



The University of Iowa

DEPARTMENT OF BIOCHEMISTRY

Graduate Student Manual



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INTRODUCTION

The University of Iowa Department of Biochemistry comprises approximately 150 individuals including faculty, postdoctoral fellows, graduate and undergraduate students, and supporting office and technical staff. Faculty laboratories and offices are located on the fourth floor of the Bowen Science Building and on the third floor of the adjacent Medical Education and Research Facility. Both buildings are located in the University's health sciences campus on the west side of the Iowa River. The department offers graduate training leading to the master of science (M.S.) and doctor of philosophy (Ph.D.) degrees in Biochemistry. These degrees require a thesis (M.S.) or a dissertation (Ph.D.) on a research topic. Students usually work towards the Ph.D. degree without first completing the M.S. degree.

Orientation

All first-year students should arrive on campus at least one week before classes start (international students should arrive at least two weeks before and in time for international student orientation) in order to move into housing, take care of formal administrative details at the Biochemistry Department main office (Room 4-403 Bowen Science Building), and get acquainted with the faculty and other graduate students. New students should talk with the Graduate Program Director who acts as the general advisor for first-year students and can be consulted concerning any aspect of graduate study. Later, an Advisory Committee of four faculty members will be formed to provide additional advice.

Students should see the Biochemistry Departmental Administrator to complete the forms necessary to receive the stipend, for which proper identification is required. The stipend will begin after arrival and the first paycheck, covering a portion of August, will be on September 1 with a full month stipend on October 1.

Finding Housing

Information on housing may be found on the University of Iowa's Graduate Admissions web page: <http://www.uiowa.edu/admissions/graduate/housing/index.html>. Other online sources to check for housing include *The Daily Iowan*, <http://www.dailyiowan.com/> and the Iowa City Press-Citizen, <http://www.press-citizen.com/apps/pbcs.dll/frontpage>. Monthly rent for apartments in the Iowa City area will vary depending upon the location and the amenities.

Health Insurance

Foreign students are required to carry health insurance and will be informed about options by the Office of International Students and Scholars. Citizens of the United States are not required to carry insurance. All graduate students may use the University's Student Health Service, for which the department pays the "Mandatory Health Fee." Graduate students are also eligible for the Student Health Insurance Policy (SHIP) or the UI GRADCare plan. Students should choose the plan when the appointment in Biochemistry begins. The student contributes a nominal amount per year to either plan, and the department pays the remainder.

Scientific Background of Students

The curriculum leading to both the M.S. and Ph.D. degrees has been designed with the assumption that students have had at least a one-semester course in general biochemistry before starting graduate school. Those who do not have sufficient knowledge should remedy this deficiency before enrolling in the graduate program or master this material on their own.

THE PH.D. PROGRAM

Summary of Course Requirements

Students have a choice of three curricula to satisfy the requirements for the Ph.D. degree in Biochemistry: a standard curriculum, a biophysical emphasis curriculum, and a molecular emphasis curriculum. Details of the three possible sets of course requirements are listed below. Most students choose the standard curriculum. **A total of 72 semester hours is required for the Ph.D. degree. Graduate students in Ph.D. programs at The University of Iowa must maintain a cumulative grade point average (GPA) of at least 3.0.**

Course Number	Title	Standard Curriculum	Biophysical Emphasis	Molecular Emphasis
099:241	Biophysical Chemistry I	3 s.h.	3 s.h.	3 s.h. of 099:241 <i>or</i> 099:242
099:242	Biophysical Chemistry II	3 s.h.	3 s.h.	
156:201	Principles in Molecular and Cellular Biology	4 s.h.	4 s.h.	4 s.h.
142:215	Molecular Biology of Gene Expression	3 s.h.	--	3 s.h.
099:261	Research Techniques	8 s.h.	8 s.h.	8 s.h.
099:282, Sec. A01	Seminar (for 1 st -year students)	2 s.h.	2 s.h.	2 s.h.
099:282, Sec. A02	Seminar (for 3 rd semester students)	1 s.h.	1 s.h.	1 s.h.
	Electives	6 s.h.	9 s.h.	9 s.h.
099:237 or 099:238	Topics in Molecular & Cell Biol. <i>or</i> Topics in Biophysical Chem.	1 s.h.	1 s.h.	1 s.h.
650:270	Responsible Conduct in Research	1 s.h.	1 s.h.	1 s.h.
Total course hours		32	32	32

The First Year

Typical course schedule (all courses are graduate level):

Fall Semester:

		<u>s.h.</u>
099:241	Biophysical Chemistry I, or Elective.....	3
156:201	Principles in Molecular and Cell Biology.....	4
099:261	Research Techniques (laboratory rotations).....	4
099:282, <i>Section A01</i>	Biochemistry Seminar.....	1
	total	12 s.h.

Spring Semester:

		<u>s.h.</u>
099:242	Biophysical Chemistry II, or Elective.....	3
142:215	Molecular Biology of Gene Expression, or Elective.....	3
099:261	Research Techniques (Laboratory Rotations).....	5
099:282, <i>Section A01</i>	Seminar.....	1
	total	12 s.h.

Description of First Year Courses

- ❖ **099:241 Biophysical Chemistry I (3 s.h.) and 099:242 Biophysical Chemistry II (3 s.h.).** These courses will cover chemical principles and their application to the solution of illustrative research problems from the contemporary literature. This material will be given in two consecutive semesters by a small number of faculty. A course in physical chemistry is recommended as a prerequisite. 099:242 is complementary to but independent of 099:241.
- ❖ **099:261 Research Techniques (9 s.h.).** Various research techniques are learned in the context of a research project during rotations in four faculty laboratories. This course is taken in both semesters of the first year. Students are expected to be in lab during hours that allow productive interaction with the faculty director and other lab members.
- ❖ **099:282 Seminar (1 s.h.).** This one-credit course is taken in three separate semesters for a total of 3 s.h. 99:282, section A01, is taught to first-year graduate students in both fall and spring semesters. The goals during the first year are to introduce students to techniques of seminar presentation and to foster critical reading of the literature. 99:282, section A02, is taught in fall—the third semester—and teaches students how to prepare a thesis proposal.
- ❖ **142:215 Molecular Biology of Gene Expression (3 s.h.).** The structure and function of eukaryotic genes and chromosomes will be stressed. Topics will include DNA-associated proteins and enzymes, the mechanisms of replication and transcription, RNA processing, protein synthesis and regulation. Special topics will include the structures and functions of oncogenes, mitochondrial genes, and immunoglobulin genes.

- ❖ **156:201 Principles in Molecular and Cell Biology (4 s.h.)**. The fundamentals of protein, DNA and RNA structure; replication and recombination; transcription and translation; membranes, protein sorting and transport; signal transduction; cytoskeleton; cell cycle and communication. Prerequisites are introductory courses in biochemistry and/or genetics or consent of the instructor.

Other Training

It is expected that students will continue to develop their speaking skills by participating in laboratory group meetings and in journal clubs. In addition, **students are expected to attend formal departmental seminars (Thursday, 10:30 a.m.) and departmental workshops (Tuesdays, 12:30 p.m.) throughout their graduate career**. These programs are an important aspect of a student's training and can be very useful for developing proposals for the Comprehensive Examination.

Graduate students should budget their time between regular course work and laboratory work. Performance in both aspects is important in judging the progress of first-year students.

Laboratory Rotations and Assignment to a Research Laboratory

Graduate students rotate through four different laboratories during their first academic year, unless they have satisfied this requirement in part by previous equivalent research experience. The course number and title for the laboratory rotations is **099:261 Research Techniques**. A student will work in two laboratories in the first semester and two laboratories in the second semester of the first year. The laboratory rotations are approximately eight weeks each. They are intended to help the student learn how to do research, to learn a wide range of experimental methods and techniques and to explore different areas of biochemical research.

Students will be assigned to their first laboratory rotation based on their choice of laboratory and the availability of faculty. Students will be polled for their choices for the first rotation before arrival at the University. Assignment to the first rotation will be made by the Graduate Program Director, the Department Head, and participating faculty. During the first few weeks of the fall semester, there will be opportunities for students to attend faculty presentations in which to learn more about the research being pursued in a faculty member's laboratory. During the first six weeks of the semester, each student should meet with several members of the faculty to discuss possible research projects for the second, third and fourth rotations. By the end of the sixth week, students will be asked to submit to the Graduate Program Director a list of at least five faculty members in whose labs they would like to complete their schedule of rotations. The Director, the Department Head, and participating faculty will then determine the laboratory assignments. These assignments will be based on educational objectives including diversity of training in different areas of biochemistry, student preference, availability of space, and faculty teaching loads. The assignments will be made in time for all four faculty members to attend the advisory committee meeting at the end of the first eight-week rotation. If the student wishes to change preferences after assignments are made, the request will be accommodated if possible.

The Laboratory Rotations Advisory Committee

The Advisory Committee is composed of the four faculty members in each student's first-year laboratory rotation schedule. The Graduate Program Director may substitute for one of the laboratory advisors at committee meetings if an advisor is unavailable. Each of these faculty members will serve, in turn, as research advisor and chairperson of the Advisory Committee during the tenure of the student in his/her laboratory. This committee evaluates a student's performance during the laboratory rotations and makes recommendations for promotion to the second year. At the end of each laboratory experience, the student will meet with the Advisory Committee to present the research and training completed during that rotation. The Advisory Committee will write a short evaluation of the student's performance, and assign a grade for the laboratory work. This evaluation will become part of the student's departmental record and will be used to assign a grade for the course **099:261 Research Techniques**.

Laboratory Rotation Presentations

The student should first discuss the presentation in depth with the research advisor before the meeting. The rotation meetings are initiated with the student giving a brief (approximately 30 minutes) oral summary of the research project. The summary should include:

- a) an introduction;
- b) the experimental design used in carrying out the project;
- c) the experimental techniques learned;
- d) a general description of the experiments pertinent to the solution of the problem, and
- e) a summary of the overall conclusions and how these relate to the original problem.

The faculty will question students about the experimental and theoretical significance of the laboratory experiences including the interpretation of their data and the limitations of the techniques used.

The student should write a short report, usually in the form of a manuscript (title, abstract, introduction, methods, results, discussion, references, tables, and figures). Typically the rotation research report will be 5–10 pages of written, double-spaced text, not including figures, figure legends and references. The figures used in the oral presentation to the committee may be used as figures in the written report.

The report should be provided to the rotation committee at least 24 hours before the committee meeting, keeping in mind that much of the written report can be prepared while the laboratory experiments are still ongoing. A copy of the report will be placed in the student's file. No grade will be assigned for the semester until the reports are deposited.

Committee meetings may be requested by the student or any member of the committee at any time.

Promotion to the Second Year

At the end of the first academic year, the student's Advisory Committee will recommend to the department whether or not the student continue as a potential Ph.D. candidate. Promotion to the second year is the decision of the biochemistry faculty based on the recommendation of the Advisory Committee, and on course performance, scholarly potential, and a reasonable expectation that the student will perform well on the Comprehensive Examination. Dismissal from the Ph.D. program by the biochemistry faculty may be due to poor performance in one or more of the above areas.

Selection of Thesis Advisor

By the last day of classes in the second semester, students should submit to the Graduate Program Director a list of three preferences for thesis advisor. This choice is an important step in one's career and should be given very serious consideration. Thus, students should discuss possible projects with any faculty members in which they are interested and familiarize themselves with the faculty laboratories. They should consider as many dimensions as possible including the definition of the thesis project, future prospects for the research, and the scientific approach. The laboratory chosen may be one of those involved in the rotations or another laboratory in the department.

Assignment of the thesis advisor is subject to the constraints of laboratory space, financial support, acceptance by the professor, and approval by the Department Head. The Department Head will consult with the faculty members involved and announce the assignments as soon as possible after final examination week.

English Proficiency Certification Examinations

The biochemistry graduate program requires doctoral students to complete two semesters of teaching assistant (TA) experience. The University of Iowa requires all students for whom English is not a first language and who have first-time appointments as TAs to take the SPEAK test to assess their effectiveness in speaking English before they are assigned assistantship responsibilities. The test, administered by the University's Teaching Assistant Preparation in English Program (TAPE), assesses students' language and comprehension skills for teaching in a typical American university classroom situation. Students must be rated "C" or higher on the SPEAK test before starting a TA assignment. Assignment of TA duties will be consistent with the level of certification. Students who receive less than a "C" should enroll in TAPE courses during the summer after the first year to achieve certification at a level of "C" or higher.

The Second Year

This is a typical schedule for second year courses:

Fall Semester (12 s.h. total)

- 099:282, Section A02, Biochemistry Seminar
- 099:237 Topics in Molecular and Cell Biology (topic varies from year to year), 1 s.h.
- Graduate Elective. This may be 142:220 Mechanisms of Cellular Organization, or 3 s.h. of biochemistry special topics courses, or a graduate elective in another science department.
- 650:270 Responsible Conduct in Research (1 s.h.)
- 099:292 Research Biochemistry (thesis research), to make a total of 12 s.h.

Spring Semester (12 s.h. total)

- 099:238 Topics in Biophysical Chemistry (topic varies from year to year), 1 s.h.
- Graduate Elective. 142:225 Mechanisms of Cell Growth and Development, or 3 s.h. of biochemistry special topics courses, or a graduate elective in another science department.
- 099:292 Research Biochemistry (thesis research), to make a total of 12 s.h.

All of these courses are graded except 099:292 and the third seminar of 099:282, section A02, which are graded “satisfactory/unsatisfactory” (abbreviated S/U).

Description of Second-Year Courses

- ❖ **099:237 Topics in Molecular and Cell Biology (1 s.h.)** Current topics in transcriptional regulation, chromatin structure and function, cell signaling pathway, regulation of development, molecular mechanisms of disease. Repeatable.
- ❖ **099:238 Topics in Biophysical Chemistry (1 s.h.)** Current topics in structure and function of membranes or proteins; DNA-protein interactions; computational biochemistry; applications of NMR, X-ray diffraction, calorimetry, or spectroscopy. Repeatable.
- ❖ **099:226 Enzyme Kinetics & Bioorganic Mechanisms (1-2 s.h.)**. Also considered to be a special topics course. Principles and applications of steady-state and transient enzyme kinetics; mechanisms of catalysis of biochemical reactions.
- ❖ **650:270 Responsible Conduct in Research (1 s.h.)**. Required of all students. Ethics, scientific misconduct, good research practices.
- ❖ **Elective Courses.** Elective courses from a variety of departments can be used to further advance training in Biochemistry. In the past the courses in the following list have been taken as electives by Ph.D. students in the Biochemistry Department. The list is meant to be representative and not exclusive since courses will continue to evolve at the University of Iowa."
 - 061 267 Animal Viruses
 - 002 170 Bioinformatics
 - 051 123 Bioinformatics Tech

- 004:205 Bioinorganic Chemistry
- 142:220 Cell Biology I
- 142:225 Cell Biology II
- 004:215 Fluorescence Spectroscopy & Imaging
- 002:180 Fundamental Neuroscience
- 002:168 Genes and Development
- 127:191 Human Molecular Genetics
- 142:201 Immunology I
- 142:202 Immunology II
- 004:180 Introduction to Molecular Modeling
- 069:270 Pathogenesis of Major Human Diseases
- 072:209 Receptors and Signal Transduction
- 004:208 Spectroscopy

Three semester hours of the elective requirement may be satisfied with biochemistry special topics courses that have a biophysical or molecular and cell biology emphasis. These should be taken in the second year of study.

- ❖ **099:292 Research Biochemistry.** As indicated above in the outline of second-year courses, students should increase their effort in their thesis research during this period. In general, the more effort and time is put into the thesis research, the quicker the research is completed. **099:292** is graded “S” (satisfactory) or “U” (unsatisfactory).

Selection of the Ph.D. Thesis Committee

Before the start of fall semester of the second year, the Ph.D. student and her/his Ph.D. thesis advisor, along with the advice of the Graduate Program Director and approval of the Department Head, identifies possible faculty members for the five-person Ph.D. Thesis Committee. (This committee is different from the Comprehensive Examination Committee.) A typical committee is made up of four Biochemistry faculty members with the fifth member from a department other than Biochemistry. The committee chair must be a member of the Biochemistry faculty. At least one of the five members must be in the Graduate Faculty from a department other than Biochemistry. (In special cases the student may request a thesis committee composed of three Biochemistry faculty and two non-Biochemistry Department faculty. The student’s thesis advisor is not a member of the thesis committee; however, the advisor may attend, as an observer, the student’s first meeting with her/his thesis committee.

The principles for selecting the thesis committee are as follows. It should be composed of faculty members who are able to judge the thesis research and include members with expertise in diverse areas. Since the student and the student’s advisor should know who could best help the student with the thesis, they should have a primary and initial role in nominating members for the committee. The responsibility for serving on these committees should be distributed equitably among the faculty. “Equitable distribution” will be determined by the Head of the Department when making the assignments.

The selection procedure is as follows. Before the start of fall semester of the second year, the student should submit to the Graduate Program Director a list of at least eight faculty members, in order of preference, to serve on the student's thesis committee. The student need not ask members of the Biochemistry faculty if they would be willing to serve; however, the student should make the request of potential members outside the department. The Graduate Program Director, with the approval of the Department Head, will compose the committees. In order to achieve equitable distribution and to maintain the diversity that can accommodate and facilitate evolving research objectives, the committee may include members who are not among the first eight faculty suggested. When a committee cannot be composed with faculty on the student's list, the Graduate Program Director will discuss alternatives with the student and the student's advisor. The Department Head will send faculty members a letter asking faculty to serve on the committee and will ask one person to be chairperson of the committee. A faculty member should decline the invitation if there is a conflict of interest. The committee membership should be finalized by October 1st in preparation for the first thesis committee meeting near the end of the fall semester of the second year.

The Ph.D. Thesis Research Proposal and First Thesis Committee Meeting

During the fall semester of the second year, the student, in collaboration with the thesis advisor, will prepare a detailed thesis proposal that describes the proposed research to be conducted for the Ph.D. dissertation. The form of this proposal should follow the guidelines given in the next section. This Ph.D. thesis proposal should be submitted to the student's Ph.D. Thesis Committee one week prior to the student's meeting with his/her Committee. The meeting is scheduled near the end of the fall semester of the second year. The Ph.D. thesis advisor should sign the first page of the student's Ph.D. thesis proposal to signify that she/he has read the final version of the document. The first thesis committee meeting is not meant to be an examination over the proposal; rather, it is an opportunity for the committee to make suggestions and offer advice, and for the student to explain any unclear details.

The Ph.D. thesis advisor may choose to attend this first thesis committee meeting as an observer. The thesis advisor should NOT participate in this first committee meeting except to provide points of clarification when asked and to discuss the student's progress after the student has left the meeting. The committee will write a short description of the meeting for the student's file.

Writing the Ph.D. Thesis Research Proposal

The entire written Ph.D. thesis research proposal should be no more than 15 pages of double-spaced type, excluding the cover page, tables, figures and references. **Acceptable fonts are those that give 10 to 12 characters per inch and 5 to 6 lines per vertical inch. The proposal should be typed on 8 ½ x 11-inch paper with one-inch margins.** The proposal should, in general, contain the elements of an N.I.H. postdoctoral research grant. It should address a research problem that could be solved by one person working for two to three years and might result in one or two significant publications. A suggested arrangement of the pages is as follows (material enclosed in quotation marks is from the instructions for an N.I.H. application.):

- 1) **Cover page:** This page should show the title of the proposal, the name of the student and the words Proposal for the Ph.D. Thesis in Biochemistry. This page should be signed by the thesis advisor before the proposal is given to the thesis committee.
- 2) **Specific Aims:** (1 page) Usually the proposal will have no more than two specific aims. "List the broad, long-term objectives and describe concisely and realistically what the specific research described is intended to accomplish and any hypotheses to be tested." This should include a brief, precise statement of the proposed research, the questions to be answered or the hypothesis to be tested.
- 3) **Background and Significance:** (no more than 4 pages) "Briefly sketch the background to the present proposal, critically evaluate existing knowledge, and specifically identify the gaps which the project is intended to fill. State concisely the importance of the research described in this application by relating the specific aims to the broad long-term objectives and to health relevance." This section should clearly state the student's rationale for the experiments proposed.
- 4) **Research Design and Methods:** (no more than 10-11 pages excluding tables and figures) "Describe the research design and the procedures to be used to accomplish the specific aims of the project. Include the means by which the data will be collected, analyzed, and interpreted. Describe any new methodology and its advantage over existing methodologies. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve the aims. Provide a tentative sequence or timetable for the investigation. Point out any procedures, situations, or materials that may be hazardous to the personnel and the precautions to be exercised."
- 5) **Literature Cited:** Literature citations should be indicated by consecutive numbers throughout the text and listed as complete references, including the titles, at the end of the Research Plan.
- 6) **Addendum:** Students should attach copies of two key papers on which the proposal is based.

After writing the first draft, the student should attempt to refine the document for clarity, simplicity and precision before submitting the final version to the Ph.D. thesis committee at least one week before the scheduled committee meeting.

The Comprehensive Examination

NOTE: The Comprehensive Examination must be taken before June 30 of the second year.

The Comprehensive Examination has two parts: a written examination proposal that is prepared during spring semester of the second year and an oral part that is administered near the end of the spring semester. Before attempting the Comprehensive Examination students must submit a Plan of Study to the Graduate College via the Graduate Program Director who will make sure that all course requirements are listed. Students and their advisors may make additions to this plan, and it may be modified to correct deficiencies following the outcome of the Comprehensive Examination. The Graduate College requires a minimum of 72 semester hours of graduate work, including acceptable transfer credit and research hours.

The Comprehensive Examination is administered by a committee of five members of the biochemistry faculty who are selected by the Department of Biochemistry. The same committee examines all eligible students in a single year. The oral portion of the examination is about two hours in length, and is based in part on the written examination proposal submitted by the student. The Graduate Program Director and the Chair of the Comprehensive Examination Committee will meet with all eligible students in the fall semester of their second year to explain how the examination will be administered and to summarize the expectations of the examining committee.

The examination is not limited to the subject of the proposal; it tests a student's knowledge of important background material or subject matter needed for a full interpretation of the experiments proposed. In this sense the examination is comprehensive in the spirit of the description found in The University of Iowa's *Manual of Rules and Regulations of the Graduate College*, which says, "This examination, administered only on campus, is intended to be an inclusive evaluation of the candidate's mastery of the major and related fields of study, including the tools of research in which competence has been certified." For Biochemistry this means that a student should, at a minimum, possess a knowledge of graduate-level biochemistry and demonstrate the ability to use this information to devise and defend original experiments aimed at solving an important biological problem.

On February 1 of the second year each eligible student will provide the examination committee with the detailed Ph.D. thesis proposal that has been prepared by the student in collaboration with the thesis advisor. This is the same proposal, or a revised version, that was prepared for the student's Ph.D. Thesis Committee at the end of the fall semester of the second year. The Ph.D. thesis advisor must sign the front page of the thesis proposal to signify that she/he has read the final version.

On February 1 the student also has the *option* of suggesting to the examination committee one to three general topics for the examination proposal; however, this is not required. Each suggested topic should be no more than two sentences. The committee may or may not select these topics for the examination.

On March 1st the examination committee will present each eligible student with two potential topics for the examination proposal. One topic will be related, but not identical, to the student's thesis proposal and one will be unrelated. The student will have 6 weeks (until April 15) to prepare a written proposal on one of the two assigned topics and the committee will approve or disapprove of the proposal within one week of its receipt (by April 22). The student will have two weeks (until May 7) to remedy deficiencies in the proposal (if there are any). **If the revised written proposal is deemed inadequate, the student fails the comprehensive exam.** If the proposal is found to be satisfactory, the student has passed the written part of the examination, and an oral exam will be given. A date for the oral exam will be assigned approximately 2-3 weeks after the proposal is accepted (typically between May 15 and June 7). A summary of the deadlines and timing of the examination is as follows:

Time Table for the Comprehensive Examination

February 1 of second year: Each eligible student gives the examination committee a copy of her/his written Ph.D. thesis proposal signed by the thesis advisor. The student may also choose to suggest one to three general examination topics to the committee.

March 1: Each eligible student is assigned two possible examination topics by the committee.

April 15: The student gives the committee a written examination proposal (see following for details) on one of the two topics.

April 22: The committee informs each student on the suitability of the proposal. If the proposal is unsatisfactory, the student has two weeks to revise the proposal.

May 7: Revised written proposals must be submitted to the committee.

A date between May 15 – June 7: Oral examination is taken on a date assigned by the Department of Biochemistry.

All deadlines are at 5 pm on the indicated day. If the deadline occurs on a weekend, the deadline is extended to 9 am on the following Monday. **Failure to meet any of these deadlines constitutes FAILURE of the Comprehensive Examination.**

In special cases (for example, MSTP students), a similar schedule of deadlines can be established at an alternative time during the year or in the fall semester.

Preparation for the Comprehensive Examination

The purpose of the Comprehensive Examination is to allow students to demonstrate their ability to:

- 1) develop a well defined original problem in experimental biochemistry, and propose how it might be solved,
- 2) present the background, methods and goals for the proposed research in written form,
- 3) answer questions concerning the feasibility and importance of the proposed research as well as questions dealing with basic concepts in biochemistry,
- 4) explain and apply the basic concepts of biochemistry to the solution of a research problem,
- 5) interpret possible results in terms of the hypotheses to be tested.

Originality of Examination Proposal for the Comprehensive Examination

The examination committee assigns each student two possible proposal topics and the student selects one topic for the examination proposal. No part of the examination proposal may be based on information contained in the proposals of other students or based on proposals of faculty or staff. That is, the proposal must be an original idea developed solely by the student. Ideas for the research proposal can come from a number of sources; for example, reading the literature, course work, journal clubs, departmental seminars, background reading during a rotation, etc. However, it is NOT appropriate to use as the basis of the proposal a term paper that has been submitted as a course requirement and critiqued by the instructor(s) of the course.

The Ph.D. thesis advisor should not contribute in any way to the development or criticism of the student's examination proposal (in contrast to the student's Ph.D. thesis proposal in which the thesis advisor participates fully). Students may discuss their examination proposal with other students and post-docs, and may use faculty members who are not their advisor as sources of factual information. Faculty members must not read and criticize the examination proposals before the examination. Plagiarism is unacceptable either from written sources or from individuals. If there is any question about what constitutes plagiarism, consult with the chairperson of your committee.

The Written Examination Proposal for the Comprehensive Examination

The form and length of the examination proposal should follow the same guidelines as those for the written Ph.D. Thesis Proposal (**SEE ABOVE FOR DETAILS**). Briefly, text should be no more than 15 pages of double-spaced type, excluding the Cover Page, tables, figures and references. The **Cover Page** should show the title of the proposal, the name of the student and the words Proposal for the Ph.D. Comprehensive Examination in Biochemistry. The **Specific Aims, Background & Significance, Research Design & Methods, Literature Cited** and **Addendum** should follow the same guidelines described above for the Ph.D. Thesis Proposal.

Passing the Oral Portion of the Comprehensive Examination

To pass the oral Comprehensive Examination, a student must perform satisfactorily both in defense of the examination proposal and in answering questions of general biochemistry that are germane to the proposal, or that are important for a full understanding of the proposed experiments and their interpretation. **Questions during the oral examination may come from the examination proposal, the Ph.D. thesis proposal or other general areas of biochemistry.** If the performance during the oral examination is unsatisfactory, the student fails the exam. An exceptional performance on one part of the examination cannot rectify an unsatisfactory performance on the other part. A report of “reservation” will be given if “deficiencies displayed by the student were modest, and can be easily rectified.” If the reservations are satisfied, the report will be changed to indicate a pass.

If the student fails the examination, the Comprehensive Examination Committee will recommend to the faculty of the Department of Biochemistry whether the student should be allowed to take the examination a second time.

Subsequent Years

The Fifth-Semester Seminar

In the fall semester of the third year (the fifth semester) the student will update and revise the written Ph.D. thesis proposal prepared during the fall semester of the second year (prior to the Comprehensive Examination), and will present a seminar on her/his thesis research to the department at one of the weekly Biochemistry Workshops. All of this should be completed in the same semester. The seminar and the updated thesis proposal should describe the background and specific aims of the thesis research, the relevant research already completed, and the experiments required to achieve the stated goals. **This updated thesis proposal must be submitted to the thesis committee at least one week before the seminar.**

After the workshop presentation, the student will meet with his or her thesis committee to discuss the proposed thesis research. Similar to the first committee meeting at the end of fall semester of the second year, this meeting is not meant to be an examination over the proposal; rather, it is an opportunity for the committee to make suggestions and to offer advice, and for the candidate to explain any remaining unclear details. The thesis advisor will NOT attend this committee meeting or subsequent meetings, but can meet with the committee either before or after the meeting at the request of either the advisor or the committee. The committee will write a short description of the meeting for the student’s file.

Subsequent thesis committee meetings with the student should be held at least once a year until the student is prepared to defend her/his Ph.D. thesis. One week before each meeting the student should provide the committee with a written report detailing progress made since the previous meeting. The committee chair should prepare a short written description of each meeting with the student and communicate the results of the meeting to the student and the advisor, both individually and in written form.

Teaching Experience

Graduate students will participate in the formal teaching programs of the department for two or three semesters. First-year students as well as students who are within a year of receiving the Ph.D. degree usually are not asked to teach. Teaching may take a variety of forms, including tutoring, leading discussions and laboratory groups, correcting examinations, preparing teaching materials and lecturing. The commitment should not exceed 20 hours/week averaged over the course of a semester. Teaching assistants will be evaluated by the faculty, and their performance must be judged at least “satisfactory.” An “unsatisfactory” assessment will require an additional TA assignment.

Registration After the Plan of Study is Completed

After completing the courses on the Plan of Study and passing the Comprehensive Examination, a student should register for 000:002 (section 000) Doctoral Continuous Registration, 0 s.h., while continuing research. The department will continue to pay the tuition and the student activity fee.

Annual Meetings with the Ph.D. Thesis Committee

Students must meet annually with their Ph.D. Thesis Committees. Meetings should be scheduled near the completion of the third, and subsequent, academic years. The final thesis defense may serve as one of these meetings. These conferences are intended to inform the committee of the student's research progress. It is the responsibility of each student to schedule these meetings.

Arranging a committee meeting takes planning and perseverance. The guidelines below should make the process as efficient as possible and enhance the success of the meeting:

- ❖ Committee meetings should be held **at least once a year, or more frequently if requested by your committee.** Meeting with your committee will help to assure the "satisfactory progress" required for continued stipend support can be documented, and will help focus your research efforts.
- ❖ You should **talk to both your thesis advisor, and your committee chairperson at least a month** before you would like to have the meeting. These discussions should include what progress and problems need to be brought to the attention of the committee.
- ❖ **Establish the dates and time that your committee chairperson will be able to attend the meeting.** Working on availability over a two-week time span is recommended. Please take into consideration that there may be large blocks of time—such as a week or more—when your chairperson or members of your committee may be off campus and unavailable.
- ❖ Once you have established when your chairperson is available, contact the rest of the committee with a list of times over the two-week period that can be used for your committee meeting. Biochemistry office staff can assist you in finding a room for the meeting.
- ❖ Prepare a written report for your committee describing your project goals; some brief background information, progress and what will be discussed in the meeting. You might include an updated CV, a Thesis Outline, and copies of any manuscripts in progress or

submitted. These written materials should be prepared in **consultation with your thesis advisor**. They should be distributed to your committee members at least one week prior to the meeting.

- ❖ If you intend to use a PowerPoint presentation, make sure to check with office staff to reserve a laptop computer and projector.
- ❖ Be prepared to give your committee some estimate of how much time you expect your thesis project will take. This might take the form of a "Timeline" in your progress report or annotations of your thesis outline indicating expected dates of completion for individual projects or chapters.

Suggested format for contacting Committee.

Dear Thesis Committee,

I would like to schedule a meeting to discuss the progress made on my doctoral work since **(the date of the last meeting you had)**. I have spoken with **(my thesis advisor)** and my chairperson **(name chairperson)** and would like to know your availability for the following dates and times **(list dates and times you and your chairperson have identified)**.

Sincerely,
Your name

It is the responsibility of the chairperson to summarize the consensus of the committee in a written report to the student, with copies of the report for the student's file and the student's research advisor. If a student fails to schedule an annual meeting, the Graduate Program Director will schedule a meeting.

Final Examination for the Ph.D.

The five-member Ph.D. Thesis Committee serves as an advisory body for preparation of the thesis. This committee meets with the student to review the material that is expected to be incorporated into the thesis. Although meetings of the Ph.D. candidate with the committee should be yearly, the candidate, thesis advisor, or the committee can request a meeting at any time. The committee as a whole and the advisor will, in general, advise the student as to the suitability of the research accomplished for a dissertation. This is most conveniently done by scheduling a committee meeting approximately four to six months before the final examination. This is an important step and can avoid problems that can occur after the thesis has been written. The student, however, makes the final decision as to when the thesis should be written and presented to the committee. The final draft must be given to all members of the committee two weeks before the final examination. Failure to meet this deadline will require re-scheduling the final examination so that all committee members have at least two weeks to read the thesis.

The final Ph.D. examination takes the form of a seminar presented to the department. This presentation is announced according to the Graduate College policy. Questions, comments, and discussion will follow. After the seminar, the candidate will meet with the committee for the

final thesis defense. The Ph.D. degree is not awarded until the thesis is signed. In some cases quite extensive revisions may be required.

Preparation of the Dissertation

Departmental funds cannot be used for preparation of the thesis or figures in the thesis; however, figures already prepared for publication may be used and paid for from grants.

Check the Graduate College Thesis Manual online at <http://www.grad.uiowa.edu/Students/ThesisResources/Manual.htm> before starting the thesis. Graduate College deadlines for deposit of the thesis and for graduation are available online at <http://www.grad.uiowa.edu/eventsdeadlines/currentac.asp>.

In March, 2008, the Graduate College addressed the issue of theses and dissertations released into the public domain upon a student's final deposit to the Graduate College. The following text, provided by the Graduate College, instructs and describes how a research thesis or dissertation will be handled after a student makes his or her final deposit.

For students filing research theses or dissertations:

By submitting this thesis or dissertation to the Graduate College with the First Deposit Checklist, I am not making any decisions about later dissemination of my work. At the time of Final Deposit, I understand that I will be making the thesis or dissertation available to University Libraries for shelving, circulation to approved borrowers, and permanent archiving or for posting on the Iowa Digital Library if my thesis is submitted in electronic form. I understand also that it will be made available to ProQuest/UMI for electronic distribution according to more detailed instructions that I provide at the time of submission.

If any of the foregoing is unacceptable because you are preparing books, research articles, or patents, you may wish to consider asking the Graduate College for an embargo of your thesis or dissertation.

ENTRANCE TO THE Ph.D. PROGRAM WITH ADVANCED STANDING

Students with Master Degrees

Students who enter the Graduate Program with a Master of Science in Biochemistry or similar experience usually will have met some of the requirements for the Ph.D. program and may be able to enter with advanced standing.

After consideration of the student's background, achievements, interests and performance on placement examinations (if indicated), the Director of Graduate Studies will suggest a tentative plan of study. This program may include rotations through one or more research laboratories. As soon as is advisable the student will select a thesis advisor, start thesis research, and take the Comprehensive Examination. The student and the thesis advisor in consultation with the Director of Graduate Studies will formulate the final plan of study and schedule the Comprehensive Examination.

M.D./Ph.D. STUDENTS

Students in the combined M.D./Ph.D. program will normally begin full-time graduate study after the first two years of medical school. Students have a choice of three curricula to satisfy the requirements for the Ph.D. degree in Biochemistry: a standard curriculum, a biophysical emphasis curriculum, and a molecular emphasis curriculum. Details of the three possible sets of course requirements are listed in the following table.

Course Number	Title	Standard Curriculum	Biophysical Emphasis	Molecular Emphasis
099:241	Biophysical Chemistry I	3 s.h.	3 s.h.	3 s.h. of 099:241 <i>or</i> 099:242
099:242	Biophysical Chemistry II	3 s.h.	3 s.h.	
156:201	Principles in Molecular and Cellular Biology	4 s.h.	4 s.h.	4 s.h.
142:215	Molecular Biology of Gene Expression	3 s.h.	--	3 s.h.
099:282, Sec. A01	Seminar (for 1 st year students)	2 s.h.	2 s.h.	2 s.h.
099:282, Sec. A02	Seminar (for 3 rd semester students)	1 s.h.	1 s.h.	1 s.h.
	Electives	6 s.h.	9 s.h.	9 s.h.
099:237 <i>or</i> 099:238	Topics in Molecular & Cell Biology <i>or</i> Topics in Biophysical Chemistry	1 s.h.	1 s.h.	1 s.h.
650:270	Responsible Conduct in Research	1 s.h.	1 s.h.	1 s.h.

Also, students must register for the seminar course, 050:212 MSTP Clinical Conferences, 1 s.h., for 4 semesters. Since the research component of the combined program should be completed in 3 years, the Comprehensive Examination should be taken at the end of the second semester, but no later than the start of the fall semester of the second year of graduate study. Although not required, it is recommended that students participate in laboratory rotations even if they are abbreviated. These can be worked out through consultation with the Director of Graduate Studies and the Director of the M.D./Ph.D. program. These students should participate in the research programs offered the summer before starting medical school and in the summer between their first and second year of medical school.

The following list of pre-clinical courses from the MD curriculum will be included on the PhD Plans of Study of MSTP students. The courses constitute a total of 30 semester hours.

- 060:103 Medical Gross Anatomy 6 hrs.
- 099:163 Medical Biochemistry 4 hrs.
- 060:116 Medical Cell Biology 2 hrs.
- 070:110 Medical Genetics 2 hrs.
- 060:234 Medical Neuroscience 4 hrs.
- 148:251 Medical Immunology 2 hrs.
- 071:105 Medical Pharmacology 5 hrs.
- 061:103 Principles of Infec. Disease 5 hrs.
- Total..... 30 hrs.

MASTER'S DEGREE PROGRAMS

Candidates for the Master of Science degree may enter the program in two ways. A student may choose to take the M.S. degree without a declared intention to pursue the Ph.D. degree (formal M.S. degree), or a student may withdraw from the Ph.D. degree program to complete the M.S. (interim M.S. degree).

Formal Master of Science Degree

The Biochemistry Department offers a two-year research-oriented program for the Master of Science degree. To enter the M.S. program the student must find a faculty sponsor who will agree to provide laboratory space and stipend support. No teaching assistant duties will be required of the M.S. student, and any tuition or stipend support must be paid either by the student or from the research grant of the faculty sponsor. In contrast to the Ph.D. program, no formal comprehensive examination or laboratory rotations are required for the M.S. degree. A typical M.S. course curriculum is shown below. These courses, or their equivalent, are required. A minimum of 32 semester hours is required for the M.S. degree.

Course Number	Title	Standard Curriculum	Biophysical Emphasis	Molecular Emphasis
099:241	Biophysical Chemistry I	3 s.h.	3 s.h.	3 s.h. of 099:241 <i>or</i> 099:242
099:242	Biophysical Chemistry II	3 s.h.	3 s.h.	
156:201	Principles in Molecular and Cellular Biology	4 s.h.	4 s.h.	4 s.h.
142:215	Molecular Biology of Gene Expression	3 s.h.	--	3 s.h.
099:261	Research Techniques	8 s.h.	8 s.h.	8 s.h.
099:282, Sec. A01	Seminar (for 1 st year students)	2 s.h.	2 s.h.	2 s.h.
099:282, Sec. A02	Seminar (for 3 rd semester students)	1 s.h.	1 s.h.	1 s.h.
	Electives	6 s.h.	9 s.h.	9 s.h.
099:237 <i>Or</i> 099:238	Topics in Molecular and Cell Biology <i>or</i> Topics in Biophysical Chemistry	1 s.h.	1 s.h.	1 s.h.
650:270	Responsible Conduct in Research	1 s.h.	1 s.h.	1 s.h.

The First Year

Fall Semester:

	<u>s.h.</u>
099:241 Biophysical Chemistry I, or Elective	3
156:201 Principles in Molecular and Cell Biology.....	4
099:292 Research Biochemistry (Thesis Research)	4
099:282 Seminar	1
total	12

Spring Semester:

	<u>s.h.</u>
099:242 Biophysical Chemistry II, or Elective	3
142:215 Molecular Biology of Gene Expression, or Elective	3
099:292 Research Biochemistry (Thesis Research)	5
099:282 Seminar	1
total	12

The Second Year

Typical curriculum

	<u>s.h.</u>
099:237/238 Special Topics (elective)	1
xxx:xxx Elective, 3 s.h. within or outside the Biochemistry Department	3
650:270 Responsible Conduct in Research	1
099:292 Research Biochemistry	7
total	12

Progress in the program will be monitored at least annually by a Thesis Committee of three members of the Biochemistry faculty, not including the student's research advisor. The student should submit a list of at least four names of faculty members to the Graduate Student Advisor by midterm of the spring semester so that a committee can be constituted and an advisory meeting held before the end of the second year. The research for the M.S. thesis ideally should be completed during the second year. The final M.S. examination takes the form of a seminar presented to the department, followed by a meeting with the thesis committee.

Interim Master of Science Degree

This program is for the graduate student who elects or who is advised by an Advisory or Comprehensive Committee to prepare a M.S. thesis. The decision to enter this program should be made no later than the end of the fourth semester of graduate work. The interim Master of Science candidate will defend the M.S. thesis before a committee of five members, selected in the same manner as the Ph.D. committees. If the student begins the M.S. program at the end of the first year, the committee should be appointed before the start of the next fall semester. The expectation is that the student will complete the requirements for the interim M.S. degree within about 12 months. At the conclusion of the M.S. thesis defense, the committee will determine if the requirements for a M.S. degree have been met and recommend to the biochemistry faculty whether the student should continue in the Ph.D. program. If the student enters the Ph.D.

program after obtaining an interim M.S. degree, the student should take the Comprehensive Examination as soon as possible. During the second year of study and while working toward an interim M.S. degree, the student should satisfy the course requirements for the M.S. and is advised to take other courses so that the course requirements for the Ph.D. are met by the end of the fourth semester.

OTHER INFORMATION

Primary Financial Support

Normally all Ph.D. students are supported by a yearly stipend that is paid monthly. Tuition is also paid. Any student not so supported will be clearly informed during the correspondence before admission. Students will be supported for the time required to finish the Ph.D. degree; however support beyond five years is contingent upon evidence of satisfactory progress on the dissertation research. Continuation of funding beyond the fifth year requires a written recommendation to the Head of the Department (with a copy to the Departmental Administrator) by the Thesis Committee, and the approval of the majority of faculty members. Compliance will be monitored by the Departmental Administrator. In cases of unsatisfactory progress, the department may reduce the level of support or even terminate the candidacy.

Although students are appointed as half-time Research Assistants, it is expected that students will devote full-time to course work and research. Students should not be employed in other jobs. If a student faces severe financial hardship, the Graduate Student Advisor or Department Head should be informed so that special arrangements can be made. In accordance with the University's policy on Conflict of Interest for faculty and staff, a student may consult, or engage in activities related to the profession, for up to nine days per year. These activities should be reported to the Departmental Administrator.

Sick Leave

The University policy on sick leave is negotiated with COGS, the graduate student union. Graduate student assistants (50%) may be absent due to illness for up to 18 workdays per year without loss of pay.

Holidays and Absences

Graduate student research assistants (50%) may be absent for 15 workdays per year, in addition to the nine official University holidays, without loss of pay.

Departmental Equipment

Several pieces of equipment owned by the department are available for use by students, staff and faculty. Faculty, staff, or students familiar with these items of equipment provide training for their uses. Report any breakdowns to the faculty member in charge, or the Departmental Administrator so that repairs may be made. Much of the equipment and materials in the

department have been procured through grants funded for specific purposes. Students must consult with the responsible faculty member when they wish to use instruments and/or facilities not clearly identified as departmental property.

Departmental Reading Room

This room is available on a 24-hour basis and is accessed by ID card. There is no librarian, so please return books to their correct place immediately after use. No books or journals may be removed from the library at any time except for photocopying. Food and drinks are not allowed in the reading room.

Ethics

Policy on Authorship of Publications. (Taken from Virginia Commonwealth University, Dean S. G. Bradley). To merit authorship, an individual should: contribute significant ideas and experimental design to the project, take part in the actual experimentation and data analysis, and be able to present and defend the work at a scientific meeting (exceptions may be made when one author has carried out a unique, sophisticated study or analysis). In general, the principal author is the first author, and a laboratory director is listed last. Other authors are listed in descending order of their contributions to the research being reported. The submitting author is usually the first or last author listed. Students should also read, "Ethical Obligations of Authors" in *Accounts of Chemical Research* 18(12), pp. 356-357 (1985).

Scientific misconduct. The U.S. Public Health Service has a formal policy dealing with misconduct. It is described in a special July 18, 1985 issue of the NIH Guide to Grants and Contracts. At the very least we must respect this statement. It says in part: "It is the policy of the PHS to maintain high ethical standards in research and to investigate and resolve promptly and fairly all instances of alleged or apparent misconduct." As defined by the policy, "misconduct" is "1) serious deviation, such as fabrication, falsification, or plagiarism, from accepted practices in carrying out research or in reporting the results of research; or 2) material failure to comply with Federal requirements affecting specific aspects of the conduct of research—e.g., the protection of human subjects and the welfare of laboratory animals."

Academic misconduct. Any form of cheating or plagiarism in respect to curricula requirements is grounds for dismissal. Plagiarism is taking another's ideas, words, or creative works and presenting them as your own, or presenting them without proper attribution (giving credit to the original source).

Sexual Harassment

The University of Iowa has clearly stated guidelines and regulations pertaining to sexual harassment. A copy of these rules are available in the departmental office and are required reading for all incoming students.

Departmental Committees

Graduate students serve on the Graduate Student Admissions Committee and provide student representation at monthly department faculty meetings.

Student Recourse

In the event that a student is failing to meet departmental standards, the department will notify the student of this fact in writing and specify the deficiencies. If the student does not remedy the deficiencies within a reasonable specified time, the student may be dismissed. If the student judges that this or any other departmental action is improper, the student has a right to request a review. If the student wishes to appeal the decision, the Head of the Department should be contacted to arrange the appeal process following the rules of the Graduate College. A document on the Academic Grievance Procedure is available in the departmental office and in the Graduate College, 205 Gilmore Hall.

Safety and Accidents

As soon as students are assigned to a laboratory, they should become familiar with the location and use of fire extinguishers, safety showers, fire blankets and fire hoses. Students should seek advice concerning hazardous reactions or procedures. Safety goggles, safety shields, lab coats, disposable gloves, film badges and other personal protection devices should be used when appropriate.

Laboratory accidents resulting in injuries requiring treatment must be reported at once to the Departmental Administrator. If the injury is not reported promptly, it may be difficult to receive compensation for the costs of treatment. See the Biochemistry Departmental Administrator for details about the University policies on safety and accidents.

Security

All members of the department share the responsibility for keeping laboratories secure against accidents (to people who may wander into a research area) and against pilferage. The core doors are automatically locked after 5:00 P.M. and on weekends.

University Policies

A booklet outlining what is expected of a student at The University of Iowa can be obtained from the Office of the Registrar. It is titled *Policies and Regulations Affecting Students*. The Graduate College posts on their website the *Manual of Rules and Regulations of the Graduate College*, which contains information about registration and examinations.

Travel to Meetings

Students will be reimbursed by the department for expenses in connection with their attendance at a scientific meeting under the following conditions:

- ❖ Expenses will be paid up to a limit of \$500 to attend one meeting during their tenure as a candidate for the Ph.D. degree. Beginning with the class of students who passed the Ph.D. comprehensive examination during 2008, this amount increases to \$1,000.
- ❖ Total expenses may not exceed the lowest air fare, registration for the meeting, and The University of Iowa per diem allowance.
- ❖ The student must be an author of a paper, poster, or oral presentation.
- ❖ The student must have passed the Ph.D. Comprehensive Examination.
- ❖ Expenses will be paid only if funds from the department are available and alternative sources of funds are not available.

Research funds or funds from training grants may be used to pay for more frequent student travel, or to supplement departmental travel.