

OUTLINE OF GRADUATE PROGRAM IN CHEMISTRY – Fall 2018/19

Orientation Examinations

Orientation examinations will be given before classes begin in September. The exams provide the faculty with a relative measure of each student's chemistry background and strengths as they are starting the program. In some cases the outcome of orientation exams may be a factor in determining an incoming student's program of study. The exams will be based on undergraduate courses in organic, inorganic, physical, and analytical chemistry.

Courses

Knowledge of the content of a core of courses – i.e. Quantum Chemistry, Organic Chemistry, Biochemistry, Inorganic Chemistry, and Physical Chemistry – is required of all graduate students regardless of field of specialization. Students who believe they have the equivalent to any of the core courses may submit a written petition requesting to place out of one graduate core course. The petition should include an outline of the course taken, the institution and date the course was taken, the book(s) used, and the grade received. Petitions must be submitted to the faculty member teaching the core course by the first day of classes each semester. The petitioning student will then be asked to take a final exam (or equivalent) for the core course they are requesting to place out of. The exam will typically be administered during the first week of the Drop/Add period so that a decision can be reached before the end of the Drop/Add period. The student must earn a grade of B- or higher on the exam in order for the request to be granted. Students may only place out of one graduate core course. The Department does not recommend that students place out of a course that is integral to their research.

In the first semester, students will be expected to take two lecture courses plus an introduction to research (research rotations; see next section). All courses should be taken on a letter-graded basis. A passing grade for graduate students is defined by the University as B- or higher. Students who receive a grade lower than B- in any core course will be required to retake the course. Students are not required to retake elective courses even if a grade of B- or lower is received.

The minimum course load for first year graduate students each semester is two courses plus CHEM591/592 (Graduate Research) plus CHEM521/522 (Chemistry Symposia) plus a seminar [to be chosen from CHEM547/548 (Chemical Physics), 557/558 (Organic & Inorganic), or 587/588 (Biological Chemistry)]. In addition, all new graduate students must enroll in CHEM500 (graduate pedagogy) in the fall semester. Two or more failing grades in core courses during the first year will usually result in the student being asked to withdraw from the graduate program. Exceptions to this rule may be made by petition to the Graduate Committee.

In addition to core courses a student will be expected to pursue a broad range of studies throughout the entire time spent at Wesleyan. Knowledge well beyond the core-course level must be acquired not only in the areas of thesis research but also in a number of other, widely distributed areas. Details of individual programs will be determined by student-advisory committee consultation, but it is expected that this guideline will ordinarily lead to several advanced courses. Example elective courses include: Analytical Chemistry (CHEM317), Biomedical Chemistry (CHEM321), Introduction to Biomolecular Structure (CHEM325), Advanced Organic Synthesis (CHEM359), Chemistry of Materials and Nanomaterials (CHEM377), Practical NMR (CHEM382), and Molecular Modeling and Design (CHEM396). Note that not all elective courses are offered each academic year.

Research Rotations

Upon entering the program, first-year graduate students will be expected to become familiar with the research area of each faculty member and to register for CHEM591/592. This course will consist of three research rotations, each about a month in length, with three faculty members. Faculty who are not planning to accept new graduate students will state their intentions explicitly during orientation. Upon completion of each rotation, the student is required to write a formalized, concise summary of their goals and accomplishments during the rotation. Summaries must be completed within one week of finishing each rotation and must be approved and signed off on by the faculty member overseeing the rotation. These summaries will be reviewed at the first committee meeting for the first year graduate student in the spring semester and will be included in the graduate student's folder. The course will be graded on a Credit/Unsatisfactory (CR/U) basis and the three rotation directors will consult with the chair of the Graduate Committee to determine the grade.

Near the end of the fall semester, each student will be asked to indicate preferences for a research director. Occasionally, it may be impossible for a student to work with his/her first choice for a research director. A final decision will be based on what is best for all concerned. Research should be started during January following the first semester.

Advisory Committee

The Graduate Committee will appoint a three-member committee for each student after the research director has been chosen. This committee will be composed of, at a minimum, (1) the research director, (2) the chairman of the committee, whose field of competence should be in the same general area as that of the research director, and (3) a third member, whose field of competence should be in an area not represented by the other members of the committee. Students participating in the Molecular Biophysics or Chemical Physics programs may have additional requirements specific to those programs.

The committee, in consultation with the student, is responsible for evaluating progress at frequent intervals and for deciding details of the student's individual program within the broad guidelines of the department program. Meetings may be held whenever the student or the committee feels it desirable to do so. The committee is expected to meet at the beginning of each semester for the first two years and once per year thereafter. The graduate student is responsible for scheduling these committee meetings.

Teaching

A teaching assistantship (TA) is a major and serious responsibility, and teaching and assisting with courses are an integral part of the graduate program. Graduate students are expected to serve at least one year as a teaching assistant.

Prior to each fall and spring semester the chair of the Graduate Committee will consult with all faculty members requesting TAs for their course(s) and will assign each graduate TA to a given course depending on faculty, course, and departmental needs. Whenever possible, it is the goal of the Department to have each graduate student gain experience as a TA for both lecture and laboratory courses during their time in the graduate program. The department recognizes that not all courses with graduate TAs will have perfectly equitable TA workloads and that it is not possible to structure courses to have perfectly equitable workloads. TAing a variety of courses across the curriculum will help even out TA workloads, will further strengthen graduate student fundamentals in chemistry, and will provide greater opportunities for students to practice and improve their pedagogy in several types of learning environments.

Feedback will be provided to graduate students regarding their performance as a TA during each committee meeting. Feedback may come in a variety of forms, such as: formal TA evaluations provided to students by the faculty of a given course, written comments provided to Committee Members prior to a committee meeting, and/or consultation with the faculty member of a given course during a committee meeting. If there are areas of concern the faculty member of a given course may request a meeting with a student's committee at any time during the semester.

Good teaching is prized at Wesleyan. Every year, the Chemistry Department awards the Tishler prize to one outstanding teaching assistant in the program.

Oral Presentations

A student is expected to present at least once per year at one of the graduate seminars [Chemical Physics (CHEM547/548), Organic & Inorganic (CHEM557/558), or Biological Chemistry (CHEM587/588)], except when they are in their first year.

Proposals

Writing scientific proposals requires evaluation of the literature, integration of knowledge from several areas, formulation of scientific questions, design of a research project to answer those questions, scientific writing and the defense of a project proposal. Two proposals are written during the course of the program, one in the second year of the program on the proposed thesis topic (though the actual thesis scope may evolve) and a second in the fourth year of the program on an original research topic,

Below is a general timeline for the second and fourth year proposals. More specific details for each proposal can be found within the *Research Proposal Guidelines* link under the Ph.D. Program section of the Chemistry Department website.

Second Year Proposal.

- a. The proposal is to be submitted to the chemistry office by the last Friday in March of a student's second year.
- b. The oral defense of the proposal must be scheduled before the end of April. The Chemistry Department administrative aide will schedule the date and time of the oral defense in consultation with their committee members.
- c. Committee members will provide the student with a written evaluation of the proposal including any requests for revisions. This written evaluation will be given to the student within 2 days of completion of the oral defense. A copy of the written review will also be forwarded to the Chemistry Department administrative aid for inclusion in the student's folder.
- d. Any revisions requested must be completed within two weeks unless the committee agrees on a longer time period. The committee will respond with a final evaluation within two weeks of receiving the revised proposal.
- e. Evaluation of the oral defense of the proposal will occur during the defense itself.

Fourth Year Proposal.

- a. A one page pre-proposal is submitted to the committee by December 1st of the student's fourth year. All committee members must approve of the pre-proposal by December 9th.
- b. The fourth year proposal is to be submitted to the chemistry office by the first day of classes during the spring semester. No oral defense of the proposal is required.
- c. The student will receive three "anonymous" reviews of their proposal, one from each committee member. The advisory committee chair will collect the written reviews and

forward to the student within one month of receipt of the fourth year proposal. Written reviews will also be forwarded to the chemistry administrative aid for inclusion in the student's folder.

- d. Any revisions requested must be completed within two weeks unless the committee agrees on a longer time period. The committee will respond with a final evaluation within two weeks of receiving the revised proposal.

Progress Examinations

Progress examinations will be given at approximately monthly intervals during the fall and spring semester. These examinations, based on important recent literature, are intended to stimulate students to keep up with new developments and continue their educational growth, to foster critical reading of the literature, and are used by the faculty as one indicator of a student's performance. Exams consisting of reprints and questions will be available Friday at 4:30 p.m. and due Monday at 9:00 a.m. Progress examinations will have elementary and advanced sections. All students should answer both elementary sections and at least one advanced section of each examination. Answers to the Progress exam must be either written legibly or typed. The results of these examinations are solely for internal use within the department and will not be reported to the Registrar nor appear on a transcript.

Each progress exam will be classified into one of four categories: organic, inorganic, physical, or biochemistry, with the category determined by the faculty member writing the exam. Graduate students must pass 15 elementary exams including at least 2 exams from each of the four categories, and 7 advanced exams including at least 1 exam from each of the four categories.

Students should be able to complete their progress exams by the end of their second year. If a student has not completed their progress exams by the end of their second year then their committee has the option of granting a one-year extension.

Evaluation

A number of factors will be considered in evaluating a student's performance: (1) coursework, (2) oral presentations in classes and seminars, (3) breadth, depth, and continuing growth of knowledge, including performance on progress examinations, (4) quality of research accomplishments, (5) teaching and assisting, and (6) the second year proposal and its defense. The decision as to whether a student may become a candidate for the Ph.D. degree will be made by the end of the second year of residence, and usually soon after presentation and defense of the first proposal when a thorough evaluation of the student's progress is conducted. It is the responsibility of the advisory committee to notify a student when performance is unsatisfactory and, when improvement is not quickly forthcoming, to require that the student withdraw from the program.

Thesis

The department in February 1989 adopted the following procedure for the thesis defense.

- a. The student completes dissertation research in a form satisfactory to the mentor and writes the thesis.
- b. The thesis must first be approved by the thesis mentor.
- c. Once the mentor approves it, the thesis is distributed to the thesis committee and a copy is deposited in the departmental office.

- d. A closed seminar (thesis examination) is scheduled by the student in consultation with their committee members. Sufficient time must be allowed for the thesis committee to read the thesis. A minimum of one week after distribution is generally considered reasonable.
- e. The closed seminar involves a presentation of the dissertation research and examination by the thesis committee and any other members of the department who wish to attend. Questioning may extend to matters related to, but not raised in, the thesis, including implications of the research and future directions the research might take. The outcome of this will be one of the following:
 - i) Accept thesis unconditionally.
 - ii) Accept thesis with minor revisions, which must be approved by the thesis mentor.
 - iii) Major revisions in thesis are required, and another closed seminar is necessary at a later time to examine the revised thesis.
- f. Once the final approval of the thesis by the thesis committee has been secured, an open seminar is scheduled by the student for the presentation of the thesis in a research seminar to the Department.

Administration of Program

A faculty Graduate Committee, usually four in number, consisting of representatives from organic, physical, inorganic, and biochemistry, oversees the graduate program. The chair of the Graduate Committee has the responsibilities to see that the provisions of the Graduate Program are carried out, that there is substantial equity in the exercise of discretionary powers by the various advisory committees, and that the program is modified appropriately whenever the need for changes becomes apparent.

Chemical Physics Program

Students may opt at any time to be part of the chemical physics program, which is sponsored jointly with the Physics Department. The requirements of that program are similar to those of chemistry but include course requirements in Physics and the option of research in that department. Interested students should contact the chemistry representative of the chemical physics program, Prof. Stewart Novick, for details.

Molecular Biophysics Program

The Chemistry Department participates in an interdisciplinary program of graduate study in molecular biophysics (<http://www.wesleyan.edu/molbiophys>) with the Department of Molecular Biology and Biochemistry (MB&B) and the Department of Physics. The program provides a course of study and research that overlaps the disciplinary boundaries of chemistry, physics, biology and molecular biology, and is designed for students with undergraduate background in any one of these areas. Students in the program are enrolled in one of the participating departments and fulfill canonical requirements of that department. In addition, they take advanced courses in molecular biophysics and pursue dissertation research with one of the faculty in the program. Centerpieces of the program are the weekly interdepartmental journal club in molecular biophysics and the annual research retreat. Both activities bring together students, research associates and faculty from all participating departments, and foster interdisciplinary collaborative projects. Interested students should contact the chemistry representative of the molecular biophysics program, Prof. Erika Taylor, for details.