

## GUIDELINES FOR GRADUATE PROGRAM IN PHARMACOLOGY

### **I. GOALS OF GRADUATE TRAINING IN PHARMACOLOGY**

Doctoral training in pharmacology is designed to prepare students to think critically concerning problems involving biochemical, physiological and molecular aspects of pharmacology. Successful students should, by the completion of their graduate training, be able to identify - and to design experiments to test - ideas at the limits of current knowledge in one of the major areas of pharmacology. Students should also learn to analyze, interpret and communicate effectively the results of their thoughts and their experiments to other scientists.

To help students achieve these goals, the Department of Pharmacology has designed a program of study that involves required and elective graduate courses, laboratory rotations introducing various approaches to the solution of pharmacological problems, journal clubs and seminars. Students are expected to use the departmental and other university libraries as well as various online resources for independent reading in order to enrich their understanding of current research advances.

Graduate study is a full time responsibility and demands a sustained effort on the part of students. Laboratory studies may require that students be in the laboratory at night, on weekends or on holidays in order to complete important experiments. Students are allowed to arrange for vacation time of approximately one month each year. Any time away from the laboratory should be scheduled in advance with the adviser. Doctoral training is planned to require approximately four years for completion and is completed when the student submits an approved dissertation embodying the results and discussion of original research on an acceptable subject.

### **II. FINANCIAL SUPPORT OF GRADUATE STUDENTS**

The Department of Pharmacology endeavors to provide financial support to all students accepted into the doctoral program. Normally, students will be supported on Graduate Assistantships provided by the University for the first two years of their program. These University assistantships provide a stipend plus full tuition credit along with a health care plan, and partial support for years three and four. Stipend support for the years needed for completion of thesis research must come from sources other than the Graduate Assistantship. The thesis adviser may provide this support from research grant funds; other available sources include the Thomas Rumble University Fellowships, University Professional Scholarships, the Pharmaceutical Manufacturers Association Fellowships, the NIH Cancer Biology and other Training Grants, Faculty Graduate Research Assistantships, American Heart Association Fellowships, Department of Defense Fellowships, and NSF Graduate Fellowships.

### **III. COURSE REQUIREMENTS**

It is expected that doctoral students will meet all of the University degree requirements as printed in the Wayne State University Graduate Division Bulletin. The course requirements for the doctoral degree total 90 semester credit hours. These are divided into two subdivisions: (1) 30 semester credit hours of Ph.D. Candidate Status, and (2) 60 semester credit hours of course work. The course work should include at least 30 credit hours in the student's major area and one minor area of 6 or more credit hours. Thirty hours not including Candidate Status must be at a level of 7000 courses or above.

A listing of required courses and a selection of available elective courses can be found on the last two pages of this guideline. Additional elective courses can be found in the University catalog under both the School of Medicine and the College of Liberal Arts.

Any student who believes that they have already completed some equivalent coursework may request to be exempted from part of the curriculum. The procedure to request partial or full exemption from particular course work is that the student asks permission from their adviser (for junior students prior to selection of major adviser, this is the Graduate Officer) to petition for exemption. If this permission is given, then the student needs to present adequate documentation (transcript showing date taken and grade awarded, syllabus details, text book) to the course director. The course director makes the determination of the equivalence of the prior work and so whether any exemption (full or partial ) will be given.

#### **IV. ROLE OF DEPARTMENTAL GRADUATE OFFICER AND GRADUATE COMMITTEE**

The Graduate Officer acts as academic adviser for the student until the major adviser has been selected and assigned by the Graduate Committee. The student should consult with the Graduate Officer before selecting courses; the signature of the Graduate Officer is required on the student's Plan of Work. After the Plan of Work has been approved by the University (see below), approval and signature by the Graduate Officer are no longer necessary.

The Graduate Officer prepares a written annual report for the progress of each student in the program. The report details the progress through the curriculum and other requirements of the program, and includes a report from the dissertation adviser (after assignment). The Graduate Officer meets with each student to discuss the annual report.

The Graduate Committee oversees student progress in the program. Approval by the Graduate Committee is required for the following: selection of rotation advisers, selection of major adviser, Plan of Work, Doctoral Committee composition, and off-campus academic activities before the major adviser is chosen. The Graduate Committee also functions to determine continuing academic eligibility of students in the doctoral program.

The Graduate Committee provides pre-submission review and advice to Ph.D. candidates who are submitting applications for external Fellowship support.

#### **V. ROTATIONS**

##### **A. DEFINITION**

Rotations are projects carried out by beginning graduate students under the supervision of a full-time Pharmacology faculty member in that faculty member's laboratory. A rotation should have defined objectives that can be accomplished within the allocated time span.

Since many laboratories in Pharmacology use radioisotopes, all students must take and pass the Radiation Safety Course offered by Health Physics in their first month on campus.

##### **B. PURPOSES**

The rotations exist to serve at least three purposes:

- (1) The student gains training and experience in laboratory research

- (2) The student gains an appreciation of the varieties of techniques and philosophies which can be applied to pharmacological research
- (3) The student is provided with a basis for choosing a specific faculty member to direct her/his research.

### **C. NUMBER AND CHARACTER OF ROTATIONS**

Each graduate student will complete three rotations within the first year of the graduate program.

### **D. DURATION**

The rotation will normally extend through one semester (or summer) during which time the student is expected to carry out laboratory work for a minimum of 16 hours per week. During the summer, the student is expected to expend full-time effort in the rotation project.

### **E. SELECTION OF ROTATION ADVISER**

All students are encouraged to consult the departmental website for initial information on the many research opportunities that are available within the program, and then to follow up through direct meetings with potential advisers. During orientation for new students, all program faculty who wish to mentor rotation students will be invited to come and meet with the students. Any program faculty who may not be able to attend the orientation will be included in the orientation list for further contact. Before the start of each rotation, the student will indicate his/her first three preferences for adviser by submitting a list to the Graduate Officer for approval by the Graduate Committee.

The Graduate Committee will match student preferences with faculty preferences for the rotations. The student's first preference may not always be granted, depending on the judgment of the Graduate Committee as to adequacy of the variety of the student's previous experiences and availability of adviser's time and resources.

Since stipend support for the completion of thesis research will normally be supplied from the major adviser's research grant funds, each faculty member should indicate to the student the prospects for student financial support in future years during the initial meeting when potential rotation projects are discussed. Students should also keep in mind that distinct advantages with respect to learning highly useful techniques may result from rotations in laboratories where the funding outlook is unclear.

### **F. PROSPECTUS**

Upon assignment by the Graduate Committee of the rotation adviser, the student and the adviser will jointly draft a one-page prospectus that specifies the following:

- (1) Objectives of the project. Examples: successful mastery of a technique such as single cell electrophysiological recording; determination of the effect of drug or toxin treatment on enzyme activity; cloning or sequencing nucleotides.
- (2) Student time commitment each week to the project. Both the student and the adviser will sign one copy of this prospectus, which is to be submitted to the Graduate Committee before the student begins work in the laboratory. The adviser and student are responsible for timely submission of the rotation prospectus.

## **G. REPORT**

At the end of each rotation period, the students who have performed rotations will be required to give a short presentation (15 minutes) to the Department in our library that describes their project. All eligible students will present consecutively at one session to maximize the attendance by the Department. A convenient time to schedule the presentation sessions for rotations performed in the Summer and Fall semester will be at the first journal club meeting of the Fall and Winter semesters, respectively (which slots are normally only used to organize presentation sequence for journal club). For rotations performed in the Winter semester, the final journal club slot that falls in Spring/Summer will be used. All graduate students will be required to attend the presentations. All faculty and other research staff will be encouraged to attend.

A copy of the presentation shall be submitted to the Graduate Committee and will serve as a final report. The Graduate Committee will not approve requests for subsequent rotations or for major adviser until the final report has been submitted.

## **H. ACADEMIC CREDIT FOR ROTATIONS**

Students will sign up for one or more credits of PHC 7710, Individual Studies, for each rotation. In some cases rotation credit will be given in the following semester if it cannot be given for the immediate session due to limits on the number of credits that can be taken in a particular semester. The faculty adviser will be responsible for assigning the grade (Satisfactory/Unsatisfactory) associated with the rotation.

## **I. EXEMPTIONS**

The student may petition the Graduate Committee for an exemption from the third rotation. Documentation of prior research experience must be presented as part of the justification for such a proposed exemption. The Graduate Committee will base its judgment upon the variety of experiences and maturity of the student.

## **VI. DEPARTMENTAL SEMINAR AND JOURNAL CLUB**

The departmental seminars are presentations and discussions of research work given by faculty members and invited speakers from other institutions. These seminars are normally scheduled on Friday afternoons during the Fall and Winter semesters. All students should register for 1 credit of PHC 7890 (Seminar) per semester when their GRA allows. Attendance is required of all students irrespective of their registration for this course.

Journal Club consists of student presentations of current research papers. Students are required to register for 1 credit of PHC 7700 each semester, starting with the Winter semester of their first year and continuing through the fourth year of the program. Each semester a grade will be assigned based on attendance and performance in presentation and critique. Attendance is required of all students, including those who may not be registered for the course.

## **VII. ACADEMIC REQUIREMENTS**

All students are required to maintain at least a "B" grade point average (3.0 GPA). If a student's GPA drops below 3.0, that student cannot be supported by a Graduate Assistantship and is placed on academic probation for the next semester. Failure to raise the grade point average to the minimum 3.0 level is grounds for dismissal from the program. A grade lower than "B" in any of the required Pharmacology courses is grounds for dismissal from the program. A failure

(grade lower than “B”, an Unsatisfactory or a Fail) in any other course may be grounds for dismissal from the program. A grade of “B-” is considered a failing grade by the Graduate School.

### **VIII. SELECTION OF MAJOR ADVISER**

Students are urged to select a major adviser as soon as possible so that additional course work that will benefit thesis research can be selected with the aid of the adviser. In general, experiences derived from the three rotation projects will provide the basis for this selection. A student may choose an additional rotation if more experience is needed. Selection of the adviser should be completed by the end of the Fall semester in the second year.

By September 1 of the second year in the program (or December 1 for students electing a fourth rotation), each student will have submitted to the Graduate Committee a list of three choices ranked from 1 to 3 for his/her major adviser. The Graduate Committee will confer with the faculty member(s) involved before assigning the major adviser.

For dissertation work carried out in the laboratory of an adjunct faculty member or any faculty member who does not hold a graduate faculty appointment in pharmacology, a full time Pharmacology faculty member must serve as Co-Adviser. The Co-Adviser shares academic responsibility for the student's program.

### **IX. PLAN OF WORK**

The doctoral applicant must complete the University Plan of Work Form at the time of scheduling of the Oral Ph.D. Qualifying Exam. This document should be prepared with the major adviser before the end of the Fall semester of the second year. The Doctoral plan of work requires the signed approval of the student's adviser and the Graduate Officer of the Department after it has been formally approved by the Departmental Graduate Committee. Forms are available from the Graduate Programs Office or online at:

<http://www.gradschool.wayne.edu/forms/Plan%20of%20Work.pdf>

### **X. SELECTION OF DOCTORAL COMMITTEE**

The doctoral applicant, together with his/her adviser, should select a Doctoral Committee during the Winter semester of the second year. This committee shall consist of five members of the Graduate Faculty. One member of the committee should be chosen from either the student's minor department or other appropriate department and so hold Graduate Faculty status outside the Pharmacology Department. The other members must include the student's adviser and three other departmental faculty members. The committee must be approved by the Departmental Graduate Committee.

The purpose of the Doctoral Committee is to administer the oral qualifying examination, to act as the dissertation committee in guiding the student's progress, and to act as the Doctoral Dissertation Defense Committee. Additions or deletions from the original committee must be approved by the departmental Graduate Committee and Graduate School.

## **XI. WRITTEN QUALIFYING EXAMINATION**

A written qualifying examination will be administered during the second year of the program and will be graded by two faculty members.

During the Spring Semester of the second year, students will be given sets of figures, tables and the methods and the introductory sections from three real or imaginary scientific papers. They will be given 72 hours to choose one of the data sets and to write an abstract, a results section, and a discussion that are consistent with these data. In addition, the manuscript should be given a title. Out of a possible 100 points, up to 75 points will be awarded on the basis of the student's interpretation of the data while up to 25 points will be awarded on the basis of the written form of the manuscript (i.e., clarity, brevity, grammar, spelling, etc.). An average score of 85 points will be required to pass the written qualifying exam.

## **XII. ORAL QUALIFYING EXAMINATION**

An oral examination based on a grant proposal covering the research proposed for the dissertation and constructed by the applicant is due in the Summer semester of the second year. A copy of the format to be followed will be provided by the Graduate Officer during the Spring semester of the second year. The oral examination will be scheduled for two (2) weeks after submission of the grant proposal. Prior to the oral qualifying examination, the department shall submit the names of the applicant's Doctoral Examination committee to the Graduate School for approval. The oral examination needs to be completed prior to that start of the Fall semester to allow registration for dissertation credit (PHC 9991)

The Doctoral Committee will administer the examination. Satisfactory performance will be determined by having no more than one dissenting vote on passing. In the event of failure, the committee may recommend to the Graduate Committee either (a) that a second examination be taken no sooner than one (1) term, yet within 12 months, or (b) dismissal of the student.

## **XIII. DISSERTATION OUTLINE AND GRANT SUBMISSION**

After successful completion of the oral qualifying examination, the written document used for the examination along with a summary as indicated on the Graduate School Dissertation Outline Form will be submitted to the Graduate School for Approval.

The dissertation outline will also be used as the basis for development of a grant proposal for fellowship support to complete graduate training. The student and adviser will jointly determine the agency and format that is most appropriate (e.g. PhRMA Foundation, American Heart Association, American Cancer Society, NIH F31, etc). A copy of the proposal will be submitted to the Graduate Committee one month prior to the deadline of the selected agency. The Graduate Committee will provide pre-submission review and advice.

## **XIV. ACHIEVEMENT OF DOCTORAL CANDIDACY**

The student achieves Doctoral candidacy status after completing the following requirements:

- A) Satisfactory completion of two years of graduate training in the department.
- B) Satisfactory completion of both the written and oral qualifying examination.
- C) Filing and approval of the Plan of Work with the Graduate School.

- D) Filing of the application form for Doctoral Candidacy.
- E) Filing and approval of the Dissertation Outline with the Graduate School.

For those students supported on Graduate Assistantships, achievement of doctoral candidacy status will result in an increase in the stipend level. Attainment of doctoral candidacy will normally occur at the end of the summer in the second year of the program.

## **XV. STUDENT RESPONSIBILITY FOR DOCTORAL COMMITTEE MEETINGS**

To insure that the student's Doctoral Committee is kept informed of progress in thesis research, each doctoral candidate is responsible for convening a meeting of his/her Doctoral Committee at six-month intervals. Prior to such conferences, the student will provide a written summary of progress to all members of the Doctoral Committee. At least three members of the committee must be in attendance at these meetings. After the meeting has taken place, the Doctoral Committee will prepare a two-page overview of the meeting that will include a summary of progress made and recommendations for future work, including timelines. (A "Report on Doctoral Dissertation Committee Meeting form" is available on the Department's website.) A tentative date for the next meeting will also be established at this time. All committee members in attendance must sign the document (indicating their approval of the contents) which is then forwarded to the Department's Graduate Officer. This document serves as evidence that the semiannual meeting has taken place. Failure to comply with these deadlines/requirements may result in suspension of pay by the Department.

## **XVI. ANNUAL EVALUATION**

Students will be provided with a written evaluation of progress annually.

## **XVII. PUBLICATION REQUIREMENT**

Students must publish their dissertation research findings in peer-reviewed journals. One first-author paper is necessary for graduation from the program. This is a minimum requirement as it is expected that additional (co-authored) papers will ultimately result from the thesis project.

## **XVIII. DISSERTATION**

To give members of a student's dissertation committee adequate time to review the dissertation, students should give their dissertation committee members their dissertation *at least 2 weeks* before the committee signs the "Final Report: Dissertation Public Lecture Presentation-Defense" form (Green Form), which allows the student to schedule his/her Ph.D. dissertation defense. This form should then be given to the Graduate Officer to turn in to the Graduate School *at least 2 weeks* prior to the date that the committee agrees on to schedule the defense.

It is the responsibility of the student to consult with the Graduate Officer to ensure that the timing of the public seminar does not conflict with other Departmental or Program activities such as teaching.

## **XVIII. CONCENTRATION IN MOLECULAR NEUROPHARMACOLOGY**

The Pharmacology program has an approved Concentration in Molecular Neuropharmacology. The admission and academic requirements will be identical to those for the pharmacology doctoral program. The Concentration in Molecular Neuropharmacology within the Pharmacology Graduate Program is directed at doctoral students desiring to receive training in research in the molecular aspects of neuropharmacology. Neuropharmacology, the study of the actions of drugs on brain functions, is an area of intense and wide-spread interest, and the application of biochemical and genetic tools to the study of brain function offers a wide variety of new approaches to understanding brain function and to devising novel treatment modes for brain dysfunction and tumors. The Concentration in Molecular Neuropharmacology has been developed to provide highly-motivated students the specialized training needed to start them on productive careers in molecular neuropharmacology.

Selection for the concentration will be made by the graduate committee. Students choosing the Concentration in Molecular Neuropharmacology are required to follow the curriculum established for all graduate students in Pharmacology (see below for example curriculum) with the following additional requirements:

IBS7030 Functional Genomics is an elective course within the IBS Systems Biology section, CMN students will be required to take and successfully pass this course as part of their curriculum. This course would normally be taken in the Winter semester of the first year of study. Note that the 4 credit PHC7010 Introduction to Graduate Pharmacology course includes a 2 credit IBS systems course in Pharmacology of the Nervous System.

Minicourses (PHC7650) - Within the requirement for 6 credits of Minicourses, 4 credits must be within the broad area of neuropharmacology or neuro-oncology as defined by the Graduate Committee. Faculty members within the Concentration will be expected to offer a minicourse every two years.

**MODEL Ph.D. PROGRAM**

**COURSE**

**SEMESTER CREDIT HOURS**

**YEAR-1:**

**Fall:** Radiation Safety Course Taken in September of First Year  
IBS 7010: Molecular Biology (5)  
IBS 7020: Cell Biology (5)  
*Total 10 credits; Course credits = 10; PHC course credits = 10*

**Winter:** IBS Systems Biol. (minimum 4 required)  
PHC 7010: "Principles of Pharmacology" (4)  
PHC 7700: Journal Club (1)  
PHC 7710: Laboratory Rotation (1)  
*Total 10 credits (20); Course credits = 10 (20); PHC course credits = 10 (20)*

**Summer:** PHC 7710: Laboratory Rotation (2)  
*Total 2 credits (22); Course credits = 2 (22); PHC course credits = 2 (22)*

*Choose major adviser at end of Summer*

**YEAR-2:**

**Fall:** PHC 7700: Journal Club (1)  
PHC 7890: Seminar (1)  
PHC 7650: Minicourses (0-3)\*  
PHC 7996: Research (1-5)\*\*  
Elective: (3)  
*Total 10 credits (32); Course credits = 10 (32); PHC course credits = 7 (29);  
PHC 7996 tot = 1-5*

*WRITTEN QUALIFYING EXAM (January)*

\*A minimum total of 6 credits of PHC 7650 (1-credit minicourses) are required over the course of study.

\*\*Maximum total allowed for PHC 7996 = 20 credits.

**Winter:** PHC 7650: Minicourses (0-3)  
PHC 7700: Journal Club (1)  
PHC 7890: Seminar (1)  
Elective: (2-4)  
PHC 7996: Research (2-8)  
*Total 10 credits (42); Course credits = 10 (42); PHC course credits = 4-10 (33-39)  
PHC 7996 total = 3-13*

*Choose Doctoral Examination Committee*

*ORAL QUALIFYING EXAM (April-July)*

*File Plan of Work*

**Summer:** PHC 7710: Laboratory Rotation (2)  
*Total 2 credits (44); Course credits = 2 (44); PHC course credits = 2 (35-41)*

**YEAR-3:**

**Fall:** PHC 7650: Minicourses (1)  
PHC 7700: Journal Club (1)  
PHC 7890: Seminar (1)  
\*Doctoral Candidacy PHC 9991: (7.5)  
*Total 10.5 credits (54.5); Course credits = 3 (47); PHC course credits = 3 (38-44)*

**Winter:** PHC 7650: Minicourses (1)  
PHC 7700: Journal Club (1)  
PHC 7890: Seminar (1)  
\*Doctoral Candidacy PHC 9992: (7.5)  
*Total 10.5 credits (65); Course credits = 3 (50); PHC course credits = 3 (41-47)*

**Summer:** PHC 7996: Research (3)  
*Total 3 credits (68); Course credits = 3 (53); PHC course credits = 3 (44-50);  
PHC 7996 total = 6-16*

**YEAR-4:**

**Fall:** PHC 7700: Journal Club (1)  
PHC 7890: Seminar (1)  
PHC 7996: Research (1)  
\*Doctoral Candidacy PHC 9993 (7.5)  
*Total 10.5 credits (78.5); Course credits = 3 (56); PHC course credits = 3 (47-53)  
PHC 7996 total = 7-17*

**Winter:** PHC 7700: Journal Club (1)  
PHC 7890: Seminar (1)  
PHC 7996: Research (1)  
\*Doctoral Candidacy PHC 9994 (7.5)  
*Total 10.5 credits (89); Course credits = 3 (59); PHC course credits = 3 (50-56);  
PHC 7996 total = 8-18*

**Summer:** PHC 7996: Research (1)  
*Total 1 credit (90); Course credits = 1 (60); PHC course credits = 1 (51-57)*

**YEAR-5+ (all semesters):**

Maintenance Status

\*Student must attain doctoral candidacy to take these credits.

REQUIRED COURSES			Credits	Semester Offered
IBS	7010	Molecular Biology	5	F
IBS	7020	Cell Biology	5	F
IBS	7030	Systems Biology	4	W
PHC	7010	Pharmacology Lecture	4	W
PHC	7650	Adv. Topics. Pharmacology (Minicourses)	Variable; min. 6 required	F,W
PHC	7700	Recent Developments (Journal Club)	7	F,W
PHC	7710	Indiv. Studies (Rotations)	5	F,W,S
PHC	7890	Seminar	6	F,W
PHC	9991,2,3,4	Dissertation Research (Candidate Status)	30 total (4 semesters x 7.5)	F,W,(S)
ELECTIVES (List is not all inclusive)				
MTX	7010	Toxicology	3	F
PHC	7210	Cancer Biology	3	
PHC	7220	Cell/Mol. Biol. of Cancer	3	
PHC	7230	Breast Cancer	2	
PHC	7240	Cancer Chemotherapy	2	
PHC	7996	Research		Variable (20 max. total)
BCH	7310	Adv. Biochem. Mol. Biol.	3	W
BCH	7320	Adv. Biochem. Proteins	3	W
BCH	7660	Bioenergetics	2	W
CB	7090	Signal Transduction and Growth Regulation	3	W
MBG	7010	Mol. Biol.	3	
PSL	7640	Cell & Mol. Physiol	3	W
PSL	7660	Neurophysiol.	3	Alt. Yrs.
PSL	7820	Membrane Biophysics	3	
CHM	8690	Chemical Carcinogenesis		
PYC	7010	Neurobiology I	3	F
PYC	7020	Neurobiology II	3	W
PYC	7510	Neurochem. Monoamine-Containing Neurons	3	Alt. Yrs.
PYC	7520	Mol. Biol. Approaches in Neurobiol.	3	Alt. Yrs.

Notes:

1. All Pharmacology graduate students are required to attend all departmental seminars and Journal Club presentations.
2. There is no foreign language requirement for the doctoral degree.
3. Students must complete 90 semester hours for graduation including:
  - 30 in Pharmacology lectures, seminars and Indiv. Studies
  - 6 in the minor (usually Cancer Biology or Physiology or Biochemistry; can be IBS)
  - 30 in Ph.D. Candidate Status (Dissertation Research)