

UMSL

2022-2023

Handbook of Graduate Studies Department of Chemistry & Biochemistry



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

September 2022

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Chemistry and Biochemistry Faculty and Staff

Graduate Faculty Advisers

Eike B. Bauer *Professor and Director of Graduate Studies*

Ph.D. University of Erlangen-Nuremberg, Germany

James Bashkin *Professor*

Ph.D. Oxford University, UK

Alicia M. Beatty *Associate Professor*

Ph.D. Washington University in St. Louis

Valerian T. D'Souza *Associate Professor*

Ph.D. University of Detroit

Cynthia M. Dupureur *Professor*

Ph.D. Ohio State University

Stephen M. Holmes *Professor and Director of Graduate Recruiting and Admissions*

Ph.D. University of Illinois at Urbana-Champaign

Michael R. Nichols *Professor and Master's Adviser*

Ph.D. Purdue University

James J. O'Brien *Professor and Director of Undergraduate Studies*

Ph.D. Australian National University

Christopher D. Spilling *Professor and Vice Chancellor Research and Economic & Community Development*

Ph.D. University of Technology, Loughborough, UK

Keith J. Stine *Professor and Chairperson*

Ph.D. Massachusetts Institute of Technology

Chung F. Wong *Professor*

Ph.D. University of Chicago

Jinjia Xu *Assistant Professor*

Ph.D. University of Tsukuba, Japan

Research Faculty

Rensheng Luo *Research Associate Professor and Director of NMR Facilities*

Ph.D. Chinese Academy of Sciences

Departmental Staff

Daniel Cranford *Coordinator Lab Operations and Stock Room Manager*

Brent Dummet *Scientific Glassblower*

Alissa Maloney *Business Support Assistant III, front office*

Dr. Bishal Nepal *Microscopic Imaging and Spectroscopy Technology Lab Fellow*

Dr. Rajamoni Jagan *X-Ray Diffraction Lab Director*

Emeriti Faculty

Lawrence Barton *Professor Emeritus*

Ph.D. University of Liverpool, UK

Janet Braddock-Wilking *Associate Professor Emerita and Director of Graduate Recruiting and Admissions*

Ph.D. Washington University in St. Louis

Joyce Y. Corey *Professor Emerita*

Ph.D. University of Wisconsin

James S. Chickos *Professor Emeritus*

Ph.D. Cornell University

Alexei V. Demchenko *Curators' Professor Emeritus*

Ph.D. Zelinsky Institute of Organic Chemistry

David L. Garin *Associate Professor Emeritus*

Ph.D. Iowa State University

George W. Gokel *Distinguished Professor Emeritus*

Ph.D. University of Southern California

Harold H. Harris *Associate Professor Emeritus*

Ph.D. Michigan State University

Wesley R. Harris *Professor Emeritus and former Dean of the Graduate School*

Ph.D. Texas A & M University

David W. Larsen *Professor Emeritus*

Ph.D. Northwestern University

Rudolph E. K. Winter *Associate Professor Emeritus*

Ph.D. The Johns Hopkins University

Thomas F. George *Professor Emeritus and former Chancellor*

Ph.D. Yale University

Nigam P. Rath *Research Professor Emeritus and Director of X-ray Facilities*

Ph.D. Oklahoma State University

Graduate Study in Chemistry. Master's Program

M.1 Admission Requirements

Applicants with at least a B.A. or a B.S. degree in chemistry the natural sciences may be admitted for graduate study in chemistry at the University of Missouri-St. Louis as candidates for the M.S. 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. official transcripts). 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 (2.75/4.0) 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 approval of the Graduate School.

The department admissions committee makes all admission recommendations. The committee considers the applicant's grade-point-average, letters of recommendation, and 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, but may be required to make up background deficiencies, usually by taking undergraduate course work.

M.2 Financial Support

Teaching assistantships for the academic year are available to qualified applicants; preference is normally given to Ph.D. students in the awarding of teaching assistantships. Research assistantships and fellowships are also available, principally for advanced students. Departmental support is not generally available beyond the fifth year in the program. For further information contact Department of Chemistry & Biochemistry Graduate Recruiting and Admissions director [+01 (314) 516-6436].

M.3 International Graduate Students

Students for whom English is not a native language are required to present TOEFL scores prior to admission. For those students awarded a teaching assistantship, 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. Classroom teaching assignments cannot be made until a student demonstrates fluency in spoken English.

All international teaching assistants for whom English is not a native language will be required to participate in the International Teaching Assistant Seminar (EAP 5400) during their first semester of registration or at the earliest opportunity thereafter.

M.4 Preliminary Advisement

Students who have been admitted to the graduate program in chemistry will be contacted by the Master's Adviser 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. *Thesis M.S. students will be contacted and advised by the Director of Graduate Studies until they have chosen the research adviser.*

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.

M.S. students are required to complete successfully all assigned remedial course work (CHEM 4212, 4302, 4412, or 4712) within two years (one year for full time students supported by the Department). Exceptions to this regulation **must** be approved by the Master's adviser or by the Director of Graduate Studies. Based on the results of the placement exams, the Master's Adviser will advise the students in order to develop a tentative plan of study that takes into consideration the student's interests and background.

All full time M.S. students supported by the Department must enroll in CHEM 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 (CHEM 6812) and spring (CHEM 6822) semesters, respectively.

M.5 Master's Degree Requirements

A minimum of 30 hours is required; no more than three hours in CHEM 6897 (Chemistry Colloquium), and no more than 6 hours of assigned remedial course work (CHEM 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 Comprehensive Examination (Independent Proposal). 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/gradschool/about/policies.html>.

Distribution Requirement

Students may choose to concentrate the majority of their coursework in one of four sub-disciplines (biochemistry, inorganic, organic, or physical chemistry). Students must complete a minimum of 6 credits 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.

M.5.1 Master of Science in Chemistry without Thesis

Form M4

Non-thesis M.S. students 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 6 credits of CHEM 6905 (Graduate Research in Chemistry), may be included in place of 4000-level courses; a maximum of 12 hours taken in 3000 or above level courses outside the department may be applied to the degree, but only with prior approval by the Master's Adviser or by the Director of Graduate Studies, and confirmation by the faculty of the Department of Chemistry and Biochemistry. No more than three credits of CHEM 6897 may be applied towards the 30 credit minimum.

A student should file an M4 form (Application for Graduation-Graduate Degree [M4]) 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 M4 form by the end of the fourth week of classes in the spring or fall semester in which the student graduates. All eligible coursework is described on the M4 form and submitted to either the Master's Adviser or Director of Graduate Studies. If a student plans to graduate in the summer semester, the M4 form typically should be filed by ca. June 5. All M-forms can be downloaded from the Graduate School website at <http://www.umsl.edu/gradschool/forms.html>.

Filing deadlines for forms are posted at the Graduate School website at <http://www.umsl.edu/gradschool/>.

M.5.2 Master of Science in Chemistry with Thesis

Forms M2 through M4

Thesis M.S. students normally will enroll full-time for at least two consecutive semesters. During this time, students are expected to enroll in CHEM 6905 (Graduate Research in Chemistry), and to work on research leading to a thesis. Selection of the thesis adviser will be coordinated by the Director of Graduate Studies. No more than 12 credits of CHEM 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 at

the 3000 level or above from outside the department may be applied to the degree, but only with prior approval by the Master's Adviser or by the Director of Graduate Studies, and confirmation by the faculty of the Department of Chemistry and Biochemistry. All eligible coursework is described on the M4 form and submitted to the Master's Adviser.

In addition to filing the M4 form (Application for Graduation-Graduate Degree [M4]) for the non-thesis option, students in the thesis track are also required to file the M2 (Appointment of Thesis, Examination, Paper or Project Committee) and M3 (Preliminary Approval of Thesis) forms. The M2 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 M3 form should be submitted to the Graduate school together with a copy of the thesis (in PDF format) at least six weeks before commencement. All M-forms can be downloaded from the Graduate School website at <http://www.umsl.edu/gradschool/forms.html>.

M.5.3 Master of Science Degrees for Doctoral Students

Form M4

Doctoral students may receive a M.S. degree in their program for work completed towards the doctoral (Ph.D.) degree. To be eligible doctoral students must complete 30 credits with a minimum of 15 credits earned at or above the 5000 coursework level. No more than 3 hours in CHEM 6897, 3 hours from a combination of CHEM 6487, 6787, 6812, 6822, 6832, and 6887, and 6 hours of CHEM 6905 may be applied. All eligible coursework is described on the M4 form and submitted to the Director of Graduate Studies.

The M.S. degree for Doctoral Students may not include any of the following non-dissertation courses:

CHEM 4212, Instrumental Analysis
CHEM 4233, Laboratory in Instrumental Analysis
CHEM 4302, Survey of Physical Chemistry with Applications to the Life Sciences
CHEM 4343, Physical Chemistry Laboratory II
CHEM 4412, Advanced Inorganic Chemistry
CHEM 4433, Inorganic Chemistry Laboratory
CHEM 4712, Biochemistry
CHEM 4733, Biochemistry Laboratory
CHEM 6196, Advanced Reading in Chemistry

There are no distribution requirements for the Master's degree for Doctoral Students.

M.5.4 Master of Science in Chemistry (Professional Science Emphasis)

This option requires a minimum of 32 hours, of which 16 credit hours must be at or above the 5000 level. Students must take 21 credit hours of chemistry, 9 hours in business, and 2 credits hours of internship or practicum. A maximum of 3 credits of CHEM 6897 and/or CHEM 6887 may be applied toward the required minimum of number of chemistry credits (21 hours). All eligible coursework is described on the M4 form and submitted to the Master's Adviser.

The courses presented for the Master's degree (professional science emphasis) may not include any of the following:

CHEM 4212, Instrumental Analysis
CHEM 4233, Laboratory in Instrumental Analysis
CHEM 4302, Survey of Physical Chemistry with Applications to the Life Sciences
CHEM 4343, Physical Chemistry Laboratory II
CHEM 4412, Advanced Inorganic Chemistry
CHEM 4433, Inorganic Chemistry Laboratory
CHEM 4712, Biochemistry
CHEM 4733, Biochemistry Laboratory
CHEM 6196, Advanced Reading in Chemistry
CHEM 6487, Problem Seminar in Inorganic Chemistry

CHEM 6687, Problem Seminar in Organic Chemistry
CHEM 6787, Problem Seminar in Biochemistry
CHEM 6812, Introduction to Graduate Study in Chemistry
CHEM 6822, Introduction to Graduate Research in Chemistry
CHEM 6887, Graduate Student Seminar
CHEM 6905, Graduate Research in Chemistry

Emphasis Area Requirements

Elective Courses in Business (9 credit hours required)

MGMT 3623, Industrial and Organizational Psychology
BUS AD 5000, Economics for Managers
BUS AD 5100, Managerial Communication
MGMT 5600, Managing People in Organizations
MKTG 5700, Contemporary Marketing Concepts
BUS AD 5900, Law, Ethics, and Business

Required Internship or Practicum (2 credit hours) are one of the following:

CHEM 5798, Practicum in Science in Business
CHEM 5799, Internship in Science in Business

There are no distribution requirements for the Master's in Chemistry (Professional Science Emphasis).

M.5.5 Master of Science in Biochemistry and Biotechnology

The Department of Chemistry and Biochemistry, in cooperation with the Department of Biology, offers a Master of Science degree in Biochemistry and Biotechnology. Information about this degree program may be found at the Biochemistry & Biotechnology Programs Home Page <http://www.umsl.edu/~biotech/>.

M.6 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.

Graduate Study in Chemistry. Doctoral (Ph.D.) Program

D.1 Admission Requirements

Applicants with at least a B.A. or a B.S. degree in chemistry (or the equivalent) may be admitted for graduate study in chemistry at the University of Missouri-St. Louis as pre-candidates for the doctoral (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. 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 (2.75/4.0) may be initially 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. Master's degree program students may apply for admission to the Ph.D. program only if they are in good standing.

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.

D.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. Research assistantships and fellowships are also available, principally for advanced students. Departmental support is not normally available beyond the fifth year in the program.

D.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. Classroom teaching assignments cannot be made until a student demonstrates fluency in spoken English.

Those international graduate students for whom English is not a native language will be required to participate in the International Teaching Assistant Seminar (EAP 5400) during their first semester of registration or at the earliest opportunity thereafter.

D.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 their timely arrival and required and suggested 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. *The Director of Graduate Studies serves as the adviser to all doctoral and thesis M.S. students until they have chosen a research adviser.*

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 spring semesters.

or

- 3) Successful completion of assigned remedial course work.

Ph.D. students are required to successfully complete all assigned remedial course work (CHEM 4212, 4302, 4412, or 4712) within one year. 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. All full-time doctoral students must enroll in CHEM 6812, Introduction to Graduate Study in Chemistry, and CHEM 6822, and Introduction to Graduate Research in Chemistry, in their first and third semesters of enrollment, respectively. These courses are normally taught during the fall (CHEM 6812) and spring

(CHEM 6822) semesters, respectively. In their third semester, students must enroll in Strategies for Independent Research Proposal Development (CHEM 6832), typically taught in the fall.

D.5 Enrollment

Each semester, doctoral students are required to register for a minimum number of credits, which in addition to equivalency credits, add up to total nine credits per semester (including CHEM 6897, Chemistry Colloquium; CHEM 6887, Graduate Student Seminar; and a problem seminar, directed reading or comparable; full-time students must attend these three courses regardless of enrollment status) until graduation. The following are requirements for students enrolled in the Ph.D. program:

D.5.1 First-Year Graduate Students (9 credit hours required for full-time status)

- (1) Fall semester: Register for Introduction to Graduate Studies (CHEM 6812, 1 credit) and Chemistry Colloquium (CHEM 6897, 1 credit). Enroll in a Problem Seminar or comparable course (1 credit) and complete remedial and departmental course credit requirements (up to 6 credits-see Chemistry Graduate Handbook)
- (2) Spring semester: Enroll in Graduate Student Seminar (CHEM 6887, 1 credit), CHEM 6897, problem seminar (or equivalent), and complete remedial and departmental course credit requirements (up to 6 credits-see Chemistry Graduate Handbook)
- (3) Three (or fewer) equivalency credits will be applied via GATS each semester (you do not need to worry about this)

D.5.2 Second-Year Graduate Students (9 credit hours required for full-time status)

- (1) Fall semester: Enroll in Strategies for Independent Research Proposal Development (CHEM 6832, 1 credit), CHEM 6897, and CHEM 6887. Complete remaining required coursework. Three (or fewer) equivalency credits will be applied via GATS.
- (2) Spring semester: Enroll in Introduction to Graduate Research in Chemistry (CHEM 6822, 1 credit), CHEM 6897, and CHEM 6887. Complete remaining required coursework. Three (or fewer) equivalency credits will be applied via GATS. *You are expected to defend your Independent Proposal by the end of this semester.*

D.5.3 Pre-candidates (9 credit hours required for full-time status)

- (1) Each (fall/spring) semester you will enroll in Chemistry Colloquium (1 credit, CHEM 6897)
- (2) Each (fall/spring) semester you will enroll in Graduate Student Seminar (1 credit, CHEM 6887)
- (3) Each (fall/spring) semester you will enroll in a Problem Seminar or comparable course (1 credit)
- (4) Enroll in coursework necessary to complete remedial and departmental course credit requirements (up to 6 credits-see Chemistry Graduate Handbook); a maximum of three CHEM 6905 credits are allowed.
- (5) Three (or fewer) equivalency credits will be applied via GATS.

D.5.4 Candidates (9 credit hours required for full-time status)

- (1) Each (fall/spring) semester you will enroll in Chemistry Colloquium (1 credit, CHEM 6897)
- (2) Each (fall/spring) semester you will enroll in Graduate Student Seminar (1 credit, CHEM 6887)
- (3) Each (fall/spring) semester you will enroll in a Problem Seminar or comparable course (1 credit)
- (4) Enroll in a maximum of 1 credit of CHEM 6905 (fall/spring)
- (5) Request 5 (or more) equivalency credits from the DoGS (using most recent G14 Form) every fall and spring semester until graduation (current default setting is 8-you do not need to worry about this). See <http://www.umsl.edu/gradschool/files/pdfs/G14.pdf>.

D.5.5 Summer Enrollment

Graduate Students do not have to enroll over the summer and no equivalency credits are required.

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" is defined as a regular semester or a 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. To remain in good standing, the Graduate School requires all students to be enrolled in a minimum of one credit hour of CHEM 6905 once coursework requirements are completed.

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.*

D.6 Teaching Assistantship

All doctoral students are typically expected to participate as teaching assistants for at least two semesters. All full time doctoral students must enroll in CHEM 6812, Introduction to Graduate Study in Chemistry, and CHEM 6822, Introduction to Graduate Research in Chemistry, in their first and fourth semesters of enrollment, respectively. These courses are normally taught during the fall (CHEM 6812) and spring (CHEM 6822) semesters, respectively. In their third semester, students must enroll in Strategies for Independent Research Proposal Development (CHEM 6832), typically taught in the fall. Those international graduate students for whom English is not a native language will be required to participate in the International Teaching Assistant Seminar (ESL 5400) during their first semester of registration.

D.7 Selection of a Thesis Adviser

Form D2

During the fall semester, each research active faculty member will present a 30-minute summary of his or her research. Typically, there will be two presentations during each session held during the Friday 1-2 PM seminar slot (CHEM 6887, Graduate Student Seminar). All new graduate students are required to attend even if they are not officially enrolled in CHEM 6887.

Within one week upon completion of the faculty presentations (typically by the end of October) each student must submit Form A (Research Adviser Selection-Form A) to the Director of Graduate Studies where the student lists the names of faculty members he/she would like to interview (typically not more than eight). *Forms A and B are provided by the Director of Graduate Studies at the beginning of the selection process.* Faculty is then given an opportunity to request to be added to or withdrawn from a specific student interview list. After that, the Director of Graduate Studies approves the Form A and the students may start interviewing the faculty on their list. Each student must indicate that he/she has spoken with each faculty member listed by obtaining the faculty member's signature on Form A. Upon completion of the interview process, Form A containing all signatures is submitted to the Director of Graduate Studies.

The student then submits Form B (Research Adviser Selection-Form B) typically by December 1, on which he/she indicates his/her first, second and third choices of 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. If the faculty member agrees to serve as research and coursework adviser for the student, the potential adviser should confirm this by providing an **official letter** to the Director of Graduate Studies. The Director of Graduate Studies then files Form D2 (Appointment of Adviser) to have the adviser's appointment approved by the Graduate Dean. *Students entering the graduate program at times other than fall will be guided by the Director of Graduate Studies.*

D.8 Appointment of a Comprehensive Examination Committee*Form D1A*

All graduate students must, in agreement with their research adviser, select a comprehensive examination committee. The committee must consist of the research adviser and at least two other faculty members. The committee members will serve as mentors during the course of the student's research program. The D1A form (Appointment of Comprehensive Exam Committee) must be signed by all committee members, the Director of Graduate Studies, and be filed at the Graduate School.

The appointed committee will evaluate the Doctoral dissertation proposal. Form D1A and other D forms can be downloaded from the Graduate School website at <http://www.umsl.edu/gradschool/forms.html>.

The Comprehensive Examination Committee is responsible for mentoring a graduate student. The committee will annually meet with a student, typically during the spring semester, to review progress in coursework and research. A written report summarizing their assessment and recommendations will be provided to the student, Director of Graduate Studies, and inserted into a departmental records file by the fall term.

D.9 Comprehensive Examinations*Form D1B*

Each student seeking the Ph.D. degree must successfully complete a comprehensive examination prior to advancement to candidacy. This examination is typically taken when formal course work has been completed. The examination must be completed before the conclusion of the fourth regular semester.

The qualifying examination will involve writing an original Independent Research Proposal that will be evaluated by the student's Committee. The student will select a topic for a research proposal that is not directly related to the expected research area. The research mentor must approve the topic. The student will prepare a proposal document not exceeding 10 pages in length, single spaced, excluding references but including all figures, tables, schemes, chemical structures, etc. The format of the document will be similar to that used either in NSF or NIH proposals and will conform to the following requirements. Each page will have minimum margins of 1" on all sides. The document will use an Arial or Helvetica sans serif typeface, not smaller than 11 point. Each page will be numbered at the bottom center. The cover page (not counted in the 10 page limit) will have the following format.

Student name:
Research mentor:
Proposal title:
Probable research area:
Date graduate studies commenced:
Courses completed and grades:

The candidate's name and the proposal title should appear again, centered at the top of the second page. The proposal should be divided into the following sections (sections A-D should not exceed 10 pages and there is no page limit for section E).

- A. Specific Aims
- B. Background and Significance
- C. Research Plan
- D. Conclusion
- E. References (references should include both starting and ending pages and the article title).

Copies of the written proposal will be circulated to Committee members at least one week prior to the oral presentation. Typically, an oral presentation of ~45 minutes will be followed by a discussion of the proposal involving the candidate and the committee members. The decision of the committee (pass or no pass by majority vote) must be reported to the Director of Graduate Studies by submission of the signed D1B form (Committee Report Results). An unsatisfactory examination will require remediation. At the committee's discretion, the candidate may retake the examination or the committee may make other appropriate recommendations. *Failure to meet the qualifying examination requirements may result in dismissal from the doctoral program.*

D.10 Doctoral Dissertation Proposal

Forms D4 and D5

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 third year of the doctoral program. The presentation should be made within six months after the candidacy examination has been completed successfully. *The D4 Form (Appointment of Dissertation Committee) should be submitted prior to the defense of the Doctoral Dissertation Proposal and submitted no later than the third year in the program.*

The Dissertation Proposal contains both a written and an oral component. Evaluation of both components will be conducted by the Comprehensive Examination Committee. Thesis proposals must be presented to the department as a whole at the Friday Graduate Student Seminar (CHEM 6887), but the examination component will be undertaken by the student's Committee and can take place at another day.

The goal of the thesis proposal presentation is to define the research project. The candidate should consider both the overall impact of the proposed work and its feasibility. The proposal will normally include preliminary results, but these should not form the bulk of the presentation. The candidate should, with the advice and consent of the research mentor or mentors, outline in seminar presentation format his or her goals and objectives for the research project. The oral presentation should be made with visual aids ("PowerPoint" slides). The presentation should not exceed 45 minutes. The written part of the dissertation proposal should be organized as follows. The cover page (not counted in the 10 page limit) will have the following format.

Student name:
Research mentor:
Proposal title:
Date graduate studies commenced:
Courses completed and grades:

Sections 1-6, indicated below, should not exceed 10 pages in length, single spaced, excluding references but including all figures, tables, schemes, chemical structures, etc. The format of the document will be similar to that used either in NSF or NIH proposals and will conform to the following requirements. Each page will have minimum margins of 1" on all sides. The document will use an Arial or Helvetica sans serif typeface, not smaller than 11 points. Each page will be numbered at the bottom center.

1. Background
2. Goals of the Overall Project
3. Specific Objectives
4. Preliminary Results (These will include results from the literature, other work in the group, the student's own work, etc.)
5. The Research Plan
6. Proposed Timeline
7. References (references should include both starting and ending pages and the article title).

The written proposal should be distributed to the Dissertation Committee (Form D4) at least one week in advance of any oral presentation. This presentation should be made as part of the Graduate Student Seminar (CHEM 6887), at which time everyone will have an opportunity to ask questions and/or comment on the proposed research.

After the presentation, the Committee ideally will raise questions and concerns, as well as making recommendations for better or different approaches, targets, goals, or objectives. The Committee and candidate will reach a consensus on the project and approach, and the Committee will meet at least annually thereafter to monitor progress. Student progress will be summarized in writing by the Committee Chairperson and reported to the Director of Graduate Studies. 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 D5, Doctoral Dissertation Proposal) must be filed with the Graduate School, along with a copy of the final Dissertation Proposal document (in PDF format). This and other D forms can be downloaded from the Graduate School website at [link](#).

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 accompanied by an oral presentation.

D.11 Advancement to Candidacy

Form D3

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

- 1) **at least 18 hours of non-dissertation work**, which **may not** include:

CHEM 4212, Instrumental Analysis
CHEM 4233, Laboratory in Instrumental Analysis
CHEM 4302, Physical Chemistry for the Life Sciences
CHEM 4343, Physical Chemistry Laboratory II
CHEM 4412, Advanced Inorganic Chemistry
CHEM 4433, Inorganic Chemistry Laboratory
CHEM 4712, Biochemistry
CHEM 4733, Biochemical Laboratory
CHEM 6196, Advanced Reading in Chemistry
CHEM 6487, Inorganic Problem Seminar
CHEM 6687, Organic Problem Seminar
CHEM 6787, Biochemistry Problem Seminar
CHEM 6812, Introduction to Graduate Study in Chemistry
CHEM 6822, Introduction to Graduate Research in Chemistry
CHEM 6887, Graduate Seminar in Chemistry
CHEM 6897, Chemistry Colloquium

At least 9 of the minimum 18 hours must be at the 5000 level. Credit for coursework performed outside the department may be applied to the 18 hour minimum contingent upon departmental approval. Normally, no more than nine such credits will be approved. (*NOTE: Eighteen hours of formal course work is the recommended minimum requirement; additional courses may be recommended by the student's adviser.*)

- 2) Pass a Comprehensive Examination.
 3) Successfully present and defend a Dissertation Proposal.
 4) Submit a Dissertation Proposal Graduate School approval.
 5) Be in good standing.

When the students satisfy all of these requirements, and Application for Candidacy (Form D3) form must be filed with the Graduate School. *You should do this when you have completed necessary coursework.* Approval is given by the Graduate School when you successfully complete the 60 credit hour minimum. All D forms may be downloaded from the Graduate School website at <http://www.umsl.edu/gradschool/forms.html>.

Successful advancement to candidacy allows the student to enroll in 6 credits/fall and spring semester or 1 credit/Summer semester (requires equivalency form G-14, available at <http://www.umsl.edu/gradschool/files/pdfs/G14.pdf>). Doctoral candidate students enroll in Doctoral Dissertation Research (CHEM 7905, *currently pending approval by the Senate*).

D.12 Dissertation

Forms D4, D6, D7, and D9

The Doctoral Dissertation Committee shall consist of Comprehensive Examination Committee and at least one additional member of the Graduate Faculty who can contribute their expertise to the dissertation defense (Form D4). The Committee should include either a Chemistry and Biochemistry Faculty member from outside the student's specialization area or a Graduate Faculty member from another Department at UMSL. Alternatively, a recognized scholar from another University may serve as a member of the Doctoral Dissertation Committee. In this case, the external scholar is selected by the student's adviser in consultation with the student (it requires revision of Form D4). Upon recommendation of the Department and approval by the Graduate Dean the external Committee member will assist efforts to evaluate the dissertation. This Committee gives preliminary approval to the dissertation (Form D6, Preliminary Approval of Dissertation and Oral Defense). This and other D forms can be downloaded from the Graduate School website at [link](#).

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 (D9, Oral Defense Announcement). The schedule of the final oral examination must be arranged at least three weeks after the preliminary approval of the dissertation. Students should simultaneously submit the D6, D9, and preliminary PDF version of the thesis to the Director of Graduate Studies for Graduate School approval. The official deadlines are typically announced by the graduate school at the beginning of each semester.

Graduate students must present an Exit seminar in the Graduate Student Seminar (CHEM 6887) in the semester they will be graduating. The exit seminar should be based on the PhD thesis defense of the student.

Final approval of the Dissertation (Form D7, Dissertation Committee Report of Defense and Final Approval of Dissertation) is verified by the Chairperson of the Dissertation Committee and approved by the Graduate Dean, indicating that all necessary corrections have been made, and must be obtained prior to graduation.

D.13 Research Expectations, Work Ethic and Student Review

The Ph.D. degree is awarded for demonstrated proficiency in performing original research. Accordingly, students that have been accepted into our Ph.D. program are expected to do fundamental research and to graduate as a fully independent scientist. The awarding of a Ph.D. is based on research outcomes, publications and presentations.

Research advisers will have expectations of Ph.D. students. The foremost expectation is that students become deeply involved in their projects, “taking ownership” of them and working full time on their research.

Students may be employed by the Department as a Teaching Assistant (TA), while other students are supported as Research Assistants (RA) without any teaching duties. RA funds come from research grants. If employed as a RA, the adviser will expect the doctoral student to work on their research in a committed, thoughtful and persistent way in addition to required coursework. If employed as a TA, funds for the salary come from UMSL through the department’s TA budget allocation. In either case, whether being employed as a TA or an RA, students report to their adviser, communicating with the adviser constantly, reporting on progress, problems experienced daily, and seeking permission in advance from them for absences. In either case, research work needs to continue. If working as a TA, teaching duties likely will be spread over a couple of half days – the rest of those days and the remainder of the week should be devoted to research once students have completed their coursework.

The progress of doctoral students is monitored closely, and reviewed *at least each year, but preferably every six months*. Each student's progress in research, course work, examination, and teaching must be reviewed. The student's Committee will undertake periodic evaluations and the student's mentor will be responsible for summarizing progress in writing to the student **and** to the Director of Graduate Studies. In some cases, specific course work or other requirements may be set by the Committee in order for the student to continue in the graduate program.

In particular cases, the progress and performance of new doctoral students may also be reviewed by the entire Faculty prior to the awarding of teaching assistantships for the following term. Problems or special circumstances may be considered by a committee of the faculty as a whole.

D.13.1 Academic 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 CHEM 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 each 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.

D.13.2 Change of Thesis Adviser

Beyond successful completion of coursework requirements, some students may fail to make "satisfactory progress" as described in the Graduate Student Handbook. Occasionally, when the mentor-student relationship fails, or other factors interfere with progress towards degree completion, the following procedure will be used to assess whether it is in the best interest of the department to continue support and/or allow another thesis adviser to be selected.

Initial advisement and recommendations will be provided by the members of the student Comprehensive Examination Committee (Form D1A), which is composed at least three members of the Graduate Faculty and the Doctoral Dissertation Adviser (Form D2). Their recommendation will be provided to the Department Chair and Director of Graduate Studies (DoGS) within one week of their meeting. When appropriate other Graduate Faculty may be solicited by the committee.

Positive Committee Recommendation: Continuation of Program. If the Comprehensive Examination Committee determines that a student is qualified and likely to be successful under the direction of another thesis adviser, the graduate student will be allowed to interview a number of prospective thesis advisers. Within one week following successful completion of the Comprehensive Examination, the student will provide names of prospective faculty to the Director of Graduate Studies (Research Adviser Selection-Form A). The DoGS will seek faculty approval and forward the final list of names to the Department Chair for final approval. The graduate student shall be notified in writing of the approved faculty interview list (by DoGS) and is required to complete all interviews; the student shall rank and submit their thesis adviser preferences (Research Adviser Selection-Form B) to the DoGS within one week. Upon consent of the DoGS, Department Chair, and prospective mentor(s) the student will be allowed to join another research group. The process is finalized when Forms D1A and D2 are approved by the Graduate School.

In the event that a new thesis adviser is not approved the student will be encouraged to leave the graduate program with a M.S. degree (Form M4, Application for Graduation-Graduate Degree). If the student has accrued an insufficient number of earned credit hours, the Department Chair and DoGS will determine whether departmental support will be extended, to allow for completion of the M.S. degree.

Negative Committee Recommendation: Program Dismissal. If, however, the Comprehensive Examination Committee recommends that the student has made unsatisfactory progress and/or is unlikely to successfully complete the Ph.D. program, the student will complete Form M4 if a sufficient number of credit hours have been earned. If the student has an insufficient number of earned credit hours, the Department Chair and DoGS will determine whether departmental support will be extended.

Graduate Study in Chemistry: Fellowships and Scholarships

The following internal scholarships, fellowships and awards are currently available to graduate students. *Graduate students are encouraged to consult their faculty mentors or course instructors regarding the nominations for particular awards.*

Jack L. Coombs Outstanding Graduate Teaching Assistant Award. This award was established to recognize a graduate student TA 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.

Graduate Student Research Accomplishment Award. This award is presented 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.

M. Thomas Jones Memorial Fellowship. This fellowship is given each semester for the outstanding seminar presented by a Doctoral Student. This fellowship is determined by the vote of the graduate students only, who should be reminded of the importance of performing this assignment responsibly and honestly.

Rudolph E. K. Winter Graduate Scholarship. This scholarship will provide one or more stipend supplements for worthy incoming PhD students, as determined by a decision of the appropriate chemistry faculty committee. Preference will be given to students majoring in some aspect of organic chemistry and the award may be renewable for one year if recipient remains in good academic standing.

Outstanding Master's Student Award. This award recognizes an outstanding performance by a current Master's 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 ranked applications may be forwarded by a department to the campus-wide competition; the awardees are determined by vote of the Graduate Council.

Graduate Study in Chemistry. Chemistry Graduate Student Association

The Chemistry Graduate Student Association (CGSA) is a student-run organization that encourages scientific and social interaction among graduate students and supports them in their pursuit of an advanced degree in the discipline of chemistry and/or biochemistry. This organization serves as a voice for the graduate students, providing them a way to express their comments, concerns and ideas about the department, and encourages cooperation among the graduate students, alumni, department administrators, faculty and the university. To achieve the goals set forth by the CGSA, various service, social, networking, and fundraising events are held throughout the year. In addition, yearly officer elections and intermittent General Assemblies are also conducted in which the graduate student body meets to discuss organizational business. To join the CGSA or for further inquiries about their activities please send a message to: UMSLCG-SA@umsl.edu