

Physiology Doctoral Program Handbook

To complete the physiology doctoral program, each student must demonstrate a breadth of knowledge of physiology and depth of knowledge in the student's chosen field of physiology, and must demonstrate that he/she can conceive, execute, and report an original piece of research.

To these ends, each Ph.D. candidate must successfully meet the following criteria:

- a. Complete the required coursework
- b. Pass the comprehensive examination, which measures breadth of physiological knowledge and depth in the chosen field of research
- c. Have yearly guidance committee meetings
- d. Complete responsible conduct of research (RCR) requirements
- e. Have one first author publication accepted and at least one other manuscript submitted
- f. Present a written and oral dissertation and pass the final oral examination

The primary objective of the doctoral program is to provide the student with a thorough knowledge of integrative, systemic, cell, and molecular physiology, to prepare him/her for independent research and to provide scholarly experience in one of the specialized areas of physiology. *For a summary of Physiology Doctoral Program requirements and deadlines, see section J below.*

A. Formulation of the Doctoral Program

A student is considered by the Department to be 'Doctoral Candidate' after they have:

- a. Selected a Thesis Advisor
- b. Completed required graduate coursework
- c. Passed the comprehensive examination

B. Selection of the Thesis Advisor

Students who would like to do their Ph.D. in the Physiology graduate program are strongly urged to select a thesis advisor by the end of their third rotation in the second semester of study. If a thesis advisor has not been selected by the end of the first year, the student will be directed to investigate additional opportunities within the BMS program or in the Department of Physiology. If a thesis advisor has not been selected, the student should consult with the BMS program director and/or with the Physiology graduate program director for further course of action.

Faculty members that qualify to serve as thesis advisors include regular and adjunct physiology faculty members. Adjunct faculty who are not regular MSU faculty must be approved by the Dean of the Graduate School prior to serving as a proxy thesis advisor.

C. Role and Responsibilities of the Thesis Advisor

- a. The role of the thesis advisor is to oversee the student's academic progress and research project.
- b. The thesis advisor and student are responsible for establishing a guidance committee
- c. The student, not thesis advisor, is responsible for writing/editing the student's thesis.

D. Role and Responsibilities of the Guidance Committee

The student and thesis advisor will arrange for the selection and first meeting of the student's guidance committee whose central role is to guide the conception, completion, and reporting of the student's research. The guidance committee shall administer the comprehensive examination and thesis defense. The guidance committee will consist of the thesis advisor and at least four other regular faculty. At least one member of the guidance committee shall be chosen from outside the Department of Physiology and represent a discipline closely related to the student's field of specialization. At least three members of the committee should be Physiology faculty. Changes to the guidance committee once established need to be approved by the Graduate Director. The guidance committee and student will outline at the first meeting a tentative program and establish target dates for each phase of training. Any member of the committee or any other member of the faculty in the Physiology Department is available to any student for counsel or guidance throughout his/her graduate career. *It is strongly suggested that the Guidance Committee be formed by the end of the fall semester of the second year.*

Guidance Committee Meetings

Prior to the first guidance committee meeting, the student must enroll in GradPlan. All guidance committee meetings must be logged and recorded in GradPlan.

The student should complete their first guidance committee meeting by the *end of the spring semester of the second year*. For the first meeting, the student is required to submit a Specific Aims page to committee members one week prior to the meeting. The student should present an update on: 1) progress on required coursework and 2) outline of thesis proposal. Following the first meeting, the committee will decide whether the student is ready to proceed to the comprehensive exam or whether an additional committee meeting is necessary. If the committee agrees that the student is ready for the comprehensive exam, the committee will provide the student *with a topic for the 3-page proposal within 1 month of the meeting* (see below, G. Comprehensive Exam).

Following completion of the comprehensive exam, the student is required to meet annually with their guidance committee. The student will need to provide the thesis guidance committee with a written progress report on their research (maximum 2 pages), submitted to the committee one week prior to the meeting.

The student's yearly meeting should be a brief (~30 min) summary, which includes the following:

- a. Brief introduction
- b. Results and discussion: This section should include an update on all progress toward the completion of the specific aims. If there have been changes in the aims or direction of investigation, these changes should be well described. This section should also include a statement of the percentage of progress on the aims.
- c. Future studies/timetable: This section should briefly indicate the studies that are incomplete and the anticipated timetable for their completion.
- d. List all manuscripts and abstracts submitted, in press, published, or presented.

Confirmation of the annual guidance committee meetings must be recorded in GradPlan. If progress is not sufficient, the committee may decide that additional meetings are necessary. Committee members will provide written summaries within GradPlan outlining the necessary steps for improvement of progress.

E. Coursework Requirements

The university requires no specific number of course credits, other than a minimum of 24 PSL 999 research credits.

Basic Physiology Coursework: PSL 828 and 829; three electives (3 credit hour, 800 level and higher), and four topic courses (1 credit hour, e.g. PSL 950).

Physiology students must attain at least a grade point of 3.0 in any required course (PSL 828, PSL 829). If a student receives below a 3.0 in a required course they have 12 months to retake the course. Failure to attain a 3.0 after retaking the course will result in dismissal from the PhD program. Additionally, accumulation of 2 or more grades in any graduate courses at/below 2.0 meets the criteria for dismissal from the Ph.D. program as listed in section L below.

ENVISIONED TIME LINE:		
Year:	Fall	Spring
1	Elective 1 Elective 2 (PSL 813 Molecular mechanisms of human disease and targeted therapies – recommended)	PSL 828 – Cellular and Integrative Physiology I Elective 3
2	PSL 829 – Cellular and Integrative Physiology II PSL 950 (1) – Topics in Physiology Guidance Committee selection	PSL 950 (2) – Topics in Physiology Thesis Specific Elective First Guidance Committee meeting TA Requirement Thesis Research
End of year 2 – beginning year 3	Comprehensive Examination (written proposal, research presentation, committee questions)	
3	PSL 950 (3) – Topics in Physiology Thesis Research	PSL 950 (4) – Topics in Physiology Thesis Research
4 and 5	Thesis Research Thesis Defense	Thesis Research Thesis Defense

F. Responsible Conduct of Research (RCR) Requirements

Per University policy, all graduate students must complete the RCR requirements listed below. Completion of training must be documented in the relevant database (SABA, Grad Plan, Grad Info).

RCR Requirements – Physiology PhD Program

Time Line:	Required Sections/Specific Description:	Alternatives:
<ul style="list-style-type: none"> BMS – first year If not completed during that time – PSL committed students need to complete by August 1st before starting year 2 	<p style="text-align: center;">CITI Modules Year 1: 4 Modules</p> <ul style="list-style-type: none"> Introduction to the Responsible Conduct of Research Authorship Plagiarism Research Misconduct <ul style="list-style-type: none"> Tracked by SABA Checked by PSL grad secretary/director for all PSL committed students after BMS year 1 	<ul style="list-style-type: none"> NONE
<ul style="list-style-type: none"> PSL – second year PSL students need to complete by October 1st 	<p style="text-align: center;">CITI Modules Year 2 : 3 Modules</p> <ul style="list-style-type: none"> 3 additional modules selected by PSL student based on recommendation/discussion with mentor <ul style="list-style-type: none"> Tracked by SABA Checked by PSL grad secretary/director for all PSL students in fall of year 2 	<ul style="list-style-type: none"> NONE
<ul style="list-style-type: none"> PSL – second and third year PSL Workshop in February/March 	<p style="text-align: center;">6 Hours Discussion Based Training (by completion of degree)</p> <ul style="list-style-type: none"> 3 hours/year of RCR workshop provided by Physiology Graduate Program Extends on CITI modules Topic discussions and role plays using NIH, Grad School, and literature material Mandatory for ALL PSL students independent of mentor's departmental affiliation <ul style="list-style-type: none"> Tracked by <u>GradPlan/GradInfo</u> Checked by PSL grad secretary/director for all PSL students at end of academic year 	<ul style="list-style-type: none"> 3 hours of RCR courses provided by Grad School OR 3 hours of individual RCR training provided by mentor or journal club – needs to be well documented
<ul style="list-style-type: none"> PSL – starting in fourth year PSL Workshop in February/March 	<p style="text-align: center;">3 Hours of Annual Retraining</p> <ul style="list-style-type: none"> 3 hours/year of discussion based RCR workshop provided by Physiology Graduate Program Mandatory for ALL PSL students independent of mentor's departmental affiliation <ul style="list-style-type: none"> Tracked by <u>GradPlan/GradInfo</u> Checked by PSL grad secretary/director for all PSL students at end of academic year 	<ul style="list-style-type: none"> 3 hours of RCR courses provided by Grad School OR 3 hours of individual RCR training provided by mentor or journal club – needs to be well documented

G. The Comprehensive Exam

By the end of the fall semester of the third year in the graduate program, the student must successfully complete the comprehensive exam. If a student recognizes that they will be unable to meet this deadline, they must submit a written request to the Physiology Chair and Graduate Director for an extension by Nov. 15 of the fall semester. Granting of an extension will be decided by the Chair of the Physiology Department and Graduate Director and will not exceed 3 months. Failure to complete the comprehensive exam by the extension deadline will result in dismissal from the PhD program and the guidance committee will determine whether conditions have been met for a master's degree.

The student's guidance committee plus a member of the Graduate Affairs Committee (GAC), who will serve as chair of the comprehensive exam committee, will administer the Comprehensive Exam. The student's thesis advisor will not be present during the oral exam that occurs after the student presents his/her thesis proposal to a general audience.

As part of the comprehensive exam the student is expected to prepare two written documents one week prior to the comprehensive exam:

1. A dissertation proposal in the form of a current NIH predoctoral fellowship (e.g. a 1-page specific aims + 6-page research plan).
2. A three-page topic grant proposal based on the topic/problem provided by the guidance committee (see guidelines below).

The comprehensive exam day will consist of 2 parts:

1. An oral presentation of the proposed research in seminar open to the public.
2. A closed session meeting with the comprehensive examination committee. The examination committee will consist of the guidance committee plus a member of the GAC. The student's thesis advisor is recused from participation in the preliminary examination.

G1. Written Dissertation Proposal

This document should provide the comprehensive examination committee with sufficient evidence to judge the student's potential (both intellectual and technical) to develop a first rate dissertation research project. It is expected that the student will discuss this written proposal at length with his/her advisor and that the advisor will have significant input into the proposal. This is an educational opportunity for trainee to learn "grant writing skills" and therefore a perfect opportunity to learn from his/her advisor. It is recognized that this proposal could be used for fellowship application to grant agencies including AHA, ACS, JDRF, CCFA, NIH etc. However, the format of the thesis proposal should follow established fellowship guidelines such as those set for the pre-doctoral NIH F31 National Research Service Award (NRSA) Program (<https://grants.nih.gov/grants/how-to-apply-application-guide/forms-d/fellowship-forms-d.pdf>, pages F-55 and F-56).

At least seven days prior to the seminar date, the student shall submit a written dissertation proposal to the members of the comprehensive examination committee.

The dissertation proposal should include these basic sections (the exact structure and length can vary depending on the fellowship type chosen):

a. Specific Aims: Not exceed 1 page. List the broad, long-term objectives and what the specific research proposed in this application is intended to accomplish. State the hypotheses to be tested.

b. Significance: Not to exceed 0.5 - 1 pages. Briefly describe the rationale leading to the present application, critically evaluate existing knowledge, and specifically identify the gaps in knowledge that the project is intended to fill. State concisely the importance and physiological relevance of the research described in this application by relating the specific aims to the broad, long-term objectives.

c. Preliminary Studies and Research Plan: Not to exceed 5 – 5.5 pages. Use this section to provide an account of the your preliminary studies pertinent to the research proposal that will help to establish your experience and competence to pursue the proposed project. Describe the research design and the procedures to be used to

accomplish the specific aims of the project. Include how the data will be collected, analyzed, and interpreted. Describe any new methodology and its advantage over existing methodologies. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve the aims.

d. Literature Cited: List all references. Each reference must include the title, names of all authors, book or journal, volume number, page numbers, and year of publication. The references should be limited to relevant and current literature. While there is no page limitation, it is important to be concise and to select only those literature references pertinent to the proposed research.

G2. Topic Grant Proposal

The guidance committee will provide the topic for the topic grant proposal within one month following the committee meeting. The purpose of this exercise is to 1) assess the student's creative thinking and mastery of physiologic principals and 2) test the student's ability to develop and communicate in a written form a research proposal. The student will be expected to write a 3-page grant that has the following elements: Hypothesis and Specific Aims (0.5 page) and Experimental Approach (2.5 pages) and References. Students should be aware that the topic provided will be distinct from their research area and therefore, the student is expected to do significant reading of literature and develop experimental strategies to test the hypothesis for the question/problem provided. For this grant proposal, the student ***will not consult with her/his mentor*** and the product should be from their independent literature search and creative thinking. Students are allowed to provide their grant for critique by their peers and are allowed to modify their grant based on their peers' critiques before submitting it to the committee.

G3. Public Presentation of Dissertation Proposal

The student is required to present their dissertation proposal in a seminar open to the public. The oral presentation of the dissertation proposal should be 40 - 50 minutes in length and will include a 10 - 15 minute question/answer period. Do not attempt to include all of the information from the written dissertation proposal in the oral seminar. The key to success in this portion of the exam is to give a clear and coherent presentation. The student should rehearse their presentation with their mentor, lab colleagues and/or fellow graduate students.

G4: Oral Comprehensive Examination

The student will have a closed exam with the comprehensive examination committee following the public seminar on their dissertation proposal. The length of the oral comprehensive examination is ~two hours.

The oral examination will include a comprehensive discussion of the:

- a. Studies the student has already conducted in the laboratory of his/her major advisor
- b. Proposal of future research that will serve as the basis for the doctoral dissertation
- c. Student's knowledge and understanding of the facts and fundamental concepts that are pertinent to the dissertation research.

The student must demonstrate defensible logic in the formulation of questions/hypotheses and in the proposed approaches to answer these questions (or test these hypotheses) experimentally. The student must also demonstrate breadth of knowledge and understanding of fundamental physiological principles that are relevant to his/her research area.

G5. Comprehensive Exam Outcome

Following the oral examination with the student, the comprehensive exam committee will decide by simple majority vote on one of the following outcomes:

- a) **Pass:** the student satisfactorily demonstrated mastery of all aspects of the exam and is ready to pursue a dissertation
- b) **Pass with condition:** the student demonstrated mastery of some aspects of the exam, but exhibited deficits in other necessary aspects. The student needs to demonstrate mastery of these aspects before moving forward as a Ph.D. candidate
- c) **Fail:** the student failed to demonstrate mastery of critical aspects necessary for successful completion of a Ph.D. dissertation

In the case of “pass with condition,” the student will be expected to fulfill the conditions set by the comprehensive examination committee within ***three months*** of the exam (e.g. this could involve rewriting the dissertation or topic grant proposal, repeating the oral comprehensive exam, or both). Failure to fulfill the conditions set by the comprehensive exam committee will result in a failure of the exam and dismissal from the Ph.D. program. If the student fails the exam, the student will be dismissed from the Ph.D. program, but may be allowed to complete the MS program.

A “Report on Doctoral Comprehensive Examination (Department of Physiology)” will be signed by the committee members and Physiology Department Chair and filed with the Physiology Graduate Program Director, the student, and the student’s major advisor. ***It is the student’s responsibility to submit the date of successful completion of the comprehensive exam to the Physiology Graduate Secretary for submission to GradPlan.***

Failure on the part of the student to fulfill the requirements of the comprehensive examination within the prescribed time limits will result in dismissal from the Ph.D. program. A student dismissed for this reason shall have the right to apply to the GAC for readmission. A failure in the comprehensive examination also provides the option for an MS degree at the discretion of the committee and the mentor.

H. Dissertation and Defense

Students must have one accepted first author publication and at least one other manuscript submitted in order to successfully complete their dissertation and graduate. Additional publications beyond the one required manuscript are strongly encouraged.

For details regarding the recommended style for dissertations, see "The Graduate School Guide to the Preparation of Graduate Master’s Thesis and/or Doctoral Dissertation." This manual is available from the Graduate School (<https://grad.msu.edu/etd>).

The final oral examination in defense of the dissertation will be conducted and evaluated by the guidance committee. The oral examination will be scheduled for a date not earlier than two weeks after the dissertation and abstract have been submitted to the thesis advisor and guidance committee. This will allow time for the members of the guidance committee to review and evaluate the dissertation before the examination. The student must be registered during the semester in which the final oral examination is taken. Students should have at least one paper published/accepted and another paper at least submitted before graduation. Simple majority rule is in effect for all guidance committee decisions.

I. Teaching Responsibilities

As part of his or her academic requirement each student (irrespective of their source of support) is required to participate in teaching (minimum of a 0.25 TA position for one semester). The teaching experience should be fulfilled ***during the second year*** in the program and ***must occur before the comprehensive exam***. Students on select training fellowships and dual-degree students are exempt from this requirement. However, these students are strongly encouraged to pursue teaching experiences at some point during their graduate work.

The importance of this classroom experience as part of their professional development is noted during the student's orientation to the doctoral program. The course coordinator provides a pre-course orientation, regular observation and feedback during the course, and a written evaluation for each student at the conclusion of the course.

Students are encouraged also to seek other opportunities for gaining teaching experience, including the presentation of formal lectures, construction and evaluation of examinations, tutoring of students, and leading discussion sections. All of these opportunities are considered important aspects of professional development in preparation for future employment.

International graduate students must have a minimum score of 50 on the University's SPEAK test to qualify for teaching. For more information about the SPEAK test, contact the English Language Center at MSU, A714 Wells Hall or on the web at <http://elc.msu.edu>.

J. Summary of Doctoral Physiology Program Requirements and Deadlines.

1. Establishment of GradPlan to document all progress towards the degree (coursework, RCR, committee meetings, comprehensive and dissertation exams)
2. Completion of required coursework (Section E)
3. Completion of RCR requirements (Section F)
4. Passing the comprehensive examination by the fall semester of the third year (Section G)
5. Teaching experience (Section I)
6. Preparing a dissertation based on original research that makes a significant contribution to knowledge (Section H). Students must have at least one paper published/accepted and another paper at least submitted before graduation.
7. Passing a final oral examination in defense of the dissertation within 8 years of entry into the Ph.D. program (Section H)

Doctoral Program Deadlines

REQUIREMENT	DUE DATE/TIME LINE
Select a Thesis Advisor*	By end of summer of first year (BMS)
Secure a Guidance Committee	By end of fall semester of 2 nd year.
First Guidance Committee Meeting	By the end of spring semester of 2 nd year, and there after annually
Comprehensive Exam	By the end of fall semester of 3 rd year
Required Teaching **	During 2 nd year of study
Defense of Ph.D. Thesis	Within 8 years from entry into the Ph.D. program

*please see BMS guidelines for further information on what to do if a thesis advisor is not identified by this time.

**teaching is required for all students with the exception of cases of fellowships, training grants, dual-degree, etc.

K. Modification of Program and Final Certification

Final certification of the Ph.D. degree or any radical departure from the suggested program of study as outlined in this handbook requires the approval of the Physiology Graduate Program Director and the Graduate Affairs Committee. In addition to Physiology Department regulations, the student must

satisfactorily complete all College and University requirements for a given degree. These requirements can be found on the MSU Graduate School homepage (<https://grad.msu.edu/etd>).

L. Criteria for Dismissal-Remediation

- a. Accumulation of 2 or more grades at/below 2.0.
- b. Grade point below 3.0 in any required course (PSL 828, PSL 829). If a student receives below a 3.0 in a required course they have 12 months to retake the course.
- c. Failure to fulfill the requirements for the comprehensive exam within the time limits. Comprehensive Exam must be administered by the end of the fall semester of 3rd year of study.
- d. Receive a Fail on the comprehensive exam
(Student may be allowed to continue in the Master's Program)
- e. Scientific misconduct (http://rio.msu.edu/sites/default/files/June_2009_Procedures.pdf)

M. Changing Thesis Advisor

There may be circumstances in which the student may voluntarily or involuntarily choose to change the thesis advisors. These circumstances may include, but are not limited to, irreconcilable differences between thesis advisor and student, change in research interest, or departure of the thesis advisor from the Physiology Department or MSU. Under such circumstances the Physiology Graduate Program Director will work with the student to identify a new thesis advisor. If a thesis advisor has not been selected by the end of the next full semester, the student will be directed to investigate additional opportunities within the Physiology Department or to withdraw from the graduate program.

If a student changes thesis advisors, all data, notebooks and research materials remain the property of the original thesis advisor. Notebooks and research materials may only be removed from the original thesis advisor's laboratory or offices after student has received written permission from the original thesis advisor.

There also may be circumstances in which a student voluntarily or involuntarily leaves MSU before completing all of the degree requirements. If a student leaves MSU, the student can be readmitted to the program within 3 consecutive semesters; readmission to the University is required after an absence of 3 consecutive semesters, including summer. The original thesis advisor, however, is under no obligation to remain the student's thesis advisor. Under such circumstances the Physiology Graduate Program Director will work with the student to identify a new thesis advisor. If a thesis advisor has not been selected by the end of the next full semester, the student will be directed to investigate additional opportunities within the Physiology Department or to withdraw from the graduate program.

Should a student leave MSU before completing all of the degree requirements, all data, notebooks and research materials remain the property of the thesis advisor. Notebooks and research materials may not be removed from the thesis advisor's laboratory or offices without written permission from the thesis advisor.