

SELECTION OF A MENTOR AND THE DISSERTATION COMMITTEE MEMBERS

By the end of May of Year-1 in the program, students are expected to have completed the process of identifying a mentor and to have joined a laboratory. It is important that both the student and prospective advisor discuss the possibility of joining a given lab at the beginning of a laboratory rotation and again prior to completing the rotation. The decision to join a laboratory for dissertation research is a mutual decision arrived at by both the student and the prospective advisor. If a student anticipates difficulty in finding a lab in which to undertake their dissertation research, he/she should notify the CDB Program Administrator no later than May 1st.

Dissertation research should begin during the summer following Year-1. During the Fall semester of Year-2, the student, in consultation with the mentor, assembles a Dissertation Committee consisting of three faculty members in addition to the mentor for a total of four¹. At least one member should have a primary appointment in the Department of Cell Biology², the other members can be selected from any of the seven BIMS Programs. Although it is anticipated that most committee members will be affiliated with the CDB training area, members from outside the area are welcome, especially if they have potential for providing valuable input in the research topic being pursued.

The student must complete the [Dissertation Committee Declaration / Change](#) form once the committee is established and submit it to the CDB Program Administrator. The Dissertation Committee should be finalized and the declaration form submitted no later than December 1st in order for the first committee meeting to be scheduled before December 15th as required. The composition of the Dissertation Committee must be approved by the CDB Academic Committee.

The Dissertation Committee should meet for the first time during the fall semester of the student's 2nd year. The CDB Program Administrator will schedule this meeting upon receipt of the Dissertation Committee Declaration / Change Form. This initial meeting must be scheduled for no later than December 15th. This committee must meet at least once each academic year to assess the student's progress in the Ph.D. Program. The committee will have to meet more often during the student's second year because of the Comprehensive Examination. All committee meetings will be scheduled by the CDB Program Administrator in consultation with the student and/or mentor. The [Dissertation Committee Meeting Summary](#) form should be completed by the mentor after each committee meeting, approved by Dissertation Committee members and placed in the student's program file.

¹Larger committees are discouraged because of difficulties in scheduling committee meetings.

²If the mentor does not have a primary appointment with the degree-granting department, at least one committee member must meet this requirement and should be listed as co-mentor with the Graduate Programs Office.

THE COMPREHENSIVE EXAMINATION (SUMMARY)

By May 15th of the second year in the program, the student is expected to have successfully completed the comprehensive examination. The comprehensive exam consists of two separate parts (written and oral) as summarized briefly below and described in detail on the next page.

THE WRITTEN EXAM

Complete no later than February 15th

The first component is an “open-book” take-home exam made-up of 4 questions prepared by the student’s Dissertation Committee. The subject of these questions should not be directly related to the proposed dissertation research topic. The student has one week in which to prepare written answers to all 4 of these questions. Following completion of writing, the answers should be sent electronically to the Program Administrator for distribution to the committee members. Upon reading and evaluating the answers, the committee will meet as a group with the student to critique and discuss the answers further. At that meeting, the committee will decide (after asking the student to leave the room) the outcome of the written exam (pass unconditionally, etc.) and the course of action to be taken. One of the committee members (not the mentor) conducts the oral comprehensive examination and completes the [Comprehensive Examination Registration – Part I, Written](#) form.

THE ORAL DEFENSE

Complete no later than May 15th

The second component of the comprehensive exam has two parts. The first is the preparation of a dissertation proposal written in the style of a grant proposal. A copy of the final version of the dissertation proposal is made available to all members of the student’s examination committee at least 2 weeks prior to the scheduled examination date. The second part of this component of the exam involves a short presentation of the proposal (~20 minutes) accompanied by an oral “defense”. The oral examination committee will consist of the student’s dissertation committee and two *add-on members* of the CDB Program faculty assigned by the CDB Academic Committee. One of the add-on faculty members conducts the oral comprehensive examination and completes the [Comprehensive Examination Registration – Part II, Oral](#) form.

Note: The written and oral components of the comprehensive exam are to be separated by a minimum of 2 months. The written exam is to be completed by February 15th of Year-2 in the program and the oral exam is to be completed by May 15th. Students who fail the oral component of the comprehensive exam may be allowed to repeat the exam one time with the approval of the student’s dissertation committee.

THE COMPREHENSIVE EXAMINATION

OBJECTIVES AND PHILOSOPHY

The comprehensive examination represents an important stage in the student's progress toward a Ph.D. in the Cell and Developmental Biology Program. The examination is organized and conducted with several goals in mind. The first is to gauge breadth of knowledge in cell and/or developmental biology and related fields. The second is to probe depth of knowledge in the specific area of the proposed dissertation project. The third is to provide practical experience in directed reading of the scientific literature and the application of this knowledge to research problems. The student is expected to have a working understanding of hypothesis-based research and, as appropriate, applied research stratagems. The fourth major goal of the comprehensive examination is to provide training and practical experience in scientific writing and oral presentation. During the course of the comprehensive examination students will also be challenged to utilize effective time management and organizational skills.

The comprehensive examination is designed not only to test ability and accumulated knowledge, but also to provide an intense learning experience that involves the combined efforts of the student, mentor, and members of the thesis and examination committees. Each exam is tailored to the student's individual needs by the mentor in consultation with the dissertation committee. It is held in a time frame that will provide ample opportunity for the student to expand his or her knowledge in specific areas, to hone specific "real-world" skills important for the successful completion of the Ph.D., and to identify areas of weakness and initiate suitable remedial actions. It is important to emphasize, however, that it is the student's responsibility to organize and manage his/her time effectively so that progress through the comprehensive examination will be successful while maintaining involvement in lab research and any other responsibilities (e.g., courses, seminars, journal clubs).

WHEN TO TAKE THE COMPREHENSIVE EXAM

Students should begin preparations for the examination in the summer preceding the second year after joining a lab for their dissertation research. Beginning in the summer and continuing through mid-fall, there are five things that the student should do in anticipation of the exam: 1) begin the process of identifying a dissertation project in earnest, in close consultation with the faculty mentor, 2) identify suitable faculty members for the Dissertation Committee (see Ph.D. requirements) and contact these individuals to confirm that they are willing/able to serve on the Committee, 3) confirm the composition of the Dissertation Committee with the CDB Academic Committee, 4) make certain that the first meeting of the Dissertation Committee is held no later than December 15th of the second year, and 5) if not already started, begin a systematic program of reading primary research literature relevant to the dissertation project.

The comprehensive examination is divided into two major components, a "written" part and an "oral" part (as discussed in detail below). Both parts of the examination are to be taken during the spring semester of Year-2 of doctoral study with the following deadlines for completion:

- Written exam February 15th
- Oral exam May 15th

The oral examination must be scheduled a minimum of two months following the successful completion of the written exam (typically between April 15th and May 15th).

THE WRITTEN EXAM

The overall objective of this part of the examination is to test the student's ability to integrate facts and concepts learned during the first three semesters and to apply this knowledge directly to research problems. The purpose of the examination is not a comprehensive retest of formal coursework but it is anticipated that this knowledge will be instrumental in the student's successful completion of the written exam. Preparation for the written exam begins at the December Dissertation Committee meeting when the student's proposed area of research is to be discussed (in broad strokes as necessary).

It will be the responsibility of the student's mentor, in consultation with other Committee members, to consider areas to be covered by the written exam and to collect the necessary questions (see below) from Committee members in advance of the scheduled exam date. The questions should not be specifically related to the student's dissertation project but could, for example, cover an area of indirect importance to the dissertation research. It is the responsibility of the mentor to make the student aware of the general themes to be covered by the written exam so that he/she may focus his/her preparations accordingly.

The written exam consists of a series of four questions that are formulated by the Dissertation Committee. The student is required to provide written answers to all four questions. The student will be provided with the exam prior to the February 15th deadline and allowed up to one week (7 days) in which to prepare written answers. The format for the exam is in the open-book (i.e., take-home) style.

Students may make use of any written source of information (e.g., journals, textbooks, internet) when taking the exam but note that all sources are to be cited where appropriate. Students are not to seek assistance from other individuals in answering exam questions, except in cases where the student seeks clarification from the mentor when a given question(s) is deemed unclear. **The page limit for each answer is a minimum of 2 and a maximum of 3 single-spaced typewritten pages (11 or 12 point font)**, not including references or sketches/diagrams that the student feels are appropriate to include. Answers should be thoughtful, in depth and well integrated.

The specific style of exam question chosen for each student is largely left to the discretion of the Dissertation Committee; however, it will usually consist of the following types of questions. The first type involves problem solving. For example, a specific experiment might be described and the student asked to draw conclusions and/or propose a model to explain the results. This type of question could also be used to address further the limitations/advantages of a given experimental system, the quality and type of controls employed, and which experiments should be done next. Alternatively, the student could be asked to pose an hypothesis and design experiments to test it. The second type of question would be directed at basic concepts. For example, the student could be asked to explain a particular theory in the literature or to discuss evidence that supports or refutes a particular model. See "Guidelines for Faculty: The Written Exam" for further information.

The CDB Program Administrator will collect the exam questions from the committee members and give the student the complete set of exam questions in electronic format. The student will then have one week (seven days) in which to prepare written answers to all 4 questions. Following completion of writing, the answers should be sent electronically to the Program Administrator for distribution to the committee members.

Upon reading and evaluating the answers, the committee will meet as a group with the student to discuss and critique the answers. At that meeting, the committee will decide (after asking the student to leave the room) the outcome of the written exam (pass unconditionally, etc.). Prior to this meeting, one member of the committee (not the mentor) will be selected to act as the examination committee chair. This person will facilitate the examination and will be responsible for completing the [Comprehensive Examination Registration – Part I, Written](#) form and submitting it to the Program Administrator.

THE DISSERTATION PROPOSAL AND ORAL EXAM

Once the student completes the written exam (Part I), has met with the Dissertation Committee, and has been evaluated with a “Pass unconditionally” or “Pass with specific conditions” and met those conditions, he/she must begin planning for Part II, the Oral Exam. To do this, the student must meet with the Program Administrator no later than March 1st to schedule a tentative date for the oral examination. The Program Administrator will work with the CDB Academic Committee to designate and notify the oral examination committee members and then confirm the date for the oral portion of the examination.

The oral examination committee will consist of the student’s dissertation committee and *two add-on members* from the CDB Program faculty at large who have been assigned by the CDB Academic Committee. One of the add-on faculty members conducts the oral comprehensive examination and completes the [Comprehensive Examination Registration – Part II, Oral](#) form for submission.

The oral examination has two components. The first is the preparation of a dissertation proposal. The second is the oral defense of the proposal.

THE DISSERTATION PROPOSAL

The student is required to prepare a Dissertation Research Proposal that will provide both background to the chosen problem area and a description of the research to be performed. The preferred length of the proposal is 10 – 15 pages not including references, title page, or abstract. Any figures and figure legends are to be included in the main body of the proposal. Typically, an outline of the proposal (i.e., specific aims) is prepared by the student in consultation with the mentor and discussed with the Dissertation Committee at the first meeting (prior to the comprehensive examination). The proposal outline is then revised and refined based on input received from the advisor and committee. The student then completes the proposal during the spring semester with the goal of defending it no later than May 15th. The research proposal should follow the following format:

Title Page: include title of proposal, student’s name, laboratory affiliation, and date, time and room for the scheduled oral examination.

Abstract: provide a concise overview of the problem to be studied, the significance, and a description of the research to be performed (~1/2 page)

Research Plan: (10 page limit including figures and legends):

1. Specific Aims (1 page or less)
2. Background and Significance (2 pages or less)
3. Preliminary Data (~1-3 pages, if available – otherwise expand sections 2. and 4.)
4. Research Design & Methods (~4-5 pages)
5. Timetable (~1 page or less) provide a flow-chart outline of each specific aim with approximate dates for completion of project goals

References: include titles for each citation

Preparation of Proposal:

Proposal should be typed using a 12 pt font. Lines in main text should be single-spaced but margins should not be less than 0.8 in. on each side. Numerical or author/year citations may be used in text but references should include complete authors, year, title, journal, volume and page numbers.

Note: The CDB Program Administrator will schedule the oral examination, typically during the first two weeks of May. The student will have approximately two months between the completion of the written exam (Part 1 – February 15th) and the scheduled oral exam to finish the research proposal. The student must plan, however, to have a final draft of the dissertation proposal in the hands of each the oral examination committee members at least two weeks (10 working days) before the scheduled oral exam date. At that time the CDB Program Administrator also contacts the general CDB Program faculty by e-mail with the date of the examination and an offer to make available the proposal to any interested faculty planning to attend the examination.

The entire comprehensive examination process must be complete by May 15th.

THE ORAL EXAM AND DEFENSE OF THE DISSERTATION PROPOSAL

The Program Administrator will work with the CDB Academic Committee to designate and organize the oral examination committee. The oral examination committee will consist of the student's dissertation committee, two "add-on" members of the CDB Program faculty assigned by the CDB Academic Committee, and a member of the CDB Program Committee. One of the add-on faculty members conducts the oral comprehensive examination.

Prior to the start of the oral examination, the committee will hold a brief session without the student present in order to discuss the student's progress in the graduate program and his/her performance on the written exam, and to hear opinions on the written dissertation proposal. The oral examination will then begin with a 20-minute presentation of the proposal by the student. The student is encouraged to include original preliminary data if available, and/or a report of progress (i.e., successes and failures) thus far.

There will then follow a period during which the student fields questions from the exam committee broadly related to the area of the dissertation proposal. In the course of this questioning, the student may also be asked to deal with any questions from the written exam (Part I) that members of the committee feel were not answered adequately.

At the conclusion of the oral exam, the student is asked to leave the room and the faculty will evaluate the student's performance and determine whether he or she has satisfactorily completed all portions of the Comprehensive Examination.

EXAM RESULTS

The range of possible outcomes from the Comprehensive Examination include:

1. The student passes unconditionally.
2. The student passes with specified conditions (e.g., additional coursework, directed study in specific areas).
3. The examination committee recommends that the student be allowed to repeat Part I and/or Part II of the exam (see additional note below).
4. The examination committee recommends that the student be allowed to earn a M.S. degree.
5. The examination committee recommends that the student be asked to leave the program.

The [Comprehensive Examination Registration – Part II, Oral](#) form is completed by the add-on committee member appointed to conduct the examination. This is placed in the student's program file and a copy distributed to the student and all members of the examination committee.

Note: If the student is deemed to have failed the comprehensive examination (outcomes 3-5), the CDB Program Administrator will be notified by the advisor immediately with a recommendation as to the specific action to be taken. The examination may be repeated once and within 2 months of the first oral examination (an extension of this date may be granted in special circumstances but only with prior approval from the Graduate Academic Committee).

THE COMPREHENSIVE EXAMINATION: STUDENT RESPONSIBILITIES AND DEADLINES CHECKLIST

SPRING – YEAR - 1

- ❑ Notify the CDB Program Administrator by April 15th of Year-1 in the program if you are having difficulty identifying a mentor/laboratory in which to undertake your dissertation research. Note: failure to contact the CDB Program Administrator will imply that you have at least identified and spoken to a prospective advisor about joining his/her laboratory “permanently” and that they have tentatively agreed to accept you.
- ❑ The student chooses a mentor and laboratory by the April 15th of Year-1 and the general area of dissertation project is developed during the ensuing summer.
- ❑ The student begins a systematic program of reading primary research related to the dissertation project (*continues* through the fall).

FALL – YEAR - 2

- ❑ The student identifies Dissertation Committee members during the fall semester of Year-2 and has the choices approved by the CDB Academic Committee.
- ❑ In consultation with the mentor, the student writes an abstract and outline of the proposed dissertation project.
- ❑ First Dissertation Committee meeting is scheduled by the student and held no later than December 15th in Year-2. The student presents an abstract and outline of the proposed dissertation project(s). The mentor advises student on preparing for the written exam (Part I of comprehensive examination) and describes some of the general areas to be covered by the Committee’s questions.

SPRING – YEAR - 2

- ❑ The student receives the exam questions from the Program Administrator no later than February 8th (in order to meet the exam completion deadline of February 15th) of the second year and has one week to answer all of the questions. Each answer is limited to a minimum of 2 and a maximum of 3, single-spaced, typewritten pages.
- ❑ Following completion of writing, the answers should be sent electronically to the Program Administrator for distribution to the committee members.
- ❑ The Program Administrator distributes copies of the exam to all members of the Dissertation Committee for evaluation.
- ❑ Upon reading and evaluating the answers, the committee will meet as a group with the student to discuss and critique the answers (the Program Administrator schedules this meeting). At that meeting, the committee will decide (after asking the student to leave the room) the outcome of the written exam (pass unconditionally, etc.) and the course of action to be taken.
- ❑ The oral portion of the exam is scheduled by the Program Administrator to be held at least 2 months following the completion of the written exam (no later than May 15th). The CDB Academic Committee appoints the add-on faculty members to the oral examination committee. The Program Administrator notifies the general CDB faculty of exam date by e-mail and offers to make available the proposal to any interested faculty members.
- ❑ Student prepares 10 – 15 page (preferred length) dissertation proposal -- a final and complete draft of which must be given to each member of the examination committee at least 2 weeks prior to the scheduled oral examination.
- ❑ Student prepares a 20-minute presentation for the scheduled oral exam and defends the proposal.
- ❑ **BOTH PARTS** of the comprehensive exam **MUST BE COMPLETED** by May 15th of Year-2.

THE COMPREHENSIVE EXAMINATION

GUIDELINES FOR THE FACULTY

WRITTEN PORTION

1. After hearing a summary of the proposed dissertation project at the first Dissertation Committee meeting, the committee members should continue the meeting without the student or schedule a separate meeting to be held within the next week to discuss the general areas in which the student should be tested. Faculty are strongly encouraged not to use e-mail communication in place of the private meeting.
2. While it is up to the Committee to decide the specific areas covered by the exam, the questions should not be directly related to the student's likely area of dissertation research. For example, if a student proposed to investigate how actin/myosin are involved in force generation in non-muscle cells, it might be appropriate to ask a question concerning how other motor proteins function. Or if the student studying a process such as cell migration during frog neurulation, it might be appropriate to ask a question about primordial germ cell migration in chick development. The exam should be looked at as an opportunity to expand the student's horizons in order to get him/her to think creatively about a (possibly similar) problem in a different system or context. Another direction might be to address differences in approach, for example, to contrast a genetic analysis with a biochemical approach in order to understand a protein's function. In each of these cases, the questions can be thought of as ways to force the student to think about problems that may enhance preparation for their own dissertation research.
 In recent years there has been an increase in questions that revolve around the information presented in a given paper(s) that is provided to the student. While this can prove an effective way to focus a question on a particular area, the tendency of the student to treat the answer like a "book report" and should be avoided. An alternative use of such a format might be to get the student introduced to a new area, technique, approach etc., and then to ask them to apply what they have learned from this paper to think about a different problem.
3. It is incumbent on the mentor to take responsibility for assigning questions to each member of the Committee and to then follow through by obtaining, editing (as necessary), and assembling the questions prior to the examination. It is also the responsibility of the mentor (reminder as necessary from the Program Administrator) to make certain that the written examination is completed by the February 15th deadline.
4. The dissertation advisor should counsel the student in general terms regarding the areas likely to be covered by the written exam in advance (typically, shortly after the first committee meeting). The advisor should also provide practical advice to the student on how to prepare for the exam and to manage their time during the taking of the exam.
5. Following the completion of the exam, the committee members will meet with the student as a group within 7 days in order to discuss her/his performance on all answers. This time can also be used to allow the student an opportunity to expand on any answer.
6. The exam committee chair then consults with the members of the Dissertation Committee to receive their evaluation of the student's performance and to determine the outcome (pass unconditionally, etc.) and the course of action to be taken.
7. After consulting with each member of the dissertation committee, the exam committee chair will complete the [Comprehensive Examination Registration – Part I, Written](#) form and deliver or e-mail it to the Program Administrator.
8. Upon receiving notification that the written examination is complete, the Program Administrator schedules the student's oral examination.

ORAL PORTION

1. The Program Administrator will work with the CDB Academic Committee to designate and organize the oral examination committee. The Program Administrator will schedule the oral exam once the written exam is complete and has been evaluated (see [WRITTEN PORTION](#)).
2. The mentor provides guidance to the student in the preparation of the dissertation proposal and ensures that the student is aware of the deadline for completion and distribution of the proposal.
3. At least three weeks prior to the scheduled oral examination, the Program Administrator contacts the student to make certain a final draft of the proposal will be distributed on or before the two-week prior deadline (the proposal must be distributed two weeks prior to the defense).
4. The faculty member assigned to chair the oral examination obtains the student's program file from the Program Administrator and brings it to the scheduled examination.
5. The chair of the examination committee calls the exam to order, makes certain all members are present and holds a brief session with the student absent. The following items are to be discussed in private session:
 - review of student's file and mentor's summary of student's progress in program (e.g., course grades, # of credits, quality/quantity of bench work)
 - dissertation committee reports on student's performance in written exam
 - examination committee discusses how the exam is to be conducted and whether answers from the written exam will need to be revisited
 - the mentor is reminded that he/she is not to answer questions for the student during the examination
6. Student gives 20 min. presentation and fields questions. The chair, with approval of the exam committee, determines when the student has been examined adequately (it is not uncommon for the exam to take two hours).
7. Exam committee meets without student present to evaluate performance. Committee determines whether the student has passed and whether there are conditions. In the event a student fails one or both parts of the comprehensive examination, the Program Administrator is to be notified immediately by the chair of the committee with a recommendation for actions to be taken.
8. After consulting with each member of the exam committee, the committee chair will complete the [Comprehensive Examination Registration – Part II, Oral](#) form and deliver or e-mail it to the Program Administrator. The student is informed of the exam results and committee members will receive a copy of the completed evaluation form.