

Requirements and Guidelines

Doctoral Graduate Program in Pharmacology and Toxicology

Medical College of Wisconsin

**Effective July 1st, 2009
(updated April 10th, 2019)**

Student Responsibility

Students in the Department of Pharmacology and Toxicology should use this handbook as a guide for use in conjunction with other sources of information from the Graduate School of Biomedical Sciences at the Medical College of Wisconsin, including the Graduate School Handbook found at the Graduate School website. **It is the sole responsibility of students to ensure that all requirements are fulfilled satisfactorily in a timely manner for degree completion.** All policies are subject to revision by the Pharmacology Department and the Graduate Studies Council.

Section 1. Entrance into the Doctoral Program

A. Selection of a Dissertation Mentor

Students enter into the Department of Pharmacology and Toxicology Graduate Program via the Interdisciplinary Program in Biomedical Sciences (IDP), the Neuroscience Training Program, or the Medical-Scientist Training Program (MSTP). These programs provide an opportunity for students to identify a dissertation mentor during the first 1-2 years of study.

Select students may also enter directly into the Pharmacology Graduate Program. Students who enter directly will be expected to complete 2-3 laboratory rotations during the first year of the program designed to identify an appropriate mentor. Students will be encouraged to choose a set of rotations that expose them to a broad range of research opportunities. Requirements and policies are as follows:

- Each rotation will be flexible in length, but should allow for completion of at least 2 rotations during the first year.
- Following rotations, each student will submit a brief written report. Written reports must be typewritten and should include figures. The report should be approximately four double-spaced pages in length (~1,200 words), excluding figures. Written reports are due to the Program Director upon the completion of each rotation.
- Students will communicate with the Program Director with regard to their faculty choices for each research rotation. Their choices will be finalized and approved by the Program Director. Students are encouraged to speak with several different faculty members during the selection process.

Although most direct admission students will be expected to complete laboratory rotations, flexibility will be allowed for students recruited to a specific laboratory.

B. Qualifying Examination

All doctoral students in the Graduate School of Biomedical Sciences must successfully complete a Qualifying Examination.

IDP Qualifying Examination. Students who join the Department of Pharmacology and Toxicology from the IDP program will adhere to the guidelines for the IDP Qualifying Examination.

MSTP, Neuroscience, and Direct Admission Qualifying Examination. Students who join the Department of Pharmacology and Toxicology directly or from the MSTP or Neuroscience Programs will be required to pass a qualifying examination administered by the Pharmacology Department based on an oral defense of a written mock grant proposal. The exam should be completed by direct entry students and Neuroscience students no later than **May 30th** of their 2nd year. The exam should be completed by MSTP students no later than **May 30th** of their first year in the Pharmacology Graduate Program.

Each student will prepare a Mock Research Proposal on a topic that is different than the research topic currently under investigation by the student in the mentor's laboratory. Students will develop the mock research proposal in consultation with their mentor; however, the written document should reflect the original thoughts of the student. The mock grant will be read and evaluated by an examination committee composed of five faculty members from the Department of Pharmacology (see below). Following completion of the mock proposal, the committee will conduct an oral examination. The oral exam will serve as a defense of the written mock proposal, an exploration of mastery of basic pharmacological principles, and as a test of information presented during the first-year curriculum. If the performance of the student on the written or oral examination is deemed unsatisfactory, the student may be required to retake one or both parts of the examination. Details of the examination are the following:

Mock proposal mentor: Preparation of the mock proposal will be supervised by the student's thesis mentor.

Mock proposal abstract: A one-page abstract summarizing the intended proposal content should be written and submitted to the Program director by **February 1st**. The Program Director will select several departmental faculty members to review the abstract, and suggestions for improvements/modifications will be given to the student. Any modifications should be completed as soon as possible so that final approval is given by **March 1st**.

Mock proposal: The written proposal is due no later than **May 1st** and must be given to committee members at least 2 weeks prior to the scheduled exam. The style of the proposal will conform to guidelines for NIH grant applications. The length will not exceed 4500 words (exclusive of figures, legends, and biography). Each mock proposal will be read and evaluated by all members of the examination committee.

Examination committee: The examination committee will be composed of five MCW faculty members including the student's thesis advisor. The committee will be assembled by the Program Director. The faculty will be chosen based on expertise and experience with the examination process. At least three of the faculty members will be primary faculty members in the Department of Pharmacology and Toxicology. The other two members may be faculty from other departments or with secondary appointments in Pharmacology. One of the primary faculty members will be selected by the Program Director to chair the committee. It is the chairman's responsibility to complete and submit the paperwork required to document the student's performance.

Oral defense of the mock proposal: The oral defense of the mock proposal should occur no later than **May 30th**. Prior to or at the time of the exam, the student should provide the examination chairman with the appropriate number of "Doctoral Qualifying Examination Evaluation" forms and one copy of the "Doctoral Qualifying Examination: Chairman's Report" form found at the Graduate School website.

Each exam will begin with a 20- to 30-minute uninterrupted presentation by the student. Students may use visual aids to facilitate their presentation. While a brief background may be given, this should last no more than five minutes. The bulk of the oral presentation should be focused on describing their experimental design and how it addresses the hypothesis/specific aim(s).

After this presentation, the remainder of the exam will consist of interactive discussion and questions. In addition to the specific areas of the proposal itself, students will also be expected to be familiar with related areas, including methods, experimental design and controls, interpretation of possible data outcomes, and other possible approaches to the proposed experiments. **The student is also expected to demonstrate knowledge of curricular material previously presented to the student and of basic pharmacological principles.** There is no absolute time limit on the length of the exam, but it usually averages ~2 hours.

Assessment of performance: The exam committee will judge the student's performance by considering both the written proposal and the oral defense. Students must be assessed as having done satisfactory or better on both portions of the exam. However, since students receive help with writing the proposal, the exam committee will use the oral defense as a stronger indicator of the student's own abilities.

The committee will dismiss the student immediately after the exam to reach a decision regarding performance and recommendations. While there are 5 committee members, the student's dissertation advisor will not have an official vote, i.e. there will be 4 voting members. In the event of a 2:2 split, the committee chair's vote will determine the outcome. The committee will orally present their overall assessment to the student immediately after a decision has been reached. This decision will be transmitted in writing to the Program Director using the "Doctoral Qualifying Examination Evaluation" forms. These forms will be completed by each committee member to document the student's performance as either Satisfactory or Unsatisfactory; additional space is available for comments on strengths and weaknesses as well as recommendations if performance is not satisfactory. The committee must then reach a consensus decision and rate the student's performance on the "Qualifying Examination: Chairperson's Report" form. The evaluation forms and overall recommendation will subsequently be forwarded to the Program Director, who will then obtain the signature of the Department Chairperson before sending all paperwork to the Graduate School Dean.

In addition to Pass or Fail, the committee may alternatively decide that remedial actions are necessary (e.g. additional coursework, writing a paper on a topic in which the student demonstrated inadequate knowledge) before a final decision is reached on pass or no pass. If the student's performance was less than satisfactory, the committee may recommend that the student retake part or all of the exam. In this case, the student will be informed if just the oral, or just the written, or if both portions need to be redone. The committee will arrange deadlines with the student for the necessary phases of re-examination, but this should not extend beyond 90 days of the first exam (exceptions may be made for extenuating circumstances). If a student does not pass both portions of the qualifying examination on the second attempt, he/she will not advance to candidacy and not be allowed to continue in the Ph.D. program.

Section 2. Course Requirements

A. Course and Credit Requirements

The training component of the doctoral program in the Department of Pharmacology and Toxicology includes didactic course work. Full-time students must register for at least 9 credits in the Fall and Spring semesters and 6 credits in the summer sessions. Students should select their courses in close consultation with their Mentor and Dissertation Committee. The curriculum for students in the Pharmacology Program places emphasis on instruction in the areas of basic pharmacological principles, mechanisms of drug action, signal transduction, and pharmacological techniques. Core courses that cover these principles offered by the Pharmacology Department include:

07237	<i>Modern Drug Discovery and Development</i> (3 credits)
07225	<i>Ion Channels and Signal Transduction</i> (3 credits)
07224	<i>Cellular Signal Transduction</i> (3 credits)
07226	<i>Current Concepts of Cancer Biology</i> (3 credits)
07214	<i>Principles of Drug Action</i> (3 credits)

Course requirements for students entering directly into the department or from the IDP, Neuroscience, and MSTP programs are the following:

1. **IDP and neuroscience students** who enter the Pharmacology Program after successful completion of the first year of coursework are required to take:

07295	<i>Readings and Research</i> (each semester enrolled)
07301	<i>Seminar</i> (each spring semester enrolled)
10222	<i>Ethics and Integrity in Science</i>
10444	<i>Ethics and Integrity Discussion Series</i>
07215	<i>Survey of Principles of Drug Action</i> (1 credit)
xxxxxx	Two additional core courses offered by the Pharmacology Department (6 credits)
xxxxxx	Elective courses for at least three credits
07399	<i>Doctoral Dissertation</i> (semester of dissertation defense)

2. **MSTP students** who enter the Pharmacology Program after successful completion of the first two years of the Medical School curriculum are required to take:

07295	<i>Readings and Research</i> (each semester enrolled)
07301	<i>Seminar</i> (each spring semester enrolled)
10222	<i>Ethics and Integrity in Science</i>
10444	<i>Ethics and Integrity Discussion Series</i>
xxxxxx	One additional core course offered by the Pharmacology Department (3 credits)*
xxxxxx	Elective courses for at least three credits*
07399	<i>Doctoral Dissertation</i> (semester of dissertation defense)

3. **Direct entry students** who enter directly into the Pharmacology Program and have successfully completed the first year of coursework are required to take:

07295	<i>Readings and Research</i> (each semester enrolled)
07301	<i>Seminar</i> (each spring semester enrolled)
10222	<i>Ethics and Integrity in Science</i>
10444	<i>Ethics and Integrity Discussion Series</i>
07214	<i>Principles of Drug Action</i> (3 credits)
xxxxxx	One additional core course offered by the Pharmacology Department (3 credits)*
xxxxxx	Elective courses for at least three credits
07399	<i>Doctoral Dissertation</i> (semester of dissertation defense)

*The *Principles of Drug Action* course (07214) does not fulfill this requirement.

These course requirements are a minimum. Upon consultation with their mentor and Dissertation committee, students may elect or be required to take additional courses to broaden their scientific knowledge or to otherwise enhance completion of their doctoral research.

B. Scholastic Achievement

Students will be subject to Graduate School policies regarding probation and dismissal, as outlined in the Graduate School Handbook. All graduate students are expected to maintain a cumulative grade point average of 3.0 or better and a “satisfactory” or better in *Readings and Research* (see below). Students and mentors should be aware that a student whose cumulative grade point average falls below 3.0 or who receives an “unsatisfactory” evaluation in *Readings and Research* will be placed on probation and may ultimately be recommended for dismissal from the Graduate School.

Section 3. The Dissertation Committee

The purpose of the Dissertation Committee is to:

- 1) oversee the student's emerging dissertation research
- 2) mentor the student in course selection
- 3) address educational deficiencies noted by the student's mentor and during the qualifying examination.

Members of the Dissertation Committee must be approved by the mentor, the Program Director, and the Dean of the Graduate School.

A. Mentor

Students entering from the IDP, MSTP, and Neuroscience Programs must have a mentor with a primary or secondary faculty appointment in the Department of Pharmacology and Toxicology prior to acceptance in the Pharmacology Doctoral Graduate Program. Students who enter directly into the Pharmacology Program will select a mentor after the first year of laboratory rotations. The mentor advises the student about courses and supervises the dissertation research. The mentor chairs the Dissertation Committee and provides guidance to the graduate student in the selection of the Dissertation Committee. The mentor oversees progress reports and committee meetings, guides the writing and discussion of the dissertation proposal, assists in selecting the dissertation committee, and supervises the dissertation defense.

B. Dissertation Committee Membership

Students who enter into the Pharmacology Graduate Program directly or from the IDP or Neuroscience Programs must select a Dissertation Committee by **September 1st** of their third year in graduate school. Students who enter the Pharmacology Program from the MSTP program must form a Dissertation Committee **within six months after becoming a full-time graduate student**. Students who enter the Pharmacology Graduate Program on July 1st should form their Dissertation Committee by the following January 1st.

The Dissertation Committee is required to have five or more members, each of whom has a Ph.D., M.D., or equivalent degree. The committee must be comprised of:

- 1) The dissertation advisor, who acts as the chairman of the committee.
- 2) At least three faculty members (and $\geq 50\%$ of the committee) with a **primary** faculty appointment in the Department of Pharmacology and Toxicology. The chairman counts as one of the three if he/she is a primary faculty member from the Pharmacology Department.
- 3) One member must have neither a primary or secondary appointment in the Department of Pharmacology and Toxicology. This individual can be from any other MCW basic science or clinical department, or from outside of MCW. **Note that the outside member must be available for at least one committee meeting/year, either in person or by conference call, and must attend the dissertation defense.**

After consulting with the mentor, the student is responsible for completing the “Doctoral Dissertation Committee Approval” form (form 1.D) and obtaining the signatures from the mentor, the Graduate Program Director, and the Graduate School Dean. The student, mentor, and department should maintain copies of the completed form.

Changes in membership of the Dissertation Committee may occur for various reasons. These changes must be documented by submission of a revised “Doctoral Dissertation Committee Approval” form, which has been approved by the mentor, the Program Director, and the Graduate School Dean.

C. Challenge of the Dissertation Committee

The Dissertation Committee will recommend further coursework when deemed beneficial for the student and will aid in directing the course of the student’s research. It is the student’s responsibility to invite faculty to serve on the committee, to assemble meetings, and to meet individually with committee members to discuss research progress and concerns. Voting members of student’s committees will attend two committee meetings per year, participate and advise in the student’s coursework, assist in the preparation of the dissertation proposal and the final dissertation, and are required to attend the dissertation defense. It is the responsibility of the Dissertation Committee to evaluate the dissertation research proposal and to determine whether the student has completed a sufficient body of original research to write a doctoral dissertation. The committee will read and evaluate the dissertation and attend and

evaluate the dissertation defense. The committee has the authority to recommend dismissal of a student who does not qualify for a PhD degree, based on the committee's evaluation of all components of the student's performance in the Pharmacology Doctoral Program.

The committee is charged with ensuring that each student's formal education has the proper breadth and scientific foundation. The committee should aid in the development of an outstanding, rigorous plan of advanced study in the core areas emphasized in the Pharmacology and Toxicology Department of cardiovascular biology, neuroscience, molecular pharmacology, cellular signal transduction, toxicology/drug metabolism, and cancer biology.

Section 4. Annual Progress

A. Dissertation committee meetings

One of the primary functions of the Dissertation Committee is to provide ongoing advice and guidance regarding the student's research and to monitor progress towards the degree. To ensure regular interaction, the student will be responsible for coordinating **two** meetings with the Dissertation Committee each year. These meetings will provide an opportunity to discuss concerns about student performance, changes in specific aims of the dissertation research, access to equipment and techniques, and any other issues that arise. During at least one of the biannual meetings each year, the student will provide a formal oral progress report, which may coincide with a departmental seminar. The Dissertation Committee has the authority to delay completion of the degree if the student does not schedule regular meetings.

Students will be responsible for providing a completed progress report at or before each meeting. This report (form found at the MCW Pharmacology website) will describe progress made since the past committee meeting and research objectives that will be accomplished before the next meeting. Notes from the meeting will be added to the form after the committee has met. After the meeting, the report must be signed by the student and all committee members and submitted to the Program Director. Copies should be provided to the mentor and all committee members.

B. Yearly Progress Reports

Progress reports for students are submitted to the Graduate School each year. The report prepared by the mentor will be read and signed by the student.

C. Readings and Research

Full-time graduate students must register for *Readings and Research* (07295) every fall, summer, and spring until they successfully defend their dissertation research. Students who leave MCW before their dissertation defense should consult with the mentor and the graduate school to determine the appropriate procedure to remain eligible for a PhD.

Performance in *Readings and Research* is assigned a grade of E (excellent), G (good), S (satisfactory), or U (unsatisfactory). Due to the varying nature of the research experience across the different labs in the department, fixed criteria for grading students in *Readings and Research* cannot be established. Mentors will consider the following when assigning grades:

- 1) written research summaries
- 2) presentations to the department or dissertations committee
- 3) motivation and commitment of time to research
- 4) data management and record keeping
- 5) familiarity with literature
- 6) collegiality within the lab
- 7) ability to establish and meet pre-set deadlines and goals
- 8) lab skills and experimental design
- 9) communication skills
- 10) scientific honesty and integrity
- 11) research accomplishments and progress towards the dissertation

The mentor will consult with members of the dissertation committee and the Director of the Graduate Program if an evaluation of Unsatisfactory in *Readings and Research* is contemplated. If student performance is evaluated as Unsatisfactory, the basis for this grade will be stated in Progress Reports and/or communicated directly to the Graduate School Dean. A student who receives a second evaluation of Unsatisfactory during subsequent semesters of study will be recommended for dismissal.

It is expected that additional hours in the evenings and during the weekends will be required to complete studies outlined in the dissertation proposal and to prepare the dissertation document and defense. Students must adhere to the Vacation Policy established by the Graduate School. Vacation time does not accrue by working after

regular working hours. Students must also adhere to the Graduate School “Sick Leave Policy”.

Any student who has not finished their dissertation research by the end of 5 years should be reviewed by the Dissertation Committee to determine the reasons responsible for the delayed progress. At this time, actions must be identified during a discussion with the student and their mentor that will result in the student’s completing a Masters Degree or PhD degree as soon as possible. If the Committee can identify no solution, the student may be required to leave the program.

D. Publication

Learning to prepare research articles and experiencing the publication process are important aspects of graduate training. While not an official requirement, students should establish the goal to publish at least one primary research paper as the lead author prior to completion of the dissertation defense. The dissertation committee will provide guidance to the student with this goal in mind.

Section 5. Dissertation Proposal

The dissertation proposal should provide a description of the proposed research to be undertaken, including the specific hypothesis to be tested, background, and experimental design. The purpose of the proposal is to ensure that the student, advisor, and Dissertation Committee agree on a research project that has potential to generate meaningful data within a reasonable time-frame. The student will discuss with the mentor potential areas of research and agree upon a reasonable hypothesis to be tested, the overall scientific objectives, and experimental design that will be used. The mentor should discuss with the student alternative hypotheses and approaches prior to discussion of the abstract with the dissertation committee. It is understood that the proposed dissertation research may be modified significantly or abandoned if so recommend by the Dissertation Committee, or as a consequence of future developments of the student’s doctoral research.

A. Deadlines

Direct entry, IDP, and Neuroscience Students. The dissertation proposal should be submitted to the Dissertation Committee by **May 1st** of the student’s 3rd year. The committee should have 2 weeks to review the proposal before meeting to discuss the

proposal with the student. The student should meet with the committee by **June 1st** (at the end of the student's 3rd year) to discuss the proposal. If the Dissertation Committee requests that the proposal be revised before it can be accepted, the deadline to submit a revision to the committee is September 1st (at the beginning of the 4th year).

MSTP Students. The dissertation proposal should be submitted to the committee **21 months after becoming a full-time graduate student** (for students entering July 1st, this corresponds to April 1st of the student's second year as a graduate student). The student should meet with the committee within one month after submitting the proposal. If the committee requests that the proposal be revised before it can be accepted, the deadline to resubmit is three months after submission of the original proposal.

B. Dissertation Proposal Format.

The dissertation proposal should follow the format of a typical NIH-style grant application, with a single-spaced 12-page maximum, 1 inch margins, and a 12-point font. The proposal should address the hypothesis to be tested, significance, innovation, and experimental approach. The literature cited section is not included in the 12-page maximum. Figures and tables should be included within the text and count towards the 12-page limit. An example of the format of a typical proposal is as follows:

Specific Aims. This section will describe and list the hypotheses to be tested and the overall goals of the project. A set of specific aims that define the key components of the experimental strategy to test the hypotheses should be listed and briefly described. This section should not exceed one page.

Significance. This section should critically evaluate existing knowledge and identify gaps that the project intends to fill. It should highlight the importance of the problem to be addressed and explain how scientific knowledge, technical capability, and or patient care will be improved if the aims are completed successfully. Describe how completion of the work will change the concepts, methods, technologies, treatments, services, or preventative interventions that drive the field. This section should describe the positive effect this work will have on solving an important problem. 0.5 – 0.75 pages are recommended.

Innovation. This section should highlight the novel aspects of the work. Explain how the application challenges and seeks to shift current research or clinical

practice paradigms. Describe any novel theoretical concepts, approaches or methodologies to be developed. 0.5 – 0.75 pages are recommended.

Experimental Approach. This section should describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Include how the data will be collected, analyzed, and interpreted. Discuss potential problems, alternative strategies, feasibility, and benchmarks for success. This section should include relevant tables, figures, and diagrams with accompanying legends and should be numbered as they appear in the text. Each aim should be addressed using the format given below. 8-10 pages are recommended.

Approach

Each Aim:

Introductory Paragraph

Justification and Feasibility

Review of Relevant Literature

Preliminary Studies

Research Design

Expected Outcomes

Potential Problems & Alternative Strategies

Future Directions

Literature Cited. This section is not included in the 12-page limit and should list all published information referred to in the preceding sections. The format should follow established and published guidelines for a major journal specific to the field of study.

C. Preparation of the Dissertation Proposal

The dissertation proposal should be an original document written by the student representing original thoughts and ideas of the student. Verbal advice from the mentor, members of the Dissertation Committee, or other faculty should be sought by the student to assist in preparation of the proposal. The student should not copy components from the mentor's grant proposals, published journal articles, reviews, textbooks, or other sources without acknowledging the source and enclosing copied sections in quotation marks. Committee members may suggest changes that would improve the content or grammar of the proposal, but should not edit or write any section of the proposal.

D. Evaluation of the Dissertation Proposal

The dissertation proposal will be evaluated no later than 4 weeks after the proposal is submitted to the Dissertation Committee. For this evaluation, the student will present an overview of the proposal and address any questions or concerns of the committee members. The committee will evaluate the proposal with respect to:

1. the hypothesis – is it appropriate and based on existing data
2. the experimental design – will the proposed experiments provide a thorough test of the hypothesis, are necessary controls included, and are alternative approaches described
3. the significance and innovative aspects of the project – has the student provided a strong enough argument that the project is novel and addresses an important problem
4. preliminary data – has the student demonstrated the ability to conduct the experiments, analyze the results, and formulate appropriate conclusions

E. Advancement to Candidacy

Acceptance of the dissertation research proposal is required for advancement to candidacy for the Ph.D. degree. The Dissertation Committee will identify any potential problems or weaknesses with the dissertation proposal and will evaluate the ability of the student to conduct the proposed experiments, obtain the required data, interpret the results, formulate conclusions based on the experimental results, and propose subsequent experiments. These skills are essential for completion of the dissertation research that is a required component of the graduate program in the Department of Pharmacology and Toxicology. It is the responsibility of the committee to determine whether the student has the necessary skills, motivation, and knowledge to complete the dissertation research, and if not, what course of action should be taken. The mentor will convey the evaluation and the recommended course of action of the Dissertation Committee to the Program Director as well as the Dean of the Graduate School of Biomedical Sciences. The committee shall either:

1. Approve the dissertation proposal. Committee members will indicate their acceptance of the final research proposal by signing the “Doctoral Dissertation Outline” approval form. This form and the completed research proposal will be submitted to the Director of the Pharmacology Program for approval and forwarded to the Dean of the Graduate School for final approval. Upon approval, a student will be admitted to Candidacy for the Ph.D. degree.
2. Call for a revision. The committee will formulate a series of steps that will provide the student with an opportunity to revise the dissertation research proposal, to discuss the revised version with the committee, and to be re-evaluated by the committee. The outcome of this evaluation will be one of the same four options (1 – 4) described in this section.
3. Recommend to the director of the Pharmacology Program and Dean of the Graduate School that, based on concerns with the preparation and presentation of the research proposal, coupled with problems on the qualifying examination, academic record, and/or concerns of the mentor, the student lacks one or more skills required for completion of the dissertation research and therefore is not qualified to be admitted to the candidacy for the Ph.D. degree, but has sufficient skills to complete the requirements for a MS degree. Students advised to pursue the MS degree must meet the requirements for that degree, which includes completion of a research project and preparation of a thesis that is approved by the Dissertation Committee.
4. Recommend to the Director of the Pharmacology Program and the Dean of the Graduate School that, based on concerns with the preparation and presentation of the dissertation proposal, coupled with problems on the qualifying examination, academic record, and/or concerns of the mentor, the student lacks one or more skills required for completion of a graduate degree from the Department of Pharmacology and Toxicology. Under these circumstances, the committee will recommend that the student be dismissed from the graduate program. Students recommended for dismissal have the right to an appeal as described in the Graduate School Handbook.

F. Modifying the Dissertation Research Proposal

During the course of the dissertation research, it may be necessary to modify or change the hypothesis to be tested or the specific aims of the research. These changes should be discussed with the entire Dissertation Committee.

Section 6. Dissertation Defense

Candidates in the Pharmacology Graduate program must present broad-based evidence of proficiency in research and of distinctive achievement in a special field, and particularly for independent investigation as demonstrated by the dissertation. The dissertation should comprise a substantial body of original research representing the student's own laboratory work. Any collaborative components of the research, other than that of the mentor, must be identified and the student's contribution clearly delineated. The dissertation must be written with a high-level of literary skill such as would be expected in leading journals specific to the candidate's field of study. The format must correspond to the recommendations of the Graduate School (see the Graduate School Handbook for details). The document must be organized around clearly stated hypotheses, rigorous experimental tests of the hypotheses, clearly presented results, and appropriate interpretation of the data. A discussion section stating the importance and relevance of the dissertation research to the field of study is appropriate and must be sufficiently clear to provide a direction for subsequent investigations. Upon completion, the written dissertation will be distributed to the members of the Dissertation Committee two weeks prior to the dissertation defense.

The dissertation defense consists of a public defense in the form of a seminar, at the end of which the candidate entertains questions from the scientific community/public and the Dissertation Committee. **The oral defense is a formal examination, and students are not allowed to invite guests to attend with the exception of parents or significant others.** Following the public defense, the candidate will meet in private with the Dissertation Committee wherein the dissertation is scrutinized in more detail, and issues both central and tangential to the work will be discussed. Upon a satisfactory defense and in accordance with the Graduate School, final copies of the dissertation, including any changes required by the committee, must be submitted to the Dean within two weeks following the defense. The degree application will then be signed.

Section 7. **The Master of Science degree program**

This program of study is available only to MCW medical students, Residents, and Fellows. Medical students accepted as M.S. candidates are expected to devote full effort to this program, which generally can be completed in 15 months of intensive work. Residents and Fellows may be accepted on a less than full-time basis, but must commit at least 75% effort to the program and must provide evidence that their clinical responsibilities have been limited to an amount which is commensurate with this level of effort.

Students in the Ph.D. degree program who cannot or elect not to complete that program may be allowed to transfer to the Master's program. This transfer must be approved by the student's advisor, the Program Director of Pharmacology and Toxicology, the chair of Pharmacology and Toxicology, and the Graduate School. To transfer to the Master's Program, the student must be in good academic standing according to regulations established by the Graduate School.

Course requirements are determined on the basis of each student's background and experience. Master's students must take at least 1 of the 4 core advanced courses offered by the Pharmacology Department. Credit requirements to achieve the Master's Degree are specified in the Graduate School Handbook. Participation in the departmental seminar course (07301) is required for all Master's Degree candidates for each year in the program. For the term in which the student intends to defend their thesis, they must register for Master's Thesis (07299; 6 credits).

Completion of an original research project suitable for the Master's thesis constitutes the major component of this program. Master's thesis research will be conducted under the supervision of the thesis advisor and by a Master's thesis committee, in accordance with Graduate School policies. The thesis committee will consist of at least three faculty members, including the thesis advisor. At least two members and $\geq 50\%$ of the thesis committee must be from the Department of Pharmacology & Toxicology.

For Master's degree students, an outline of Master's thesis research must be prepared, approved by the thesis committee, and submitted to the Graduate School according to Graduate Handbook policies. Proficiency of research at the level of a Master's Degree is demonstrated by preparation of a written thesis and completion of an oral thesis defense. Preparation of the thesis and completion of the oral defense should follow the procedures outlined for the Ph.D. dissertation defense.

Section 8. Summary of Deadlines

Deadlines for students entering from the Interdisciplinary Program (academic year begins July 1st and ends June 30th)

	Year	Semester	Month	Day
Qualifying Exam	2	Fall	November	30th
Form Dissertation Committee	3	Fall	September	1st
Submit Dissertation Proposal to Dissertation Committee	3	Spring	May	1st
Evaluate Dissertation Proposal with Dissertation Committee	3	Summer	June	1st
If necessary, Submit revised Dissertation Proposal	4	Fall	September	1st

Deadlines for direct entry students or from students entering from the Neuroscience Program (academic year begins July 1st and ends June 30th)

	Year	Semester	Month	Day
Qualifying Exam				
Submit Abstract	2	Spring	February	1st
Submit Proposal	2	Spring	May	1st
Oral Defense	2	Spring	May	30th
Form Dissertation Committee	3	Fall	September	1st
Submit Dissertation Proposal to Dissertation Committee	3	Spring	May	1st
Evaluate Dissertation Proposal with Dissertation Committee	3	Summer	June	1st
If necessary, Submit revised Dissertation Proposal	4	Fall	September	1st

Deadlines for MSTP students who enter the Pharmacology Program July 1st

	Year	Semester	Month/Day	Month
Form Dissertation Committee	1	Spring	January 1st	6
Qualifying Exam				
Submit Abstract		Spring	February 1st	7
Submit Proposal		Spring	May 1st	10
Oral Defense		Spring	May 30th	10
Submit Dissertation Proposal to Dissertation Committee	2	Spring	April 1st	21
Evaluate Dissertation Proposal with Dissertation Committee	3	Spring	May 1st	22
If necessary, Submit revised Dissertation Proposal	3	Summer	August 1st	25