
Drexel University College of Medicine

BIOCHEMISTRY

POLICIES AND PROCEDURES

2015-2016

Patrick J. Loll, Ph.D.

Professor of Biochemistry & Molecular Biology
Director, Graduate Program in Biochemistry
Drexel University College of Medicine
Department of Biochemistry
245 N. 15th Street, Mail Stop 497
Philadelphia, PA 19102-1192
TEL: 215-762-7706
FAX: 215-762-4452
ploll@drexelmed.edu

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I. INTRODUCTION

This booklet:

- Describes academic policies and procedures pertaining to graduate study in the Biochemistry Graduate Program;
- Supplements procedures and general rules of the Office of Biomedical Graduate Studies;
- Contains current guidelines that are revised periodically by faculty in the Program.

The Graduate Program offers coursework and research opportunities leading to the Ph.D, M.D./Ph.D and M.S. degrees. The goal of the Graduate Program is to provide an intensive interdisciplinary research training and classroom experience in order to prepare graduates for significant contributions to their field. Research interests of the faculty members are described elsewhere.

There are five components of requirements to be fulfilled for obtaining a Ph.D. degree:

- Research rotations
- Required and elective courses
- Preliminary examination
- Qualifying examination and dissertation research proposal
- Research dissertation and defense

In addition, the Biochemistry graduate program requires a Ph.D. candidate to submit at least one manuscript for publication by a peer-reviewed journal and to prepare a second manuscript for submission.

Two types of M.S. degrees are offered, the thesis and non-thesis degrees. For the thesis M.S. degree, the requirements include all of the above except for the qualifying examination, the dissertation research proposal, and manuscript submission, which are not required. For the non-thesis M.S., degree, students take a comprehensive exam instead of the preliminary exam, and the dissertation is replaced by a scholarly paper or some combination of written and/or oral presentation.

II. BASIC GUIDELINES FOR THE Ph.D. DEGREE

A. CURRICULUM

1. Required Core Modules

Core Curriculum I

Core Curriculum II

Required Courses for Program

BIOC-502	Biochemistry 1 st Laboratory Rotation
BIOC-503	Biochemistry 2 nd Laboratory Rotation
BIOC-504	Biochemistry 3 rd Laboratory Rotation
BIOC-506	Biochemistry Journal Club
BIOC-507	Biochemistry Seminar Series
BIOC-508	Experimental Approaches to Biochemical Problems
BIOC-600	Biochemistry Thesis Research
MCBG-507	Macromolecular Structure & Function
BIOC-511	Scientific Writing for Biomedical Researchers
BIOC-603S	Advanced Topics in Biochemistry & Molecular Biology
MCBG-506	Advanced Cell Biology

Required Courses for Biomedical Graduate Office

IDPT-501-05	Biostatistics I
IDPT-500-05	Scientific Integrity and Ethics

2. Suggested Elective Courses (One is required)

BIOC-510	Cancer Biology
MIIM-603	Advanced Molecular Biology
MIIM-555	Mechanisms of Microbial Pathogenesis
MIIM-604	Special Topics in Virology
PATH-601	Cell & Molecular Pathobiology of Cancer
NEUR-607	Advanced Neuroscience
PHYS-503	Graduate Physiology
PHYS-512	Graduate Pharmacology
PHARM-525	Drug Discovery & Development

Or other 3-credit elective, with approval of the Program Director

Formal courses should be completed within the first two years (class schedules permitting).

3. Special Topics Courses and Seminars

Students are required to sign up for and participate in the Departmental Seminars. Graduate students are expected to present their research at least once each year in the Biochemistry Journal Club.

4. Lab Rotations

The students will perform three lab rotations during the first year. Rotation labs will be chosen by the student, in consultation with their rotation mentors and the Program Director. At least one of the three rotations must take place in a laboratory within the Dept. of Biochemistry and Molecular Biology in the College of Medicine. Research rotations should provide the students with opportunities to:

- Practice scientific logic and experimental design
- Acquire useful technical expertise
- Extend scientific and personal interactions within and between labs
- Assess labs as potential thesis research laboratories
- Diversify scientific knowledge

At least 20 hours per week for a twelve-week period are required for rotations that take place during the semester; students must spend at least 40 hours per week in the laboratory during summer rotations. Students must satisfactorily complete all rotations.

The typical rotation schedule will be as follows: Rotation 1, Fall semester; Rotation 2, Spring semester; Rotation 3, mid-May to July. Additional rotations are possible, but should only be undertaken in consultation with the Program Director. *Students should consult with the Program Director when choosing all rotations.*

Laboratory rotations are graded on a Satisfactory (S) or Unsatisfactory (U) basis. Students receiving an “S” are rated on a performance scale ranging from Outstanding (1) to Poor (5). A “U” for a lab rotation is reserved for students that do not meet rotation performance requirements, including attendance, as stipulated by the program. A “U” for a laboratory rotation is grounds for dismissal.

5. Teaching Experience

The ability to teach is essential for some careers in the biomedical sciences; therefore, should the student be interested, they may participate in the teaching skills course (MIIM 640-05). Teaching experience may also be obtained in other ways, including teaching/preparation for the medical

school laboratory, "hands on" teaching of medical students, or through other teaching experiences approved by the faculty. Interested students should discuss this with the program director.

6. Research

A minimum of two years of full-time research is required following the choice of the thesis research laboratory (generally by the end of the first summer). Additional time is required for writing the dissertation and research publications. Generally, the approximate time required to complete a Ph.D degree is five to six years and an M.S. degree is two to three years.

7. Committee Meetings

Meetings between the student and his/her Thesis Committee serve to provide an objective, supportive and critical feedback evaluation of academic and scientific progress throughout Graduate School training. They are an essential part of the mentoring process.

Committee meetings should be held every six months, and **MUST** be held at least once per year. It is the responsibility of each student to convene committee meetings at a mutually convenient time and to provide evidence of such meetings in writing to his/her program director and the Biomedical Graduate Studies office.

B. ADVISORY COMMITTEES

1. The Program Director will serve as advisor during the first year.
2. After successful completion of the Preliminary Examination (see below), a research advisor will be selected by the student. The student and advisor select an Advisory/Dissertation Committee consisting of two additional Program faculty members. This Advisory committee should meet at least once before the qualifying examination.
3. Before the qualifying examination, the committee will be expanded to five members by including two more faculty: at least one from outside the Program or outside Drexel University College of Medicine. At least two of the five committee members must be drawn from faculty with full-time appointments in the College of Medicine. At this time a chair of the dissertation committee will be elected who is **not** the dissertation advisor. The dissertation committee shall evaluate the student's progress every 6 months.

C. EXAMINATIONS

1. **Preliminary Examination:** The purpose of the Preliminary Exam is to assess whether the student is capable of integrating, processing and utilizing the knowledge they have accumulated through their coursework. Biochemistry Graduate Program faculty will be involved in preparing and evaluating this exam. The faculty will also consider the student's performance in classes and rotations at this time. The results of the exam are included in the student's permanent file.

Format: During the summer between the 1st & 2nd years, the students are given a specific research question whose complete answer requires the integration of several overlapping fields of scientific investigation. Students are given several weeks to research and evaluate the given topic in the form of a written outline (ca. 5 single-spaced pages with additional space for diagrams and references). Shortly thereafter, students orally present their response to a panel of Biochemistry faculty. The oral exam lasts 1-2 hours. Successful completion of the preliminary exam is necessary to continue in the program.

The oral exams for all students in a given year will be conducted by the same committee, to ensure consistency in grading; no more than half of the committee members will rotate off the committee from year to year, to ensure continuity. The exam will be graded pass/fail. In the event of a failing grade in the preliminary exam, one attempt at remediation will be granted. The student will be granted one additional month to prepare for their remedial oral exam.

2. **Qualifying Examination:** This is a mock NIH grant proposal that is defended orally. The purpose of the examination is to assess students' scientific creativity, ability to design a research project, and oral and written communication skills. The student's dissertation committee administers the exam.

Written Portion (A): The student can choose to focus either on their thesis research, or (in rare cases) on a closely related topic approved by their committee. The format should follow that of the research plan of an NIH F31 application, allowing one page for the Specific Aims and 6 pages for the remainder of the research plan (references do not contribute to this page limit). The proposal should cover a research project that the student can realistically hope to accomplish within 3 years. Graduate student peer review is recommended, but the proposal should be written entirely by the student. No explicit faculty or postdoctoral assistance is permitted in the actual writing of the proposal.

Oral Portion (B): Several weeks after submitting their proposal to the Advisory Committee, the student will give an oral presentation of their

proposal and then defend the proposal before their Advisory Committee. At this time both the theoretical knowledge that is pertinent to that branch of science and the experimental design and evaluation of the proposed research are examined. The mock grant and the committee's evaluation of performance are included in the student's permanent file. Successful completion of the qualifying exam is necessary to continue in the Ph.D. program.

The qualifying exam must be completed by the end of December in the student's third calendar year in the program (e.g., a student entering in August of 2013 must complete their qualifying exam by December 2015). Failure to meet this deadline is grounds for dismissal from the PhD program.

D. EVALUATION OF PROGRESS

The Advisory Committee or dissertation committee will evaluate performance in coursework, on exams, in laboratory rotations and oral presentations every 6 months.

Students are required to maintain a GPA of 3.0 or better in order to remain in good standing. Failure to do so will place their stipend in jeopardy.

Performance in Journal Clubs and Seminar: Three unexcused absences are allowed per year for journal clubs and seminar. More than three absences will result in a grade of Unsatisfactory (U). The “U” must be remediated to the satisfaction of the program. If not, it will be grounds for dismissal.

In addition:

1. Summer Between 1st and 2nd Years

- a. *Students with 3.0 GPA and satisfactory rotation performance* will take the Preliminary Examination.

Pass on Preliminary Exam - qualifies the student to continue to the second year of the Ph.D. program.

Failure or Deficiency on Preliminary Exam - the student is permitted a single retake of the Exam, to be scheduled within one month of the original examination.

Failure on retake of Preliminary Exam - the student must withdraw from the Ph.D. program, and is eligible to apply for the M.S. program (acceptance is not guaranteed). Reapplication to Ph.D. program is possible after completion of M.S. The committee may decide at this time to waive further preliminary examinations for the Masters degree.

- b. *Students with <3.0 average or who have less than a B in Core Curriculum I and II* are not eligible to take the Preliminary Exam, except with the permission of the faculty. If this request is granted:

Pass on Preliminary Exam - student may continue in Ph.D. program under probationary status, upon recommendation of the faculty and in accord with Office of Biomedical Graduate Studies policies regarding any necessary course remediation.

Failure on Preliminary Exam - withdraw from the program.

2. Summer Second Year/Fall Third Year

To continue in the third year of the Ph.D. program, students are required to achieve an overall GPA 3.0, satisfactory performance in the laboratory, and pass the Qualifying Exam.

Failure on qualifying exam - One retake will be permitted, within one month of the first attempt. The retake may constitute submission of a new proposal, a revision of the first proposal, and/or a repeat of the oral presentation and defense, at the discretion of the committee. A second failure will result in withdrawal from the Ph.D. program. A student who fails their qualifying exam may petition the faculty to be accepted into the M. S. program.

Failure of required courses. A grade of 80 or better must be achieved in all required courses. Students who fail to achieve this grade may remediate, at the course director's discretion, or may retake the course once. Any student who fails a required course twice will be dismissed from the program.

E. DISSERTATION AND DEFENSE

The preparation and public oral defense of the Ph.D. dissertation are conducted as outlined in the Office of Biomedical Graduate Studies guidelines. In conjunction with the dissertation, the student must have submitted one first-author manuscript and prepared, to the satisfaction of their thesis committee, a second manuscript for publication. The student's dissertation committee must approve the dissertation proposal, and is responsible for evaluating the dissertation, conducting the oral defense, and recommending approval to the Associate Dean, Biomedical Graduate Studies. Students in the Biochemistry Graduate Program must submit their final, completed dissertation to their thesis committee at least two weeks prior to the oral defense date. Student who fail to meet this deadline may not be allowed to graduate.

III. GUIDELINES FOR M.D./Ph.D. DEGREE

A. PROGRAM

1. Except where agreed upon by the student and his/her advisory committee, the MD/PhD program consists of two or three years of graduate work following the second pre-clinical year of medical school. The general schedule for the M.D./Ph.D. program is (1) to complete the first two years of medical school. It is strongly recommended that students complete the rotation and any required graduate school courses that are offered during the summers preceding formal enrollment into the Graduate Program, (2) complete the required graduate program courses, exams and research during the next three to four years, (3) complete the last two years of medical school, finishing and defending the dissertation prior to December 31st of the year of the return to Medical School.

2. The MD/PhD student completes all of the standard requirements of medical school, and all of the requirements for the Ph.D. degree, with the following exceptions:
 - a. A single two-month lab rotation is required. A second rotation may be arranged if appropriate.
 - b. The same core and elective courses are required as for the Ph.D. degree, except where equivalent courses have been passed during medical school training.
 - c. Selection of the research advisor should be made immediately following the lab rotation(s).
 - d. Teaching is not required but may be arranged if requested by the student and approved by the Advisory Committee.
3. The M.D./Ph.D. student upon entry into the graduate program is equivalent to a beginning second year student, and as such will select a thesis committee and take the Qualifying Exam at the end of the first year in the Graduate Program. Committee meetings will be held every six months.
4. The manuscript preparation requirement and the dissertation preparation and defense guidelines are identical to those of the Ph.D. program. The dissertation must be written and defended before returning for the last two years of medical school. In exceptional cases, the dissertation committee in accord with the Office of Biomedical Graduate Studies guidelines may grant an extension to this deadline.
5. For further information, see the bylaws of the MD/PhD program. The most current rules of the MD/PhD program may supercede information given here.

IV. GUIDELINES FOR MASTER OF SCIENCE PROGRAM

THESIS MASTERS. There is an increasing demand within biotechnology and pharmaceutical industries for M.S. level research assistants with expertise in all areas of Biochemistry. M.S. students will have specific research goals, relating to a chosen area of Biochemistry. Students who achieve outstanding performance during the M.S. may apply to the Ph.D. program and proceed with Ph.D. research after successfully completing the first-year core curriculum and Preliminary Exam. General requirements for admission to and completion of the M.S. program may be found in the Drexel University College of Medicine Graduate Student Handbook. Specific departmental requirements are similar to those for the Ph.D. degree (see Guidelines for the Ph.D. program), with the exceptions and clarifications noted below.

A. GENERAL REQUIREMENTS

1. Full time M.S. students are expected to complete their program within three years, and in no more than four years.

2. A temporary advisory committee will be assigned upon admission to the program. After satisfactory completion of the first year, a formal advisory committee will be selected as described in the Graduate Student Handbook.
3. Opportunities for teaching are available to interested students; there is, however, no teaching requirement.
4. Satisfactory performance is required on the Preliminary Examination, administered at the same time as for Ph.D. students (see above). The Preliminary Exam for thesis Masters students will follow the identical format as the Ph.D. Preliminary Exam. The examination committee will grade the student according to the following scale:

Pass at Ph.D. level: Entitles the student continue to the second year of the M.S. program. Required for any student wishing to transfer to the Ph.D. program.

Pass at M.S. level: Entitles the student continue to the second year of the M.S. program.

Failure or Deficiency on Preliminary Exam - the student is permitted a single retake of the Exam, to be scheduled within one month of the original examination.

Failure on retake of Preliminary Exam - the student must withdraw from the M.S. program.

B. COURSE REQUIREMENTS

1. Course requirements are the same as those for the PhD program.
2. A GPA of 3.0 or better must be maintained to successfully complete the program.

C. RESEARCH REQUIREMENTS

1. The students will complete at least one and no more than three rotations in program laboratories during the first year. It is highly recommended that M.S. students do no more than two laboratory rotations. These rotations are designed to expose the student to a variety of important techniques and research problems. At any time after the first laboratory rotation, M.S. students can choose a thesis advisor. After completion of the Preliminary Exam, the student in conjunction with his/her thesis committee and advisor will select a research project with clearly defined objectives and feasibility. The thesis committee will consist of at least three members of the graduate faculty, at least one of whom must be a full-time faculty member in the Department of Biochemistry and Molecular Biology in the College of Medicine.
2. The project should require approximately one year of full time research. A suitable objective is the preparation of a publishable research paper.

3. The preparation and defense of the M.S. Thesis is conducted as described in the Graduate Student Handbook. The Thesis may follow the traditional format, or may consist of a research paper submitted or accepted for publication, with any additional material deemed necessary by the Thesis Committee.
4. Committee meetings will be held every six months.

D. NON-THESIS MASTERS

We envision two likely tracks for students in the non-thesis Masters. The first is for students who transfer to the Masters track after one year in the PhD program. Students transferring to the Masters program after their Preliminary exam will complete their second year coursework, but instead of pursuing thesis research, they will instead do literature research (working under the guidance of a mentor) and prepare a scholarly paper. This paper will ideally be submitted for publication as a literature review, but acceptance is not a requirement for graduation. Students will also be required to present their work to the members of the program in a one-hour oral presentation.

The second track is for students who matriculate in the non-thesis Masters program. Two laboratory rotations will be required; the rotations will either be focused on learning experimental techniques, or take the form of tutorials dedicated to a topic of expertise in the lab. Students may opt (with the mentor's approval) to do two consecutive rotations in the same laboratory, so as to develop specialized knowledge of one or a few particular techniques. Students in this track are not required to take the preliminary exam; instead, they will take a comprehensive examination, which will take the form of a written response to a question. The comprehensive examination must be completed by the end of the Fall semester during the student's second year (ideally, it will take place during the summer between first and second years). Satisfactory performance in coursework is also required to maintain good standing. Work in the second year will continue to focus on experimental studies in a mentor's laboratory. This work is expected to culminate in authorship of one or more papers; these needn't be first author papers, but the student is expected to make a significant technical contribution to these papers. Again, since this is a non-thesis Masters program, submission and acceptance, while encouraged, are not required for graduation. Students will also be required to present their work to the members of the program in a one-hour oral presentation.

Coursework for both tracks will be the same (except for the fact that students in the first track may have performed three lab rotations). The suggested curriculum is shown on the next page.

CODE OF BEHAVIOR

The Graduate Program in Biochemistry subscribes to the **Code of Behavior** for all of its members. This policy states that professional behavior appropriate to a faculty and students in an academic research setting is expected and required at all times. Admission to and continued participation in the Graduate Program in Biochemistry is therefore contingent upon the student's understanding of this policy, and his/her agreement to adhere to its guidelines.

CODE OF ETHICS

The Graduate Program in Biochemistry subscribes to the **Code of Academic Integrity** (presented in its complete form in the Student Handbook) for all its members. This policy states that cheating, plagiarism, forgery, or other forms of academic misconduct are not tolerated at our institution. Admission to and continued participation in the Graduate Program in Biochemistry is therefore contingent upon the student's understanding of this policy, and his/her agreement to adhere to its guidelines.

**Drexel University College of Medicine
Graduate Program in Biochemistry
Typical Schedule for First Year, PhD & MS Programs**

FALL

Meet with Dr. Pat Loll, Advisor to New Graduate Students

Core Curriculum I	6 credits	IDPT-521-05
Biochemistry 1st Laboratory Rotation	4 credits	BIOC-502-05
Biochemistry Journal Club	1 credit	BIOC-506-05
Biochemistry Seminar Series	1 credit	BIOC-507-05
Special Topics in Biochemistry & Molecular Biology	1 credit	BIOC-603S

SPRING

Meet with Dr. Pat Loll

Core Curriculum II	4 credits	IDPT-526-05
Biochemistry 2nd Laboratory Rotation	4 credits	BIOC-503-05
Biochemistry Journal Club	1 credit	BIOC-506-05
Biochemistry Seminar Series	1 credit	BIOC-507-05
Biostatistics	2 credits	IDPT-501-05
Advanced Cell Biology	1 credit	MCBG-506

SUMMER

Biochemistry 3rd Laboratory Rotation	4 credits	BIOC-504-05
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Preliminary examination must be passed in summer between 1st & 2nd years.

Choose Research Advisor by 8/31.

**Drexel University College of Medicine
Graduate Program in Biochemistry
Typical Schedule for Second Year
Required and Elective Courses**

FALL

Thesis Research	9 credits	BIOC-600-05
Biochemistry Journal Club	1 credit	BIOC-506-05
Biochemistry Seminar	1 credit	BIOC-507-05
Experimental Approaches to Biochemical Problems	3 credits	BIOC-508-05
**Committee Meeting		

SPRING

Macromolecular Structure and Function	2 credits	MCBG-507-05
Thesis Research	9 credits	BIOC-600-05
Biochemistry Journal Club	1 credit	BIOC-506-05
Biochemistry Seminar Series	1 credit	BIOC-507-05
Scientific Integrity and Ethics	2 credits	IDPT-500-05
Writing for Researchers	1 credit	BIOC-511-05
One Elective Course (either spring or fall of 2 nd year*)		
**Committee Meeting		

SUMMER/FALL

Qualifying Exam - Mock NIH grant proposal, to be followed by oral qualifying exam; must be completed by the end of December in the third year (e.g., for a student matriculating in Fall 2015, the qualifier should be completed no later than 31 December 2017). *We strongly urge that students schedule as early as possible, no later than July in the third year, to allow for timely submission of fellowship applications.*

**The student has the opportunity to take elective courses other than those listed earlier, with the consent from the Advisory Committee*