is to go on-line on a computer provided in 1605 Gilman and register for your first semester of classes. Some of the class times may be changed by the University Registrar (due to filled sections, etc.); if so, the student must report adjustments of his or her schedule with the Graduate Records Secretary.

2.2. Subsequent Semesters

2.2.1. Registration. Students must obtain a registration sheet in the Graduate Chemistry Office, complete the registration sheet and obtain their major professor's signature. The Graduate Records Secretary will then issue a 4-digit registration number so that the student may register by the Web through AccessPlus. www.adp.iastate.edu/accessplus.html. After logging onto AccessPlus, click on "Register for Classes" under "Students".

2.2.2. Changes in Schedule. The "Request for Schedule Change" form, available from the Graduate Records Secretary, is used for drops, adds, credit changes. Limitations apply regarding the timing of such changes and are available either in the ISU Directory or at www.iastate.edu/~registrar/registration/.

3. SELECTING A MAJOR AND A MAJOR PROFESSOR

3.1. Areas of Study

3.1.1. Major. Options for graduate degree majors are:

- a. Chemistry
- b. Analytical Chemistry
- c. Inorganic Chemistry
- d. Organic Chemistry
- e. Physical Chemistry

Options b through e is “traditional” disciplines. The availability of the first major, “Chemistry,” provides considerable flexibility in designing an interdisciplinary program of study. It is also the major to be selected by those who wish to specialize in “Chemical Education”.

3.1.2. Minor. A student may elect an optional minor in another discipline or in another department.

3.2. The Major Professor

Any professor may serve as Major Professor to any graduate student regardless of the student’s major. The choice of a Major Professor represents an agreement between the graduate student and the professor to work together in planning academic studies and research for an advanced degree. Students should give this matter careful consideration, exploring conscientiously the available options as to major, research specialty and research group. The following policies are intended to promote a thorough exploration and a free decision on the part of all students.

3.2.1. Learning about research programs

Chem 579. All new graduate students must register for this course in their first semester. This course will acquaint students with the research underway in the Department.

In the Fall Semester, Chem 579 consists of research presentations and one-on-one discussions with the faculty. As a part of the process, students are to engage in such personal discussions with at least three professors and obtain the signatures of those professors on the form provided during Chem 579.

In the Spring Semester, for January entrants, only one-on-one discussions with the faculty are offered.

3.2.2. Choosing a major professor

Expressing the choice. During Chem 579, students will be asked to return the “Major Professor Preference Form” to the Graduate Records Secretary. On this form students state their preference for a Major Professor by listing up to three choices and numbering them 1 to 3 in order of preference with 1 being the first choice. Students may elect to postpone the choice of Major Professor with Departmental approval, but for no longer than the end of Spring Semester.

The faculty will honor a student's preference for a given research group insofar as allowed by considerations of faculty workload, space, research support, and so on.

Early selection of a major professor can be arranged by petition to the Graduate Activities Committee, with an adequate justification for the immediate initiation of research. If the petition is approved, the student may submit the “Major Professor Preference Form” after interviewing six professors and obtaining their signatures on the Major Professor Preference Form. The student is still required to attend Chem 579.

Recording the choice of major and Major Professor. Once the choice of the Major Professor has been ratified by the faculty, the student should submit to the Graduate Records Secretary the form entitled "Selection of Major Discipline and Major Professor" (Form 1) which can be obtained from the Graduate Records Secretary.

Change of Major Professor. A graduate student should make a careful selection of discipline and Major Professor. Nonetheless, in the rare event a change might be desired, a student should act promptly, preferably by the end of the second semester to avoid prolonging the time to an advanced degree. (See the longevity schedule, Section 9). This is particularly so if the change also entails a change in major.

Any such change must first be adequately explored with the potential new Major Professor. If the new Major Professor concurs, then the student should give the reasons in a memorandum to the Graduate Activities Committee. The new Major Professor should sign the memorandum to indicate concurrence; the current Major Professor should also sign the memorandum to indicate cognizance of the pending change. The change requires the approval of the Department. If the POS Committee has already been constituted, the Graduate College must also be informed and a modification to RCA and POS forms needs to be completed and filed with the Graduate Records Secretary and the Graduate College. These forms are available from the Graduate Records Secretary or on-line at www.chem.iastate.edu/Dept/FStudent.html.

4. PROGRAM OF STUDY

4.1. The Program of Study Committee (POSC)

The student's personal POSC approves the Program of Study, and conducts the oral prelim and final exams. In addition, oversight of the student's progress is ensured by annual meetings of the POSC, which is assembled no later than the end of the student's second semester. The student (with help from their Major Professor) initiates the annual meetings. The purpose of the meetings, which start no later than the student's third semester in residence, is to provide informal discussion of planning and progress of the student's program and *not* to entail formal presentations on the part of the student. These meetings are not examinations. No more than one member of the committee may be absent at these informal meetings. These discussions are not held in years in which the oral exams are scheduled. The "Program of Study Committee (POSC) Annual Meetings" form should be completed and returned to the Graduate Records Secretary upon completion of the meeting. This form is available from the Graduate Records Secretary or on-line at www.chem.iastate.edu/Dept/FStudent.html.

4.1.1. The Ph.D. committee consists of five professors, and is chaired by the Major Professor. At least three members must represent the major (including the major professor), and at least one member must be from another discipline or department.

A minor discipline, if any, must be represented.

A list of the professors of the Department of Chemistry by discipline is available on-line at <http://www.chem.iastate.edu/Dept/Faculty.html>.

4.1.2. The M.S. committee consists of three professors, and is chaired by the Major Professor. One member must be from another discipline or department.

Students who are aiming solely for the M.S. degree should so inform the Department as soon as possible, to avoid an excessive time to the degree. This form is available from the Graduate Records Secretary or on-line at www.chem.iastate.edu/Dept/FStudent.html.

4.1.3. Appointment of the POSC. The student and Major Professor select the members and submit the "Recommendation for Committee Appointment" form to the Graduate Records Secretary. Copies of the approved form will be returned to the Major Professor, the student, and the originals will be filed with the Graduate College. **Pre-registration for your third semester will not be approved until this has been completed.** The "Recommendation for Committee" form is available from the Graduate Records Secretary in 1605 Gilman, or you may access the Graduate College Forms on-line at www.grad-college.iastate.edu/deadline/formss.html.

4.1.4. Changes. A member of the POSC may be replaced permanently or temporarily by another professor by submission of the “Request to Change Committee Appointment Form” available from the Graduate Records Secretary or on-line at www.grad-college.iastate.edu/deadline/formss.html.

4.1.5. Annual POS Meetings. The student and committee members will meet annually in a manner to foster student/faculty interactions as well as collaboration between the many divisions and departments. The purpose of the meetings, which start no later than the first day of the student’s third semester in residence, is to provide informal discussion of planning and progress of the student’s program and will include a short student led discussion of their research. This discussion is designed to make the committee aware of the student’s academic and research progress and allow for collaborative discussion by the student and faculty that may address on going problem areas. The format of the discussion may include PowerPoint slides, transparencies, outline, or a chalk talk and last no more than 15 minutes to allow time for discussion. *These meetings are not examinations.* No more than one member of the committee may be absent at these informal meetings. The Prelim Oral and Final Defense will substitute for these annual meetings. The “Program of Study Committee (POSC) Annual Meetings” form should be completed and returned to the Graduate Records Secretary upon completion of the meeting. This form is available from the Graduate Records Secretary or on-line at <http://www.chem.iastate.edu/students.html>.

Annual Meeting Schedule before the:

1st day of the 3rd semester – Set up POS and First Annual Meeting

end of the 4th semester – Prelim Oral or Annual Meeting

end of the 6th semester – Prelim Oral or Annual Meeting

end of the 8th semester – Annual Meeting

end of the 10th semester – Final Defense or Annual Meeting (showing justification for continued funding for post fifth year)

4.2. Degree Requirements

This section describes the requirements to obtain Ph.D. and M.S. degrees. Graduate study centers on research, carried out under the guidance of the Major Professor whose selection is described in Section 3. Expectations regarding research are summarized in Section 6.1. The focus of this section is on the other requirements, such as courses and preliminary examinations.

Students who wish to pursue the Ph.D. specializing in Chemical Education will obtain a degree in “Chemistry”, as described below. The research component of their degree shall have two parts. The first component of the research will be carried out in the laboratories of any member in the Department who is active in a chemical research area other than Chemical Education. This component shall be of the quality and quantity of a M.S. degree, and the students will ordinarily write a thesis, defend it, and obtain the M.S. Students may obtain this M.S. in one of the traditional disciplines or in “Chemistry”, but must in any case; fulfill the requirements for the Chemical Education specialty. The second component of the research may be carried out under the same or a different Major Professor and shall consist of research in the field of Chemical Education.

4.2.1. The Ph.D. Degree

4.2.1.1. Graduate College requirements for all majors:

- (a) Complete ≥ 72 semester hours of graduate credit. 5X0 courses do not count towards the outside credit. Courses included within each major are defined in Section 4.2.1.3.
- (b) Pass courses on the POS.
- (c) Pass the written cumulative exam requirement.
- (d) Pass the preliminary oral exam conducted by the student's POSC.
- (e) Pass a final exam in defense of the thesis.

4.2.1.2. Department of Chemistry requirements for all majors:

(a) **Coursework.** Students take at least 16 credit hours of 500-level chemistry courses (excluding 5X0s, 550, 555, and 579—or any such courses of an orientation nature) or substitutions approved by the POSC and the Major Professor. Most individual majors have more specific requirements, as given in Section 4.2.1.3.

Additionally, the student must take at least one 600-level special-topics course in or out of the Department of Chemistry. This course must be for at least one credit-hour. Alternately, with the approval of the POSC, the student may take a course that is at least 500-level outside of the Department of Chemistry or a 500-level Chemistry course given in alternate years or less frequently. This course cannot be one of the seminar courses and does not count among the 16 credit hours noted above.

All students must take:

"Safety in the Chemical Laboratory", Chem 550, offered in Spring Semester.

"Introduction to Research in Chemistry", Chem 579, offered in Fall Semester.

(b) **Seminars.** Students must present at least one public seminar (on their research or on the scientific literature) before the end of their sixth semester in residence. An oral presentation at a national or international meeting before the end of the sixth semester in residence may satisfy this requirement. Documentation of completion of the seminar should be filed with the Graduate Records Secretary by completing the "Seminar/Oral Presentation Record" form available from the Graduate Records Secretary or on-line at www.chem.iastate.edu/Dept/FStudent.html.

4.2.1.3. Department of Chemistry requirements for specific majors:

The following courses must be included in the POS for each individual major.

Chemistry: No requirement.

Chemical Education: The chemical education specialty is administered as a “chemistry major”, but will ordinarily have the following requirements, subject to the agreement of the POSC. Students will take at least 12 units of 500-level chemistry courses, as outlined for one of the masters level programs. They must fulfill the special topics requirement of Section 4.2.1.2. Additionally, students will take the following courses to develop their understanding of education and education research: Stat 401 (3), Stat 402 (3), Curr 615 (2, twice), Curr 533 (3), Chem 599 (1-3 each semester).

Analytical: 511 (3), 512 (3), 513 (3), 516 (3), plus 611 (1 each semester offered).

Inorganic: 505 (3), 506 (3), 600 (3x1), ≥ 4 Cr. of other inorganic courses, including at least 2 credits in 601.

Organic: 531 (2), 532 (2), 537 (3), 538 (2), 632 (2 for credit, 2 for audit), plus 631 (1, each semester offered. Students must present one seminar in 631, and must receive a grade of B- or better). Also, 572 (3, with a grade of B or better).

Physical: 561 (4), 563 (2), 583 (1) and 562 (3), or 564 (3); plus 660 (1 credit every semester offered). Each course requirement may also be met by the following substitutions: Phys 591 for 561; Phys 592 for 562; Phys 531 for 563 (they may be particularly attractive to students interested in Chemical Physics).

4.2.1.4. Minor requirements: About 12 hours in a discipline, chosen from:

Analytical: 510 (2), 511 (3), 512 (3), 513 (3), 516 (3).

Inorganic: 500 (2), 505 (3), 506 (3), 601 (1-2).

Organic: 530 (2), 531 (2), 532 (2), 537 (3), 538 (2).

Physical: 560 (2), 561 (4), 562 (3), 563 (2), 564 (3).

General: 570 (2), 571 (3), 572 (3), 573 (2), 574 (2), 575 (3), 576 (3), 578 (2).

4.2.1.6. Additional Specialties: A Ph.D. student in chemistry may choose one of four specialties, in addition to the major discipline. M.S. students may petition their POSC and the Graduate Activities Committee for permission to add a specialty. This addition should, however, not extend the student's time to degree. A minimum of 10 credits is required for each specialty. Any course which could be used to fulfill the requirements of the student's major may not be used for a specialty. Any special topics course offered by Chemistry (Chem 601, 619, 632, 667, or 668) which is not eligible for the student's major may count toward the specialty, with approval from the POSC. A course which satisfies the preceding requirements, and which is not listed below, may be used with approval from the Curriculum Committee and from the POSC. A student must choose at least one course from outside of chemistry. In addition to special topics courses, suitable courses for the five specialties are:

Materials Chemistry: Chem 571, Chem 573, Chem 575, MatE331, MSE 534, MSE 516, MSE 539, MSE 635, ChE 443, Phys 511, Phys 512.

Industrial Chemistry: Chem 574, Chem 576, , Chem 578, ChE 410, ChE 688, Stat 401, Stat 402, Stat 407, Stat 495, Stat 496.

Biomolecular Science: Chem 503, Chem 578, BBMB 404 or 501, BBMB 405 or 502, BBMB 411, BBMB 451 or 551, BBMB 642, BBMB 675, Biol 302, Biol 302L, Gen 520, Gen 411, Tox 501.

Chemical Instrumentation: Chem 513, Chem 516, Chem 576, Chem 577, Chem 581, Chem 582x, BBMB 411, Phys 310, MSE 534, MSE 635.

Forensic Chemistry: Chem 510, 511, 512, 513, 516, 572, 577, BBMB 411/511, Tox 501, Stat 401 or Stat 447.

Students who do not have the prerequisite coursework (or equivalent) in their background for any of the above should contact the course instructor about waiving the requirement.

4.2.2. The M.S. Degree

4.2.2.1. Graduate College requirements

- (a) Complete ≥ 30 hours of graduate credit.
- (b) Pass courses on the POS.
- (c) Pass a final exam in defense of the thesis.

4.2.2.2. Department of Chemistry requirements for all majors:

(a) Complete Chem 550, "Safety in the Chemical Laboratory" offered during Spring Semester.

(b) Complete ≥ 12 hours, but not more than 16, of graduate course work exclusive of seminars, orientation courses (such as 5X0s, 550, 555, and 579), special topics courses and research. Of these, at least 6 must be within the major discipline, and 4 outside of the major discipline, as defined in Section 4.2.2.3. Chem 500, 510, 530, 560 are acceptable as 'outside' courses, as are courses numbered 570-578.

(c) Present at least one public seminar (on current research or on the scientific literature), prior to their final defense. An oral presentation at a national or international meeting may satisfy this requirement. Documentation of completion of the seminar should be filed with the Graduate Records Secretary by completing the "Seminar/Oral Presentation Record" form available from the Graduate Records Secretary or on-line at www.chem.iastate.edu/Dept/FStudent.html.

4.2.2.3. Department of Chemistry requirements for specific majors.

Students must complete ≥ 6 hours in the major. Coursework acceptable for each major is defined below. (Chem 500, 510, 530, 560 is not acceptable.) Coursework required for the M.S. in each major is indicated by an asterisk.

Chemistry: No additional requirement.

Analytical: 511 (3), 512 (3), 513 (3), 516 (3), 611 (1, each semester)

Inorganic: 501 (2), 505* (3), 506* (3), 600* (1)

Organic: 531* (2), 537* (3), 572* (3), and either 532* (2) or 538* (3)

Physical: 561 (4), 562 (3), 563 (2), 564 (3), 660 (1, each semester)

4.2.3. Preparing the POS

The student and Major Professor prepare the proposed Program of Study (POS). The form is then approved (or modified) by all members of the POSC, and submitted to the Graduate Records Secretary. The "Program of Study" form is available from the Graduate Records Secretary in 1605 Gilman, or on-line at www.grad-college.iastate.edu/deadline/formss.html. Return the completed form to the Graduate Records Secretary for processing.

All students are expected to submit the POS no later than early in their third semester. Pre-registration for the fourth semester will not be approved without completion and submission of the POS.

Further Instructions appear on the reverse of the POS form. Note:

Part I, Item 4: All M.S. degrees require a thesis.

Part I, Item 6. List Chemistry

Part I, Item 7. List the major (e.g. Analytical Chemistry)

Part I, Items 8 to 11: Specify NONE unless a minor is desired.

Part I, Items 12 and 13: These dates are tentative guides that should agree with the schedule in section III of the POS form.

Transfer Credits: Transfer credits from another university to be applied for graduate credit are designated T in the * column. The request must be approved by all members of the POSC on a signed form accompanying the POS. Transfer credit is not normally given for a course in an area in which a student received an "NP" on the Diagnostic Examination, for a course in which the student received a grade below B, or in courses that are not comparable to the 500-level courses in this University. Transfer credit will not be awarded for courses applied to a student's undergraduate degree. Transfer requests must be accompanied by photocopies of the relevant transcripts, course syllabus, exams, and any other pertinent course materials. The materials should be submitted to the Chair of the Graduate Activities Committee who will then ask the professor who teaches the comparable course in the Department of Chemistry to review the materials and make a recommendation for acceptance of the transfer credit. The Graduate Activities Committee will then review the final recommendations and either approve or not approve the transfer credits.

Graduate Courses: List the courses in the major first, indicating them as "X" in the ** column. Outside or minor credits are designated "Y". Courses in foreign languages, elementary computer science, remedial English, and other courses not receiving graduate credit should be designated "Z".

Audits: Audits are listed on a student's transcript only if the student obtains the instructor's approval on the "Request for Audit(s) to Appear on Transcript" form. A thorough listing of policies applying to auditing a course appears on page 4 of the *Graduate College Handbook*. The form is available from the Graduate Records Secretary or on-line at www.gradcollege.iastate.edu/deadline/formss.html.

Changes in the POS are made on the "Modifications to POS Form". Both forms are available from the Graduate Records Secretary or on-line at www.gradcollege.iastate.edu/deadline/formss.html.

4.2.4. Teaching Experience

One semester of half-time teaching experience is required for a graduate degree. Normally such experience is gained as a TA in this Department, but equivalent, substantive prior science teaching as a high school teacher or as a TA at a university in which English is the language of instruction can be substituted. However, teaching done during a student's undergraduate career or as a teacher's aide does not qualify.

These possible reductions in the required TA service will not allow a student to be released from a teaching assistantship agreement, unless the change is acceptable to the Department.

4.2.5. A Chemistry minor

A minor in Chemistry or in any of its disciplines, for students from other departments requires 10 credit hours of lecture courses carrying graduate credit, six of which must be at the 500 or 600 level, and exclusive of credit for seminars and research. The specific courses chosen require approval by the chemistry member of the student's POSC.

5. PRELIMINARY EXAMINATIONS AND Ph.D. CANDIDACY

The Preliminary Examination is designed to promote an integration of the student's knowledge, to require the student to stand up to oral questioning by experts in the field, and to screen students being considered for the Ph.D. degree.

5.1. PRELIMINARY WRITTEN EXAMS (Cumulative Examinations)

Dates for cumulative examinations for the academic year are announced for all disciplines at the beginning of the Fall Semester. The dates and professors writing the exams are determined by the Graduate Activities Committee, in consultation with the faculty. The professor preparing the exam and the topic of the exam are announced one week prior to the exam. The cumulative examinations will last two hours. Professors inform the GAC for which discipline(s) they are willing to write examinations.

Each discipline gives its examination on the same day, 9 times each academic year (none being given in December, July, and August). Five series of examinations now exist, but this number may change as our doctoral program evolves. The student is required to pass 5 out of 12 exams. No more than 2 low passes may substitute for 2 passes. For traditional disciplines, two passes (pass or low pass) outside the area are permitted.

Students begin writing examinations no later than the first February following August enrollment or the first September following January enrollment. The POSC and the Graduate Activities Committee may make an allowance for exceptional cases; in these instances, a student may begin taking cumulative examinations at a later date. Once a student has begun to write examinations, he or she must continue to write them; examinations missed without a waiver are considered a no pass. If there is an exceptional reason for missing a cumulative exam, a student may apply for a waiver by first petitioning the Major Professor, then the POSC. Finally, the waiver must then be approved by the Graduate Activities Committee.

Exams are graded as pass, no-pass, or low-pass. No more than two grades of low pass are accepted among the required five passing exam grades. Faculty are not obliged to employ the low-pass grading option.

Students who intend to obtain a PhD specializing in Chemical Education should pass three exams in the area related to their first research component and two exams in the Chemical Education series. Because of the limited number of students in Chemical Education and small number of faculty who will write these exams, students should inform their potential Chemical Education advisor when they intend to begin taking Chemical Education exams, as they may not be offered when there is no apparent demand. Students who change majors to Chemical Education late in their careers and who have passed 3 or more cumulative exams in another field may petition the POSC and Graduate Activities Committee to arrange a plan to fulfill the written Chemical Education portion of the written preliminary exam. Each graduate student is responsible for retaining all cumulative exams which may be requested to be presented at the preliminary oral examination.

5.2. Preliminary Oral Exam

After passing written prelims, and in any event no later than the end of the fifth semester in residence (not counting summers), the student will complete the oral preliminary examination. The appropriate form, Form 3A, is available from the Graduate Records Secretary or on-line at www.chem.iastate.edu/Dept/FStudent.html and must be submitted to the Graduate Records Secretary at least two weeks prior to the preliminary oral exam. Depending on the outcome of this preliminary oral exam, the student's POS Committee may schedule a second preliminary oral exam within 90 days of the first exam. This second exam can extend no more than 90 days past the end of the fifth semester.

Preliminary oral exams will ordinarily comprise discussion in three broadly defined areas: (1) the student's general knowledge in the field of the major; (2) the student's research up to the time of the preliminary oral exam; and (3) proposed research. The student will prepare a presentation on the latter two points. Specific requirements regarding the proposed research component, such as whether the proposal reflects the student's own future research or an 'outside project' and whether a written document is required in advance vary from major to major.

The specific formats of the preliminary oral exam are as follows:

Analytical: The student, in consultation with the Major Professor, may elect one of two options for conducting the preliminary oral examination.

Option A: In this option, the topics for discussion are chosen at the discretion of the members of the POSC, to include topics from course work, applications of those topics to analytical problems, and research which the student has already completed and plans to complete for the Ph.D.

Option B: In this option, the preliminary oral examination will be directed to a defense by the student of an original research proposal. Although the student may select a topic based on consultation with others including the Major Professor, the POSC will be looking for evidence of originality on the part of the student. The topic may not be that research to be pursued by the student, and may not duplicate planned or on-going projects in this or other departments. The research proposal should be of a scope that would lead to a significant publication in the analytical literature. Students selecting Option B will give each member of the POSC, at least two weeks in advance of the preliminary oral exam, a written summary of the proposal (3-5 pages). This summary shall include a specific statement of the problem, a critical evaluation of prior work on the problem, and an explanation of the student's approach to solving the problem. The quality of the written proposal, including spelling and grammar, may be viewed as positive or negative evidence of the qualifications of the student. Although the major portion of the preliminary oral examination in Option B will be devoted to the research proposal, the members of the POSC shall not be restricted in their choice of questions.

Chemistry: The preliminary oral examination should be scheduled to occur no later than the fifth semester in residence, not counting summer sessions.

Chemical Education: The preliminary oral exam will ordinarily consist of two parts. The student will defend his or her research to date. This shall focus on the chemical research carried out for the first research component and would ideally coincide with a defense of a M.S. thesis regarding this research. The second part of the preliminary oral exam will focus on the student's proposal for future research in Chemical Education. A written proposal, whose specifications are given below, is required.

The student's future research plans in Chemical Education will be developed after consultation with his or her research mentor. The written report, to be distributed to the POSC at least two weeks in advance of the preliminary oral exam, shall consist of the following sections: "Background and Literature Review", "Nature or Significance of the Problem", "Research Questions", "Methodology and Research Design", and "References." The report must be well-organized and the theory base and research design must be clearly indicated and discussed. The choice of statistical analysis and/or qualitative research techniques must be explained and instruments used to gather data must be shown to have appropriate indicators of validity and reliability. Overall, the proposal should demonstrate that the student has the creativity and technical ability to carry out research in Chemical Education. The content of this proposal will be presented in the preliminary oral exam.

It is recognized that some students may choose to enter the Chemical Education specialty late enough in their careers that they may need to finish the written prelims (as discussed in section 5.1) in an unorthodox manner or may need a short additional time past the usual deadline for the preliminary oral exam, as outlined in the beginning of this section. Such students should petition the POSC and the Graduate Activities Committee for an appropriate extension schedule.

Inorganic: The primary component of the inorganic preliminary oral examination is a presentation of the student's own research, including background and significance, objectives, results, conclusions and future work. The student will also prepare and defend an original research proposal as part of the preliminary oral exam. The proposal should not be related to the student's own research or to projects in the student's research group.

After clearing written preliminary exams, the student shall submit a pre-proposal for original research to his/her POSC, or to a subset of it, as designated by the Major Professor. The pre-proposal must not be longer than 600 words, excluding references. It will include a title, date, and concise statements of what questions will be answered, why the problem is important, what will be done, the new and significant knowledge that can be anticipated and key references in ACS format. It will be evaluated for significance, creativity, and feasibility. A review of the pre-proposal should take place within a week of submission. The Major Professor will convey to the student a decision of "approved" or "not approved". In the latter case, suggestions for revision may be made, or the idea may be rejected, in which case the student is to submit a revised or a new pre-proposal.

After approval of the pre-proposal, the student prepares a full proposal (1700 words maximum, excluding references), giving copies to the members of the POSC a week before the preliminary oral examination. During the examination, the student will present, expand on, and defend the idea. The preliminary oral exam will conclude with general questions.

Organic: A written proposal describing research not directly linked with the student's research or that of her or his Major Professor's research group is required. The student should prepare presentations (e.g., transparencies) to describe both her or his research and the proposal. The student may decide which presentation to give first.

As part of preparation for the preliminary oral exam, the student will submit a pre-proposal to the organic professors on his or her POSC. The pre-proposal will not be longer than two pages including illustrations, but excluding references. Along with the student's name, the date of submission, and the proposal title, it should include an objective and justification, sufficient background to make the pre-proposal understandable, and a summary of key points that highlight the creative aspects of the proposal. Key references should also be included.

The organic professors on the POSC will evaluate the pre-proposal, usually within 3 - 4 days, and the results will be communicated to the student by her or his Major Professor. The criteria will include originality, creativity, and feasibility. If the pre-proposal is approved, the student should proceed with preparation of the full proposal and scheduling of the preliminary oral exam. If the pre-proposal is not approved, the student must prepare a new or revised pre-proposal. The student will be informed as clearly as possible why any rejected pre-proposals were not approved.

The "full proposal" is limited to 2000 words, exclusive of illustrations and references. The proposal should consist of four sections, entitled "Background," "Objective and Justification," "Planned Work," and "References." The proposal should be distributed to the members of the POSC at least one week before the preliminary oral exam.

Physical: The preliminary oral examination is to ascertain that minimum academic standards have been achieved and to evaluate the proposed plans for research leading to a dissertation. Normally, a successful performance in the written cumulative examinations and in the core courses is perceived by the physical chemistry faculty as an indication of satisfactory academic progress in the major area.

5.3. Advancement to Candidacy

The Preliminary Oral Examination can have one of the following conclusions:

- (a) **Pass.** The student is admitted to candidacy and advanced to RA II standing.
- (b) **Conditional Pass** (subject to specified remedial action, such as submission of a research report, further academic course work, etc.). Promotion to RA II is delayed until the conditions are met.
- (c) **Fail.** A careful screening is made by the POSC whether or not to allow the student to repeat the exam or a part of it. The POSC might require the student to terminate with an M.S. degree. The POSC might require other conditions (e.g., preparation of a proposition, a research report, further academic course work) or the presentation of an M.S. thesis if the student is to be given a second chance at the preliminary oral examination. Any repeat should be re-taken within 90 days.

5.4. Time Limitations. The preliminary oral exam should be passed by the end of the fifth semester in residence to avoid a reduction of the assistantship stipend (See Section 9).

6. RESEARCH, THESIS, AND GRADUATION

6.1. Research

The conduct of research resulting in a thesis is the basis for awarding the M.S. and the Ph.D. degrees at ISU. Usually a student will begin to participate in research work before having been admitted to Ph.D. candidacy. After attaining candidacy, the advancement and completion of the thesis research should become the central objective of the student's study and work.

6.2. Other requirements

Continuous Registration: All graduate students, including off-campus and part-time students are required by the Iowa Board of Regents to register for at least 1 Cr. or "R" Cr. each semester after passing the preliminary oral exam. This policy involves fee payment for Fall and Spring semesters each year. Off-campus M.S. students need register only for the semester they plan to graduate.

Diploma Slip: By the start of the semester in which graduation is expected, the student should submit the "Application for Graduation (Diploma Slip)" to the Graduate Records Secretary. This form is available from the Graduate Records Secretary or on-line at www.gradcollege.iastate.edu/deadline/formss.html. If the student does not graduate in that semester, a new diploma slip is needed. The deadline for submission is posted on the Graduate Bulletin Board.

Fees for the Final Semester: When registering for their final semester, students planning to finish should be aware of Graduate College deadlines on the termination of Graduate Assistantships. Please refer to the Graduate Student Handbook and/or consult the Graduate Records Secretary. Missing certain deadlines can result in severe fee penalties.

The Final Examination: The final examination is conducted by the POSC. The candidate submits a copy of the thesis to each member of the POSC two weeks in advance. The final defense consists of a publicly announced oral presentation, which is open to the public, followed by a closed examination. This applies both to Ph.D. and M.S. candidates. The convening of the final exam rests with the student and Major Professor. The student submits Form 4 (only available from the Graduate Records Secretary) to the Graduate Records Secretary and completes the "Final Defense" title form three weeks prior to the Final Examination. The Major Professor completes Form 5 and returns it to the Graduate Records Secretary immediately after the exam

Graduation Approval: The full thesis must be approved by the Chair of the Department of Chemistry, who will sign the title pages and the Graduation Approval Slip. The latter can be obtained from the Graduate College on a one-day notice. Timely graduation requires the proper handling of this document.

7. SCHOLASTIC STANDARDS AND THE EVALUATION OF STUDENTS

7.1. Remaining in good standing

Graduate College policies stipulating requirements for academic grades, probation, appointments, etc., are given in the Graduate Student Handbook, <http://www.grad-college.iastate.edu/degree/graduatecollegehandbook.html>.

The Graduate Activities Committee evaluates each student's progress in graduate studies. The faculty as a whole, not just the Graduate Activities Committee or the Major Professor, will determine whether the student is making satisfactory progress toward the degree being sought, based on the academic and research performance of the student.

These areas are pertinent:

- Active involvement in research as soon as is feasible within the limitations of the time necessary to choose a Major Professor and a research problem. The student should have exhibited sufficient proficiency in the chosen research area by the end of the first year that the Major Professor may have a basis for judging whether or not it would be to the student's benefit to remain in the chosen area, or indeed, to remain in the Graduate Program. The extent to which a student can become deeply involved in research during the first year will, of course, depend upon the major area and the student's preparation and program.
- Performance in research as determined by the Major Professor and POSC. The criteria are the motivation, aptitude and capacity of the student for research. A student is expected to be productive and competent as a research scientist, and to be able to communicate with members of the research group, discipline, and profession. Familiarity with current literature in the student's major discipline is mandatory.
- The written and preliminary oral exams, which are to be taken by the end of the fifth semester in residence.
- Maintenance of a grade point average ≥ 3.0 in academic courses (exclusive of research). Experience has shown that a student with only B grades in the major discipline may find written prelims and preliminary orals difficult.
- Proficiency in English.
- Proficiency in Chemistry.
- The student and the Major Professor are expected to be in communication regarding research performance. Major Professors should keep students apprised of their progress.

7.2. Review of first-year students.

At the end of the first semester, students are provided with timely information on their scholastic standing. Because of the limited amount of information available at that time, this first review is preliminary in nature, and is based upon their grades and additional evaluations solicited from the faculty. The Graduate Activities Committee then places each student in one of the following groups:

Group I: Satisfactory progress.

Group II: Some indication of possible scholastic weakness as evidenced by a GPA slightly below 3.0, or a grade of C or C+ in one course, or the completion of only one substantive course during the first semester. Such student's are sent a letter expressing mild concern about their progress.

Group III: Serious scholastic difficulties. These students are encouraged to show substantial improvement in order to be permitted to continue. Students should consult their Major Professor and/or a member of the Graduate Activities Committee in writing or in person, to avoid further academic difficulty.

7.3. Annual review of students

Review data: During the Spring Semester all professors are asked to evaluate students on research, teaching performance, and overall intellectual and research potential. The evaluating professor may be familiar with the student from an academic course or as a teaching supervisor.

As part of the evaluation process, the faculty recommends that each professor meet with each of his/her students to discuss research progress and progress toward the degree at least twice per year.

The faculty within each major then recommends to the entire faculty the tentative placement of students in one of the eight scholastic groups described below, and the students are so informed in writing.

Scholastic groupings:

Group A: Admitted to Ph.D. candidacy. The student must have passed the preliminary oral and demonstrated proficiency in Chemistry and English.

Group B: Satisfactory progress toward the Ph.D., prior to admission to candidacy. A student in **B** may obtain an M.S. degree while progressing toward a Ph.D. degree.

Group MSC: A student plans to terminate with an M.S. degree. The POSC will consist of 3 members only. A student who may go on to the Ph.D. degree should not be in this group, and an **MSC** student who later decides to work for the Ph.D. degree will still be held to the time requirements, which include the time in **MSC**.

Group MSP: These students are required to complete an M.S. thesis before they can be considered for Group **B**, and should endeavor to do so by the end of the second year.

Group MST: A student in this group will terminate graduate studies with an M.S. degree.

Group D: Uncertain Degree Status. This is a temporary assignment, and students will not normally remain in Group **D** beyond the third academic semester.

Students in Group **D** must carefully plan their courses, research and exams to ensure two objectives in the second year: (1) to determine whether they will be able to continue towards the Ph.D.; (2) to be able to complete the M.S. degree promptly if called upon to do so.

The faculty of the major will recommend to the faculty as to whether a student in Group **D** should be moved to Group **B**, **MSP** or **MST**. The performance during the first semester of the second year is therefore crucial.

Group F: No graduate degree

Group S: Special cases

8. ASSISTANTSHIPS

8.1. Promotions.

RA-II appointments may carry a higher stipend than RA-I. Appointment as a TA is contingent upon proper certification as a result of the SPEAK/TEACH test; if a Fully Certified level is not attained, the stipend will be lower than that for TA-I.

Promotion to RA-II occurs after the student has passed the preliminary oral examination, and demonstrated proficiency in English and Chemistry. Form 8 "Promotion to RAI" is supplied to the Major Professor by the Graduate Records Secretary at the time the student presents his/her preliminary oral examination. Form 8 is then returned to the Graduate Records Secretary by the Major Professor after successful completion of the preliminary oral examination and demonstration of proficiency in the above mentioned categories.

8.2. Fellowships

Students making excellent progress are encouraged to apply for outside fellowships (NSF, NIH, etc.). Departmental fellowships are awarded by the Graduate Activities Committee during the Spring Awards Ceremony based on faculty nominations.

8.3. Students without Departmental Support

Such students become eligible for graduate assistantships only by action of the Graduate Activities Committee and the Chair of the Department. *Admission without support carries with it no assurance that an assistantship will ever be awarded.* To be eligible for departmental support, students must have completed at least 7 credits of graduate courses other than research and seminars at ISU; maintained a GPA of >3.0 (excluding research and seminars) at ISU; demonstrated proficiency in English, and obtained the concurrence of their POSC. Of course, funding must also be available.

9. PROGRESS TOWARD THE GRADUATE DEGREE

9.1. Normal Academic Progress

A student in good standing must maintain a 3.0 grade point average, make timely progress in preliminary written and oral exams, and demonstrate accomplishments, diligence, competence and progress in research. These expectations are given in more detail elsewhere in this manual.

The Department has set standards as to timely progress. It is not to a student's advantage to prolong the time toward a graduate degree. To avoid an unduly long time to attain a graduate degree, students should exert due effort in the early stages of their graduate work, paying careful attention to program deadlines.

9.2. Conditions of appointment; stipend reductions

The Department will reduce the assistantship stipends of students not making timely progress; in extreme cases, it will not renew a graduate assistantship.

Level of Attainment	Level of stipend and tuition reduction if requirements for attainment are not reached by the start of the year shown
<p>English proficiency</p> <ul style="list-style-type: none"> Completion of Graduate English Exam by end of 2nd semester 	<p>By the beginning of the 5th semester: 5% reduction in stipend.</p> <p>By the beginning of the 7th semester: 10% reduction in stipend.</p> <p>By the beginning of the 9th semester: No support in stipend.</p>
<p>Chemistry proficiency</p> <ul style="list-style-type: none"> Completion of diagnostics or clearing of any deficiencies by end of 3rd semester. 	<p>Students entering 4th semester must petition their POSC for continued support if the deficiencies are not cleared. The POSC makes a recommendation to the Graduate Activities Committee based on the comments of the POSC, which then makes the final decision. There will be no support after the 5th semester, except in circumstances approved by the POSC, the Graduate Activities Committee, and the Department Chair.</p>
<p>SPEAK/TEACH</p>	<p>At the beginning of the 1st semester: TA status.</p> <p>“1-2” rating = no reduction.</p> <p>“3” rating = \$250 reduction in stipend per month.</p> <p>“4” rating = \$500 reduction in stipend per month.</p>
<p>M.S. Degree (required or desired)</p>	<p>By the beginning of the 7th semester: 5% reduction in stipend.</p> <p>By the beginning of the 9th semester: No support in stipend.</p>
<p>Ph.D. Candidacy</p> <ul style="list-style-type: none"> Completion of preliminary oral examination by the end of 5th semester 	<p>By the beginning of the 6th semester: 5% reduction in stipend.</p> <p>By the beginning of the 7th semester: No support in stipend.</p> <p>Includes time to prior M.S. degree at ISU.</p>
<p>Ph. D. Degree</p>	<p>By the beginning of the 11th semester: No support in stipend.</p> <p>Students entering Year 6 must petition their POSC for continued support in stipend and tuition. The student must obtain the “Request for Support” form, schedule a meeting of his/her POSC, and present a completion plan to the POSC. The POSC makes a recommendation to the Graduate Activities Committee based on the results of the POS meeting, which then makes the final decision. The Graduate Activities Committee will either implement full support for students in good standing who are expected to complete their dissertation in the next year, or zero support for students making insufficient progress to expect completion in the next year. There will be no support after Year 6, except in circumstances approved by the POSC, the Graduate Activities Committee, and the Department Chair.</p>

10. VACATION AND LEAVE POLICIES

10.1. Vacations

- a. Arrangements for vacation and leaves of absence are made between the graduate assistant and that assistant's supervisor. A graduate assistant on a teaching appointment should also get approval of their teaching supervisor. When a graduate student employee needs to be absent either for personal reasons or illness, the supervisor should be understanding and accommodating to that need. At the same time, the graduate assistant should attempt to plan personal leave so that it does not interfere with or cause neglect of the duties associated with his or her appointment. Supervisors of graduate assistants are responsible for ensuring that their assistants do not exceed reasonable limits for leave.
- b. Although we do not tabulate any record of accruals, usage or balances, there will still be a requirement to submit absence requests to the Department. These will be filed in the main office for each major professor.
- c. Assistants whose appointments are in the Ames Laboratory submit Ames Laboratory absence requests. Students on Department of Chemistry appointments obtain and submit their forms in the Department office.
- d. Research Assistants should take their vacation so that it can be conveniently worked into the research plans of their major professor.

10.2. Leaves of absence

10.2.1. Maternity leave. A six month extension on stipend reductions (Section 9) is automatic.

10.2.2. Military leave. These are honored upon petition.

10.2.3. Other leaves. These are handled as special cases.

11. GRADUATE STUDY BY FULL-TIME EMPLOYEES

Full-time employees of ISU or another employer who pursue a graduate degree must have the background expected of regular students, including the required technical courses a Chemistry major takes and an appropriate grade record. Application should be made to the Graduate College. Applicants are invited to correspond with the Department concerning their suitability for admission. Applicants who do not qualify may be admitted as Special Students in an effort to fulfill admission requirements.

Because of the special circumstances involved, it is recommended that the student, the employer, the Major Professor and the Department agree in writing on the plans and time schedule of the candidate.

Immediately prior to the semester in which graduate study will begin, the student is to take the diagnostic exams in all four areas. Proficiency requirements in Chemistry and English must be met promptly.

The student should complete the forms "Recommendation for Committee Appointment" and "Program of Study" at an early date. A maximum of 6 hours per semester may be earned by an employee of ISU.

Full-time employees, like other students, are required to undertake an original research project and defend their thesis before the POSC. Results of a routine or repetitive nature which lack a creative, original component are not acceptable. If a student plans to include in the thesis research done in fulfillment of job requirements, not only must the employer agree, but such students should delineate in advance to their POSC their intentions in a written statement, so that the suitability of such plans may be judged at an early stage.

The time requirements stated elsewhere in this document will be appropriately extended for full-time employees.

12. GRADUATE STUDENT ACADEMIC MISCONDUCT

Academic misconduct by graduate students is taken very seriously. The more serious cases involve cheating or plagiarism on preliminary written and oral examination, thesis or dissertation. Plagiarism involves taking or passing off as one's own the ideas or writings of others. Other individual's ideas or writings should always be openly acknowledged and thoroughly referenced. Such matters of misconduct are very serious violations of academic ethics and usually result in dismissal from the University without a degree.

Cheating on a course examination or plagiarism on a paper related to a course more often results in lesser penalties than permanent dismissal. If a graduate student is believed to have plagiarized a term paper or to have cheated on an exam, most often that situation is handled informally between the professor and the student or by a representative of the Department. The student or the faculty member may ask for more formal review by the Dean of Students' office using policies developed for ensuring that due process is followed. A formal investigation of the situation may be conducted by the Dean of Students office, a hearing held by a committee of the all-university judiciary, and a recommendation made to the Vice President for Student Affairs. The student may appeal to the Vice President for Student Affairs if he/she is not satisfied with the decision of the hearing committee.