

**Biochemistry Handbook**  
**Graduate Program in Biochemistry**

Brandeis University  
June 2007

The purpose of this handbook is to help students navigate the various requirements and expectations of the Graduate Program in Biochemistry. It describes the requirements for the Ph.D. degree and contains general information about the procedures to be followed in satisfying these requirements. These are also summarized in the "Pocket Handbook" on the final page of this handbook. You will need to consult the instructions and forms contained here at various times during your graduate studies, so please save your copy or select Biochemistry Student Handbook at the website: <http://www.bio.brandeis.edu/biochem/index.html>.

The Biochemistry Graduate Program is an interdepartmental graduate training program with faculty drawn from the Biochemistry, Biology, Chemistry, and Physics departments. Progress of students in the program is monitored mainly by faculty of the Biochemistry Department, and the Biochemistry Chair also serves as chair of the graduate program. An up-to-date list of faculty associated with this program is posted on the Biochemistry Graduate program webpage: [http://www.bio.brandeis.edu/biochem01/phd\\_biochem.html](http://www.bio.brandeis.edu/biochem01/phd_biochem.html)

Program administration and record keeping:

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## Degree requirements -- General Information

To obtain the Ph.D. degree, students must satisfy both the general requirements of the graduate school and the specific requirements of the Biochemistry Graduate Program. Both sets of requirements are summarized in the Brandeis catalog:

[http://www.brandeis.edu/registrar/catalog/one-subject.php?subject\\_id=500](http://www.brandeis.edu/registrar/catalog/one-subject.php?subject_id=500)

Each student is responsible for fulfilling each requirement before the relevant deadline. Students failing to complete requirements on time may, at the discretion of the faculty, be required to leave the program.

Students in the Biochemistry Graduate Program are expected to work full-time towards the degree throughout the entire calendar year. Students should be aware that scientific research is a demanding occupation and that researchers often find it necessary to do work on nights, weekends, and holidays in addition to that during "normal working hours." This precludes students undertaking outside employment or outside academic activities that would require a significant amount of time.

The Graduate School requires that "*Students entering Brandeis University with no previous graduate work must earn the doctorate within eight years from the inception of study. Students who are granted credit for a year of graduate work completed elsewhere must earn the degree within seven years from the inception of their study at Brandeis.*" This is an absolute upper limit for time to completion.

However, the Biochemistry Program expects students to complete Ph.D. thesis research before year 5.5.

## Requirements for the Ph.D. degree

### 1. Courses

To fulfill the course requirement for the Ph.D. degree, the student must complete each course with a letter grade of B- or higher. To make any subsequent modifications to the Required Program of Study, the student must obtain, in advance, written approval from the Program Chair.

The Required Program of Study consists of seven one-semester courses, of which four must be satisfactorily completed in the student's first year. In the first year, all students must take BCHM 101a, 102a, BIOP 200b, and one elective course. In subsequent years, three additional advanced-topics courses or seminars may be chosen from any 100- or 200- level Biochemistry, Biology, Chemistry, or QBIO course listed in the Brandeis catalog. Other advanced-topics courses may be substituted with explicit permission of the Graduate Program Chair. In addition, students must take laboratory rotations and the non-credit course CONT 300b, which do not count among the seven courses required. All graduate students beyond the first year must register for BCHM 401d *Biochemical Research Problems*. The following is a typical program of study:

#### Year 1, Fall Semester

BCHM 101a	Advanced Biochemistry: Enzyme Mechanism
BCHM 102a	Quantitative Approaches to Biochemistry
BCHM 300a	Laboratory rotations

#### Year 1, Spring Semester

BCHM 104	Physical Chemistry of Macromolecules
BIOP 200b	Reading in Macromolecular Structure-function Analysis
BCHM 300b	Laboratory rotations
CONT 300b	Ethical Practice

#### Year 2

BCHM 103	Advanced Biochemistry: Information Transfer Mechanisms
BCHM 401	Biochemical Research Problems
	Advanced-topics seminar

#### Year 3

CHEM 235	Advanced NMR Spectroscopy
BCHM 401	Biochemical Research Problems

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### **Biochemistry Ph.D. with Specialization in Bioorganic Chemistry**

In order to receive a Ph.D. in biochemistry with a specialization in bioorganic chemistry, students must complete the requirements defined above for the biochemistry Ph.D. degree, with the following restrictions:

**A.** As one of their four elective courses, students must complete one course in synthetic organic chemistry, chosen from the following:

CHEM 134b Advanced Organic Chemistry: Synthesis

CHEM 135a Advanced Organic Chemistry: Synthesis II

**B.** As one of their four elective courses, students must complete one other advanced chemistry course approved in advance by the graduate program chair.

Students wishing to obtain the specialization must first gain approval of the graduate program chair. This should be done as early as possible, ideally during the first year of graduate studies.

### **Biochemistry Ph.D. with Specialization in Quantitative Biology**

In order to receive a Ph.D. in biochemistry with a specialization in quantitative biology, students must complete the requirements defined above for the biochemistry Ph.D. degree and in addition must satisfy the course requirements for the quantitative biology specialization that are described in the quantitative biology section of the *Bulletin*. Any alteration to the quantitative biology course requirements must be approved by the quantitative biology program faculty advisory committee. With the approval of the biochemistry graduate program chair, courses taken to satisfy the quantitative biology specialization requirements can be used to satisfy course requirements of the biochemistry Ph.D. degree.

Students wishing to obtain the specialization must first gain approval of the graduate program chair or Quantitative Biology liaison. This should be done as early as possible, ideally during the first year of graduate studies.

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In addition to passing the formal course requirements, all students should endeavor to keep abreast of current developments in Biochemistry and related fields. To accomplish this, students are urged to attend weekly research seminars, such as: the Wednesday afternoon Biology/Biochemistry colloquium series, Friday Biochemistry/Biophysics Journal Club or Biology Research Talks, and specialty journal clubs according to the student's interest.

We strongly recommend that students choose BCHM 104 and BCHM 103 among their electives, as these courses cover fundamental issues in biochemistry addressed in the Comprehensive Exam.

## **2. Acceptance by dissertation advisor**

After the first year, each student carries out research for the Ph.D. dissertation under the direction of a Brandeis faculty member. If a student wishes to work with a dissertation advisor not listed as

a Life Sciences Faculty member (see <http://www.bio.brandeis.edu>), prior approval of the Biochemistry Program Chair is required. Ordinarily, students choose a research laboratory immediately upon completion of the fourth laboratory rotation. However, some students elect to do a fifth rotation during the summer after the first year. In that case, the Ph.D. advisor must be selected before the beginning of the student's second year.

### 3. Teaching

All Ph.D. candidates are required to serve as a teaching assistant for two courses, sections, or labs. This is usually done in the student's second year of study.

### 4. Propositions

Propositions are research proposals that the student writes and then defends in an oral exam. Each student must pass *two* propositions in order to obtain the Ph.D. degree. Each proposition is an original research proposal based on an understanding of current literature in specific fields of research. The student should identify an interesting and experimentally tractable question at the forefront of biochemistry, and should design a plan to attack this question (or maybe even to answer it!).

*The first proposition* (the "outside" proposition) is a proposal for research that does not cover the field of the student's Ph.D. research. This proposition must be completed before the beginning of the second semester of the second year.

*The second proposition* (the "inside" proposition) should be in the general field of the student's dissertation research. If the student wishes, it may take the form of a thesis research proposal, but this is not a requirement. This proposition must be completed before the end of the second year (July 1).

For both propositions, the chosen topic should be approved by the thesis advisor well in advance. The propositions are defended orally before a committee of three faculty members, including the dissertation advisor. **The Chair of the committee should NOT be the advisor.**

**At least two weeks before the scheduled date the student must submit the proposition exam scheduling form** (see Appendix). **Each member of the committee must be given a final copy of the written proposition no later than three days before the examination date.** The student should bring a copy of the proposition defense form (see Appendix) to the oral exam for the signatures of the committee. ***It is the responsibility of the student to choose the proposition committee, to schedule the oral presentation, and to reserve a room through the Biochemistry office.***

*Written proposition.* Proposition topics are original research proposals formulated by the student. Propositions are academic exercises only; students do not actually perform the research proposed. A proposition defines a specific current research problem and proposes the experimental means to investigate it.

The proposition should clearly and explicitly define a goal of the proposed research. Usually, the goal is to answer a single, specific scientific question.

The proposition should make a convincing case, using appropriate literature citations, that achieving the goal would be scientifically worthwhile and should summarize (with references) relevant work done by others.

The proposition should also describe a practical plan of experiments by which the goal might be achieved. The plan should explicitly state the experimental methods to be used and contain sufficient detail, including literature citations, to allow the reader to evaluate its feasibility.

The written proposition is typically ~10 double-spaced pages in length. Many students have found the following format, based on that used in NIH grant proposals, to be useful: i) Specific Aim; ii) Significance; iii) Background and iv) Experimental Plan.

*Oral examination.* The student should prepare a 30-minute presentation, which will in practice end up as a one-hour discussion. The student should bring a copy of the proposition defense form (see Appendix) to the oral exam for the signatures of the committee.

*Grading.* Propositions are graded pass-fail. Students receiving a failing grade are ordinarily given the opportunity to repeat the defense within five weeks from the initial defense.

## **5. Comprehensive examination**

In May of the second year, a Comprehensive Exam will be given. This will consist of a 3-hour written exam followed several days later by a short oral exam. This exam is to be taken only once, and passing it is a requirement of admission to Ph.D. candidacy. The exam will cover fundamental principles of macromolecular biochemistry, and will set for the student new problems in which these principles are to be applied.

## **6. Progress Meetings**

Starting in the third year of study, the student meets with a faculty committee of three members at least once every academic year to discuss progress towards completing research and the dissertation. The committee, which includes the dissertation advisor, is chosen by the student, and its makeup should approximate that of the intended dissertation committee. These meetings are held on a schedule posted each year. The student should bring to the meeting the required form (see Appendix) which the committee members sign to indicate whether the student is making satisfactory progress toward completion of dissertation research. ***Students should not think of these meetings as exams!*** Their sole purpose is to facilitate the student's trajectory towards a successful dissertation.

For the first Progress Meeting, held during the third year, the student should submit a written

description of the general aims of the thesis research-project and the progress made towards these aims. In subsequent years, the meetings are more informal and do not require a written report. However, students often find it helpful to prepare a written outline to bring to the meeting.

Students should feel free to call a Progress Meeting at any time, i.e., before the scheduled time, if they feel that the advice of a committee would be helpful. Otherwise, these meetings will be scheduled by the Program Chair.

## **7. Residence**

The graduate school requires a student be resident at Brandeis (i.e., enrolled as an on-campus graduate student) for three years to receive the Ph.D. degree. Consult the Brandeis catalog and/or the Graduate School Office if you need more information on the residency requirement.

## **8. Dissertation**

The Ph.D. candidate must write a dissertation that summarizes the results of an original investigation of an approved subject and which demonstrates the competence of the candidate in independent research. The student delivers a public lecture on the dissertation research.

A final oral examination based on the dissertation must be passed. The defense committee will be composed of 3-4 faculty members, one being the dissertation advisor. At least one of the members of the defense committee should be chosen from outside the Biochemistry Program (and is customarily from outside the University). The examination is open only to the student, the committee, and members of the Biochemistry Graduate Program faculty.

It is the responsibility of the student:

- to ensure that all requirements are satisfied before the dissertation exam

- to ensure that the dissertation is in a form and format acceptable to the Graduate School and is submitted by the required deadlines (students should obtain specific instructions for the preparation of the dissertation directly from the Graduate School office before starting to prepare the dissertation)

- to fill out the defense committee form (obtained from GSAS) with the required signatures prior to the defense, and place a copy in Trisha Murray's mailbox (Friedland Bldg)

- to arrange a time and place for the Ph.D. defense at least two weeks in advance

- to give a copy of the dissertation to each committee member at least two weeks before the defense

- to come to the examination with the forms required by the university: (1) Report on Ph.D. Dissertation and Final Oral Examination (obtained from the registrar's office), and (2)

signature pages for final dissertation copies.

to obtain the signatures of the members of the dissertation defense committee and to file the forms and the final dissertation copies with the graduate school.

Students have not fulfilled the dissertation requirement until the final version of the dissertation, including any changes required by the committee and the Graduate School, is submitted to the Graduate School office. For theses that include copyrighted material (for example, text already published in journal articles), copyright permission must be obtained from each journal and submitted to the Graduate School office with the dissertation. There is usually no need to get permission from co-authors, since it is usually the journal, not the authors, that owns the copyright.

The Graduate School requires that the oral exam be retaken if the final thesis is not submitted sufficiently soon after the exam; if delays are anticipated please consult the Graduate School office. In any case, the final thesis must be submitted within eight years of the inception of graduate study.

### **Summary of deadlines for Ph.D. degree requirements**

End of second semester of year 1:

- pass first-year courses
- be accepted by dissertation advisor (for students doing only four rotations)

Before start of year 2:

- be accepted by dissertation advisor (for students doing five rotations)

Before start of second semester of year 2:

- pass first Proposition exam ("outside" proposition)

End of second semester of year 2:

- pass Comprehensive exam (given in May)
- pass second Proposition exam ("inside" proposition) before July 1

Autumn of year 3:

- Set up a Progress Meeting Committee and present proposed thesis project

In every subsequent year:

- complete Progress Meeting

Note: For the purpose of Biochemistry program deadlines, "end of the second semester" refers to the date listed in the Brandeis academic calendar as the date final grades are due, and "before the start of year" means before the first day of classes.

### **Information for first-year students**

Upon arrival on campus, first-year students should stop by the Biochemistry Department Office (Friedland 15) to fill out forms so that fellowship stipends and health insurance may be started and to meet Lynn Olsen who will be your contact with administration. Please check your mailbox (located in the hallway outside the Biochem office) for information about orientation activities, registration, and class schedules. Please also contact the Biochemistry Program Chair (Chris Miller, Volen 415) to set up an appointment to discuss your course selections. It is best not to register for classes until after this meeting.

#### Miscellaneous information

As a graduate student, your only official affiliation with Brandeis is as a member of the graduate program, not of a department (e.g., Biochemistry) or center (e.g., Volen).

The following is information from the Registrar's office which all Biochemistry students (both first-year and beyond) should be aware of:

"Every semester some graduate students completely overlook their obligations to enroll in classes, thinking it a matter of little importance which can easily be corrected at anytime. ***This is a false impression.*** We will make a concerted effort to reach unregistered and unenrolled students in advance of the deadline. But thereafter, we are not at liberty to enroll students in courses; we will presume they are not in attendance, and process their withdrawal from the University, which in turn will invalidate any financial support they may be receiving."

However, first-year students should not register until they discuss their academic program with the program chair.

## Proposition Examination Scheduling Form

To the Biochemistry program:

I have scheduled my Biochemistry proposition exam for

\_\_\_\_\_  
(date, time and location)

The proposition defense committee consists of the following faculty in addition to my advisor:

\_\_\_\_\_  
(Chair)

\_\_\_\_\_  
(Advisor)

\_\_\_\_\_  
(Committee member)

The subject or title of my proposition is:

\_\_\_\_\_  
(signature of student and date)

\_\_\_\_\_  
(printed name)

I approve the proposition subject. [Note to advisor: subject must be outside of the student's dissertation research field].

\_\_\_\_\_  
(signature of advisor and date)

\_\_\_\_\_  
(printed name)

Instructions for the student: Photocopy the completed form and give original to Trisha Murray (Biochemistry Dept., MS 009). Please also keep a copy in your own files.

**Proposition Defense Form**

\_\_\_\_\_ 's proposition defense took place on  
(student's name)

\_\_\_\_\_. The grades were:  
(date)

Written proposition -- pass fail; Oral examination pass fail;

\_\_\_\_\_  
(chair signature)

\_\_\_\_\_  
(chair printed name)

\_\_\_\_\_  
(committee member signature)

\_\_\_\_\_  
(committee member printed name)

\_\_\_\_\_  
(dissertation advisor signature)

\_\_\_\_\_  
(dissertation advisor printed name)

Instructions for the student: Give a copy of this form to the examination committee chair before the exam.

Instructions for the chair of the examination committee: Give the completed form to Trisha Murray (Biochemistry Dept., MS 009).

## Progress Meeting Form

To the Biochemistry Graduate Program:

The undersigned held a meeting with \_\_\_\_\_ on \_\_\_\_\_  
(name of student) (date)

to discuss progress toward the completion of the Ph.D. degree.

Comments:

\_\_\_\_\_  
(committee member signature)

\_\_\_\_\_  
(committee member printed name)

\_\_\_\_\_  
(committee member signature)

\_\_\_\_\_  
(committee member printed name)

\_\_\_\_\_  
(committee member signature)

\_\_\_\_\_  
(committee member printed name)

\_\_\_\_\_  
(dissertation advisor signature)

\_\_\_\_\_  
(dissertation advisor printed name)

Instructions for the student: Photocopy and give original to Trisha Murray (Biochemistry Department, MS 009). Please also keep a copy in your own files.

## Graduate Teaching Assistants In Biochemistry

**Assignments.** Over the course of graduate study, each Ph.D. student is required to teach 2 undergraduate sections, courses, or labs. These are usually done in the second year. TA assignments are made before the summer prior to the commencement of teaching responsibilities. In rare cases of unexpected enrollment shifts, cancellation or addition of courses, or inequities in work loads, assignments may be changed with little notice. In such a case the teaching assistants concerned will be notified as soon as the changes are known.

**Responsibilities.** Graduate teaching assistants and faculty members will discuss course requirements, attendance policies and the range of graduate responsibilities (e.g. in class or lab, outside class or lab, administrative duties, technical assistance).

If graduate teaching assistants are to grade undergraduate work, the faculty member and TA will discuss the number of assignments, grading procedures and standards and an expected range of grades.

Graduate teaching assistants should hold weekly office hours as needed for the course.

Graduate teaching assistants are seldom asked to tutor students requiring additional help. If regular tutoring is needed to address difficulties in the course, the graduate student will refer the problem to the professor and, if necessary (and agreed upon), to the appropriate agency on campus for additional assistance.

Faculty members will advise graduate teaching assistants on policies for academic honesty and sexual harassment at the beginning of the term, at which time procedures for alerting the proper university officers and dealing with such matters will be agreed upon.

Graduate teaching assistants are encouraged to discuss teaching with the professor or with a member of the graduate committee.

Graduate teaching assistants are advised to consult teaching materials available at the Office of the Dean of Arts & Sciences and to attend teaching seminars sponsored by the Graduate School.

Every attempt should be made to resolve difficulties arising between graduate teaching assistants and faculty members. If such resolution is impossible, official grievances should be made per the stated procedures in the student handbook.

Graduate teaching assistants are encouraged to document teaching experiences for future job searches. Faculty members should agree to provide letters of reference for teaching which will be included in the student's departmental file.

## Pocket Handbook - Graduate Program in Biochemistry

Here's what you have to do - and when:

### First year

**Show up** in the Biochemistry Office (Friedland Bldg) and announce yourself to Lynn Olsen

**Meet with Program Chair** (Chris Miller, Volen 415) to plan out your academic courses

**Register** for classes. You must take:

BCHM 101a, BCHM 102a, BCHM 300a,b, BIOP 200b, CONT300b, and one additional class

During the 4<sup>th</sup> rotation, choose a PhD thesis advisor

In May, you will receive T.A. assignments for next year

*Do not forget to register for summer session - important!*

### Second year

Fulfill one or two of the three additionally required **advanced-course electives**

Register for BCHM 401d *Biochemical Research Problems* beyond the first year

Carry out **T.A. assignments**

Prepare and your **1st proposition defense** (written and oral), to be completed by mid-January

Prepare and your **2nd proposition defense** (written and oral), to be completed by July 1

Prepare throughout the year for the **Comprehensive Exam** (taken in May)

*Do not forget to register for summer session - important!*

### Third year

Continue towards completing your **advanced-course elective** requirement

Choose **Progress-Meeting** committee in fall semester. You will be prompted to do this.

*Do not forget to register for summer session - important!*

### Succeeding years

Complete advanced-course requirement

Yearly **Progress Meeting**: you will be prompted to arrange this.

*Do not forget to register for summer session - important!*

You should aim to have completed your Ph.D. research by the end of year 5. This does not always (or often) happen, but you should certainly be finished in year 6.

**Hint:** As you begin to see light at the end of the tunnel, start to think about where you want to do postdoctoral research **18 months in advance**. Contact prospective postdoc advisors and give them plenty of lead-time in knowing that you're interested in working with them. An early-bird attitude greatly enhances the likelihood of your acceptance into your preferred postdoctoral lab.