

**Second Year Requirement for Chemistry Ph.D. Students
Policies and Procedures**

Purpose

The goal of the second year requirement is for students to develop the critical-thinking skills that they need to be effective researchers in their chosen area of study.

Description

Every Ph.D. student in the Department is required to register for a minimum of two semesters prior to their fifth semester of residency in one of the following courses (according to the chosen major area).

Major Area	Course Number
Analytical Chemistry	A800
Biological Chemistry	B800
Inorganic Chemistry	N800
Materials Chemistry	M800
Organic Chemistry	R800
Physical Chemistry	P800

Each course is worth one credit hour. Thus each student will earn at least two credit hours from these courses. These credit hours do not count towards the total of 12 credit hours required to satisfy the major coursework requirements. Nor do they count towards the total 18 coursework credit hours required for a Ph.D. in chemistry.

Students will be assigned a letter grade for their second year requirement course at the end of each semester. In some cases a grade of R may be assigned and replaced by a letter grade on completion of the final semester of the course.

The details of the second year requirement vary depending upon the area of chemistry in which the student is majoring. Specific descriptions for each area are given at the end of this document.

Administration

- Communication to Students
 - All entering Ph.D. students in the Department will be given a copy of this “Policies and Procedures” document during their orientation.
 - During their second semester of residency, students will be reminded of the second year requirement and they will be instructed to register for the appropriate course.
 - At the end of the required course, students will be sent a statement of whether or not they have satisfied their second year requirement. Students who have satisfied the requirement will be instructed to make arrangements for their “fifth semester” candidacy exams. Students who have not satisfied the requirement will generally be informed that they must leave the Ph.D. program; it will often be possible for such students to transfer to the M.S. or the M.A.T. degree program.

Second Year Requirement Policies & Procedures

- Faculty Responsibility.
 - The instructor for each of the second year requirement courses will be the representative of that major area on the Graduate Standards Committee or an alternative designated faculty member in that area.
 - In most cases, implementation of the second year requirement course in a given area will be carried out collectively by all faculty members with substantial interests in that area of chemistry.
 - Recommendations regarding the assignment of instructors to the second year requirement courses will be made by the Director of Graduate Studies in consultation with the Graduate Standards Committee. These recommendations will be made early in each spring semester for the following academic year and will be communicated immediately to the Director of Undergraduate Studies and the Department Chair who will make the final teaching assignments and inform the Director of Graduate Studies of these assignments.

- Procedures for Changes to the Second Year Requirement
 - The general and area-specific details of the second year requirement courses have been developed after much thought and discussion and have been tailored to maximize the educational value of the courses for students in each major area. Nevertheless, occasional modifications of these courses are anticipated.
 - Minor changes that fall within the descriptions of the courses given herein may be made at the discretion of the course instructor without any administrative approval.
 - Any changes that result in the course no longer satisfying the written descriptions of the courses given herein will require the prior approval of the Graduate Standards Committee. In such cases, the following procedures are required.
 - (1) The course instructor must prepare a modified course description and this new description must be ratified by a majority of faculty members with substantial interests in that area of chemistry.
 - (2) The course instructor must present the modified course description (and the results of the area faculty vote) to the Graduate Standards Committee no later than April 30th of the academic year prior to the intended change being implemented. The Graduate Standards Committee will either approve or reject the proposed change.
 - (3) If the change is approved, the new course description will be incorporated into this “Policies and Procedures” document and all first-year Ph.D. students majoring in the relevant area will be sent a copy of the updated document.

Chemistry Ph.D. Second Year Requirement in Analytical Chemistry

Course Number: A800

Course Title: Analytical Chemistry Research Seminar

Credit Hours: 1 (may be taken repeatedly up to a maximum of 2 times)

Required Registration: Students majoring in Analytical Chemistry must enroll for A800 during their third and fourth semesters of residency.

Prerequisite (for Graduate Bulletin Publication): Satisfactory completion of the first-year requirements for graduate study in analytical chemistry or permission of the instructor

Brief Description (for Graduate Bulletin Publication): Evaluation of second year analytical chemistry students.

Goals

- (1) To familiarize students with a variety of areas of research in analytical chemistry
- (2) To enhance the abilities of students to read, understand and analyze critically analytical chemistry studies presented in seminars and in the literature
- (3) To maximize the benefit to students of attending analytical chemistry seminars
- (4) To provide students with the opportunity to meet and converse with some of the top scientists in the field of analytical chemistry.

Format

- (1) The class will meet for one hour each time an external speaker is scheduled to present a seminar in the analytical chemistry series.
- (2) Prior to each class meeting, students will read literature articles written by upcoming analytical chemistry seminar speakers and/or related articles and will prepare questions for speakers based on that preparation.
- (3) At each class meeting, students will pose prepared questions to the visiting speaker and will discuss issues of importance to them and to the field of analytical chemistry.
- (4) Students will be required to attend all relevant analytical chemistry seminars.

Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Quality of preparation for meetings with seminar speakers
- (2) Attendance of class meetings and analytical chemistry seminars
- (3) Participation in class discussions and in seminar series
- (4) Questions asked at analytical chemistry seminars
- (5) Written material or examinations as assigned by the instructor

Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Analytical Chemistry majors are required to pass A800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

Chemistry Ph.D. Second Year Requirement in Biological Chemistry

Course Number: B800

Course Title: Biological Chemistry Research Seminar

Credit Hours: 1 (may be taken repeatedly up to a maximum of 4 times)

Required Registration: Students majoring in Biological Chemistry must enroll for B800 during their third and fourth semesters of residency.

Prerequisite (for Graduate Bulletin Publication): Satisfactory completion of the first year requirements for graduate study in biological chemistry or permission of the instructor

Brief Description (for Graduate Bulletin Publication): The preparation and presentation of student research lectures based on current journals and other research literature in biological chemistry and related areas not closely related to the student's own research.

Goals

- (1) To familiarize students with a variety of areas of biochemical literature
- (2) To enhance the abilities of students to read, understand and analyze critically biochemical studies reported in the literature
- (3) To maximize the benefit to students of attending biochemistry seminars
- (4) To provide experience, guidance and critical feedback to students in the organization and oral presentation of literature seminars.

Format

- (1) The class will meet for one hour a minimum of ten times throughout the semester (or equivalent time).
- (2) Prior to each class meeting, students will read literature articles written by upcoming biochemistry seminar speakers and/or articles on current topics in biochemistry.
- (3) At each class meeting, one or more student(s) will present a summary of the assigned papers and the class will discuss the reported studies.
- (4) Students will be required to attend all relevant biochemistry seminars.

Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Attendance of class meetings and biochemistry seminars
- (2) Quality of literature analysis and presentation thereof
- (3) Participation in class discussions
- (4) Questions asked at biochemistry seminars
- (5) Written reports on literature and/or seminars

Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Biological Chemistry majors are required to pass B800 with an average GPA of 3.0 or better over the two semesters. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

Other Relevant Information

This course will typically be joint listed with Biochemistry program Course B600.

Chemistry Ph.D. Second Year Requirement in Inorganic Chemistry

Course Number: N800

Course Title: Inorganic Chemistry Research Seminar

Credit Hours: 1 (may be taken repeatedly up to a maximum of 4 times)

Required Registration: Students majoring in Inorganic Chemistry must enroll for N800 during their third and fourth semesters of residency.

Prerequisite (for Graduate Bulletin Publication): Satisfactory completion of the first year requirements for graduate study in inorganic chemistry or permission of the instructor

Brief Description (for Graduate Bulletin Publication): Preparation and presentation of second year inorganic chemistry research project.

Goals: Instruction on how to recognize national or local needs which can be advanced by chemistry, then develop creative and original approaches to such needs. Emphasis placed on case studies of past successes in such quests, as well as peer-critiqued writing of research proposals.

Format

- (1) Semester 1: Faculty lectures on principles of giving high quality research lectures, as well as principles of writing a research proposal, as distinct from a scientific publication: defense of speculative ideas, as well as conceiving of multiple approaches to a goal, to be strategically prepared for potential problems and the inevitable setbacks towards a goal. To illustrate these principles by historical precedent, student-led oral presentations will be chosen from among approximately 18 faculty-selected recent thematic research topics in inorganic chemistry, with analysis of how the topic developed, its goals, approaches and successes. Student presentation of a short research proposal, first orally, with critical comments invited, then transformed into a written research proposal (approx. 8 pages in length).
- (2) Semester 2: Further presentation and analysis of additional major modern inorganic, bioinorganic and materials chemistry research themes, with emphasis on instrumental techniques used for each, as well as the key insights which led to dramatic advances in a given competitive research group. Emphasis on creativity, originality, as well as on the evolutionary character of some discoveries. Drafting, then oral presentation of a larger scope research proposal, on a different topic from semester 1, followed by student criticism, then preparing of a written version, 15 pages in length, to be graded by a class peer as well as faculty.

Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Quality of both written and oral presentations.
- (2) Active questioning and discussion during class.

Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Inorganic Chemistry majors are required to pass N800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

Chemistry Ph.D. Second Year Requirement in Materials Chemistry

Course Number: M800

Course Title: Materials Chemistry Research Seminar

Credit Hours: 1 (may be taken repeatedly up to a maximum of 2 times)

Required Registration: Students majoring in Materials Chemistry must enroll for M800 during their third and fourth semesters of residency.

Prerequisite (for Graduate Bulletin Publication): Satisfactory completion of the first year requirements for graduate study in Materials chemistry or permission of the instructor

Brief Description (for Graduate Bulletin Publication): Preparation and presentation of student research lectures based on current journals and other research literature in Materials chemistry and related areas on topics not closely related to the student's own research.

Goals

- (1) To provide experience, guidance and critical feedback to students in the organization and oral presentation of literature seminars
- (2) To familiarize students with a variety of areas of the Materials chemistry literature
- (3) To enhance the abilities of students to read, understand and analyze critically Materials chemistry studies reported in the literature
- (4) To maximize the benefit to students of attending Materials chemistry seminars

Format

- (1) The class will meet for one hour a minimum of ten times throughout the semester (or equivalent time).
- (2) At each class meeting, one or more student(s) or a faculty member or a visitor will present a seminar on current Materials chemistry research
- (3) Each enrolled student will present one of these seminars, normally during the third semester of residence.
- (4) Students will be required to attend all relevant Materials chemistry seminars

Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Attendance of class meetings and Materials chemistry seminars
- (2) Quality of literature analysis and presentation thereof
- (3) Participation in class discussions

Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Materials Chemistry majors are required to pass M800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

Chemistry Ph.D. Second Year Requirement in Organic Chemistry

Course Number: R800

Course Title: Organic Chemistry Research Seminar

Credit Hours: 1 (may be taken repeatedly up to a maximum of 4 times)

Prerequisite (for Graduate Bulletin Publication): Satisfactory completion of the first year requirements for graduate study in organic chemistry, or permission of the instructor.

Brief Description (for Graduate Bulletin Publication): Major topics in the field of organic chemistry will be examined. A list of subjects will be provided at the beginning of the year.

Goals

- (1) To familiarize students with topics that are central to the discipline of organic chemistry.
- (2) To encourage and motivate predoctoral students for self-directed learning.
- (3) To develop problem-solving abilities which are considered fundamental skills for scientists in the field of organic chemistry.
- (4) To provide a broad knowledge base which integrates classroom teaching with the research literature.
- (5) To enhance opportunities for students to present the logic of scientific rationale and experimental design in a clearly understood and precise manner.

Format

- (1) Exams will be based on topics of current literature that have been published in journals featuring organic chemistry as well as classic problems in the field. A random listing of subjects and research journals to be covered will be posted at the beginning of each academic year during the first week of August.
- (2) Exams will be given in the evening of the last Monday of each month during the timeframe of May through November (seven times per calendar year).
- (3) Student exams will be graded as “satisfactory” or “unsatisfactory”. Over a two-year period, individuals can attempt 14 cumulative exams.
- (4) Students should begin taking these exams in May of their first year of residency and continue throughout their second year and into their third year if necessary. Students, who satisfactorily pass five exams, have completed the course requirement, and need not attempt all 14 exams.

Grade Assessment

Grades will be based upon the following criteria.

- (1) Students who finish the requirement of five passes in one cumulative exam session (May through November) will receive an A letter grade indicative of an outstanding to excellent overall performance.
- (2) Students who finish the requirement of five passes within the second session (14 attempts) will receive a B letter grade indicative of a good to excellent overall performance.
- (3) Students who fail to achieve five passes in 14 attempts will receive a C letter grade indicative of an unsatisfactory performance.
- (4) R grades will be posted, prior to completion of the requirement.

Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Organic Chemistry majors are required to pass R800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

Chemistry Ph.D. Second Year Requirement in Physical Chemistry

Course Number: P800

Course Title: Physical Chemistry Research Seminar

Credit Hours: 1 (may be taken repeatedly up to a maximum of 2 times)

Required Registration: Students majoring in Physical Chemistry must enroll for P800 during their third and fourth semesters of residency.

Prerequisite (for Graduate Bulletin Publication): Satisfactory completion of the first year requirements for graduate study in physical chemistry or permission of the instructor

Brief Description (for Graduate Bulletin Publication): Preparation and presentation of student research lectures based on current journals and other research literature in physical chemistry and related areas on topics not closely related to the student's own research.

Goals

- (1) To provide experience, guidance and critical feedback to students in the organization and oral presentation of literature seminars
- (2) To familiarize students with a variety of areas of the physical chemistry literature
- (3) To enhance the abilities of students to read, understand and analyze critically physical chemistry studies reported in the literature
- (4) To maximize the benefit to students of attending physical chemistry seminars

Format

- (1) The class will meet for one hour a minimum of ten times throughout the semester (or equivalent time).
- (2) At each class meeting, one or more student(s) or a faculty member or a visitor will present a seminar on current physical chemistry research
- (3) Each enrolled student will present one of these seminars, normally during the third semester of residence.
- (4) Students will be required to attend all relevant physical chemistry seminars

Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Attendance of class meetings and physical chemistry seminars
- (2) Quality of literature analysis and presentation thereof
- (3) Participation in class discussions

Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Physical Chemistry majors are required to pass P800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.