

## **GSBS Biochemistry and Cell Biology Program Candidacy Examination Guidelines**

BCB students are required to take an on-topic candidacy exam in which the research proposal is based on the student's intended dissertation project. Significant preliminary data is not expected and should not be a reason for delaying the qualifying examination.

### **1. Candidacy Examination Timing**

The BCB Program will follow GSBS guidelines with respect to timing of the candidacy exam. Ph.D. students who matriculated in a Fall semester must submit the candidacy exam petition to the GSBS Academic Standards Committee by August 31 of the first term of the third year. The exam must be completed by the end of the first term of the student's third year. M.D./ Ph.D. students must petition by the end of the Fall Term of GS2 and complete their exam by the end of Spring term of GS2. The Program will honor extensions granted by GSBS. All students must take their candidacy exam within 8 weeks of the approval of their Specific Aims page by the Academic Standards Committee (ASC). The final exam proposal is due to the student's Candidacy Exam Committee and to GSBS for Turnitin analysis three weeks prior to the exam date. Students should consult the GSBS website for form submission requirements and plan accordingly. Students are encouraged to begin making arrangements for the exam 4-5 months in advance, as described in the following sections.

### **2. Formation of the Candidacy Exam Committee**

The Program Director will appoint a Program Examination Committee (PEC). This shall consist of approximately 10 BCB program faculty who are representative of the diverse interests of the program. Committee members are to be available for service on BCB student candidacy exams. BCB students are required to choose 4 of their 5 examination committee members from this roster (including the Chair). The 5<sup>th</sup> member must be from outside the BCB Program. A maximum of two members of the student's Candidacy Exam Committee may also be members of the student's Advisory Committee. One member of the student's Exam Committee must have significantly different expertise than the topic of the proposal; this member can be the person from outside the program or one of the PEC members.

The PEC Chair serves for the academic year and must chair all BCB student exams for that academic year unless a conflict of interest or scheduling exists, in which case an Alternate Chair will serve. The committee is responsible for ensuring consistency and high standards of both the written and oral portions of the candidacy exam. Students are strongly encouraged to consult with the Program Director and/ or the PEC Chairperson while selecting committee members, **prior** to requesting that individual faculty serve on the exam committee in order to ensure adequate diversity and expertise. If the student and mentor feel strongly that particular *critical* expertise is not represented by the faculty listed on the PEC roster to permit a thorough and fair examination, the student should contact the Program Director to determine whether *ad hoc* PEC members should be appointed.

### **3. Format of the Candidacy Examination**

The examination consists of a written 6-page "inside" research proposal related to the student's planned thesis project and a live oral examination by the committee. The oral examination will consist of a brief oral presentation of the proposal by the student, followed by a question/ answer session conducted by the committee. At the end of the oral exam, the committee will evaluate the student's performance and make a determination of the outcome, which will be communicated to the student at that time.

### **4. Preparation of the written proposal**

a. *Proposal Conception.* As the first step in writing the research proposal, the student must write a Specific Aims page. The topic of the research proposal will be related to the student's anticipated thesis

project. The aims must be reviewed and approved by the student's Advisory Committee before being forwarded to the GSBS Academic Standards Committee for final approval. Ideally this should be presented and discussed in an Advisory Committee meeting. The student then prepares a full research proposal based on the approved aims to be defended in the Oral Examination.

*b. Writing the Proposal.* A BCB Candidacy Exam Proposal should describe a novel hypothesis supported by rigorous prior research, either from the literature or the student's own preliminary data. The student should propose to test this novel hypothesis in specific aims developed by the student using suitable experimental approaches. Preliminary data is not necessary for the development of the specific aims or any aspect of the proposal. The student is not required to propose Aims that he/she plans to actually undertake, but they may do so. The proposal will follow the format of an NIH Individual Predoctoral Fellowship application.

**The full proposal is due to the Candidacy Exam Committee via email at least three weeks prior to the oral examination date.** The committee will review the proposal and determine whether it is suitable for an oral examination. If the proposal is not of sufficient depth or quality, the committee may ask the student to rewrite a portion or the entirety (rarely) of the proposal.

*Consultation and academic conduct.* All portions of the proposal must be written independently by the student. Although the specific aims of the student's proposal may be similar to aims developed in consultation with the advisor for other purposes, the text must be composed entirely of the student's writing and not that of any other person. The student's thesis advisor will be asked to verify that the proposal is an original contribution that is distinct from the mentor's existing written proposals. The student may seek feedback on the written exam proposal from others, including fellow students, postdocs, at-large faculty, and the thesis advisor(s). Members of the current BCB Program Examining Committee, including those on the student's committee, are not permitted to provide feedback or edits on the written proposal, with the exception of the student's own thesis advisor(s).

It is permissible for a student to submit for the candidacy examination some or all of an individual fellowship proposal s/he previously submitted in their own name for funding consideration to NIH or another agency. Utilization of such proposals, or sections thereof, is permissible even if the mentor had provided input. Students are strongly encouraged to review such previous fellowship proposals to determine suitability for an examination by a diverse scientific group.

*c. Proposal format.* For details on formatting requirements, please consult the PHS SF424(R&R) Fellowship Instructions on the NIH website. Generally, proposals are single-spaced with minimum 0.5" margins and 11 pt font; several fonts are allowable. Arial is suggested.

**-Title Page:** Title, student name, faculty advisor's name, date of exam

**-Abstract** (350 words max): Provide an overview of the project, hypothesis, significance and approach

**-Specific Aims** (1 page): State concisely and realistically what the research is intended to accomplish and/or what hypothesis is to be tested.

**- Research Strategy** (6 pages)

**Significance:** Briefly sketch the background to the proposal, critically evaluate existing knowledge, and specifically identify gaps which the research is intended to fill. State concisely

the importance of the research by relating the Specific Aims to long-term objectives. (suggested 1-2 pages of the 6 allowed for Research Strategy).

**Approach:** Briefly summarize the experimental design and the procedures to be used to accomplish the specific aims of this research. Include a description of the types of data to be obtained and how they will be analyzed to accomplish the specific aims, as well as (optional) preliminary results that bear directly on the rationale and Specific Aims of the proposal. Alternatively, the student may cite published work by the student or others.

**References Cited** (not counted *toward page limit*)

## **5. Preparation for the oral examination**

*a. Oral examination format.* The oral examination is comprised of an opening presentation of the research proposal by the student (20-25 min). Visual aids are permitted, and the presentation will not be interrupted. The committee will then conduct an oral examination (up to 3 hours) covering the proposal, directly related areas, general and background information, breadth questions, and other questions as the committee deems appropriate. No questions will be provided to the student in advance of the exam.

**-Assessing Depth.** During the oral exam, the committee will examine the student's understanding of the intellectual basis for the research proposal, pertinent background, details of the technical approaches and experimental strategy, interpretation of results, potential pitfalls and alternative approaches. The Examination Committee will carefully assess the student's responses to determine whether the student has adequate depth of understanding to carry forward as a post-candidacy student and, in part, as confirmation that the student made original and substantial contributions to the overall conception of the proposal.

**-Assessing Breadth.** After receiving the written portion of the exam but before the oral exam, the Examination Committee will confer in order to devise a cohesive and fair plan to evaluate the breadth of the student's knowledge. Breadth questions and topics will be related to the proposal but will also effectively examine the student's breadth of knowledge. The Examination Committee will choose the most effective questions (usually ~2-3 per committee member) to be used during the examination. These questions are not provided to the student in advance. The Examination Committee Chair will be responsible for ensuring that breadth is assessed in a fair manner among all student exams that year.

*b. Preparation for the oral examination.* Students are encouraged to review the relevant literature and be able to explain and defend their proposed studies to an intelligent, not necessarily expert, group of scientists. Students are also encouraged to review content from coursework, as the committee will be informed about the prior academic work of the student. The presentation slides and presentation should be rehearsed for timing and clarity. Practice fielding live questions is strongly encouraged. A successful Ph.D. candidate will know the difference between "It is not known" and "I do not know" and will be ready to discuss what is and is not known in the relevant literature or the student's own work, as well as to propose new or alternative experiments in real time to address gaps in scientific knowledge.

*Consultation and academic conduct.* The student may seek feedback on the visual aids and presentation for the oral examination from others, including fellow students, postdocs and at-large faculty. The student is encouraged to schedule mock (also termed "practice") exams. **The thesis mentor and faculty currently serving on the Program Examining Committee are not permitted to attend or participate in mock/practice exams or Q/A sessions that are for the specific purpose**

***of practicing for the candidacy examination.*** Routine Q/A during scientific discussions or lab meetings are permitted, whether or not the discussions pertain to aims or experiments that are also included in the candidacy exam proposal. Students may always ask questions of the mentor, or any other faculty, regarding background, techniques, experimental design or interpretation of their data, as part of normal scientific discourse and training. Students are not expected to change the nature or content of their scientific interactions, rather asked to exclude their mentor and PEC faculty from mock exams.

### **6. Performance Assessment**

After the exam, the committee will confer privately without the student present. Performance on the written proposal, depth and breadth components is graded separately as unconditional pass, conditional pass, re-examination, or fail. All parts must be passed, but each can be remediated separately. The exam outcome and mechanism of remediation, if necessary, will be determined by the Examination Committee and conveyed to the student, the Program Director and GSBS in writing by the Examination Committee Chair. The Examination Committee will also make a recommendation to the Academic Standards Committee about whether the student should be permitted to bypass the M.S. degree. The GSBS rubric will also be submitted by the Chair to GSBS. In outcomes of re-examination or fail, the student is encouraged to meet with the Exam Chair and committee members to discuss suggestions for improvement. In an outcome of fail, the student's advisor, Advisory Committee and GSBS Dean for Academic Affairs will determine whether the student should be granted the opportunity to complete a terminal M.S. degree.