



**2009-2010**

# **Handbook for Graduate Students Department of Chemistry & Biochemistry**



**Prepared by the Graduate Policy Committee  
Approved by the Faculty  
Department of Chemistry & Biochemistry  
University of Missouri - St. Louis**

**October 2008**

## 1. Faculty and Staff

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### Departmental Staff

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## 2. Graduate Study in Chemistry

### 2.1 Admission Requirements

Persons with at least a B.A. degree in chemistry (or the equivalent) may be admitted for graduate study in chemistry at the University of Missouri-St. Louis either as candidates for the M.S. degree or as pre-candidates for the Ph.D. degree. Admission to the Graduate School may be under regular, restricted, or provisional classification. Provisional admission is granted for one term to those students who appear to qualify for regular admission, but who have not submitted all the required admission information (e.g. general GRE scores, official transcripts, etc.). Provisional students will be reclassified to regular status after receipt of the required material. Students who fail to meet the minimum GPA requirements as set by the Graduate School (2.75) may be admitted as M.S. candidates under the restricted classification. Restricted students may be reclassified to regular status after successful completion of required course work, pursuant to the recommendation of the faculty and with approval of the Graduate School.

The department admissions committee makes all admission recommendations. The committee considers the applicant's grade-point-average, general GRE scores, and letters of recommendation as well as the rigor of previous academic programs. The committee normally requires above-average performance in all areas of chemistry (analytical, biochemistry, inorganic, organic, and physical) as well as in physics and mathematics, or otherwise requires evidence of high aptitude for graduate work in chemistry.

Students with Bachelor's degrees in fields other than chemistry may be admitted to pursue graduate chemistry studies, but may be required to make up background deficiencies, usually by taking undergraduate course work.

### 2.2 Financial Support

Teaching assistantships for the academic year are available to qualified applicants; a limited number are also available during the summer usually to first year students. Preference is normally given to Ph.D. students in the awarding of teaching assistantships. Departmental support is not normally available beyond the fifth year in the program. Research assistantships and fellowships are also available, principally for advanced students.

### 2.3 International Graduate Students

Students for whom English is not a native language are required to present TOEFL scores prior to admission, and to demonstrate satisfactory fluency in spoken English before they will be given classroom assignments as teaching assistants. A formal test of English language ability, appropriate for graduate teaching assistants will be administered prior to the start of the first academic year. If satisfactory abilities in English are not demonstrated, specific remedial course work will be assigned.

Those international graduate students for whom English is not a native language will be required to participate in the ITA Seminar (ESL 5400) during their first semester of registration or at the earliest opportunity thereafter. Classroom teaching assignments cannot be made until a student demonstrates fluency in spoken English.

### 2.4 Preliminary Advisement

Students who have been admitted to the graduate program in chemistry will be contacted by the Director of Graduate Studies who will outline requirements for timely arrival and activities during orientation (typically the week prior to the beginning of classes). The information provided includes a tentative schedule for placement exams, new student orientation, and other activities.

All entering students are required to demonstrate competence (at the undergraduate level) in four of the following five areas, Analytical, Biochemistry, Inorganic, Organic, and Physical chemistry. This proficiency may be demonstrated in one of the following ways:

- 1) Outstanding performance in recent undergraduate course work at UMSL.
- 2) Satisfactory performance in placement examinations. These examinations are given twice a year, approximately one week before the beginning of the fall and winter semesters.
- or 3) Successful completion of assigned remedial course work.

Ph.D. students are required to successfully complete all assigned remedial course work (Chemistry [4212](#), [4302](#), [4412](#), or [4712](#)) within one year, M.S. students - within two years. Exceptions to this regulation must be approved by the Director of Graduate Studies.

Based on the results of the placement exams, the Director of Graduate Studies will advise the students in order to develop a tentative plan of study that takes into consideration the student's interests and background. The Director of Graduate Studies serves as the adviser to all students (including thesis students) until they have chosen a research adviser.

## 2.5 General Course Work (Distribution) Requirements

Students must take chemistry courses for graduate credit at the 4000 and 5000 levels. Students may choose to concentrate the majority of their coursework in one of four areas (biochemistry, inorganic chemistry, organic chemistry, or physical chemistry). Students must complete at least 6 hours of chemistry coursework in one (or more) sub-discipline(s) outside of their major emphasis area. The following courses may not be used to fulfill the distribution requirement: Chem. 4212, 4233, 4302, 4343, 4412, 4433, 4712, and 4733.

In exceptional cases, and only with the adviser's prior permission, a student may receive graduate credit for one course (3 credits) at the 3000-level or above taken in another department.

## 2.6 Master's Degree Requirements

Candidates for the M.S. degree in chemistry must demonstrate proficiency in four areas selected from Analytical, Biochemistry, Inorganic, Organic, and Physical chemistry within two years of initial enrollment.

A minimum of 30 hours is required; no more than three hours in Chemistry [6897](#) (Chemistry Colloquium), and no more than 6 hours of assigned remedial course work (Chemistry [4212](#), [4302](#), [4412](#), or [4712](#)), may be applied toward the required minimum of 30 credit hours. Master's students are not required to take the cumulative or qualifying examinations.

Students are expected to follow all other general requirements of the Graduate School regarding the master's degree and thesis requirements. These requirements are available at <http://www.umsl.edu/divisions/graduate/formsregs/mastforms.html>.

### 2.6.1 Master of Science in Chemistry without Thesis

*Forms M-1 and M-4*

Students who select this degree program need not be enrolled full-time. Of the minimum required 30 hours, at least 15 credits must be in coursework at the 5000-level. A maximum of six credits of Chemistry [6905](#) (Graduate Research in Chemistry), may be included in place of 4000-level courses. A maximum of 9 hours course work from outside the department may be applied to the minimum required 30 hours only with prior approval of the Director of Graduate Studies and confirmation by the faculty of the Department of Chemistry and Biochemistry.

A student should file an M-1 form before entering the final one-third of his/her program. This form lists courses completed and to be taken to satisfy all course requirements. A student also needs to file an M-4 form by the end of the fourth week of classes in the Winter or Fall semester in which the student gra-

duates. If a student plans to graduate in the Summer semester, the M-4 form should be typically filed by June 15. All M-forms can be downloaded from the Graduate School website at <http://www.umsl.edu/divisions/graduate/formsregs/mastforms.html>.

## 2.6.2 Master of Science in Chemistry with Thesis

*Forms M-1 through M-5*

Students who select this degree program normally will enroll full-time for at least two consecutive semesters. During this time, students are expected to enroll in Chemistry 6905 (Graduate Research in Chemistry), and to work on their thesis. Selection of the thesis adviser will be coordinated by the Director of Graduate Studies.

No more than 12 credits of Chemistry 6905 may be applied toward the minimum required 30 hours; at least 9 additional credit hours of courses at the 5000-level are also required. A maximum of 9 hours course work from outside the department may be applied to the minimum required 30 hours only with prior approval of the Director of Graduate Studies and confirmation by the faculty of the Department of Chemistry and Biochemistry.

In addition to filing the M-1 and M-4 forms as for the non-thesis option, students in the thesis track are also required to file the M-2, M-3, and M-5 forms. The M-2 form should be filed when a student is defending his/her thesis. When a thesis is completed and provisionally acceptable to his/her thesis committee, an M-3 form should be submitted to the Graduate school together with a copy of the thesis at least six weeks before commencement. After approval by the Dean of the Graduate School, an M-5 form needs to be filed for final approval of the master thesis. All M-forms can be downloaded from the Graduate School website at <http://www.umsl.edu/divisions/graduate/formsregs/mastforms.html>.

## 2.6.3 Transfer to the Ph.D. Program

A Master's degree student in good standing may apply for admission to the Ph.D. program. Up to 30 hours credit completed at UMSL as an MS student may be transferred to the Ph.D. program.

## 2.7 Doctoral Degree Requirements

Students entering the doctoral program will be classified as pre-candidates.

### 2.7.1 Enrollment

Each semester, doctoral students are required to register for a minimum number of credits, nine credits for pre-candidates or six credits after advancement to candidacy (including Chemistry 6897) and one credit in the summer until graduation.

Those who receive financial support through the department, either as Teaching Assistants, Graduate Research Assistants or Fellowship recipients, are required to register for at least nine hours each semester and a partial fee waiver will be provided by the Graduate School. Students are reminded of the Graduate School residency requirement that mandates enrollment for a total of at least 15 credit hours over two consecutive terms. (A "term" refers to a regular semester or summer session). In addition to the residence requirement of the Graduate School, students working toward the Ph.D. degree in chemistry are expected to spend at least two consecutive years of full-time study in the research phase of their program. Although this requirement does not preclude the possibility of outside employment, it does imply a full-time commitment to the study of, teaching of, and research in chemistry, and participation in all activities normally expected of graduate students.

The precise description of a full-time commitment will be determined on an individual basis by the student's adviser with the consent of the Chair. A copy of the registration form must be submitted to the Director of Graduate Studies each semester.

Enrollment of part-time doctoral students admitted for the program will be determined by their advisers in consultation with the Director of Graduate Studies.

### 2.7.2 Qualifying Examinations

In addition to the requirements set forth by the Graduate School, each student seeking the Ph.D. degree must successfully complete a qualifying examination in his/her major area of specialization prior to advancement to candidacy. The format of the qualifying examination depends upon the student's major area of emphasis.

For biochemistry and physical chemistry students, the qualifying examination consists of a comprehensive written and/or oral examination, usually administered near the end of the 4<sup>th</sup> semester. The content of the comprehensive qualifying examinations (biochemistry and physical chemistry) will be determined by the collective faculty in those specific departmental divisions. Responsibility for assigning grades resides with the faculty members in each specialization area (physical or biochemistry) with grades of PASS or NO PASS as options.

For organic and inorganic chemistry students, the qualifying examination consists of a series of cumulative examinations given eight times a year. In the latter case, a student must pass a minimum of two cumulative examinations per year and eight cumulative examinations before the end of the 6<sup>th</sup> semester. At least six of these cumulative examinations must be in the student's major area of specialization. Students taking cumulative exams are expected to participate beginning in their first semester and should maintain continuous enrollment in Chemistry 6196 from their second semester until eight passes have been achieved. The content of each cumulative examination will be determined by the faculty members in each specialization area (inorganic and organic). Topics and/or study guidelines will be announced in advance. Responsibility for assigning grades resides with the author(s) of each examination, with letter grades A, B and C or NO PASS as options. The letter grade C constitutes a PASS only when offset by an A. The letter grades for Chemistry 6196 will be assigned by the Director of Graduate Studies based upon performance in cumulative exams for the term.

Failure to meet the qualifying examination requirements may result in dismissal from the doctoral program.

### 2.7.3 Selection of a Thesis Adviser

*Form D-1, Form D-2*

Each student must interview at least four faculty members but must include all faculty in his/her specialization area. Faculty may request to be added to or withdrawn from a specific student interview list. Students may request to interview additional faculty members, but typically not more than eight total, by submitting Form S. (Forms S, A, and B are provided by the Director of Graduate Studies at the beginning of the selection process.) Each student must indicate that he/she has spoken with each faculty member within the chosen sub-discipline by obtaining the faculty member's signature on Form A. The student then submits Form B on which he/she should indicate his/her first, second and third choices as thesis adviser. Assignments of research advisers will be made by the Department Chair and the Director of Graduate Studies. The Director of Graduate studies then informs the potential advisers of the results. Upon agreement, the potential advisor should then provide an official letter to the Director of Graduate Studies stating his/her willingness to serve as research and coursework adviser for the student. The Director of Graduate Studies then files Form D-2 to have the adviser's appointment approved by the Graduate Dean.

During the first year of doctoral study, all graduate students must, in consultation with their research adviser, indicate their specialization area (Inorganic, Physical, Organic or Biochemistry). A comprehensive examination committee is then appointed: the student should file Form D-1 signed by the research adviser and the Director of Graduate Studies, to the Graduate School. The committee appointed will evaluate the Doctoral dissertation proposal. (This and other D forms can be downloaded from the Graduate School website at <http://www.umsl.edu/divisions/graduate/formsregs/gradforms.html>).

### 2.7.4 Teaching Assistantship

All doctoral students are typically expected to participate as teaching assistants for at least two semesters. All teaching assistants must enroll in Chemistry [6812](#) and [6822](#), Introduction to Teaching and Graduate Research in Chemistry, beginning in their first semester of enrollment. These courses are normally taught during the Fall ([6812](#)) and Winter ([6822](#)) semesters, respectively.

### 2.7.5 Seminar Requirement

Full-time Ph.D. students are required to give at least three seminars in the course of their graduate studies. The first (usually given in the fifth semester) will be presented in connection with the dissertation proposal, the second (usually given in the fourth year) will be a research progress report, and the third (given sometime within the calendar year prior to the student's anticipated graduation and usually after all laboratory work has been completed) will provide a summary of the dissertation. The actual dissertation defense shall be scheduled independently from the Colloquium program. The first and third seminars must be part of the Department's regular Friday Colloquium schedule. The second seminar (research progress report) also may be scheduled as part of the regular Friday Colloquium. Alternatively, students may fulfill this requirement by giving an oral presentation describing their research at a recognized professional meeting (such as an ACS National or Regional meeting) sometime within three semesters subsequent to their dissertation proposal seminar. Giving an oral presentation at a professional meeting does not preclude a student from giving a research progress report as part of the Friday Colloquium series. Continuous enrollment in Chemistry [6897](#) (Chemistry Colloquium), is required for all students until graduation.

### 2.7.6 Doctoral Dissertation Proposal

*Form D-5*

A doctoral student must provide a Dissertation Proposal before the student completes the equivalent of six semesters of full-time study; this will normally take place in the fifth semester in the doctoral program.

The Dissertation Proposal contains both a written and an oral component. Evaluation of both components is conducted by a committee of chemistry faculty members. It is referred to by the Graduate School as the Comprehensive Examination Committee and by the Chemistry Department as the Dissertation Proposal Committee. The committee is typically composed of all faculty members in the student's specialization area - Biochemistry Inorganic, Organic or Physical.

Typically, the written portion of the Dissertation proposal will be no more than ten pages in length (typed double-spaced). The proposal should contain background material, an outline of the planned research and appropriate references. The student is urged to consult with his/her Doctoral Dissertation Adviser to decide on the format. A draft of the written proposal should be distributed to the Comprehensive Examination Committee (typically all faculty members in the student's specialization area - Biochemistry Inorganic, Organic or Physical) at least one week in advance of any oral presentation.

An oral presentation must precede submission of the written proposal to the Graduate School. This presentation should be made as part of the regular Friday Colloquium at which time the divisional faculty members will have an opportunity to ask questions and/or comment on the proposed research.

After the oral defense of the Dissertation Proposal and any modifications suggested by the committee members have been incorporated into the written document, a statement of proposed research (Form D-5) must be filed with the Graduate School along with a copy of the final Dissertation Proposal document.

The dissertation proposal is not intended to restrict the normal development of a research project that may involve a direction different from that originally proposed. However, an entirely new dissertation project will require submission of a new dissertation proposal preceded by an oral presentation.

### 2.7.7 Advancement to Candidacy

Form D-3

In addition to fulfilling all Graduate School requirements, students must complete the following:

- 1) at least 21 hours of non-dissertation work, which **may not** include:
  - Chemistry 4212, Instrumental Analysis
  - Chemistry 4233, Laboratory in Instrumental Analysis
  - Chemistry 4302, Physical Chemistry for the Life Sciences
  - Chemistry 4343, Physical Chemistry Laboratory II
  - Chemistry 4412, Advanced Inorganic Chemistry
  - Chemistry 4433, Inorganic Chemistry Laboratory
  - Chemistry 4712, Biochemistry
  - Chemistry 4733, Biochemical Laboratory
  - Chemistry 6196, Advanced Reading in Chemistry
  - Chemistry 6487, Inorganic Problem Seminar
  - Chemistry 6687, Organic Problem Seminar
  - Chemistry 6787, Biochemistry Problem Seminar
  - Chemistry 6812, Introduction to Graduate Study in Chemistry
  - Chemistry 6822, Introduction to Graduate Research in Chemistry
  - Chemistry 6897, Chemistry Colloquium

but must include at least 6 credit hours of coursework outside of their major area of emphasis (see Distribution Requirement). At least 9 of the minimum 21 hours must be at the 5000 level. Credit for coursework performed outside the department may be applied to the 21 hour minimum contingent upon departmental approval. Normally, no more than nine such credits will be approved. (NOTE: Twenty-one hours of formal course work is the minimum requirement; additional courses may be recommended by a student's adviser.)

- 2) Pass eight cumulative examinations or a qualifying examination.
- 3) File a dissertation proposal with the Graduate School.
- 4) Present at least one seminar on their dissertation research.
- 5) Be in good standing.

Successful advancement to candidacy allows the student to enroll in 6 credits/semester. (requires equivalency form G-14 available for download at <http://www.umsl.edu/divisions/graduate/formsregs/general.html> ). Doctoral candidate students enroll in Doctoral Dissertation Research (Chemistry 7905).

### 2.7.8 Dissertation

Forms D-4, D-6, D-7, D-9

A Defense of Dissertation Committee composed of at least four members of the Chemistry and Biochemistry Faculty (including a Chemistry and Biochemistry Faculty member from outside the student's specialization area), is selected by the student's adviser in consultation with the student (requires completion of Form D-4), and appointed by the Graduate Dean. This committee gives preliminary approval to the dissertation (D-6). In order to meet the formal graduation deadline, the dissertation must be submitted to the Graduate School no later than six weeks prior to the date of graduation. At the same time, an electronic copy of an Oral Defense Announcement must be forwarded to the Graduate School (D-9). The schedule of the final oral examination must be arranged at least three weeks after the preliminary approval of the dissertation. The official deadlines are typically announced by the graduate school at the beginning of each semester.

Final approval of the dissertation (Form D-7, verified by the Chairperson of the Dissertation committee and approved by the Graduate Dean), indicating that all necessary corrections have been made, must be obtained prior to graduation. Since the final dissertation submission is now made in electronic format, it is a student's responsibility to obtain a bound hard copy of their dissertation for the Department of Chemistry and Biochemistry. This can be made by contacting an off-campus bindery with direct billing/shipping to the Department.

Doctoral students should be advised by their advisor in the consultation with the Director of Graduate Studies of the rules and regulations of the Graduate School as they pertain to this matter.

## 2.8 Review, Probation, and Dismissal

The progress of doctoral students is monitored closely, and reviewed each year. In May, a full review of both doctoral and master's students is held following the completion of the Winter semester. Each student's progress in research, course work, cumulative examinations, and teaching is reviewed. Each doctoral student is informed in writing of the recommendations of the faculty. In some cases, specific course work or other requirements may be set by the faculty in order for the student to continue in the graduate program. In particular cases, the progress and performance of new doctoral students may be also reviewed by the Faculty early in the Winter semester prior to the awarding of teaching assistantships for the following term.

### 2.8.1 Probation and Dismissal

A graduate student whose transcript GPA falls below 3.0 is automatically placed on academic probation. The faculty of the Department of Chemistry and Biochemistry may also place a graduate student on probation if his/her GPA in coursework (excluding Chemistry 6196, 6487, 6687, 6787, 6812, 6822, 6897, and 6905) falls below 3.0, or if he/she otherwise fails to meet the Department of Chemistry and Biochemistry's standards for satisfactory progress. Failure to meet the qualifying examination requirements may result in dismissal from the doctoral program. Letters so indicating will be sent by the Director of Graduate Studies to the student with a copy sent to the Graduate School.

The progress of each student on probation is reviewed after every semester. At that time, the student may be removed from probation, continued on probation, or dismissed from the program. Students may not continue on probation for more than one calendar year without the recommendation of the Chemistry and Biochemistry Faculty and the consent of the Dean of the Graduate School.

## 2.9 Fellowships and Scholarships

The following scholarships, fellowships and awards are currently available to graduate students.

**Graduate Student Research Accomplishment Award.** This achievement is awarded annually to a Graduate Student based on an outstanding research record as indicated by published results and by presentations at regional, national, and international meetings. The recipient of the award is determined by vote of the faculty.

**Jack L. Coombs Outstanding Graduate Teaching Assistant Award.** This award was established to recognize graduate student TAs whose performance in the last academic year was truly exceptional. In addition to an individual award, other TAs may be recognized for good performance. The recipient of the award is determined by vote of the faculty.

**M. Thomas Jones Memorial Fellowship.** This fellowship is given each semester for the outstanding seminar presented by a Doctoral Student as determined by the vote of the graduate students only.

**Outstanding Masters Student Award.** This award recognizes an outstanding performance by a current part-time Masters Student in good standing who has fulfilled all deficiencies, completed 18 credit hours of coursework, and has enrolled for at least one course in the current academic year. The recipient of the award is determined by vote of the faculty.

**Graduate School Dissertation Fellowship.** This fellowship awarded and funded by the Graduate School supports the completion of the dissertation by providing a stipend up to the month in which the dissertation is successfully defended. The award is funded for a maximum of 12 months. The recipient(s) is/are expected to have defended their dissertation proposal and/or have made sufficient progress so that it will require no more than one year to finish all phases of the dissertation. Currently, two applications may be forwarded by a department to the campus-wide competition; the awardees are determined by vote of the Graduate Council.