

Introduction: The Chemistry PhD program has certain clear, objective, and well-defined quantitative requirements with definite deadlines. These are indicated in this document. There are also several requirements that are necessarily more subjective and that should be accomplished as soon as a student is prepared. For these requirements, this document provides guidelines and recommendations, but specific requirements and deadlines will be determined in consultation with the thesis advisor and advisory committee.

Annual Review: A yearly review of each graduate student's progress will be conducted by the Graduate Education Committee (GEC). Each student will fill out a GEC progress report form at the end of spring semester. The GEC will review the progress of each student and will determine whether he/she has made satisfactory progress on the requirements as defined below and will also make recommendations to the student and advisory committee regarding any pending requirements.

1. Proficiencies. Students must demonstrate proficiency in at least 3 chemistry subject areas. New students will take the five proficiency exams (organic, inorganic, physical, analytical, and biochemistry) the week prior to the beginning of their first semester on campus. If they do not pass three exams at the 50%tile or higher level, they must take a course(s) in the area(s) they choose to show proficiency. The selection of courses will be decided in discussion with the GEC and will depend upon the student's interests and their score on the exam(s), among other factors. A grade of B or higher in the course(s) will satisfy the proficiency requirement. If a B or higher is not obtained, the student may retake the exam(s) in late January. If the grade(s) or proficiency exam score(s) are not achieved, the student will take an additional course(s) spring semester. Again, a course grade of a B or higher is required, or if this is not achieved, the student will be able to take the exam(s) a third and final time, in late May. If the student does not demonstrate proficiency in three areas through this process, as defined above, the student will not continue in the program. Students who enter spring semester may defer starting the exams until the following fall so that they are on the same schedule as the new cohort.

2. Coursework. The coursework that a graduate student takes is dependent upon their research area, the degree they are pursuing, and the need to cover deficiencies as determined from the proficiency exams. In general, at least 60 semester credits are required for the doctorate of which 18 credits must be lecture-based courses (e.g., six courses usually worth 3 credits each at the 500 level; some 400 UG level courses can be used upon recommendation of the advisory committee).

Specific requirements:

- Students must successfully complete CHMY 501 and CHMY 640 in the first Autumn Semester registered
- Students must successfully complete CHMY 650 in the first two Spring Semesters registered.
- Students must successfully complete CHMY 652 in the Autumn Semester following completion of 2 credits of CHMY 650.

- All graduate students will register for CHMY 630 (Departmental Seminar) every semester. Attending departmental research seminars is integral to a student's education and allows the student a chance to learn about areas of science outside of their research area. Attendance of these seminars is mandatory unless excused by the faculty member responsible for organizing the seminar. The method of grading this class is the choice of the faculty member organizing the seminar.
- Students must complete 18 credits in letter-grade courses. The specific courses completed must be selected in consultation with the thesis advisor and advisory committee.
 - Nine of the 18 credits must be in 500-level letter-grade Chemistry courses
 - Six of the 9 Chemistry credits must be in 500-level letter-grade Chemistry courses outside the student's research specialty area, as determined by the advisory committee.
 - The remaining 9 of the 18 credits may be in traditional letter-grade courses within or outside the Department of Chemistry and Biochemistry when approved by the student's committee.
 - Students should plan a course of study that will allow them to complete coursework in their first four semesters of residence. Students will typically complete two graduate courses in each of their first two semesters in residence and at least one graduate course in each of the following two semesters.

Students must maintain a B (3.0) average in courses taken for graduate credit at The University of Montana; no grade below C (2.0) will be accepted toward any degree requirement. The graduate school automatically places a student on academic probation if the cumulative grade point average falls below 3.0. The Department will take the following actions for a student who fails to maintain this average:

End of first semester in residence: Receive a notice from the chair of his/her advisory committee and/or from the Graduate Education Committee warning of academic probation.

End second semester in residence: Be retained or placed on probation by the Department for a deficiency of six or more grade points. Grade point deficiency is defined in terms of the number of hours of 4.0 which would be needed to make the average 3.0. For example, either 3 hours of D or 6 hours of C would require 6 hours of A to bring the average to 3.0 and a 6 grade point deficiency would exist.

End of third semester in residence: Be recommended automatically to the Graduate School to be dropped from the graduate program at any time during the second year if the deficiency exceeds 9 grade points, or at the end of the second academic year in residence or thereafter if the deficiency exceeds 6 grade points. Reinstatement can be made on the basis of a petition approved by the Department and the Graduate School. Such a petition can only be considered during the regular academic year.

Graduate School regulations allow the repeat of up to six semester credits to raise the grades obtained, upon approval of the Department Chair. Students should be aware that the repetition of "F" grades counts within this limit and that the approval of the Department Chair can be expected only in the case of compelling extenuating circumstances.

There are no options on grading procedures in courses taken for graduate credit. Traditional letter grades must be obtained in all courses except research (graded N, Continuation), thesis (graded N, Continuation) and seminar (630, 650, 652; graded P/NP) courses. Continuation grades are converted to letter grades upon completion of the program.

Transfer of Graduate Credit: Graduate School policy allows for the transfer of graduate credits taken elsewhere with the Department's recommendation. Credits with grades other than A or B, thesis or correspondence credits, extension credits outside the Montana university system, or credits earned at institutions not offering graduate degrees in the discipline of the course are not transferable. In the Department of Chemistry and Biochemistry, the student's advisory committee must initiate the recommendation for transfer of credits. The advisory committee should be organized as soon as possible if credit transfer is desired. The advisory committee will take into consideration the student's background and professional goals along with the performance on the incoming proficiency exams in making the recommendation. Graduate credit will not be transferred for a chemistry course unless the student passes the proficiency exam in the related area of chemistry when taken at the beginning of the first semester in residence.

3. Graduate Student Committees. Not later than the second semester of graduate study, students must select a thesis advisor and become active in research (doing research and attending group meetings). In consultation with the thesis advisor, the student must also select an advisory committee that reflects their area of study. The advisory committee is comprised of five members that include the thesis advisor, two internal (Department) members and one external member chosen by the student in consultation with the thesis advisor, and one member selected by the Department Chair. Students should have their first committee meeting early in the third semester, and a minimum of each year thereafter.

4. Divisional Examination. At the end of the third semester in residence, students must complete a Divisional Examination. Examinations will be offered in each of the traditional areas of chemistry (Analytical/Environmental, Biochemistry, Inorganic, Organic, and Physical). The divisional examination completed should represent the area of chemistry most closely related to the student's area of research. Students should select which divisional examination to complete in consultation with their thesis advisor and advisory committee. Examinations will be graded as pass or fail by the faculty of the respective division. Students who fail to pass the examination on their first attempt may complete the examination a second time at the end of the following semester. Failure to pass the exam on the second attempt will render the student ineligible for a PhD.

5. Graduate Seminar and Dissertation Proposal. All graduate students will enroll in and successfully complete CHMY 650 during the first two Spring Semesters registered. The minimum requirements for CHMY 650 are presented below. The faculty member of record for the course may define other requirements in a given semester.

The first time registered students will attend all class meetings and give informal presentations either on their background and experience or on their research project plans.

Students enrolled for the second time will write and successfully defend a dissertation proposal. The proposal will typically be 10 pages or less and will consist of a literature review, preliminary research results, description of proposed studies, and a timeline for completion of the research. The student will present their dissertation proposal in a 45 minute public seminar during the regular meeting time for CHMY 650 and will defend the proposal to their advisory committee. Students will not receive a passing grade in CHMY 650 until their advisory committee indicates that they have successfully presented and defended their dissertation proposal. A student who fails to successfully defend the dissertation proposal during the spring semester may make a second attempt during the following summer session. Failure to successfully defend the dissertation proposal by the end of that summer session will render the student ineligible for a PhD from the graduate program.

Once completed and successfully defended, the Dissertation Proposal must be forwarded to the Graduate School for approval.

6. Original Research Proposal. During the summer and autumn following completion of the dissertation proposal, the student will write an original research proposal and defend it to the advisory committee in an oral examination. Students who have received a Ph.D. in Chemistry from UM usually feel that the experience of writing a serious research proposal is one of the most valuable components of their graduate education. Both proposal-writing skills and the expanded experience are highly valued in academia and industry. The oral research proposal examination, with the Divisional examination, satisfies the comprehensive examination requirement for Graduate School doctoral programs.

To provide the best indication of the student's abilities, the research proposal topic should be as remote as practical from his/her dissertation research. The proposal should not be directly related to the student's dissertation research or other research projects in the thesis advisor's laboratory. Before the end of the summer session, the student will provide their advisory committee with a title and brief abstract of their proposal. The advisory committee will advise the student as to the acceptability of the proposal topic. A full proposal should not be written until the advisory committee has indicated approval of the selected topic.

During the Autumn Semester, the student will enroll in CHMY 652 and will write and defend the original research proposal. CHMY 652 will provide instruction and guidance on writing and presenting an original research proposal. Students will only receive a passing grade and credit for CHMY 652 when they have successfully written and defended an Original Research Proposal. Students that do not defend the proposal within the above timeframe are placed on University probation.

The format of the proposal is determined by the advisory committee and usually matches that of a major funding institution (NIH, NSF, DOD, DOE etc). A copy of the written research proposal and abstract must be delivered to each committee member at least ten days before the date set for the oral examination. At the same time, a one-page abstract of the proposal, including key references, must be distributed to all other chemistry faculty and graduate students.

The oral research proposal examination will have the following format:

- A 30-40 minute presentation open to all faculty and students
- 15 minute question/answer period open to the general audience
- 1-2 hour question/answer period conducted by the committee and interested UM faculty (the general audience will be asked to leave)
- Candidate excused and committee votes to pass or fail

The examination chair (an advisory committee member other than the thesis advisor) will supervise the question period, arranging that each committee member and interested UM faculty member has adequate opportunity to question the candidate. Although most of the questions in this examination will be concerned with the proposal, questions on cognate and minor areas may, and likely will, be asked.

The student's advisory committee determines whether the original research proposal and oral examination are acceptable in every respect: independence from dissertation topic, novelty, content, and demonstration of chemical knowledge and intuition. Only advisory committee members vote on the performance of the candidate in the examination. The candidate and guests are excused before the vote is taken. There are three possible outcomes:

- The student passes if there are three or more votes to pass.
- The student fails and the committee affords a second examination based on the same or a new research proposal.
- The student fails outright and is not afforded a second examination.

Failure of the examination outright or on a second attempt will render the student ineligible for a PhD. After passing the oral research proposal examination, the candidate will furnish a copy of the research proposal to the Department.

7. Application for Graduation. After the Original Research Proposal and Oral Examination has been passed and at least one semester before the PhD degree is to be

awarded, the student must submit to the Graduate School three copies of the Application For Graduation Form and a graduation fee. The Graduate School will conduct a degree audit and send a copy of this form back to the Department and a copy to the student early in the graduating semester. The Department and student should note any problems and rectify them at least two weeks prior to the end of the final semester by using a Graduation Amendment Form. If the student fails to meet the original graduation date as requested on the form, the student may request the application be reactivated for the following semester by notifying the Graduate School one semester prior to the revised completion date.

8. Dissertation and Dissertation Defense

Students are required to submit an Electronic Thesis, Dissertation and Professional Paper (ETDP) that describes their empirical or scholarly research and findings. The EDTP will have a front section, including a title page, abstract, acknowledgements, and table of contents, a body section that contains an introduction, literature review, materials and methods, results, discussion and conclusions, and a back section that contains references and appendices. The document is prepared using a word processor and converted to pdf format with relevant multimedia objects embedded. ETDPs may contain supplemental files, hypertext links, audiovisuals and other interactive features. The ETDP will in most cases be available to anyone who can browse the World Wide Web. Wide dissemination of research results and scholarly inquiry are encouraged, but the advisor and advisory committee can request limited access where there are legitimate patent or publishing issues. The student should arrange for submission of the draft and final versions of their EDTP with their thesis advisor.

The style of the EDTP text must follow the formal recommendations in the latest edition of *Form and Style: Theses, Reports, Term Papers* by W.S. Campbell and Stephen V. Ballou or *A Manual for Writers of Term Papers, Theses and Dissertations* by Kate L. Turabian (copies are available in the UM Bookstore). The following requirements are supplementary to the above-mentioned material:

- Literature references are to be collected in a bibliography at the end of the thesis (not as footnotes and not at the end of chapters).
- Entries in the bibliography may be in alphabetical order or in order of citation in the text.
- The form of each bibliographic entry and the manner of citing the reference in the text of the thesis may follow the style of any major journal in the area of the student's thesis. The principal methods of citing references are listed on pp. 106-107 of the *ACS Style Guide*, James S. Dodd, Editor. A copy is available in the chemistry office.
- The student must consult with his or her advisor concerning preferred bibliographical style, particularly regarding the omission or inclusion of article titles.

In addition, students should refer to the Graduate School web site for guidance on formatting the ETDP. When preparing the Approval Page, Copyright Notice and Abstract for the ETDP, students should use the templates provided by the Graduate School.

The Graduate School and the Department of Chemistry and Biochemistry have established several deadlines and procedures relative to the dissertation defense. At least five weeks before the dissertation defense and at least nine weeks before the end of the semester in which the student expects to receive the degree, the candidate must submit unbound committee drafts or electronic copies (with prior committee approval) of the dissertation/EDTP to each advisory committee member. Advisory committee members who have concerns about whether the dissertation meets the criteria to proceed to the defense should express those concerns to the thesis advisor at least one week before the scheduled examination. If there are less than two committee members with concerns, the student's adviser and the Graduate Dean may elect to proceed. If there are two or more committee members who feel that the thesis is not ready to be defended, the defense will be indefinitely postponed. One copy of the draft EDTP and the student's e-mail address must be electronically submitted to the Graduate School office one week in advance of the defense. [Instructions](#) for submitting the draft are available from the Graduate School. This submission indicates the document is defensible and all members of the advisory committee have agreed it is ready for defense. The draft may include the comments of the advisory committee members as to corrections and suggested revisions.

The dissertation defense is an oral examination of the student's knowledge and a defense of the thesis. The dissertation committee will conduct a final examination dealing primarily with the dissertation and its relationship to the student's fields of study. This examination is held no later than four weeks before the end of the semester in which the degree is to be granted. It must be preceded by the preliminary approval of the EDTP by the dissertation committee and the Graduate School, as well as the completion of all other requirements for the degree, including any set by the dissertation committee.

The time and place of the dissertation defense must be announced to the Graduate School and to the Department at least two weeks before the examination, and notice must appear in the Faculty and Staff Newsletter at least one week before the defense.

The dissertation defense begins with a seminar (less than one hour) given by the student on the dissertation topic followed by periods for questions. If the seminar is given as a general departmental seminar, it need not immediately precede questioning by the committee. If both seminar and questioning period are scheduled in one session, then three hours must be allowed. The seminar is followed by a question and answer session that is open to the public; guests may ask questions upon recognition by the examination chair. The committee and UM faculty guests are then allowed by the examination chair to closely question the candidate on his or her general chemical knowledge and on the dissertation. Finally the advisory committee members discuss privately the student's performance and vote upon the outcome, which will be one of the following: (1) The student passes, and the dissertation is accepted as presented. (2) The student passes, but

minor revisions are required in the dissertation. (3) The student fails and/or major revision is required in the dissertation. The committee result is a pass if no more than one member dissents. If the student fails, and the committee so advises, he/she may make the necessary revisions and defend again. At least thirty days must elapse between examinations. In no case will a student be allowed to defend his/her thesis more than twice.

If the student passes the dissertation defense, the chair and co-chair of the committee sign the Degree Completion document (The "Department" copy of the Graduation Application) under Final Degree Requirements.

At least two weeks before the end of the semester in which the degree is to be conferred, and after any revisions required by the committee or the Graduate School have been made, the EDTP must be submitted electronically to the Graduate School and to UMI/ProQuest through the University of Montana section of the UMI/ProQuest web site. Directions for submitting the document to UMI/ProQuest can be found on the Graduate School [web page](#). The student will also submit the signed Certificate of Approval Form and any other documentation required by the Graduate School. Submission of the electronic document by the thesis advisor will certify that the document has been reviewed and approved as the final document by all members of the committee. The Graduate School will match up the electronic document with the Certificate of Approval Form and the document submitted to UMI/ProQuest and will give final approval for release of the document into circulation. In addition, one bound thesis copy is given to the Department for its library. A bound copy should also be provided to the research advisor. It is a courtesy to provide bound copies to members of the dissertation committee.

The following summarizes deadlines relating to the dissertation defense and graduation.

- Draft of dissertation to committee – five weeks before dissertation defense.
- Notify Graduate School and Department of Chemistry and Biochemistry of time and place of defense – two weeks before dissertation defense.
- Submit approved draft of EDTP to the graduate school – one week before dissertation defense.
- Announcement of time and place of defense appears in Faculty/Staff Newsletter – one week before dissertation defense.
- Dissertation defense – four weeks before the end of semester.
- EDTP submitted to the graduate school along with signed Certificate of Approval Form and any other required documents – two weeks before the end of the semester.

Dissertation *in absentia*: With prior approval of the Department and the Graduate Dean, a student may register for and receive residence credit for research done *in absentia* for the

dissertation. Prior to finishing the dissertation and taking the final examination, a graduate student is responsible for making himself/herself fully available to his/her research advisor and advisory committee to meet published deadlines and to allow the required time for examination procedures.

9. Time limit. The graduate school requires that all requirements for the doctorate must be completed within seven years of commencing graduate course work at The University of Montana.

GENERAL EXPECTATIONS

Students should be actively looking for a research group and join no later than the end of the second semester of their first year. Rotations among research groups are encouraged and the student is advised to work in the lab for a period of time prior to committing to that group. The individual professors must approve these arrangements. To assess their progress and to avoid misunderstandings, new students without a research advisor should arrange regular meetings with the GEC.

The expectations for a student in a PhD program are advisor-specific. It is important that a student discuss these expectations with their prospective research advisor and have a clear understanding of what is expected of them in terms of daily work hours, work duties, and the necessary milestones expected for a PhD. All absences should be negotiated in advance with the student's advisor or the GEC if the student has not selected an advisor.

Successful completion of a PhD in Chemistry entails more than passing course work and standardized tests. The graduate student must demonstrate the ability to comprehend fundamental scientific problems, read and understand the primary literature in their area of research, and successfully transmit their knowledge to an experimental or theoretical application. Failure to demonstrate such skills can result in termination of the candidate from the PhD program regardless of his/her success in coursework and standardized tests.

In general, the expectation is that a PhD will not be awarded unless the student has made significant contributions on one or more peer-reviewed papers (published or in press). Students are also encouraged to give presentations of their work at scientific meetings.

If a research advisor determines that a student is making insufficient progress in the PhD program, the student will receive a written warning. Within one month of such a warning, the student must convene their thesis advisory committee to review the situation and to develop suggestions for alternative approaches or remedial work. Within three months of this review, the student must reconvene the committee to assess progress. If progress is insufficient, the committee will proceed with termination of the student from the PhD program. A student may appeal the committee's decision to the Graduate School which, along with the Department Chairperson, will meet with the advisory committee to review the process and determine whether there were sufficient grounds for dismissal.

Chemistry Graduate Program Timeline

Requirement	Semester									
	1	2	3	4	5	6	7	8	9	10
Proficiency exams	→	→								
Coursework (recommended)	→	→	→	→						
Form research committee		→								
First committee meeting (1 per year recom.)			→	→						
Divisional exam			→	→						
CHMY 501	→									
CHMY 630	→	→	→	→	→	→	→	→	→	→
CHMY 640	→									
CHMY 650 (Dissertation proposal)		→		→						
CHMY 652 (Original research proposal)					→					
Conduct research	→	→	→	→	→	→	→	→	→	→