

# Graduate Program in Genetics and Genomics Boston University School of Medicine

## QUALIFYING EXAM GUIDELINES FOR STUDENTS

The qualifying exam is an important step for a Ph.D. student that allows you to focus wholly on the context of your own thesis work in the field, the theory behind the approach you plan to use, and the application of general scientific principles to a scientific problem. These goals will be accomplished by a combination of written and oral components.

### **Examining committee membership**

The examining committee consists of five faculty members at Boston University. The chair of a student's examining committee may *not* be their thesis advisor, and the committee will be composed of five faculty examiners, two members who must be core faculty of the Graduate Program in Genetics and Genomics and three additional members who are faculty members at Boston University School of Medicine. The members of your examining committee should be chosen in consultation with your thesis advisor and on the basis of their expertise in the areas of your proposal.

### **Setting the date**

The qualifying exam should be completed no later than *September 1 immediately preceding your third year*. The date should be set by considering with the advice of your thesis advisor what sorts of preliminary experiments you would like to be able to refer to in your proposal. Towards this end, sketching out 3-4 specific aims of your thesis well in advance is a valuable exercise. Realize, however, that the amount of preliminary experiments at this point in your graduate career likely will not be particularly extensive. Also realize that your ability to pass your exam will not depend on how many experiments you have completed to date. Rather, the focus is to evaluate your critical thinking skills. In fact, the process of preparing for your exam will sharpen your thinking about the project, and delaying to achieve results may be counterproductive. Instead, approaching your exam as a chance to prepare yourself further for carrying out your dissertation research will help you get the most out of this experience. Furthermore, we anticipate that you will submit your thesis proposal for fellowship applications.

### **The written proposal**

The written component is a grant-style proposal focusing on the student's dissertation research.

#### *Proposal tips and student responsibilities*

- Students will begin development of the proposal by preparing an abstract and outline for review by the student's mentor. These abstracts should be prepared at least 4 weeks prior to the student's designated exam date.

- The student should be working on an outline of the complete proposals and prepare a draft at least 3 weeks prior to the exam date. The drafts should adhere to an abbreviated version of the standard NIH grant application format. The first section consists of the Specific Aims, and should be no more than one page. It should begin with a short paragraph stating the hypothesis to be tested (i.e., the overall goal of the work) and the importance of the proposed research. Each aim should then be stated, and a terse list of proposed experiments to support it provided. The Specific Aims section can be the same as the abstract, listing its most essential concepts and information. The second section consists of Background and Significance, and should be approximately 1-2 pages. The background should lead the reader to the experiments proposed later by describing the state of knowledge in the field, and important outstanding questions. Preliminary data should follow this section, and will vary in length depending on the extent of work done in the area of the dissertation proposal; in general, however, the key data should be described in 1-2 pages. The most important section of the proposal is the Experimental Methods. This section should be organized around the Specific Aims and average about 4-8 pages in length. For each aim, the experiments used to test the particular hypothesis, and integration of the experiments toward the hypothesis, should be described. Sufficient detail should be provided to enable readers to assess the likelihood of success as well as the student's understanding of the approach. A brief discussion of possible results for each specific aim should also be included. Importantly, alternative experiments should be proposed in the event that initial experiments fail. Both of these areas are likely to be further explored in the oral exam. The proposal should conclude with a brief (1 paragraph) section that summarizes the important concepts and experiments. Finally, a references section will complete the proposal.
- In preparing and refining the proposal, students should read the literature broadly. For instance, if your project is related to stages of cancer, you should read about the type of cancer you study, other types of cancer, normal development of that tissue type, normal functions of genes you suspect may be involved, etc. Because of the intense reading required, it is recommended that students allocate 4-6 weeks for reading, depending on the extent to which laboratory work is conducted concurrently.
- Once the first draft is prepared, students should get feedback from at least their PI and potentially all examining committee members to continuously improve the written proposals.
- A final version of the proposal should be distributed to the examining committee at least 7 days prior to the exam, but 14 day advance notice is a stretch goal.
- Your proposal can also be distributed in advance to lab members and mentors for feedback, and final versions should be distributed to the same people prior to holding practice exams. It is understood that the proposal will reflect the work of the student, but incorporation of feedback is allowed.

### **The oral exam**

The written proposal is tested in an oral exam administered by your qualifying examining committee. In the beginning of the exam, you can expect to be asked to leave the room while the committee reviews your academic history at BUSM.

After this portion of the exam, the student will give a brief (20 minute) Powerpoint presentation to review the key points of your proposal to the examining committee. Extra slides should not be included in a presentation as backup for projected questions. The presentation should serve as a basic outline of your written proposal and should not be considered a comprehensive review. For further guidance on presentation mode, discuss the options with your exam committee chairperson. Throughout the talk, your examiners will begin asking you questions focused on your thesis proposal and general knowledge. Topics often include, but are not limited to:

1. Other experimental approaches that could be used to test a proposed hypothesis (e.g., from other disciplines),
2. Basic theory underlying experiments,
3. Experimental design and data analysis,
4. Related experiments in the literature, and
5. Related systems in the literature.

The best way to prepare for this phase of the exam is to conduct practice exams with your peers, especially students, post-docs and experts in the field. This will help you to get a flavor of potential questions and to maintain poise under exam conditions. The exam chair will conclude each portion of your exam and ask you to leave the room while the committee confers on your performance. The entire exam should last approximately 2 hours in duration. You will be given feedback immediately after completing your exam.

### **The exam outcome**

Your examining committee will be evaluating the written and oral components of your qualifying exam based on the following criteria:

- the logical organization of your proposal,
- the clarity of your proposal,
- your scholarship and level of preparation,
- the originality of your proposal,
- your delivery of the talk,
- your responsiveness to questions,
- your depth of knowledge,
- your ability to answer questions when you are unfamiliar with the answer, and
- your poise.

The exam outcome will fall into one of three categories:

1. *Pass* – Congratulations on your commendable performance on a grueling exam!
2. *Pass with modifications* – The committee felt that overall your performance was good but that one or more specific areas needed improvement. They may ask you to rewrite your proposal, to give a research seminar, or to be re-examined on a focused area.
3. *Fail* – The committee felt that the student was not adequately prepared for the exam. In order to pass, the student must retake the entire exam, both the written and oral

components. If necessary, the possibility of withdrawing from the program will also be discussed.

### **Now what?**

Once you've completed your qualifying exam, it is time to enact those experiments you proposed for the exam. Also, reflect on your exam experience to see in what areas you may want to deepen your knowledge. Likewise, consider which of your committee members were most helpful to you in the process. Who gave you the most helpful, constructive feedback? Who suggested the most insightful experiments? Who helped keep you on track when you were feeling unfocused? These people are the ones you will probably want to ask to be on your dissertation advisory committee. This committee will be composed of the student's advisor and at least four other faculty members with a minimum of two faculty members from the Graduate Program in Genetics and Genomics and one Division faculty member from an outside graduate program. You may also consider inviting a specialist in your field from a neighboring institution. The dissertation advisory committee should meet at least 12 months after your qualifying exam and annually thereafter. However, increasing the frequency of these meetings, to every 6 months for example, has been known to increase student focus and shorten the time to degree.

Congratulations on advancing to Ph.D. candidacy, and enjoy the experience!