

The Ph.D. Program
in
Chemistry and Biochemistry
at
The University of Oklahoma

Fall 2023

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I. Table of Contents

I. Table of Contents.....	2
PREFACE.....	4
I. ADVISING.....	5
II. PROFICIENCY INSTRUMENTS.....	6
A. Before Arriving in August.....	6
B. Completing the Proficiency Instruments.....	7
C. Advising by the Instructors of Record.....	7
D. Optional Advising by Graduate Committee in September.....	7
I. ENGLISH LANGUAGE REQUIREMENTS.....	8
II. COURSE REQUIREMENTS.....	8
A. Course Nomenclature.....	8
B. Departmental Requirements.....	9
C. Lecture Course Requirements.....	11
D. Transfer Credit.....	12
E. Research Credit Hours.....	12
F. Total Number of Credit Hours.....	13
G. Petitions.....	13
H. The Advisory Conference Report (ACR).....	13
III. RESEARCH.....	14
A. Choice of Laboratory Rotation Supervisor.....	14
B. Choice of Ph.D. Advisor.....	15
C. Expectations.....	16

D. Alterations in the Student's Ph.D. Advisor(s) and/or Concentration of Study.....	17
IV. THE PH.D. ADVISORY COMMITTEE.....	18
A. The First Advisory Conference	18
B. Preliminary and General Examinations	18
C. Yearly Evaluation of Student Progress	18
D. Preparation and Defense of the Dissertation	18
V. YEARLY EVALUATION OF GRADUATE STUDENTS.....	19
VI. ACADEMIC MISCONDUCT.....	20
VII. PRELIMINARY EXAM.....	20
A. Purpose of Preliminary Exam:	20
B. Preliminary Exam Format	21
C. Preparation for Preliminary Exam	21
VIII. GENERAL EXAMINATION.....	23
XI. Ph.D. DISSERTATION.....	26
CONCENTRATION SPECIFIC REQUIREMENTS.....	29

PREFACE

The Ph.D. degree is awarded for academic excellence in research and scholarship, along with successfully completing a required program of courses. A Ph.D. degree is not only a result of spending time in its pursuit. It signifies the acquisition of a thorough and comprehensive understanding of a research area as well as the attainment of a high level of professional independence and competence. The Graduate College of The University of Oklahoma normally grants a Ph.D. degree only to an individual who does not already hold the Ph.D. or a similar degree.

A student should expect to spend approximately five years beyond the bachelor's degree in the pursuit of their Ph.D. degree. During this period of time, the student must: (1) successfully complete the appropriate coursework, (2) successfully complete the General Examination, and (3) submit and successfully defend the results of their original research that will be presented as a dissertation.

The purpose of this document is to describe the requirements for a student to be awarded a Ph.D. in the Department of Chemistry and Biochemistry. While a student is awarded a Ph.D. in “Chemistry and Biochemistry”, several “Concentrations” are available within the department for the students to choose from for their degree pursuit. Individual topics will be discussed in this handbook in the approximate order that students will encounter them. Thus, while the general requirements apply to every student, there are differences in curriculum composition for each specific concentration within the department. This document is intended to serve as a guide for successful matriculation in our Ph.D. program and should be carefully consulted as needed by students and faculty. Students should be aware that failure to fulfill any of the requirements set out in this handbook may result in them being separated from the Ph.D. program. The student must also completely and independently satisfy the requirements prescribed by the Graduate College at The University of Oklahoma. These requirements are given in the Graduate College Bulletin, which can be obtained from the graduate college ([Graduate College Bulletin \(ou.edu\)](http://graduatecollege.ou.edu)).

I. ADVISING

The Department of Chemistry and Biochemistry graduate committee will advise the first year graduate students before classes begin their first semester. The advising process is to help the new students to select the appropriate course work for the first semester and discuss any course limitations or deficiencies based on the transcripts from their bachelor's/master's degree. Entering graduate students who have not taken two semesters of General Chemistry and Organic Chemistry must take and pass the appropriate undergraduate courses offered by the University of Oklahoma and/or an appropriate Proficiency Exam. Entering graduate students who do not have Physical Chemistry (generally thermodynamics, kinetics and equilibrium) on their undergraduate transcript must take and pass a one credit hour Physical Chemistry course offered at the beginning of the Fall term. These deficiencies and the recommendations of the graduate committee to address them will be communicated to the department administrative office to be included in the student record. [Note: Undergraduate courses taken for remedial purposes cannot be used to satisfy either the 16-hour letter-graded course requirements described below, or the 90-hour total credits required for the doctoral degree (see Section IV for details on credit requirements).]

Students are typically advised to enroll in two introductory courses, from several concentration-specific areas that may be offered. Students must also enroll in other department specified courses such as Fundamentals I and Laboratory Rotations. After advising, the instructors of introductory (i.e., CHEM 5XYZ, where Y = 0-2) courses will assess their enrollments and administer the concentration proficiency instrument(s) (see Section II) at an appropriate time to assess whether the student is prepared for the introductory courses they are interested in taking. After administering the proficiency instrument(s), if it is established that the student is not adequately prepared for a course and they still wish to enroll in the course, the instructors will advise the student about remedial preparation that would be required to ready them for the course. The instructors will convey these recommendations to the department administrative office as appropriate. Based on these recommendations, the graduate committee will advise the student on appropriate coursework for the first semester.

At the end of the first semester, once a Ph.D. advisor (Section V.B.) is assigned and the student has selected a concentration of study, the student's Ph.D. advisor and/or a representative of the concentration will advise the student regarding the coursework that they should enroll in during the second semester.

At the end of the second semester, the student's Ph.D. advisory committee will advise the student regarding the remaining letter-graded coursework and the appropriate semester(s) in which the student should enroll in these courses. The student will use these recommendations to complete the Advisory Conference Report (ACR) form, which needs to be submitted to the graduate college for approval (see also Sections IV.C. and VI.A.). In this initial meeting, the Ph.D. advisory committee will also discuss the student's proposed research plan. [Note: any changes in course work as mentioned in the initial ACR will need to be updated by submitting an updated ACR form to the graduate college for approval.]

Thereafter, the graduate student will be advised/evaluated annually by their Ph.D. advisory committee during the Spring semester regarding curriculum and research progresses. As part of this evaluation, a letter recording the student progress in both course requirements and research aspects should be prepared, signed by all the committee members, and submitted to the department administrative office. This letter will be forwarded to the department graduate committee who will use these documents to provide the student the annual departmental evaluation letter (see also Section VI).

II. PROFICIENCY INSTRUMENTS

Students will have to make important decisions regarding their curriculum during the first semester (assuming a Fall admission). In September, about five weeks into the semester, the students will make a final decision on which two (or three) introductory (5XYZ, Y = 0-2) courses to enroll in, one of which should eventually be the concentration of their studies. The department provides several resources so that the student may make informed decisions about these course enrollments.

A. Before Arriving in August

Students who have formally accepted the offer to the departmental graduate program will receive the research description/syllabi of Introductory (5XYZ, Y = 0-2) courses that will be offered in the first semester, through an initial packet of information. Students are advised to examine these materials for the available Introductory (5XYZ, Y = 0-2) courses, keeping in mind that one of the areas will likely be a concentration of their study and at least one more of the concentrations will typically be required to satisfy the department's "breadth" course requirement (see Section IV.C.). Particular attention should be placed on the description of the proficiency

instrument(s) as the individual's background may require self-instruction (such as revisiting an undergraduate textbook) in order to demonstrate readiness to take the graduate course. Students are encouraged to contact the instructor of record should they have any questions about courses they may be interested in.

B. Completing the Proficiency Instruments

To assess the readiness of the students to be successful in the introductory level graduate courses offered in the first semester, proficiency instruments have been devised for the different concentrations. The proficiency instrument(s) are administered near the beginning of the first semester (typically within the first two weeks of the semester) and may comprise an examination or other methods for assessing student readiness for the first-semester coursework. This evaluation is administered by the faculty teaching the introductory course. The purpose of the proficiency instrument(s) is to establish the proficiency level of new students with respect to the Introductory (5XYZ, Y = 0-2) courses that are offered that semester. Proficiency (at the undergraduate level) of the entire subject may not be required to succeed in the corresponding graduate course. Students are only required to complete the proficiency instrument(s) in the areas in which they are interested in taking introductory coursework in their first semester (typically two or three classes). It is important that the student recognizes the importance of the proficiency instrument(s) and therefore prepares for them, so that the graduate committee and the instructor for the introductory course can accurately assess the strength of the student's background in various areas and hence can advise the student properly.

C. Advising by the Instructors of Record

If a student satisfies the proficiency instrument for a particular concentration, they can enroll in that introductory course without further advising from the instructor of record or the graduate committee. In the event that a student does not exhibit the required proficiency and they still wish to enroll in that course, the instructor of the corresponding introductory course will advise the student regarding possible remedial instruction to prepare for the introductory (5XYZ, Y = 0-2) courses during the first five weeks of the semester.

D. Optional Advising by Graduate Committee in September

If a student has not demonstrated proficiency in at least two concentrations' Introductory (5XYZ, Y = 0-2) coursework by the end of the fifth week of the semester, they should meet with the graduate committee for further advice.

Which introductory (5XYZ, Y = 0-2) courses a student will enroll in is entirely up to the

student; the opinions of the department graduate committee and the instructor(s) of record are entirely advisory, as are the results of the proficiency instrument(s). However, it behooves students to make use of all of the available resources to make informed decisions in a timely fashion (for example to make good use of the first five weeks of the semester to study subjects that they are interested in, but for which they do not have a strong background).

[Note: Students entering in the spring semester are required to meet with the graduate committee prior to the start of their first semester to discuss curriculum requirements and timelines.]

I. ENGLISH LANGUAGE REQUIREMENTS

A. According to the Graduate College Bulletin, any graduate student for whom English is not the native language must be certified as proficient in English before they may assume teaching duties that require direct communication with students. The English Training and Certification Services (ETCS) administers certification tests.

B. All students for whom English is not the native language are required by the Department of Chemistry and Biochemistry to demonstrate a suitable level of English proficiency. A level B certification ("Certified to Instruct") in the English tests administered by the ETCS of the university is required for the graduate students to teach laboratory and recitation classes. A graduate student must reach the minimum level of C ("Certified to Support") in the English tests at the start of the first semester to be able to provide instructional support to undergraduate courses, a role where the graduate student does not directly interact with the undergraduate students enrolled in a course. Students certified with a level of C on their initial English tests are expected to satisfy the "Certified to Instruct" level of certification by the end of their first semester. The "Certified to Instruct" level is required to qualify for regular teaching assistant duties in the department. In addition, "Certified to Instruct" is a prerequisite for the department's graduate students to take their General Examination (typically occurs in the fourth semester).

II. COURSE REQUIREMENTS

A. Course Nomenclature

Graduate courses in the Department of Chemistry and Biochemistry are denoted as CHEM 5XYZ, where X is the concentration of study, Y is the sequence number within that concentration (for Y

= 0-9), and Z is the integer that may reflect the number of credit hours as follows:

X =	0	Departmental Requirements
	1	Analytical
	2	Biochemistry
	3	Inorganic
	4	Organic
	5	Physical
	6	Chemical Education
	7	Structural Biology
	8	Materials Chemistry

Y =	0-2	Introductory Instruction (no graduate prerequisite)
	3-7	Advanced Instruction (beyond the introductory courses)
	8	Practicum
	9	Seminar

Z =	0-4	Credit Hours (modules)
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Within this numbering scheme, X=9 refers to graduate college-reserved course numbers; these are:

- CHEM 5960 Directed Readings
- CHEM 5980 Research for the Master's Thesis
- CHEM 5990 Independent Studies
- CHEM 6980 Research for the Doctoral Dissertation

The department of Chemistry and Biochemistry switched to a modular instruction format starting in 2015. Each semester (Fall and Spring) is divided into three modules, each lasting approximately 5 weeks. The graduate courses offered by the department can range from one to three modules, such that the students can choose from available modules to create a combination of courses that closely matches their academic and research requirements.

B. Departmental Requirements

Every graduate student in their first semester is required to complete Fundamentals I (CHEM 5011), two credit hours of letter-graded Laboratory Rotations (CHEM 5080), and two letter-graded, two-credit hour introductory courses (CHEM 5XY0, Y = 0-2). With the permission of the department graduate committee, well-prepared students may enroll in a third 5XY0 course (Y = 0-2) or through a petition process enroll immediately in advanced coursework 5XY0 course (Y = 3-7). Graduate students in their second semester are required to complete the letter-graded Fundamentals II (CHEM 5021) course. All students teaching general chemistry laboratories in their first semester must enroll in the Practicum in Chemical Education (CHEM 5001). International students entering in the fall who do not qualify to be certified to instruct may also be required to enroll in CHEM 5001. The requirement to enroll in CHEM 5001 may be waived by the Assistant Chair on a case-by-case basis for students who are assigned to teach non-general chemistry laboratories in their first semester.

After a graduate student's first semester, continuous enrollment and participation in an appropriate topical graduate seminar (Y= 9) is required until a student reaches either the 12-credit hour graduate seminar limit or 90 total graduate credit hours. Enrollment is optional after reaching one of these limits, but participation is still required as part of their graduate training if the student is a research assistant, teaching assistant, or receiving support through a University sponsored scholarship/fellowship. If a graduate student is participating in activities related to their degree program (e. g. internships, collaborative research, expeditions, etc.) that would necessitate the student's long term absence from the department during the appropriate seminar, enrollment may be waived on a semester-by-semester basis by successful petition to the graduate committee.

All graduate students must enroll and participate in the Departmental Colloquium (CHEM 5090) throughout the entire period of graduate study. All graduate students are required to attend all of the Karcher/Barton seminars. Enrollment is optional if the student is not a research assistant, teaching assistant, or receiving support through a university sponsored scholarship/fellowship. If a graduate student is participating in activities related to their degree program (e. g. internships, collaborative research, expeditions, etc.) that would necessitate the student's long term absence from the department during the appropriate seminar, enrollment may be waived on a semester-by-semester basis by successful petition to the graduate committee. In the first semester, graduate students are required to attend ten (10) seminars while enrolled in CHEM 5090. The attendance is monitored by the CHEM 5011 instructor of record. These seminars can be any combination of

general examination, dissertation defenses, CHEM 5X9Z ($X \neq 0$ Program seminars), departmental, Karcher/Barton seminars, research group meetings or literature club discussions.

C. Lecture Course Requirements

In addition to the departmental requirements (Section IV.B), every student must complete a minimum of sixteen (16) credit hours in letter-graded courses, which will be distributed into two different categories: "Core" and "Electives".

Core: These are concentration-specific courses that a student must complete based on concentration specifications. The specified list for each concentration is included in pages 29-36 of this document.

Electives: This category includes courses that may facilitate and/or enrich graduate student learning and research. Each concentration can provide a list of recommended courses to fulfill this requirement, which the students will use for consulting with their Ph.D. advisory committee to develop their 16 credit hour letter-graded course list (includes both core and elective). At least 1 course (2 credit hours) must come from within the department (CHEM) but from a concentration outside the student's core courses (i.e., an X different than the courses that are listed as the core courses for each concentration).

Students may take a course offered by an outside department at the University of Oklahoma to count towards their 16 credit hour, letter-graded courses. The first four out-of-department credit hours do not need prior approval from the department graduate committee if approved by their Ph.D. advisory committee. If more than four credit hours from outside the department will be used towards the required 16 credit hour letter-graded courses, students must get prior approval from both the student's Ph.D. advisory committee and the department graduate committee, even if the course is in their concentration's recommended list of courses. The proposed electives for each student should be approved by their Ph.D. advisory committee during their first annual evaluation (see Section VI.A.). The proposed coursework should be included with the annual evaluation materials submitted to the department administrative office, and this approved list will be used to fill in the Advisory Conference Report (ACR) to be done no later than the third semester (not including summers) in the program. Any further changes in the ACR form should be promptly updated and submitted to both the department administrative office and the graduate college.

A minimum grade point average of 3.0 (on a 4.0 scale) must be achieved for all approved

lecture coursework (X = 1-9 and Y = 0-8; e.g., does not include CHEM 5001, 5011, 5021, 5080), with not more than four credit hours with a grade below B. Failure to meet these requirements will result in the student being discontinued from the Ph.D. program in Chemistry and Biochemistry.

D. Transfer Credit

Graduate lecture course credits obtained from other institutions may be transferred to fulfill some of the above requirements or the 90-hour total credit requirement towards the Ph.D. degree (see Section IV. F below). As a first step, the student should consult the department administrative office about the verification process for acceptable courses for transfer. The student should then discuss with the graduate committee what would be required in a petition to have the transferred credit counted. Whenever possible, the corresponding University of Oklahoma course numbers should be clearly identified. The graduate committee may advise the student to first get written approval from faculty of the appropriate concentration of study and the student's Ph.D. advisory committee, which may typically request syllabi of the course(s) under consideration and other appropriate information needed to evaluate which OU course is equivalent to the course being transferred. The graduate committee will evaluate the submitted materials and make a decision on the course transfer request. If the petition is approved, the graduate committee will provide written documentation to that effect to be included in the student's file in the department administrative office. This documentation will specify the course and credit hour equivalencies to replace some of the 16 required credit hours of the letter-graded lecture courses or to count the transferred credit against the 90 credit hours required for graduation with a Ph.D. degree. The petition for course transfer should be done prior to the first annual evaluation meeting (typically during the student's second semester in the program, see Section VI.A.) such that the student's Ph.D. advisory committee can evaluate the make-up of the 16 concentration-specific letter-graded course hours and other departmental requirements that are needed to complete the ACR. The course(s) to be transferred should be incorporated into the ACR for final approval by the graduate college dean (see section IV.H.).

E. Research Credit Hours

A graduate student can start enrolling in CHEM 6980 (Research for the Doctoral Dissertation) during the semester in which they take their general examination. However, the department recommendation is to enroll in CHEM 6980 once the student has passed their general

exam. Once enrolled in CHEM 6980, continuous enrollment (at least 2 hours per semester, excluding summers, unless holding the dissertation defense during the summer semester) is required until finishing the Ph.D. program. A maximum of 9 hours of CHEM 5990 (Independent Studies) and 6 hours of CHEM 5960 (Directed Readings) can be applied towards the total 90-credit hours required for the Ph.D. degree (see Section IV.F.).

F. Total Number of Credit Hours

A minimum total of 90 graduate-level, post-baccalaureate credit hours is required for finishing the Ph.D. degree. No more than one-half of the credits for OU coursework, excluding Research for Doctoral Dissertation (6980), may be S/U-graded coursework.

G. Petitions

A student with special circumstances may petition to receive an exception to any departmental Ph.D. degree requirement(s) itemized in this document. Such a petition, submitted in writing, must be successively approved by the student's Ph.D. advisory committee (if appointed) and the graduate committee of the department, and should be acceptable to the graduate college. The petition must clearly specify the exception requested, including justification, and the modified requirement that will substitute for the original (e.g., different timetables to meet the departmental graduate program requirements, or use of different courses to fulfill the course requirements, etc.). The students should consult with the graduate committee for any deviations from the handbook, for example, before enrolling in a particular course. A previous approval of a particular course substitution may not constitute a precedence. The graduate committee, based on the justification provided by the student, evaluates each petition objectively on a case-by-case basis. The decision of the graduate committee is communicated to the student and conveyed to the department administrative office. The department's graduate liaison will use the information provided by the department administrative office to verify to the graduate college that appropriate procedures and rules have been followed. In addition, the student must provide copies of all graduate committee approved petitions when submitting paperwork to the graduate college.

H. The Advisory Conference Report (ACR)

The ACR form submitted to the graduate college documents the course and research curriculum the student plans to follow to complete the 90 credit hours required for graduating with a Ph.D. degree. This form will document the courses chosen to fulfill departmental and

concentration specific course requirements, and other research credit hours (independent studies, directed readings, and research for the doctoral dissertation) taken by the student. A completed form is submitted and approved by the graduate college no later than the student's third semester (not including summers) in the program. When submitting the ACR form to the graduate college, the student must append any approved petitions from the graduate committee if the student deviated from any requirements as specified in this handbook. The department graduate liaison and the graduate college use these approvals to evaluate and approve the ACR form. Students are encouraged to consult with the department administrative office before submission of the ACR form to ensure that they are meeting both the departmental and graduate college guidelines. Approval of the ACR by the graduate college is also essential to officially establish the student's Ph.D. advisory committee. Any subsequent amendments of this report, (for example, change in course work or course credits), requires an updated Advisory Conference Report form. These forms are available on the graduate college website (<https://www.ou.edu/gradcollege/forms-and-policies/forms>).

III. RESEARCH

The demonstrated ability to perform original and independent research is the single most important aspect of a graduate education in Chemistry and Biochemistry. This includes designing and conducting studies, evaluating the data collected/obtained, considering previously published work, and formulating and presenting valid conclusions. The Dissertation (see Section XI below) represents the essential demonstration of this ability.

A. Choice of Laboratory Rotation Supervisor

To ensure that new students are fully informed about the research opportunities available in the department, all graduate students entering in the Fall semester are required to attend a series of short talks at the beginning of the semester. Each faculty member describes the research projects that are under investigation in their lab in these talks. Attendance at these brief talks is mandatory, and attendance will be taken. In addition to the talks, a list of available laboratory rotation projects will be distributed. Students are encouraged to speak with prospective laboratory rotation supervisors, and will be asked to submit a prioritized list of selected projects to the graduate committee. The graduate committee chair will forward placement recommendations to the department chair and committee A. Committee A and the chair will approve placement of

each graduate student in two different rotation laboratories, with each lab rotation typically lasting a period of seven weeks. At the end of each rotation, a report approved by faculty sponsoring the rotation is to be submitted to the instructor of record for CHEM 5080 Laboratory Rotations. Students will be given an opportunity (approximately two weeks before the start of the second rotation) to reprioritize their list of selected projects, which may arise due to evolving changes in their research interests. These requests will be honored in so far as is possible and as approved by the graduate committee, the department chair, and committee A. Requests for both the rotations to be performed in the same laboratory will not be honored. In rare cases, a student may request a third and final rotation opportunity during the start of their second semester. This request will be considered by the graduate committee and the recommendation will be forwarded to the department chair for approval.

B. Choice of Ph.D. Advisor

A student has to submit to the department administrative office three choices of Ph.D. advisors, in the order of their preference towards the end of the first semester. To make informed decisions regarding the Ph.D. advisors, graduate students in our doctoral program should make an appointment with at least three prospective Ph.D. advisors to discuss in more detail the nature of their research and the specific dissertation projects that are available. The faculty who are willing to serve as Ph.D. advisors may or may not have participated in the short talks at the beginning of the semester or in laboratory rotations. Thus, the students are encouraged to refer to the departmental faculty list and schedule individual faculty meetings to explore all their research interests. At the conclusion of each meeting, the student should obtain the professor's signature on the appropriate form provided by the department administrative office. After obtaining a minimum of three signatures, the student must indicate their selected concentration of study and three choices for a Ph.D. advisor in the order of their preference. The selected professors do not have to be formally affiliated with the chosen concentration of study or be one of their laboratory rotation supervisors. The list will be reviewed by the graduate committee, which will forward its recommendations to the department chair and committee A. The graduate committee makes its recommendations based on the preference level indicated by the student for each faculty and available openings for a particular laboratory. Subject to the consent of the faculty member, the department chair (in consultations with committee A) will make the assignment of the student to a Ph.D. advisor who will typically serve as the chair of that student's Ph.D. advisory committee.

In some cases, a student may request a Ph.D. advisor and a co-advisor, who will typically serve as a co-chair of that student's Ph.D. advisory committee. This occurs when the dissertation project of a student draws heavily on the expertise and guidance of more than one advisor. Until the process of placing a student into a research laboratory is finished, a student is not formally assigned to work with a Ph.D. advisor. This process must be completed by the end of the first semester of enrollment, unless given an exception by a successful request for a third rotation. Not finalizing the choice of Ph.D. advisor in a timely fashion may result in delays in fulfilling other curriculum requirements, which may lead to a termination from the program.

C. Expectations

The Ph.D. degree in Chemistry and Biochemistry is a research-based degree. Entering graduate students begin research work in their first semester while participating in two Laboratory Rotations (CHEM5080). Intensive activity in the laboratory, including evaluating the relevant scientific literature, will provide a much more realistic context for the lectures and seminars in which the student will participate.

Research productivity is not measured by the total number of hours spent in the lab and/or studying of science, but by the demonstrable (i.e., publishable, or worthy of inclusion in a dissertation) research accomplishments. This somewhat subtle distinction is sometimes overlooked or forgotten, and students may suddenly become aware that considerable time has gone by with little or no demonstrable progress. Consequently, it is important to recognize from the beginning that the amount of time spent in graduate school is dictated primarily by the student and by how disciplined their work habits are. It should also be noted that the time between semesters does not constitute vacation time, but rather an opportunity to make progress in research without the competing time demands of coursework and teaching responsibilities.

The progress in each graduate student's concentration of study is evaluated during each year of their enrollment in the graduate program in Chemistry and Biochemistry, including the first year. Such documentation will be incorporated into the Annual Progress Report (see Section VII below) that is submitted each year in April.

Graduate students are expected to complete their doctoral degree requirements and dissertation by the end of their fifth year. It is recognized, however, that because of the intrinsic unpredictable nature of research, additional time may be required. The department does not guarantee teaching assistant support after the first year. From the second year, the graduate

students are supported by several mechanisms such as graduate research assistantship, graduate teaching assistantship, individual fellowships, or a combination of these mechanisms. The general expectation by the department is for the graduate students to be supported on faculty research grants or individual fellowships beginning their first summer.

D. Alterations in the Student's Ph.D. Advisor(s) and/or Concentration of Study

A student may change their concentration of study and/or Ph.D. advisor(s). This would normally occur when the student's major research or career interests has changed, or a situation arises when a change in the Ph.D. advisor(s) will positively influence the graduate trajectory of the student. Firstly, if the student is interested in changing their Ph.D. advisor(s), they should meet with the department graduate committee and/or other appropriate departmental representative to ascertain proper procedures to follow. The procedure will include such actions as the student informing the current Ph.D. advisor(s) about the change, arranging for a potential new mentor, and an evaluative period during which the student will work in the potential mentor's laboratory to meet a set of preapproved goals and evaluation criteria. Subject to the consent of the newly requested Ph.D. advisor(s), the student should make a formal petition to the graduate committee. After approval from the graduate committee, the department chair, in consultation with committee A, will make a change in the assignment of the Ph.D. advisor(s). It should be noted that each request for a change in Ph.D. advisor(s) may represent a unique situation and the set of guidelines established to process this request will be catered to meet the demands of each situation.

If the student seeks to change their concentration of study, a plan for meeting the candidacy requirements of the new concentration of study must be approved by the student's Ph.D. advisory committee. If the student already finished the candidacy requirements in the previous concentration, the suitability of using this to meet the candidacy requirements of the new concentration should be assessed and approved by both the student's Ph.D. advisory committee and the department graduate committee. Documents noting the change and its final approval must be filed with the department administrative office. All of these steps must be completed before the change is considered official. The Advisory Conference Report, if on file in the graduate college, must also be amended using the appropriate form.

IV. THE PH.D. ADVISORY COMMITTEE

Students form their Ph.D. advisory committee during their second semester (not including summers) in the program. Until the formation of this committee, the department graduate committee serves as their advisory committee. The Ph.D. advisory committee consists of at least three graduate faculty members from the Department of Chemistry and Biochemistry, and at least one member from outside the department, who will serve as the graduate college representative. The members are normally selected by the student in consultation with their Ph.D. advisor(s) who also serves as the chair (or co-chairs) of the student's advisory committee. There are four primary functions of this committee:

A. The First Advisory Conference

Within the second semester (not including summers) of enrollment, the student must arrange a meeting with their Ph.D. advisory committee to plan their graduate program curriculum. Note that by this time the student must have selected their Ph.D. advisor(s) (Section V.B.) and a concentration of study. During this meeting, the student will discuss with the Ph.D. advisory committee and develop the plan to fulfil the 16-letter graded, concentration-specific course hours. The approved list should be filed with the department administrative office and should be used as a guide to complete the ACR form from the graduate college (see Section IV.H.).

B. Preliminary and General Examinations

The Ph.D. advisory committee will supervise the student's preliminary and general examinations (Sections IX and X). Following the preliminary exam, the ACR form (see Section IV.H.), amended as necessary, should be submitted to the graduate college, which will trigger an approval process requiring signatures from all the members of the Ph.D. advisory committee and the department's graduate liaison.

C. Yearly Evaluation of Student Progress

Each year during the student's graduate career, the Ph.D. advisory committee will be responsible for evaluating the progress of the student and recommending appropriate courses of action based upon their progress (Section VII).

D. Preparation and Defense of the Dissertation

Although the Ph.D. advisor(s) will be most closely involved in this process, the entire advisory committee is responsible for supervising the preparation and conducting the defense of the Ph.D. Dissertation (Section XI). The student is responsible for making sure their most recent

ACR is accurate and up to date the semester prior to holding their dissertation defense. They are encouraged to compare records with the department administrative office. The student must submit a Request for Degree Check to the graduate college within the required due date in their final semester.

V. YEARLY EVALUATION OF GRADUATE STUDENTS

The performance of all graduate students will be reviewed annually to ensure that appropriate progress toward the degree is being achieved. The first step in the evaluation will be performed by the Ph.D. advisory committee at an annual meeting, arranged by the student and held prior to the end of the Spring semester. The presence of the outside department member (i.e., the graduate college representative) is mandatory for all annual evaluation meetings. The student will supply all the members with a research and general progress report using the Annual Graduate Student Advising Form (emailed to the students by the department) one week prior to their advisory meeting. Based upon this material, the Ph.D. advisor(s), on behalf of the Ph.D. advisory committee, will prepare a written evaluation to be signed by all committee members. If warranted by discussions during the advisory meetings, a modified evaluation will be written by the Ph.D. advisor(s) and subsequently signed by all committee members. These documents must then be filed with the department administrative office for the second step of evaluation by the graduate committee to ensure student's continued enrollment in the graduate program and securement of financial support (if applicable). Based on these documents and any other pertinent information, the department graduate committee will evaluate the progress of each student. The results of the evaluation will then be given to each student in writing. The graduate committee would normally classify the student's progress in one of the following categories:

1. The student's progress is satisfactory, and the student should continue with the Ph.D. program.
2. The student's progress is marginal, and specific courses of action will be required to gain satisfactory standing.
3. The student's progress is unsatisfactory. An unsatisfactory evaluation results in a student being eligible for separation from the Ph.D. program. Depending on the exact reasons and circumstances for the unsatisfactory evaluation, the graduate committee may recommend options ranging from, but not limited to, specific steps needed to address

deficiencies, obtaining the M. S. degree first and reapplying to the Ph.D. program, obtaining the M. S. degree if possible and leaving the program, or termination from the graduate program in the department of Chemistry and Biochemistry. If the recommendation involves a terminal degree change or termination from the program, the graduate committee will forward the recommendation to the department chair and committee A for final action.

VI. ACADEMIC MISCONDUCT

The Student Code specifies the responsibilities and conduct of students at OU, and it is the responsibility of each student to be familiar with the definitions, policies, and procedures concerning academic misconduct. The Student Conduct Policies are available at <https://www.ou.edu/studentconduct/students-rights-and-responsibilities>. The definition of academic misconduct is as follows:

Academic misconduct includes (a) cheating (using unauthorized materials, information, or study aids in any academic exercise), plagiarism, falsification of records, unauthorized possession of examinations, intimidation, and any and all other actions that may improperly affect the evaluation of a student's academic performance or achievement; (b) assisting others in any such act; and (c) attempts to engage in such acts.

Of particular note for chemists and biochemists in training is the issue of citation, and it is important that Chemistry and Biochemistry students understand, before they write their research proposition and dissertation, that any facts, conclusions, or ideas that are extracted from another paper or source must be properly referenced back to their source. In addition, verbatim usage of another author's text—even when it is from within the same research group—must be placed in quotes with proper citation. Failure to do so constitutes plagiarism. Simply combining extensive quotes from existing sources without providing original organization and argumentation also constitutes plagiarism. Professional ethics demands proper citation in all papers and presentations as well as originality of the content.

VII. PRELIMINARY EXAM

A. Purpose of Preliminary Exam:

The preliminary exam is *not* another general exam but is meant to assess the student's readiness for the general exam. It will also aid the student in preparing for the general exam. The

examination will be based on the presentation and analysis of a research paper in the area of the student's research project. The student's Ph.D. advisory committee will examine each student in two primary areas:

1. The student's competence on knowledge of the science in and relevant to the paper (i.e., the general area of their research project).
2. The student's potential to succeed in the general exam in the areas of critical thinking and oral communication.

Topic Selection, Scheduling, and Committee composition: An oral examination will be conducted by faculty of the student's Ph.D. advisory committee (see B.1. below) no later than the end of the third semester (not including summers) from the time they entered the program.

1. The student and their Ph.D. advisor(s) will choose two or more papers from which the Ph.D. advisory committee will select one on which the student will be examined.
2. The papers must be submitted to the Ph.D. advisory committee no later than the 6th week of the semester (Fall and Spring only). The committee will notify the student of their choice within one week.
3. *At least three* members of the Ph.D. advisory committee must be present for the exam to proceed. These members must include the student's Ph.D. advisor(s) and two other Chemistry and Biochemistry faculty.
4. Students are encouraged to submit their papers to their Ph.D. advisory committee and schedule their preliminary exam early in the semester.

B. Preliminary Exam Format

The exam will comprise of a short (~20-40 minutes) oral presentation on the paper that summarizes and analyzes key results and identifies its importance to the field, followed by addressing questions posed by the faculty related to, but not limited to, the paper. For scheduling purposes, the student should allow at least two (2) hours for the oral presentation and subsequent question/answer period.

C. Preparation for Preliminary Exam

Students should prepare by reading and understanding the paper they chose for the preliminary exam. They should also read relevant related papers, especially those that are cited in their primary paper (e.g., reviews, important preliminary communications, important papers by

competitors, etc.). Students should demonstrate knowledge and a critical understanding of fundamental chemical/biochemical principles, concepts, and methods. The oral presentation should be prepared in the manner of a scientific talk (e.g., PowerPoint, Keynote, etc.). Students should understand and be able to explain all experimental details in the paper (i.e., spectroscopic techniques, synthetic methods, activity, and cellular assays etc.).

E. Possible Outcomes: There will be three possible outcomes of the exam:

1. **Pass;** advance to the general exam.
2. **Deferred;** the student was found deficient in one or more aspects of the exam and will address the deficiency according to a plan of action determined by the Ph.D. advisory committee. A deferral does not constitute completion of the preliminary exam requirement. If a deferral occurs near the end of a semester and will not be completed until the following semester, the student must petition the graduate committee for an extension of time to complete the preliminary exam requirement detailing why the requirement could not be met. If approved, the deferred exam is still considered to have taken place in the semester it was started, and it is expected that the general exam requirement will be fulfilled accordingly.
3. **Fail;** the student will leave the Ph.D. program. The student may continue in the Master's program.

If the Ph.D. advisory committee vote on the outcome of the exam is tied (Pass/Deferred or Deferred/Fail), the result of the exam shall be a "Deferred" decision.

A student may take the preliminary exam earlier than their third regular (non-summer) semester if their Ph.D. advisory committee agrees to it. If the student passes, they may take the general exam earlier than the fourth regular semester if their Ph.D. advisory committee agrees to it; but they are not required to take their general exam early simply because they passed their preliminary exam early. In the case where a student passes the preliminary exam early but did not get permission from their Ph.D. advisory committee to take the general exam early, it will be expected the student returns to the normal general exam schedule, with the first attempt during the fourth, non-summer, semester.

VIII. GENERAL EXAMINATION

During the normal progression of graduate curriculum, the student will attempt the general exam in their fourth, non-summer, semester since enrolling into the graduate program. This usually is the semester following the student passing the preliminary exam, except if the preliminary exam is taken early. Any delay beyond the fourth semester will require a petition approved by the graduate committee. The purpose of the general examination is for the student to demonstrate their proficiency in developing original research idea(s) independently and defending them competently in both written and oral formats before their Ph.D. advisory committee. Specific guidelines need to be followed for each of the following steps:

- A. Selection of the research topic
- B. Approval of the research topic by the Ph.D. advisory committee
- C. Development of the written proposal
- D. Oral defense of the proposed research

In addition to the specific departmental guidelines, the student is expected to familiarize themselves with the graduate college regulations regarding the general exam, such as fulfilling the course credit requirements, performing an Advisory Conference Report (ACR) check, and applying using the General Exam Authority Report Form, within the stipulated timeline as specified by the graduate college.

A. Selection of the Research Topic:

The student should critically analyze literature and independently identify scientific questions or challenges in the field that represent significant research questions. Addressing these questions or challenges should positively impact a field that aligns with the student's research concentration. The students can choose a topic either from (i) their own research area or (ii) an unrelated topic. The student should discuss with their Ph.D. advisor(s) on these two possibilities and should together identify the best option for the student. The student is encouraged to discuss their topic with other committee members to ensure the topic's viability. Once the student finalizes the topic, it should be developed into 2-3 specific aims. It is recommended that each specific aim be testable with a hypothesis. For each specific aim, the student should develop an approach that will directly test the hypothesis and articulate how the planned experiments' results will be analyzed to address the selected research questions or challenges.

B. Approval of the Research Topic by the Ph.D. Advisory Committee:

The selected research question and the specific aims should be prepared in the format of a National Institutes of Health (NIH) specific aims page or a National Science Foundation (NSF) project summary page. The committee will evaluate this document, which can have three outcomes:

- (1) Committee approves the page as it is.
- (2) Committee asks for clarifications on aims/background/methodology or any other aspect to help them assess the appropriateness of the topic.
- (3) Committee rejects the page.

For situation (1), the student can proceed to developing the written proposal. For situation (2), if the committee's questions are satisfactorily addressed by the student in a documented format, the committee will approve the proposed research topic, and the student can proceed to writing the proposal. If the committee does not approve the topic based on the additional information provided, this will fall into situation (3). For situation (3), the student is expected to receive feedback from the committee, go back to step A, and develop a new specific aims/project summary page. There will be only two chances for the student to develop a topic for approval by the committee. Approval can be done by an in-person/zoom committee meeting (desired format) or by approval of the specific aims/project summary over email communications between the student and the committee (less desirable). If a student is unable to get the specific aims/project summary approved on the second try, this will constitute a failure in the general exam. The Ph.D. advisory committee should communicate the result with the graduate college. The student has an opportunity to request attempting the general examination a second time following the graduate college guidelines (see graduate college bulletin for details).

C. Development of the Written Proposal:

The students should develop the specific aims/project summary page into a full research proposal. The student is encouraged to work with their Ph.D. advisor(s) on proposal planning and execution, such that the Ph.D. advisor(s) can use this opportunity to train the student in scientific writing. The student should discuss with the committee about the expected proposal format (usually following NIH R01 or NSF regular proposal guidelines) and any other specific expectations the committee may have during the topic approval step of the General Exam. The student should also inquire at this time if the committee can provide informal feedback before submitting the final written document to the committee, which is due at least two weeks prior to

the oral exam date. The informal feedback is entirely dependent on the availability of the committee members and is not a mandatory requirement. A general timeline to submit the written proposal for informal feedback is four weeks before the oral defense date.

There are three possible outcomes for the written exam:

- (1) **Pass:** the committee approves the final proposal, and the student can now proceed to the oral exam
- (2) **Abeyance:** the committee finds that the proposal quality is marginal, but not unsatisfactory
- (3) **Fail:** the proposal quality is unsatisfactory

If the committee selects abeyance (outcome #2), they can request the graduate college to hold the result in abeyance. The documentation for this request should contain the additional work to be performed by the student and the specific time period to finish the additional work. If the student fails (outcome #3) the written examination, they may request one more attempt to retake the general examination. The decision of abeyance/failure should be indicated in the "General Exam Authority Report Form" and the report should be submitted to the graduate college within 72 hours of this decision. The requests to the graduate college for abeyance or for a second chance to take the general exam should have approval from both the student's Ph.D. advisory committee and the graduate liaison. Note that passing the written part of the general exam is a prerequisite for conducting the oral exam. This decision can be made by the committee on the day of the oral exam before proceeding to the oral defense or through email communications before the oral exam date.

D. Oral Defense of the Proposed Research:

The student should fix a date for the oral exam well in advance to ensure that all their committee members can attend the exam. A suggested timeline is to fix this as soon as the topic is approved. On the day of the oral exam, if it is not done already, the committee should first evaluate if the student has passed the written part of the general exam. If the committee decides that the student has passed the written part (i.e., prepared a satisfactory full written proposal), they can proceed to the oral examination. The oral exam is typically conducted for a duration of 1.5 to 3 hours. During the oral exam, the student presents the research project covering aspects such as significance of the proposed work and in-depth presentation of each of the specific aims including methodology, data analysis and interpretation, potential issues/failures, expected outcome and how the outcomes will drive future studies. Students can also expect to be evaluated on the fundamental

concepts essential for the chosen field.

There are three possible outcomes for the oral exam:

- (1) **Pass:** If the student successfully defends the proposal and adequately addresses the committee's questions during the oral exam, the committee will determine that the student passed the general examination and has now advanced to the candidacy for their Ph.D. study.
- (2) **Abeyance:** If the committee finds marginal weaknesses in one or more aspects of the oral presentation, they will decide to hold the exam in abeyance and propose a course of action to rectify the weakness within a suggested time. The proposed actions may require the student to provide additional materials in the form of a written report or another (short) oral exam to address the committee's particular and limited concerns during the first exam. It should be noted that since the student already passed the written exam before proceeding to the oral exam, the committee cannot task the student with writing a full-length proposal as a solution for abeyance. If the additional work is deemed not sufficient by the committee to rectify the weakness, the student will fail (outcome #3) the general exam.
- (3) **Fail:** If the student showed severe deficiencies during the oral exam, the committee will determine that the student failed the general exam. The student may request a second and final chance to repeat all aspects of the general examination.

The decision of pass/abeyance/failure should be indicated in the "General Exam Authority Report Form" and the report should be submitted to the graduate college within 72 hours of the exam. The requests submitted to the graduate college for abeyance or for a second chance to take the general exam should have approval from both the Ph.D. advisory committee and the graduate liaison. The graduate college Dean will evaluate the request and make the final decision on abeyance and permission to retake the general examination.

Please note that with regards to departmental requirements an "abeyance" that goes beyond the semester in which the exam was started does not fulfill the requirement that the general exam be completed in a specific semester. The student must therefore also successfully petition the graduate committee for an extension of time to complete the general exam requirement.

XI. Ph.D. DISSERTATION

Following completion of the general examination, the student normally concentrates upon original research that will contribute to creating new knowledge, and, in the process, demonstrates both a mastery of the research methods and tools of the appropriate field, as well as addressing significant scientific problems and arriving at successful conclusions. In consultation with the Ph.D. advisor(s), this process culminates in the writing of the Ph.D. Dissertation. Instructions for the format of the dissertation are available from the graduate college (<https://www.ou.edu/content/dam/gradcollege/docs/gc-thesis-dissertation-instruction-packet.pdf>). At least four weeks before the dissertation defense, a reading copy must be submitted to the student's Ph.D. advisory committee. The student also arranges a date, time, and place for the dissertation defense so that all members of the Ph.D. advisory committee can attend. It is advised that the student schedule this early on in the semester to find a convenient time for all the members to attend the defense and also to plan the timeline to finish writing the dissertation. Based on the existing graduate college guidelines during the preparation of this document, the student must submit the Report of Reading Copy Submission and Request for Authority to Defend form to the graduate college at least ten (10) working days prior to the defense and no later than the end of the semester deadline set by the graduate college.

The dissertation defense will require the candidate to demonstrate the expected depth of critical knowledge of the subject area through a presentation of major portions of the dissertation research in a public seminar followed by questioning by the public and the Ph.D. advisory committee. For the dissertation defense aspect, the candidate must answer questions that pertain to the key aims and advances of the work described, the methodology used in the work, the critical analysis of the supported conclusions and the structure and organization of the dissertation itself.

The Authority Report Form, obtained from the graduate college and brought to the exam by the student, must be completed and returned to the graduate college within 72 hours following the completion of this process. Deadlines for these requirements, which are coupled to the date of graduation for each specific semester, are given in the current class schedule for each semester. The successful student must submit the dissertation electronically on the SHAREOK website as instructed in the Graduate College Bulletin according to the deadlines established by the graduate college. The student should also discuss with the Ph.D. advisor(s) the requirement of a dissertation embargo ahead of time and choose the appropriate options in SHAREOK during

submission of their dissertation.

In addition to the above, there are several requirements specified by the graduate college for students defending their Ph.D. dissertation (details can be found at <https://www.ou.edu/gradcollege/forms-and-policies/graduate-college-bulletin#info-doc-students>). The student must be enrolled in at least two credit hours of CHEM 6980 at OU in the semester that the dissertation is defended. A waiver for not enrolling in the concentration seminar/departmental colloquium during the last semester may be obtained through petition to the department graduate committee. The student should make any updates as necessary to the Advisory Conference Report form, perform a degree check and obtain the Authority to Defend form from the graduate college following the timelines specified for each of these processes by the graduate college. Also, the student must complete the Application for Graduation to graduate during the correct semester.

CONCENTRATION SPECIFIC REQUIREMENTS

ANALYTICAL CHEMISTRY

A minimum of 16 credit hours in letter-graded courses through a combination of core and electives.

Category	Course Number	Credit Hours
Core	CHEM 5100 Instrumental Methods of Analysis	2 hrs
	CHEM 5110 Spectroscopic Chemical Analysis	3 hrs
	CHEM 5120 Separation Methods	3 hrs
Electives	Additional 5000 and/or 6000 coursework: minimum of 8 hours of coursework as approved by the student's Ph.D. advisory committee so that the total number of letter-graded hours of core and electives combined equals a minimum of 16 hours. The additional coursework may include other concentrations in CHEM; out-of-department coursework; or transfer credits from accredited college or university. At least 1 course (2 credit hours) must come from within the department (CHEM) but from a concentration outside the student's core courses.	8+ hrs
Seminar	Continuous enrollment and satisfactory participation in CHEM 5191 during every regular fall and spring semester following the first semester.	1-12 hrs

BIOCHEMISTRY

A minimum of 16 credit hours in letter-graded courses through a combination of core and electives.

Category	Course Number	Credit Hours
Core	CHEM 5200 Principles of Biochemistry CHEM 5210 Molecular Biology CHEM 5240 Biochemical and Biophysical Methods	2 hrs 2 hrs 2 hrs
Electives	Additional 5000 and/or 6000 coursework: minimum of 10 hours of coursework as approved by the student's Ph.D. advisory committee so that the total number of letter-graded hours of core and electives combined equals a minimum of 16 hours. The additional coursework may include other concentrations in CHEM; out-of-department coursework; or transfer credits from accredited college or university. At least 1 course (2 credit hours) must come from within the department (CHEM) but from a concentration outside the student's core courses (the structural biology concentration (57YZ, except CHEM5730 – Macromolecular Crystallography) cannot fulfill this 1 course requirement but can fulfill other elective hours).	10+ hrs
Seminar	Continuous enrollment and satisfactory participation in CHEM 5291 during every regular fall and spring semester following the first semester.	1-12 hrs

INORGANIC

A minimum of 16 credit hours in letter-graded courses through a combination of core and electives.

Category	Course Number	Credit Hours
Core	Enrollment in any combination of the following 3 courses to equal a minimum of 5 hours: CHEM 5300 Intermediate Inorganic Chemistry, and/or CHEM 5330 Advanced Inorganic Chemistry, and/or CHEM 5360 Frontiers in Inorganic Chemistry	 2 hrs 2-3 hrs 2-3 hrs
Electives	Additional 5000 and/or 6000 coursework: minimum of 8 hours of coursework as approved by the student's Ph.D. advisory committee so that the total number of letter-graded hours of core and electives combined equals a minimum of 16 hours. The additional coursework may include other concentrations in CHEM; out-of-department coursework; or transfer credits from accredited college or university. At least 1 course (2 credit hours) must come from within the department (CHEM) but from a concentration outside the student's core courses.	8+ hrs
Seminar	Continuous enrollment and satisfactory participation in CHEM 5391 during every regular fall and spring semester following the first semester.	1-12 hrs

MATERIALS CHEMISTRY

A minimum of 16 credit hours in letter-graded courses through a combination of core and electives.

Category	Course Number	Credit Hours
Core	<p>Enrollment in any combination of the following 3 courses to equal a minimum of 6 hours:</p> <p>CHEM 5300 Intermediate Inorganic Chemistry, and/or CHEM 5330 Advanced Inorganic Chemistry, and/or CHEM 5500 Topics in Quantum Chemistry</p>	<p>2 hrs 2-3 hrs 2 hrs</p>
Electives	<p>Additional 5000 and/or 6000 coursework: minimum of 9 hours of coursework as approved by the student's Ph.D. advisory committee so that the total number of letter-graded hours of core and electives combined equals a minimum of 16 hours. The additional coursework may include other concentrations in CHEM; out-of-department coursework; or transfer credits from accredited college or university. At least 1 course (2 credit hours) must come from within the department (CHEM) but from a concentration outside the student's core courses.</p>	<p>9+ hrs</p>
Seminar	<p>Continuous enrollment and satisfactory participation in CHEM 5391 or 5591 during every regular fall and spring semester following the first semester.</p>	<p>1-12 hrs</p>

ORGANIC

A minimum of 16 credit hours in letter-graded courses through a combination of core and electives.

Category	Course Number	Credit Hours
Core	Enrollment in any combination of the following 3 courses to equal a minimum of 6 hours:	
	CHEM 5400 Organic Chemistry I: Mechanism and Reactivity, and/or	2 hrs
	CHEM 5430 Organic Chemistry II: Reactions and Synthesis, and/or	2-3 hrs
	CHEM 5460 Special Topics in Chemical Reactivity and Physical Organic Chemistry	1-3 hrs
Electives	Additional 5000 and/or 6000 coursework: minimum of 8 hours of coursework as approved by the student's Ph.D. advisory committee so that the total number of letter-graded hours of core and electives combined equals a minimum of 16 hours. The additional coursework may include other concentrations in CHEM; out-of-department coursework; or transfer credits from accredited college or university. At least 1 course (2 credit hours) must come from within the department (CHEM) but from a concentration outside the student's core courses.	8+ hrs
Seminar	Continuous enrollment and satisfactory participation in CHEM 5491 during every regular fall and spring semester following the first semester.	1-12 hrs

PHYSICAL CHEMISTRY

A minimum of 16 credit hours in letter-graded courses through a combination of core and electives.

Category	Course Number	Credit Hours
Core	CHEM 5500 Topics in Quantum Chemistry, and/or	2 hrs
	CHEM 5530 Topics in Statistical Thermodynamics	3 hrs
Electives	Additional 5000 and/or 6000 coursework: minimum of 11 hours of coursework as approved by the student's Ph.D. advisory committee so that the total number of letter-graded hours of core and electives combined equals a minimum of 16 hours. The additional coursework may include other concentrations in CHEM; out-of-department coursework; or transfer credits from accredited college or university. At least 1 course (2 credit hours) must come from within the department (CHEM) but from a concentration outside the student's core courses.	11+ hrs
Seminar	Continuous enrollment and satisfactory participation in CHEM 5591 during every regular fall and spring semester following the first semester.	1-12 hrs

STRUCTURAL BIOLOGY

A minimum of 16 credit hours in letter-graded courses through a combination of core and electives.

Category	Course Number	Credit Hours
Core	CHEM 5240 Biochemical and Biophysical Methods	2 hrs
	CHEM 5730 Macromolecular Crystallography	2 hrs
	CHEM 5750 Macromolecular Structure and Function	2 hrs
	CHEM 5780 Practicum in Structural Biology	1 hr
Electives	Additional 5000 and/or 6000 coursework: minimum of 9 hours of coursework as approved by the student's Ph.D. advisory committee so that the total number of letter-graded hours of core and electives combined equals a minimum of 16 hours. The additional coursework may include other concentrations in CHEM; out-of-department coursework; or transfer credits from accredited college or university. At least 1 course (2 credit hours) must come from within the department (CHEM) but from a concentration outside the student's core courses.	9+ hrs
Seminar	Continuous enrollment and satisfactory participation in CHEM 5291 or 5791 during every regular fall and spring semester following the first semester.	1-12 hrs