

## **Degree Programs in Pharmaceutics**

### *Policies and Guidelines*

## I. CONTACTS

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This handbook can also be found on-line at:  
[http://depts.washington.edu/pceut/pharm\\_studies/graduate/phd/grad\\_doctoral1.html](http://depts.washington.edu/pceut/pharm_studies/graduate/phd/grad_doctoral1.html)

## II. THE Ph.D. DEGREE

The Doctor of Philosophy degree is considered the most accomplished academic achievement an individual can attain in preparation for a career of creative scholarship. It is the highest degree conferred by our universities and, by nature and tradition, it is a research degree. It is not conferred merely as a certificate to a prescribed course of study. Every department offering a Ph.D. degree has the responsibility to assure that the degree will be granted only to candidates who have demonstrated present capacity and future promise to be an independent and creative thinker.

The University, its Graduate School, and Departments have defined responsibilities toward their graduate programs and graduate students. The major responsibility is to provide the most favorable environment possible in which graduate students can develop their maximal potential for creative scholarship and independent research. This environment comprises the graduate faculty, instructional offerings, research facilities, library resources and a stimulating group of capable graduate students. The selection and screening process of graduate students is, therefore, a very serious responsibility. Ph.D. students are those who have demonstrated the necessary intellectual ability, motivation, and drive to take optimal advantage of the enriched environment in the development of their potential as creative scholars and independent research investigators. It is the mission of our department to recruit and train those outstanding students who are highly motivated to achieve excellence in research and seeking a career in the pharmaceutical sciences.

## III. PROGRAM OBJECTIVES

The doctoral degree program in Pharmaceutics trains research scholars in the fundamental aspects of drug disposition and drug action. Drug disposition pertains to the facets of drug absorption, distribution, and elimination. Areas of emphasis include: drug delivery – processes for enhancing the absorption of a drug and targeting it to the site of action in order to improve therapeutic effect, drug metabolism – enzyme catalyzed molecular transformations that often impart different disposition and pharmacological properties compared to the parent molecule, and drug excretion – the transport of drug molecules into excretory fluids such as the renal filtrate and bile. Pharmacokinetics is the study of the time course of these processes and its relationship to pharmacological effects. Graduates will possess expertise in basic biochemical, cellular and molecular techniques, quantitative analytical methods, and in the elaboration of mathematical models to describe the kinetics of drug disposition and action. Scientists graduating from this program will be capable of investigating the causes of inadequate exposure to a drug at the target site. They will be able to elucidate the relationship between the kinetics of drug and metabolites in various body compartments or tissues and the manifestation of pharmacologic, therapeutic and toxic effects. They will be able to probe the effects of alteration of physiological and biochemical processes, which may occur due to disease states or genetic variations, on drug disposition and pharmacological response. Many of these studies require expertise with *in vitro* methodologies, which students will also acquire. Often, students will gain experience in the conduct of pharmacokinetic and pharmacodynamic studies in animals and man.

Typically, our graduates will interact with clinicians, medicinal chemists, biochemists, pharmacologists, analytical chemists, and physiologists. This will be possible because their training is highly interdisciplinary at the didactic and research levels.

#### IV. PROGRAM REQUIREMENTS

Graduate students in Pharmaceutics are also students of the Graduate School and as such must satisfy the general requirements of the Graduate School and the requirements of the Department in which they undertake their graduate training. A full description of requirements of the Graduate School can be found on their website: [http://www.grad.washington.edu/area/currstuds\\_f.htm](http://www.grad.washington.edu/area/currstuds_f.htm). Some of the pertinent requirements of the Graduate School and Department are described below. They deal with scholarship, residence, supervisory committees, research dissertations, and examinations (general and final).

The following include a combination of pertinent Graduate School and Department requirements for the Ph.D. degree in Pharmaceutics:

- (1) **Residence:** A minimum of three academic years of resident study is required, two of them being at the University of Washington. Residence is defined as 10 credits per quarter (A,W,Sp) or 2 credits during summer quarter. Only courses numbered 300 and above count toward residence. Thesis research must be conducted at the University of Washington, unless the research is of a collaborative nature requiring off-campus facilities.
- (2) **Credits and Scholarship:** A minimum of 41 credits of course work, exclusive of thesis and non-thesis research, must be satisfied. An average grade point of 3.0 in all numerically graded courses numbered 300, 400, and 500 is required. A minimum passing grade in any given course is 2.7, except required pharmaceutics courses (PCEUT 506, 501, 502, 503) in which a passing grade is 3.0. Credits earned for a Master's degree may apply towards the doctoral degree.
- (3) **Teaching Experience:** A minimum of two quarters of teaching assistantship experience is a required component of training for the Pharmaceutics Ph.D. degree. Students will not be asked to assist more than 1 class an academic quarter (< 12 contact hrs/week). Most students will complete this requirement during the first three years in the program.
- (4) **Examinations and Progress Evaluation:** All graduate students must participate in the departmental examination program. A series of preliminary, cumulative (written) examinations and a general (oral) examination is required for advancement to Ph.D. candidacy, and a final examination (defense of the thesis) is required for the degree. See Appendix A, "Progression Steps in Relation to the Doctoral Degree," for an overview of major milestones leading to the doctoral degree and scheduling details of the general and final examinations. Appendix B describes the cumulative examinations, which precedes the general oral exam. Appendix C provides details about the formation of a doctoral supervisory committee and its role in the general exam and thesis defense. Appendix D provides details about the structure and conduct of the general oral exam.
- (5) **Master's Degree Bypass:** Students who qualify for continuation to the Ph.D. degree may be allowed to bypass the M.S. degree. See Appendix A for petition procedure.
- (6) **Seminars:** All graduate students must present a minimum of 2 and a maximum of 4 seminars while in the doctoral program (PCEUT 520). In addition, a presentation of papers from current literature is required twice a year, starting at the beginning of the second year until defense of the thesis (PCEUT 583). See Appendix E, "Training in Oral Communication through Seminars and Journal Club" for additional details.

## V. DIDACTIC TRAINING

### A. Ph.D. Degree Program

Course work for the doctoral program is divided into four components: (1) prerequisites which define the level of entry into the program; (2) a required core program which is analogous to the major; (3) elective courses, which are not required but are encouraged; (4) seminars and literature review.

#### (1) Prerequisites:

- Differential Calculus (MATH 124; 5 cr)
- Fundamental Concepts in Medicinal Chemistry (MEDCH 400; 3 cr)

Applicants with a PharmD degree should have fulfilled the medicinal chemistry requirement. For those who have not, MEDCH 400 can be taken in Autumn quarter of their first year. Candidates are accepted into the program on the condition that any deficiencies in course requirements are rectified by the end of the first academic year.

#### (2) Core Program:

The didactic core consists of the following disciplines and specific courses:

- PCEUT 506, Pharmacokinetic Principles (6 cr)
- PCEUT 501, Advanced Pharmacokinetics (5 cr)
- PCEUT 502, Pharmacokinetics of Drug Metabolism (4 cr)
- PCEUT 503, Drug Transport and Delivery (5 cr)
  
- PCHOL 510-13, General Pharmacology (2 cr each/6 cr total)
- BOST 511, Medical Biometry I (4 cr)
- BOST 512, Medical Biometry II (4 cr)
- TC 509, Writing the Scientific Article (3 cr)
  
- PCEUT 600, 800 (variable credits)

The above core courses are considered essential for all students in the program. It is unlikely that any of these courses would be waived, except for students entering with previous graduate-level course work in the required areas. In addition, all students must attend the following training sessions, preferably during the first academic year: Chemical Safety, Biological Safety, and Bioethics training. Radiation Safety and Animal Care may also be required at some point, if relevant to the student's thesis research.

#### (3) Directed Electives:

The purpose of elective coursework is to provide an enhancement of the core training. By its nature, it is highly individualized and should be geared to suit individual interests. There is no formal requirement for elective coursework in the Pharmaceutics doctoral program. However, the student is encouraged to take elective courses that might be a benefit to their thesis project and career goals. Courses that might be of interest to students in our program include:

##### ***Biotransformation/Biochemistry***

- PCEUT 513, Basic Concepts in Pharmacogenetics and Toxicogenomics (3 cr)
- MEDCH 501, 502, 503, Advanced Medicinal Chemistry (4 cr each)
- MEDCH 527, Drug Metabolism (4 cr)
- MEDCH 530, Mass Spectrometry of Drugs, Toxicants and Metabolites (3 cr)
- BIOC 530, Introduction to Structural Biology (3 cr)
- ENVH 533, Molecular Toxicology (2 cr)
- ENVH 567, Mechanisms of Carcinogenesis (2 cr)

- GENOM 465, Advanced Human Genetics (4 cr)
- IMMUN 532, Advanced Immunology (4 cr)
- PBIO 509, Neuroendocrinology (3 cr)

#### ***Biologics / Drug Delivery***

- PCEUT 586, Pharmaceutical Biotechnology (3 cr)
- BIOEN 550, Transport and Rate Processes (3 cr)
- BIOEN 576, Protein Engineering (4 cr)
- BIOEN 592, Surface Analysis (3 cr)
- CONJ 501, 502, 503, Molecular Basis of Cell Function (3 cr each)
- GENOM 552, Technologies for Genome Analysis (1.5 cr)
- GENOM 520, Protein Technologies (1.5 cr)
- GENOM 530, Advanced Genetic Analysis (1.5 cr)
- MEDCH 541, Mass Spectrometry Based Proteomics (3 cr)
- PABIO 525, Cell Surface Membrane in Cell Sociology and Immunology (2 cr)
- PBIO 507, Cardiovascular Respiratory Physiology (3 cr)
- PHCOL 530, Neuronal Signaling Pathways (2 cr)

#### ***Pharmacology/Cell Biology***

- PHCOL 528, Neuropsychopharmacology (2 cr)
- PHCOL 529, Ion Channel Pharmacology (2 cr)
- PHCOL 530, Neuronal Signaling Pathways (2 cr)
- PHCOL 531, Genetic Analysis of Signaling Systems (3 cr)
- PHCOL 533, Molecular Toxicology (2 cr)
- PHCOL 534, Molecular Basis of Addictive Drug Action (2 cr)
- PHCOL 535, Transcriptional Control in Human Disease (2 cr)
- PHCOL 536, Free Radicals in Health and Disease (2 cr)
- PHCOL 537, Molecular Neurobiology of the Cell Membrane (2 cr)

#### ***Physiological Modeling/Biostatistics***

- BIOST 514, Biostatistics I (4 cr)
- BIOST 515, Biostatistics II (4 cr)
- BIOST 521, Biostatistics for Experimentalists (4 cr)
- BIOST 524, Design of Medical Studies (3 cr)
- BIOST 533, Classical Theory of Linear Models (3 cr)
- BIOST 534, 535, 538, Statistical Computing (3 cr each)
- BIOEN 542, Computer Simulation in Biology (3 cr)
- BIOEN 550, Transport and Rate Processes (3 cr)

#### **(4) Seminars and Literature Review**

- PCEUT 520: Seminar (1 cr/quarter; 3 qtr/year until graduation)

Beginning in the second year, students are to make 1 presentation each year, with a maximum of 4 presentations by the time of graduation. A general topic seminar is presented in the second year; and research presentations in subsequent years.

- PCEUT 583: Journal club (1 cr/quarter; 3 qtr/year until graduation)

Beginning in the second year, students are to make 2 presentations each year until graduation. Journal club presentation is waived in the quarter during which the student is scheduled to make a PCEUT 520 seminar presentation.

#### **(5) Research**

- PCEUT 600, 800 (variable credits)

Students entering the doctoral program are required to complete 3 research laboratory rotations (PCEUT 600, 2 cr), one per quarter, starting Autumn quarter of their first year. A student may opt to complete a rotation in the Summer quarter before the initiation of classes. This will involve an early appointment in the department and, thus, decisions must be made at the time they accept our offer to enroll in the doctoral program. The matching of available labs with each incoming student will be facilitated by the 1<sup>st</sup> year graduate advisor. Student preferences will be given due consideration.

Students must choose a thesis advisor at the end of spring quarter in their first academic year (See Appendix A for additional details).

**Students must begin research in the lab of their advisor by summer quarter at the end of their first academic year (PCEUT 600, variable credit). Due to the course work and research demands of the doctoral program, most students may find that after-class and off-hours are the best and most productive time for their laboratory research (See Appendix A1b for additional details).**

After successful completion of the Master's Bypass requirements (see Appendix A for details), students will sign up for PCEUT 800, variable credits, until the defense of their thesis in order to meet the research requirements of the program and the Graduate School.

#### **(6) Cumulative Examination**

Students are to begin taking cumulative exams in Autumn quarter of their second academic year, and are to continue taking them at every offering until completion of pass requirements or until they take the maximum of eight exams. A total of eight exams will be offered, two each in Autumn, Winter, Spring and Summer quarter. For each exam, there will be two questions to be answered. Students must pass 4 of 8 exams to complete the Cum requirement and to continue their pursuit of the Ph.D. degree. Students that do not achieve this goal will be given the option of completing requirements for a terminal Master's degree or withdrawal from the program.

### **B. Master's of Science Degree Program**

The department of Pharmaceutics offers an entry-level M.S. degree on a restricted case-by-case basis. Entry into the program is granted only with prior sponsorship by a Pharmaceutics faculty member and approval of the faculty.

The program of course work is divided into three components: (1) prerequisites which define the level of entry into the program; (2) an abbreviated core program which is analogous to the major; and (3) seminars and literature review.

#### **(1) Prerequisites:**

- Differential Calculus (MATH 124; 5 cr)
- Fundamental Concepts in Medicinal Chemistry (MEDCH 400; 3 cr)

#### **(2) Core Program:**

The M.S. degree entails an accrual of 36 credits, of which 18 must be graded (9 of the graded credit must be from graduate courses of 500 level or above). In addition, 27 credits must be derived from courses that do not include independent study, seminar, journal club and thesis study. Of the 27 required course credits, 20 are derived from the following "core" courses that are intended to give the student the minimum knowledge base in the field of pharmaceutical sciences.

- PCHOL 510-13, General Pharmacology (2 cr each/8 cr total)

- PCEUT 506, Pharmacokinetic Principles (6 cr)

One of the following advanced pharmacokinetics classes, depending on its relevance to the student's thesis work and in consultation with the student's advisor:

- PCEUT 501, Advanced Pharmacokinetics (5 cr)
- PCEUT 502, Pharmacokinetics of Drug Metabolism (4 cr)
- PCEUT 503, Drug Transport and Delivery (5 cr)

- PCEUT 600, 700 (variable credits)

The above core courses are considered essential for all students in the M.S. program. It is unlikely that any of these courses would be waived, except for students entering with previous graduate-level course work in the required areas. In addition, all students must attend the following training sessions, preferably in the first academic year: Chemical Safety, Biological Safety, and Bioethics training. Radiation Safety and Animal Care may also be required at some point, if relevant to the student's thesis research.

### (3) Seminars and Literature Review

- PCEUT 520: Seminar (1 cr/quarter; 3 qtr/year until graduation)

M.S. students are not required to make a presentation, but they may take the opportunity to present for the experience.

- PCEUT 583: Journal club (1 cr/quarter; 3 qtr/year until graduation)

M.S. students are expected to make 2 presentations each year (beginning at the start of their 2<sup>nd</sup> year, until graduation.

### (4) Research

- PCEUT 600, 700 (variable credits)

Entry-level M.S. students will have selected an advisor by mutual agreement before starting the program. Terminal track M.S. students will have selected a thesis advisor at the end of spring quarter in their first academic year (See Appendix A1 for details).

**Students must begin their laboratory research by summer quarter of their first academic year in the lab of their advisor. Due to the course work and research demands of the program, most students may find that after-class and off-hours are the best and most productive time for their laboratory research. (See Appendix A1b for details)**

Entry-level M.S. students will sign up for PCEUT 600 (lab research, variable credit) during their first year in the program and PCEUT 700 thereafter until the defense of their thesis, in order to meet the research requirements of the program and the Graduate School. Terminal-track M.S. students will enroll in PCEUT 700 for research credit (variable number) until the defense of their thesis.

### (5) Master's Thesis

M.S. students are required to submit a Master's thesis. The content of the thesis should be a research summary of his/her laboratory project. Under special circumstances and with the consent of the advisory committee, a comprehensive review of a relevant area of pharmaceutical research may be permitted. Each student should work closely with his/her major advisor in order to identify and develop the content of the Master's thesis and the composition of the supervisory committee (see Appendix C).

### (6) Other

Students admitted into the M.S. program can formally apply to Ph.D. program only after successful completion of the first year in the M.S. degree program. The application will be reviewed competitively with other Ph.D. applicants. The M.S. student is not eligible to participate in cumulative exams until he/she is formally enrolled in the Ph.D. program.

## **VI. SELECTION OF A RESEARCH SUPERVISOR**

Students in the Ph.D. program will be assigned a research supervisor (major advisor) no later than the end of Spring quarter of their first academic year (See Appendix A). Each student must submit three ranked choices to the Department Chair before the last week of that quarter.

The relationship between a research supervisor and a graduate student is a very special one. In our Department, we want graduate students to have as much freedom as possible in the selection of a research supervisor. After a selection is made and agreed to, further change is possible only by petition, with approval by the Department Chair. Agreement in the selection of a supervisor must be mutual and must be done on a fully informed basis. Although we will attempt to accommodate every student's first choice for an advisor, it is possible that this will not occur because of previous commitments by the faculty to other students in the program and laboratory space constraints (See Appendix A1a for details). In general, no two incoming students will be assigned to the same advisor. In the event where two first-year students choose the same advisor as their first choice, the final assignment will be made based on drawing lots.

Once selected, a research supervisor becomes the dominant mentor to the student and shares with the student responsibility for the Progression Steps listed in Appendix A. The research supervisor, in collaboration with the Master's Bypass and Doctoral Supervisory Committee, of which he or she is chairperson, is responsible for the student's program of study and research.

Students must begin research leading to a Master's or Doctoral degree by summer quarter of their first academic year. All students are expected to enroll for graduate research in either PCEUT 600, 700 or 800 all four quarters, including summer, in every year they are in the program.

## **VII. FINANCIAL ASSISTANCE**

Financial support for students enrolled in the Ph.D. program is available in the form of a research assistantship, Public Health Service predoctoral training fellowships, and outside fellowships such as those from the American Foundation for Pharmaceutical Education and the pharmaceutical industry. Financial support is awarded annually so long as substantial progress toward the degree is being made (see section VII). Annual evaluations will be based on grades and laboratory/research performance. A Ph.D. student can expect to receive support for a period of 5 years if consistent progress is made towards the Ph.D. degree. The period of support can be extended through petition.

Students who are directed into a terminal M.S. track may receive continued support for up to 6 months from the time that the decision has been made in order to complete research requirements and to prepare an M.S. thesis. This will be contingent on continued research productivity. The department does not offer financial support for entry-level M.S. candidates. However, we will assist the student (Letter of Recommendation) if they choose to seek financial support from extramural sources.

## **VIII. RA REAPPOINTMENT PROCEDURE**

Upon admission into the Pharmaceutics doctoral program, most students are offered a Research Assistantship that can be renewed annually. The renewal procedure begins with a notification letter to the student on August 1 of each year, instructing them to provide a 1-page summary of research and training activities, and other accomplishments (e.g., extramural research presentations, publications, awards), during the preceding year. Students will also be asked to provide a brief outline of goals for the next academic year. This document should be turned in to their faculty advisor (or the department Chair, if they are absent) by August 21<sup>st</sup>. The document will be reviewed by the student's advisor and the department Chair between August 21 and September 14, with a decision regarding reappointment rendered by September 15. Members of the Master's Bypass and Doctoral Supervisory Committee may be asked for their input as well.

RA reappointment decisions, as well as financial support and benefits that they can expect for the next academic year, will be communicated in writing to the student. When significant deficiencies in the progress of a student are identified, a meeting between the student, faculty advisor and Department Chair will be scheduled to determine the appropriate course of action. This may include remedial work

and more frequent milestones during the next year. Reappointment can be denied because of a failure to maintain good scholastic standing (GPA below 3.0) or a failure to make substantive research progress towards the degree. RA reappointment letters will be placed in the student's academic file and can be viewed, upon request, by the student at any time.

## **IX. APPENDICES**

The following appendices provide additional details on departmental policies and guidelines:

- A. Progression Steps in Relation to the Doctoral Degree
- B. Cumulative Examination
- C. Role of the Master's and Doctoral Supervisory Committees
- D. General Examination
- E. Training in Oral Communication through Seminars and Journal Club
- F. Preparing the Written Proposal for M.S. Degree Bypass and General Examination
- G. Typical Course Sequencing Tables

## APPENDIX A

### Ph.D. Program in Pharmaceutics Progression Steps in Relation to the Doctoral Degree

#### 1. Selection of a Research Supervisor:

Students are encouraged to become familiar with the research interests and activities of all faculty members in the department and are required to work on non-thesis related research with three of the department faculty members as a part of a laboratory rotation requirement during their first year in the program. Students should make their decision concerning a research supervisor no later than the end of spring quarter of their first academic year. Each student must submit three ranked choices to the department chair before the last week of the quarter.

In general, no two incoming students will be assigned to the same advisor. In the event where two first-year students choose the same advisor, the final assignment will be made based on drawing lots. Thus, it is possible that you will not be assigned to your first choice for a research advisor. In the interest of fairness to all 1<sup>st</sup> year students, early decisions will not be permitted except in the most extraordinary circumstances.

#### 2. Development of Research Skills and Identification of a Thesis Topic:

By summer quarter of the first year, the student must begin to participate fully and actively in the laboratory of the major advisor. Early in the second year, the student should begin discussions with their advisor on identifying a suitable topic for their thesis. These discussions should be accompanied by a comprehensive search of the literature by the student to obtain a good understanding of the research question to be addressed. The student should be actively conducting thesis research by summer quarter of the 2<sup>nd</sup> academic year (8<sup>th</sup> academic quarter).

Success in graduate studies requires both dedication to research and a commitment to excellence in course work. Accordingly, most students should expect to conduct thesis research before and after the normal class period (9-5 pm), and during the evening/weekend hours. Past students who were successful in the program found these “off-hours” to be among the best and most productive times for their thesis research.

#### 3. Petition to Bypass the M.S. Degree:

Most students admitted to the doctoral program will be allowed to bypass the Master’s of Science (M.S.) degree and proceed directly to the Ph.D. degree. In order to determine whether a student can proceed directly to the Ph.D. degree, an evaluation of his/her performance will be made. This process is multi-step and initiated with the formation of a Master’s Bypass Committee composed of three departmental faculty members, one of which is the student’s advisor. The student should begin to assemble the Committee, in consultation with their advisor, once they have successfully completed their cumulative exam requirement (end of summer quarter of the 2<sup>nd</sup> academic year at the latest). The committee should meet at least once a year to discuss the progress of the student and the research direction the student has selected for their thesis project. Additional meetings may be beneficial and can be called anytime at the request of the student or advisor. The student should not delay in forming this committee, as it will serve an important advisory role during the initial stage of the student’s graduate research.

A petition to bypass the M.S. degree is considered by the Master’s Bypass Supervisory Committee and should occur sometime during the 3<sup>rd</sup> academic year in the program. Criteria to be considered include student progress in course work, successful completion of the cumulative exams, seminar participation and performance, and research performance. Specifically, it will be based on the following items assembled by the student and submitted to the committee:

- (1) Completion of the cumulative exam requirement (pass any 4 of the 8 exams offered); see Appendix B for further details.
- (2) A 4-5 page written proposal outlining research progress and future direction
- (3) Satisfactory evaluation of oral presentations in seminar and journal club

- (4) Oral presentation to the Master's Bypass supervisory committee of the research accomplishment and future research directions, including a tentative thesis topic and experimental approaches that might be taken for implementation.

After a student presentation (item 4), it is the duty of the supervisory committee to come to an independent decision as to whether to pass, fail, or recommend re-examination of the student. A bypass of the M.S. degree must be obtained before appointment of the Doctoral Supervisory Committee. Questions concerning the appointment and operation of the Master's Bypass supervisory committee should be directed to the department Chair.

#### **4. Appointment of the Doctoral Supervisory Committee:**

This must be completed soon after the student has obtained permission to bypass the M.S. degree. It is important to note that four months must lapse between the appointment of the Doctoral Supervisory Committee and a request to schedule the General Examination. In general, members of the Master's Bypass Committee will continue to advise the student as a member of the Doctoral Supervisory Committee. Additional details regarding the composition and duties of the committee can be found in Appendix C.

#### **5. Scheduling of General Examination:**

The General Examination cannot be scheduled any sooner than four months after the appointment of a Supervisory Committee. Further, the general examination should be scheduled within twelve months from the time of approval to bypass the M.S. degree. No later than three weeks prior to the desired date of the General Examination, the student must request the final examination using the MyGrad Program Student View (<http://www.grad.washington.edu/MyGrad/student.htm>) by completing the online request. All committee members will be notified by email of the date and time of the exam. Additional details regarding the conduct of the general exam can be found in Appendix D.

#### **6. Appointment of the Thesis Reading Committee:**

When a thesis is in the final stages of preparation, the student with consultation from his/her research supervisor should ask members (usually three) of the Supervisory Committee to act as the Thesis Reading Committee. Once the chosen faculty agree, the student notifies the Graduate Program Assistant, who completes the online appointments through MyGrad Program. Using the forms supplied by the Graduate School, the Reading Committee reports on the distinctive achievements of the dissertation project, the methods employed and the results obtained.

#### **7. Scheduling of the Final Examination:**

No later than three weeks prior to the desired date of the Final Examination, the student must request the final examination using the MyGrad Program Student View (<http://www.grad.washington.edu/MyGrad/student.htm>) by completing the online request. All committee members will be notified by email of the date and time of the exam. The Graduate Program Assistant will print out the warrant and GSR form and give them to the Chair of the Committee and GSR, respectively, on the day of the exam.

## APPENDIX B

### Ph.D. Program in Pharmaceutics Cumulative Examination

All graduate students in the Department of Pharmaceutics are expected to take and pass a series of cumulative exams (PCEUT 599, 1 cr) that serve as part of the requirements necessary for waiving the Master's degree. Upon completion of the Cum exam requirements and a successful bypass of the M.S., a student is eligible to take the General Examination for admission to Ph.D. candidacy status.

#### 1. Format:

- a) A total of eight exams will be given to students in their second academic year; 2 each in Autumn, Winter, and Spring quarters, and 2 in the Summer quarter. Each exam will be 4 hours in length and administered usually on a Saturday morning between 8:30 a.m. and 12:30 p.m. Dates will be determined by a majority consensus of the students.
- b) Two questions are submitted in each exam and students must answer both. The Pharmaceutics faculty will prepare and select exam questions. At the beginning of each quarter, a general research topic as well as the selection of articles for journal club discussion (PCEUT 583) will be announced to guide exam preparation. Cum questions will be prepared in accordance with the assigned general topics and drawn from journal club presentations (PCEUT 583), PCEUT 520 seminars, core courses (PCEUT 501, 502, 503 and 506), and current and past literature. A compilation of old exams can be found on the Department website.
- c) Students must take their first exam no later than the start of the 5<sup>th</sup> academic quarter in residence, generally, autumn quarter of their 2<sup>nd</sup> year. Students may begin taking exams earlier, but once started students must take every exam offered. A missed exam counts as a failure.

#### 2. Grading:

- a) Exam questions will be graded by the respective faculty author. Pass/fail is decided by faculty action after each exam. A score of  $\geq 60$  constitutes an automatic pass. Borderline scores are evaluated for special consideration. Students must pass 4 out of 8 exams attempted. If they do not, they are automatically ineligible for Ph.D. candidacy status. In special circumstances, the student may appeal to the Department Chair for one-time exceptional consideration; any subsequent decision to alter the Cum exam requirement would require the entire faculty's approval.
- b) Students who pass fewer than 2 of the first 5 exams attempted should work closely with their advisor to improve subsequent performance.
- c) Two weeks after each exam, a review/discussion session (~ 1 hr) will be offered by the grading faculty. All students taking the exam are required to participate.

## APPENDIX C

### Ph.D. Program in Pharmaceutics

#### Role of the Master's and Doctoral Supervisory Committees

Each student working toward a graduate degree at the University of Washington should be guided by a faculty supervisory committee. This committee serves an important evaluative and mentoring function for the student throughout his or her graduate career.

##### 1. The Master's Supervisory Committee

Appointment of a supervisory committee for the Master's degree is a function of the Graduate Faculty in the degree-granting units. The Graduate Program Coordinator, in consultation with the student and appropriate faculty members, appoints a committee of two to four members. The Chair and at least one-half of the total membership must be members of the graduate faculty.

##### 2. The Doctoral Supervisory Committee

The appointment of a doctoral supervisory committee indicates that the Graduate Faculty in the student's field finds his/her background and achievement a sufficient basis for admission into a program of doctoral study and research. Students are not admitted directly into a doctoral program when they are admitted to the Graduate School.

The doctoral supervisory committee should be established at least four months before the request for the General Examination is submitted to the Graduate School. The student, with consultation from his/her advisor, will recommend appropriate Graduate Faculty members in the student's field of study to Graduate Program Assistant who will complete the appointment through the MyGrad Program. Members of the supervisory committee may be replaced only by action of the Dean of the Graduate School.

The doctoral supervisory committee must have a minimum of four members; at least three of whom (including the Chair and the Graduate School Representative or GSR) must be members of the Graduate Faculty with an endorsement to chair doctoral committees. A majority of the committee must be members of the Graduate Faculty. The GSR must be a productive scholar in his or her own research area that may differ from that of the student's dissertation project. The GSR cannot hold a faculty appointment in the student's home department or a conflict of interest that would prevent them from providing a fully independent evaluation of the student's performance. Generally, faculty members with primary, joint, adjunct or affiliate appointments in the student's degree offering unit or the committee chair's department are not eligible to serve as a GSR. Exceptions to this rule can be found on the Graduate School website. The remaining members must be identified by the student's appointing department or program as productive scholars in the student's major field and/or subfields.

The Chair of the supervisory committee must be able and willing to assume principal responsibility for advising the student. He or she should have adequate time available for this work and should expect to be accessible to the student. Emeritus faculty may serve as Chair if they meet the above conditions. In special circumstances, Co-Chairs may be appointed when two Graduate Faculty members serve with equal importance on a student's supervisory committee and equally share responsibility for the student's progress. Affiliate faculty are normally not assigned to Chair positions, however under special circumstances exceptions can be made by petition.

The GSR represents the broad concerns of the Graduate School with respect to high standards of scholarly performance, ensuring that the student's mastery of the subject matter is broad and comprehensive. The GSR is a voting member of the committee and must attest to the validity of the examination, must indicate approval of the process by which the examinations was conducted, must ensure that the student is treated in an unbiased manner, and must represent the Graduate School in ensuring university-wide standards of scholarly performance. Thus, the GSR must sign the warrant and submit a standardized evaluation form on the examination process to the Graduate School. In preparation for the general and final examination, students should see that the GSR receives all necessary materials (i.e., copies of the dissertation proposal, the dissertation, etc.) in a timely manner. Changes in the appointment of the GSR are made only under extenuating circumstances.

Responsibilities of the voting members of the doctoral supervisory committee include the approval of a course of study that will fulfill the general course requirements of the student's major and supporting fields, conducting the student's General Examination and, when appropriate, recommending advancement to Candidacy. The doctoral supervisory committee approves the Candidate's dissertation proposal and guides the student in carrying out appropriate research for the dissertation. At least four members of the committee (including the Chair, GSR, and one additional Graduate Faculty member) must be present at both the General and Final Examinations.

After the General Examination, a Reading Committee consisting of at least three voting members of the supervisory committee will be formed. At least one of the members of the reading committee must hold an endorsement to chair doctoral committees. The reading committee is appointed to read and approve the dissertation. When the reading committee has read an entire draft of the dissertation and the voting members of the doctoral supervisory committee agree that the candidate is prepared to take the Final Examination, the student will schedule the Final Examination. At the Final Examination, the dissertation is evaluated, and if a majority of the voting members of the supervisory committee members agree that the evaluation is positive, the doctoral supervisory committee recommends to the Dean that the degree be awarded. If members of the doctoral supervisory committee do not agree with the majority recommendation concerning the examination, a minority recommendation should also be forwarded to the Dean.

Questions concerning the appointment and operation of the Master's and Doctoral supervisory committees may be directed to the Graduate School's Division of Student Services. Additional information on graduate supervisory committees may be found in the University's General Catalog.

## APPENDIX D

### Ph.D. Program in Pharmaceutics

#### General Examination

(See UW General Catalog for more information)

The General Examination (Ph.D. Candidacy Examination) should be completed before the end of autumn quarter of the 4<sup>th</sup> year. General exams are scheduled no sooner than four months after the Supervisory Committee is officially formed. No later than three weeks prior to the desired date of the General Examination, the student must request the final examination using the MyGrad Program Student View (<http://www.grad.washington.edu/MyGrad/student.htm>) by completing the online request. All committee members will be notified by email of the date and time of the exam. The general examination consists of two parts:

#### 1. Submission of a Written Description of the Student's Dissertation Research.

This document will be in a format similar to an NIH grant application, but no longer than 10 pages including figures and references and should include an introduction/background, specific aims, significance, preliminary data, and experimental plan. It should be submitted to the Supervisory Committee one week prior to the scheduled Ph.D. candidacy examination.

#### 2. Oral Ph.D. Candidacy Examination.

The examination starts with an oral presentation by the student of the proposed thesis research, followed by a question and answer session. A PowerPoint presentation is highly recommended. The student should prepare a presentation of no more than half an hour in length, if uninterrupted. The student should assume that the committee has read the written proposal and avoid unnecessary repetition. The student should also expect interruptions from committee members to clarify the significance of the experiments, question specific aims, or to ask about technical issues.

The student should demonstrate a thorough understanding of the field of research and the concepts and logic underlying the proposal. The student is also expected to display a thorough knowledge of topics covered in the core curriculum and to be familiar with current literature in areas related to the thesis research. In general, the research presentation will serve as a starting point for questions of a broad ranging nature. The student will be examined in these other areas during the discussion of the research plans or as a separate part of the examination.

The oral examination itself normally takes about two hours. The student and advisor should have available a transcript of the courses taken and credits earned as well as plans for future course work and completion of any outstanding requirements. While the advisor is the Chair of the Supervisory Committee he/she does not play any active role during the examination, and should only provide clarification or comment if asked by members of the committee.

The Department encourages the committee to conduct the examination in a critical way that will ensure that the student is on track to graduate and will continue to excel. If the committee feels that the student is below average in any way, the committee can vote to fail the student with one of two recommendations, encourage a reexamination after corrective action has been taken or to recommend termination in the program, with the possibility of a terminal Master's degree. With regard to corrective action, the committee may request that the student take specific electives, attend certain journal clubs or meetings, meet with committee members more frequently than the required annual meeting, or whatever they feel will be most beneficial for the academic progress of the student. All students are strongly encouraged to view their committee members as a resource, to be consulted about any matter in one-on-one discussions.

## APPENDIX E

### Ph.D. Program in Pharmaceutics

#### Training in Oral Communication through Seminars and Journal Club

##### 1. Departmental Seminar Policy and Guidelines

All graduate students in Pharmaceutics are expected to attend and to participate regularly in the Departmental seminar program. The program will consist of seminars presented by graduate students and guest lecturers (funds permitting).

In addition to the thesis defense, graduate students are required to lead a minimum of three journal club discussion sessions and present two seminars during their residence in the program. Usually, seminar and journal club presentations begin in the 2<sup>nd</sup> year and continue until graduation. While students are not expected to present a seminar in their first year, they should acquire by observation and direct inquiry the essential skills needed to organize, prepare and present a formal seminar.

The seminars will be of three types:

1. At least one seminar (usually the first) will be presented on a topic selected by the graduate student, as described in detail in the instructions for "Preparation and Presentation of Seminars" which accompanies this statement.
2. At least one seminar concerning the student's thesis project will be presented in the 3<sup>rd</sup> or 4<sup>th</sup> year in the program. This seminar should describe in depth the background, present status, and future plans for the student's research.
3. The final seminar will be given when the student formally presents his/her research and defends his/her thesis. For seminar purposes, the academic year is considered to end on the last day of Spring Quarter.

The graduate student is expected to work closely with his or her research advisor in preparing each seminar.

Student will be graded on a credit/no credit basis. Grades will be assigned by the seminar coordinator. Students are responsible for signing up for the seminar course (PCEUT 520) each quarter. Students are expected to attend all seminars. If a student completes the requirements for a Ph.D. in 5 years, he/she should have made a total of 4 presentations (e.g., 2 general, 1 research, 1 defense). Students will not be asked to make more than 4 seminar presentations while in the doctoral program.

##### 2. Preparation and Presentation of Seminars (PCEUT 520)

###### A. Selection of Topic

Students are encouraged to select their own general seminar topics. Preferably, they should select a topic about which there has been recent (or current) significant research activity. As such, it should be a topic of interest to all members of the audience. Students receive the maximum benefit from the seminar preparation when they have no unusual prior knowledge of the seminar topic. Thus, they should not pick a topic directly related to their research problems or a topic on which they have already done a literature survey for another University course.

Students who need help in selecting a seminar topic should consult with their research advisor or with the seminar coordinator. The student's research advisor must approve the seminar topic before it is considered final. Students must present a detailed plan of presentation to the advisor two weeks prior to the seminar.

###### B. Written Review

Speakers are expected to write a review of the subject thoroughly investigating several different sources of information and organizing all the gathered information for the presentation. They should decide at this stage the major points they wish to communicate and limit their review and seminar accordingly. Consideration should be given to the basic problem, theories pertaining to the problem,

experimental approaches which have been applied in seeking a solution, the limits of present knowledge or methods, and points which require further study. The reviews should not be less than two pages and not more than four (including references).

It is the student's responsibility to type the review and to have it approved by the research advisor. It is expected that all reviews will be duplicated and distributed to the faculty, graduate students, postdoctoral fellows, and technicians in both Medicinal Chemistry and Pharmaceutics departments 3-4 days before the seminar.

### **C. Format to be followed**

Group all references in numerical order at the end of the manuscript under the heading, "REFERENCES." The bibliography should reflect the student's effort. Important references that will not be discussed in the presentation should be listed in the bibliography under a separate heading, such as "GENERAL REFERENCES." The citation of references should be done according to the method used in one of the following journals: *Pharmaceutical Research*; *Drug Metabolism and Disposition*; *Journal of Pharmacology and Experimental Therapeutics*. However, no matter what the format, the title of the article must be cited between the names of the authors and the name of the journal, as is done in the *Journal of Pharmacology and Experimental Therapeutics*. This enables others to utilize more effectively the literature presented in the bibliography.

### **D. Presentation**

The seminar may be presented either extemporaneously, from notes, or from a written text. However, direct reading is not effective and should be avoided. The use of visual aids, such as PowerPoint presentation is recommended to enhance the experience for the audience. New students are encouraged to practice their talk with colleagues or their advisor prior to the formal presentation.

Students should strive to be at their best for the seminars, since this offers the faculty an important opportunity to observe individual accomplishment in a non-classroom setting. As discussed in Appendix A, the student's performance will become part of the Master's bypass evaluation. A maximum of forty-five minutes and not less than 35 minutes will be allowed for the presentation of the seminar. The remaining ten minutes, or more, will be devoted to an interactive discussion (Q & A) with the audience.

### **E. Grading Policy**

Seminars will be graded on a credit/no credit basis. Factors to be considered by the seminar coordinator in arriving at a grade decision are: preparation and content of the written review, oral presentation, handling questions, and attendance and participation at the seminars.

### **F. Evaluation**

Students are encouraged to discuss their presentation with their advisor, the seminar coordinator, and any of the faculty in Pharmaceutics and Medicinal Chemistry in order to receive the maximum benefit from the seminar experience.

## **3. Preparation and Presentation for Journal Club (PCEUT 583): "Topics in Pharmaceutics"**

### **A. Course Objectives**

- To promote reading and discussion of the available literature in current areas of interest within pharmacokinetics and biopharmaceutics fields.
- To complement the Pharmaceutics 501-6 series and amplify and extend fundamental pharmacokinetic concepts.
- To learn to critically evaluate scientific literature.
- To develop an appreciation for optimal and efficient design of experimental studies through a critical analysis of literature examples.
- To acquire the skills required to organize and communicate complex ideas and concepts to an audience of peers.

### **B. Course Requirements**

All students in their 2nd year in the program or beyond, including those in their last year of study, will be asked once each quarter to lead the discussion of a recently published or landmark article selected from the literature. Articles should be selected within the general research topic announced at the beginning of each quarter. Students are exempt from journal club presentation only during the quarter that they are scheduled as a speaker in the joint Pharmaceutics/Medicinal Chemistry Seminar (Pharmaceutics 520).

All students should master the subject matter or issues raised in the article in preparation for departmental examinations, including the cumulative examination, Master's bypass examination, and the General Examination for Ph.D. candidacy, as well as the final thesis defense. Therefore, each member of the class is expected to have read the article distributed prior to class and to participate to the best of his/her ability in the discussion. The emphasis is on a free exchange of ideas, in the form of questions and comments, between students. The main role of the faculty is to facilitate discussion and, when necessary, to correct misconceptions and/or omissions that may arise during the discussion. Students will not be graded according to the comments they make. Rather, their questions and comments give the faculty valuable insight into the collective level of understanding of the class.

Those students who have not taken our core courses may, at times, have difficulty understanding the journal article and following the discussion. These students are encouraged to seek the help of senior students and the presenter. It should be recognized that, at an early stage of training, this course serves more to orient students to the topics of conceptual importance and research interest rather than to provide didactic information.

These journal club meetings also provide a convenient forum for senior students to share their research experience with fellow students. Occasionally, individuals will present findings from their thesis research projects in lieu of an article from the literature.

### **C. Article Selection Procedure**

The process of selecting an article for discussion should be viewed as an important part of the presentation exercise. Students will learn to identify what type of research is relevant to the discipline of Pharmaceutics (i.e., pharmacokinetics, drug metabolism and drug delivery) and to evaluate the importance and contribution of a particular publication to the literature of the field. At the beginning of each quarter, 2-3 general research topics or specialty disciplinary areas within the pharmaceutical sciences will be announced. Each presenter must select articles that fall into one or more of the announced topics or specialty areas, and consult with his/her advisor in choosing an article for discussion. The traditional practice is for students to identify 3 to 4 articles that fit his/her interests and then discuss the pros and cons of the selection with their advisor at least 2 weeks in advance of the presentation date. Any faculty member who has particular expertise in the assigned areas should also be consulted. Once the article is decided upon, it is the responsibility of the presenter to work with the department clerical staff to distribute copies of the article one week before the meeting. This is to allow ample time for the audience to acquaint themselves with the article. There will be occasions when, in addition to the lead article, supplemental articles from earlier literature may be helpful.

### **D. Presentation Format**

The following format should be considered in preparing your presentation:

1. Introduction (no more than 10 min). A brief explanation of the background of the reported study would be helpful. This introduction is particularly important in orienting those in the audience who do not have a specific research interest in the area to be discussed. Avoid the use of jargon.
2. Specific Aims. The specific aims of the study should be briefly reviewed.
3. Methods and Results. Highlight those aspects of the experimental design that are crucial to hypothesis testing and/or interpretation of results. Present the main findings.
4. Interpretation/Discussion. Outline the conclusions and try to answer the following questions:
  - (a) Did the investigators accomplish what they set out to do?
  - (b) Were the conclusions reached by the authors justifiable?

5. Final Comments. What are the positive contributions of the work? What are the shortcomings? Propose possible future experiments to resolve the pending issues.

The speaker has the responsibility to address questions from the audience. Effort should be made to understand the questions being asked. However, the speaker is not expected to provide complete answers to each and every question raised. At times, he/she may defer the question to the faculty or a more knowledgeable colleague, or may simply acknowledge the fact that there is not a ready answer. In the latter case, a search of the literature afterwards to obtain answers to the questions posed is an excellent practice. The presenter is encouraged to bring the information he/she found back to the class for sharing. Those in the audience should try to state their questions in a clear and concise manner and refrain from interrupting the speaker during the presentation by saving their questions until the end, unless the question will help to clarify the methods or details being described.

## APPENDIX F

### Ph.D. Program in Pharmaceutics

#### Preparing the Written Proposal for M.S. Degree Bypass and General Examination

##### 1. General guidelines:

The purpose of these written proposals is to train the student in scientific writing, to present the framework of the student's thesis project and to provide the necessary details of the student's thesis research to his/her committee. The student should craft the proposal to present relevant background and a focused research plan. For each examination the written proposal should be submitted to the supervisory committee no later than one week before the scheduled examination. Failure to prepare the proposal in time may result in rescheduling of the examination or a request for additional writing requirements.

##### 2. Specific instructions for preparing the Master's degree bypass proposal:

The student should take their M.S. bypass examination when he/she has successfully completed the CUM exam requirements and has several quarters of laboratory experience in his/her selected research laboratory. It is expected that the thesis research project is outlined at this stage in terms of major goals and hypotheses and that the student is familiar with the background of the research area as well as the main experimental techniques that will be used in their investigation.

The Master's Degree Bypass proposal should be between 10-15 pages in length, 12 point font, with 0.5 inch margins and 1.5 line spacing. Part of the scientific training is to learn to identify the important material and focus it within a limited space. Thus, the student should not exceed the 15 page limit in their proposal. The proposal should consist of five sections:

- (1) Abstract: The abstract should be a maximum of 250 words and describe the background, specific hypotheses and aims, the research methods to be used, preliminary results and an overview of future experiments.
- (2) Background and significance: This portion of the proposal should be 4-5 pages long and present an overview of the literature. The student is strongly encouraged to use tables and figures to summarize data. The student should describe the significance of his/her thesis research.
- (3) Specific aims: The specific aims should be 1 page in length and clearly state how the aims address the overall research hypotheses for the student's research project. The specific aims should be numbered and state the objectives of the experimental research to be conducted by the student. A brief description of how each specific aim will be addressed can be included.
- (4) Preliminary data: The preliminary data section should be 2-4 pages in length and describe the experiments the student has conducted in the lab before the bypass examination. Experimental methods should be described briefly to provide the reader with the necessary information required to understand the results. For example, number of animals used in a specific experiment, drugs and dosages administered, cell lines used, method of analysis such as qRT-PCR, Western blotting or mass spectrometry. The student is encouraged to present their data in graphical and tabulated formats and be prepared to answer specific questions regarding the design and conduct of these experiments.
- (5) Experimental plan: The experimental plan should be structured around the specific aims of the student's research. This portion of the proposal should be 2-4 pages in length and outline the experimental plan for the student's graduate research. The main methods (i.e. clinical studies, animal studies, cell culture, mRNA or protein measurements) and instrumentation that the student plans to use should be described briefly. When appropriate, the methods of data analysis and modeling should be described.

- (6) **References:** References should be included at the end of the proposal and written in the style used by *Journal of Pharmacology and Experimental therapeutics* or *Drug Metabolism and Disposition*. References should be included in the text using the first author's last name, et al., and the year of publication (i.e. Scientist R. et al., 2004).

The student is encouraged to submit their proposal to the committee with a cover letter that describes their own view of their progress in the program and milestones achieved prior to the bypass examination.

### **3. Specific instructions for preparing the proposal for general examination:**

The student should take their general examination when he/she has a clear understanding of the background, hypotheses and aims of the entire project and he/she has obtained sufficient data. The student is also expected to understand and explain those aspects of his/her didactic training in the pharmaceutical sciences that are relevant to his/her thesis project.

The proposal should be written in a format similar to an NIH grant application and consist of the same five sections as in the master's bypass proposal. The proposal should be maximum 20 pages in length, 12 point font, with 0.5 inch margins and 1.5 line spacing. The recommended pages should be used as follows:

- (1) **Abstract:** The abstract should be maximum 250 words and describe the background, specific hypotheses and aims, preliminary results and methods used and the experimental plan for the thesis research.
- (2) **Background and significance:** This part of the proposal should be 5-7 pages long, in depth presentation of the critical background for the research project. It is important that the student captures both the broad perspective of the field as well as the detailed evidence available to support his/her research hypotheses. The student is strongly encouraged to use tables and figures to summarize data from literature. The background should not include the student's own experimental results that will become part of the thesis.
- (3) **Specific aims:** The specific aims should be 1 page in length and clearly state the detailed research hypotheses for the dissertation research. The specific aims should be numbered and state the objectives of the experimental research conducted by the student. A brief description of how each specific aim will be addressed should be included.
- (4) **Preliminary data:** This section should be 4-6 pages and organized around the specific aims of the project. For each aim, the specific experiments that demonstrate applicability of a selected technique or support the original hypothesis should be presented. The purpose of the preliminary data is to demonstrate that the student has accrued the skills and techniques necessary to complete his/her dissertation and to convince the committee that the proposed hypotheses are viable and can be tested. Experimental methods should be described briefly to provide the necessary information required to understand the results. The student is encouraged to present their data in graphical and tabulated formats and be prepared to answer specific questions pertaining to the design and conduct of these experiments.
- (5) **Experimental plan:** For the experimental plan, the student should describe in 3-5 pages a relatively detailed plan of the experimental conduct of his/her dissertation research. It is important that the extent of experiments planned is described for each aim to allow the committee to reach a conclusion of the feasibility and likelihood of success of the proposal.
- (7) **References:** References should be included at the end of the proposal and be written in the style used by *Journal of Pharmacology and Experimental therapeutics* and *Drug Metabolism and Disposition*. References should be included in the text using the first author's last name, et al., and the year of publication (i.e. Scientist R. et al., 2004).

The student is encouraged to submit their proposal to the committee with a cover letter that describes their own view of their progress in the program and milestones achieved prior to the general examination. They can also include as an attachment to the proposal any publications derived from their dissertation research.

## APPENDIX G

### Ph.D. Program in Pharmaceutics Typical Schedule of Core Requirements

#### YEAR 01

| Autumn   | Winter   | Spring   | Summer   |
|--|--|--|--|
| BIOST 511 (4 cr; A,Su)<br>PCEUT 506 (6 cr)<br>MEDCH 400 (3 cr)<br>PCEUT 520 (1 cr)<br>PCEUT 583 (1 cr)<br>PCEUT 600: Lab Rotation (2 cr) | BIOST 512 (4 cr)<br>PCEUT 502 (4 cr; even year)<br>PCHOL 510, 511 (4 cr)<br>PCEUT 520 (1 cr)<br>PCEUT 583 (1 cr)<br>PCEUT 600: Lab Rotation (2 cr) | PCEUT 501 (5 cr; even yr)<br>PCEUT 503 (5 cr; odd yr)<br>PCHOL 513, 514 (4 cr)<br>PCEUT 520 (1 cr)<br>PCEUT 583 (1 cr)<br>PCEUT 600: Lab Rotation (2 cr) | PCEUT 584 (2 cr)<br><br><br><br><br><br>PCEUT 600: Pre-thesis Research |

#### YEAR 02

| Autumn  | Winter   | Spring  | Summer  |
|---|--|---|---|
| (Elective)*<br>PCEUT 520 (1 cr)<br>PCEUT 583 (1 cr)<br>PCEUT 599: CUM Exam (1 cr)<br>PCEUT 600: Pre-thesis Research | PCEUT 502 (4 cr; even year)<br>(Elective)*<br>PCEUT 520 (1 cr)<br>PCEUT 583 (1 cr)<br>PCEUT 599: CUM Exam (1 cr)<br>PCEUT 600: Pre-thesis Research | PCEUT 501 (5 cr; even yr)<br>PCEUT 503 (5 cr; odd yr)<br>PCEUT 520 (1 cr)<br>PCEUT 583 (1 cr)<br>PCEUT 599: CUM Exam (1 cr)<br>PCEUT 600: Pre-thesis Research | PCEUT 599: CUM Exam (1 cr)<br>PCEUT 600: Pre-thesis Research <sup>‡</sup> |

\* Electives are not required, but students are encouraged to take classes that will enhance their thesis research or career.

<sup>‡</sup> A student can sign up for PCEUT 800 once they have completed the requirements for the Master's Bypass.

**Typical Schedule of Core Requirements  
YEAR 03 to Graduation**

| <b>Autumn</b>   | <b>Winter</b>   | <b>Spring</b>   | <b>Summer</b>               |
|---|---|---|-----------------------------|
| (Elective)*   | (Elective)*   | (Elective)*<br>TC 509 (3 cr)  |                             |
| PCEUT 520 (1 cr)<br>PCEUT 583 (1 cr)<br>PCEUT 800 (Thesis Research) | PCEUT 520 (1 cr)<br>PCEUT 583 (1 cr)<br>PCEUT 800 (Thesis Research) | PCEUT 520 (1 cr)<br>PCEUT 583 (1 cr)<br>PCEUT 800 (Thesis Research) | PCEUT 800 (Thesis Research) |

\* Electives are not required, but students are encouraged to take classes that will enhance their thesis research or career.