Neuroscience Program Candidacy Exam

The second year is an important milestone in preparation for obtaining a doctorate degree in Neuroscience. To advance to candidacy for a Ph.D. degree, you must pass a Neuroscience Program candidacy exam consisting of writing and orally defending an original research proposal. The qualifying exam is designed to test your ability to think as a scientist and the written document is modeled after a fellowship application to the National Institutes of Health. The subject area is open to the diverse breadth of modern Neuroscience and may be either "on-topic" or “off-topic”. On-topic typically covers your ongoing research project but might include aims that use approaches which are currently not used in your mentor’s lab. Off-topic is defined as a project that is NOT related to a rotation project, a previous thesis project or other ongoing research in your mentor’s lab. Because the candidacy exam focuses on understanding an area of research, and the breadth of neuroscience training is obtained via didactic information presented primarily in coursework, you must pass (grade of B or better) the required core program coursework prior to taking the candidacy exam.

Examining Committee

The standing committee for the Candidacy Exam in the Neuroscience Program is composed of four faculty members representing the different research areas of the Neuroscience program and one outside member. The choice of the outside member is left to the Chair of the Committee. However, you can help facilitate this process by submitting the names of up to 3 faculty members (GSBS members) who are familiar with you or with the chosen research topic. The committee is currently chaired by Dr. John O’Brien.

Exam Timeline

The Neuroscience program requires that you take your candidacy exam at the end of their 2nd year, but not later than during the fall semester of their 3rd year. If you will not complete your candidacy exam by the end of the fall semester of their 3rd year, you can submit a request for extension stating the reason for the delay. This extension letter must be signed by the advisor and submitted to the program director for action. Only one six-month extensions will be allowed. If the exam is not completed by the end of their 3rd year you will default to the path towards a terminal Masters.

Exam Preparation Timetable

- Once you have decided to join a lab, have affiliated with the Neuroscience Program and by the end of your first year, you must form your advisory committee and have it approved by the Academic Standards Committee (ASC).
- Paperwork must be submitted on the first Wednesday of the month so that it can be reviewed at the ASC meeting on the second Wednesday of each month.
- Before June of your second year, schedule a meeting with your advisory committee and request permission to take the exam.
Before the Exam Date: The program coordinator will schedule your oral exam with your examining committee once your abstract has been approved by the ASC.

Written Proposal

Prior to the written proposal an abstract must be submitted to the student’s advisory committee for approval. In addition to the abstract you must provide a statement (one page maximum) justifying how the proposal is “off-topic” (if applicable) and a single page describing your thesis project (abstract and aims). After the proposal abstract has been accepted by the advisory committee, you submit the signed Petition form (first and last page) along with abstract and statement to the program coordinator.

The written proposal will be based both in content and format on the NIH guidelines for an individual predoctoral fellowship application (NRSA). The proposal will consist of an abstract (include a title), a single page for specific aims and six pages for the background and significance, and research plan. Expected outcomes and pitfalls and limitations are an important part of the proposal and should be addressed in the research plan. The proposal should be appropriately referenced, and the cited literature does not count towards the seven-page limit. The proposal should be in Ariel font, 11pt, 0.5-inch margins left/right top/bottom, and use Journal of Neuroscience citation format.

The best way to design a successful proposal is to first analyze a field of interest by reading current reviews and the most exciting recent articles (e.g. news articles in Science, Nature, etc.). A search is essential to avoid missing key papers. Read the literature critically. Do not assume that every conclusion stated in a paper that you read is correct. Next outline the key questions in the field. Refine one or more of these questions into a testable hypothesis. Formulation of a good hypothesis is perhaps the most difficult part of research.

While you are not required to produce preliminary data in support of your proposal, you are expected to provide evidence (from the literature) that the approach to be used is feasible.

Further refine the goals of your project by writing a list of specific aims that could be accomplished during a 2-3 year period. Now carefully design a line of controlled experiments that will accomplish your aims and test your hypothesis. Choose the most appropriate methods to address your question. Become thoroughly familiar with the theory behind the methodology and potential artifacts that may be encountered. Be sure that you know how to analyze and quantify the results of your experiments. Finally consider alternative approaches that can be pursued if the results do not meet your expectations.

The complete original is to be submitted as a .pdf file to the program coordinator who will send it to the examining committee. In addition, an electronic version in word format is required for Turnitin evaluation by the GSBS and should only include the text of the proposal (no tables, figures, figure legends and references).

The proposal should be submitted no later than two weeks prior to the exam.
What is “off-topic”?

If you decide to take an off-topic exam, the topic of the abstract and the main proposal should be distinctly different from your planned dissertation work. The goal is to allow you to devise your own original research plan and to learn about other areas, including areas completely unrelated to your mentor’s scientific objectives.

The central hypothesis and specific aims should not:

- Include work you have already done or planned in your dissertation project.
- Include projects you have already completed as part of a previous thesis or dissertation (if you have another degree).
- Overlap projects that are being worked on by others in your mentor’s lab, or overlap projects known to be planned by your mentor.
- Be based on trivial variations of published work or of your dissertation project (i.e. the same experiments in another organism or the exact same approach applied to a different gene).
- Simply repeat experiments that have already been published or presented publicly by others.

If the abstract is deemed “not off-topic” by the committee you will be required to submit another one. If you have questions about whether a particular idea is sufficiently “off-topic” you can seek advice from the Program Director or the Chair of the Qualifying Exam committee.

Oral Exam

Following notification that your abstract is acceptable, you will defend your proposal in an oral exam with the examination committee within 6 weeks. The program coordinator will schedule this meeting when the petition is submitted. During the exam you will be expected to make a presentation of about 15-20 min that will consist of an Introduction, Background, Aims, Experimental Plan, and Summary after which the committee will ask questions.

Prepare for the oral exam by thinking of criticisms that external reviewers might raise and decide how to overcome them. Remember the kinds of questions that are asked after rotation talks. These are examples of the types of questions that you may be asked. Be prepared to present the possible outcomes of your experiments and how they may be interpreted. An effective way to organize your summary talk is to introduce a list of specific questions to be answered and then present lines of experimentation that will address each question. It is a good idea (nearly essential) to practice before a group of experienced graduate students. Be sure to review areas of Neuroscience that you will need to know in order to defend your experiments.

Specific Areas you should be prepared to address at your oral defense

- The existing body of knowledge on the subject of your proposal.
• Details of the experimental techniques to be used for the proposed research. If a technique is cited in the proposal, you should be able to explain it in detail, and draw a diagram of the expected results.
• A clear statement of the central hypothesis of the proposal.
• Likely outcomes of the proposed experiments and their interpretation.
• Difficulties and limitations of the proposed procedures.
• Alternative approaches to achieve the specific aims.
• The biological significance of the project.
• Relevant details of any literature cited in the proposal.
• Future directions of the proposed research beyond the specific aims.

Reserving a Room

You will need to schedule a room for a three-hour block of time for your oral exam.

Grading of Oral Exam

After the oral exam (1st try only), your committee will elect to give you one of three possible grades for your oral exam – Unconditional Pass, Conditional Pass, or Retake. Unconditional Pass and Retake are the most common outcomes. Conditions attached to a Conditional Pass can involve rewriting part of the proposal, writing a literature report on an area of deficiency or enrolling in a course specified by the committee that will benefit the student’s education. In a typical year a few students may be required to retake the exam. These students always perform much better on the second try. Note that the outcome for a second oral exam is either Pass or Fail (see “retaking the exam” below).

M.S. Bypass

Once you successfully pass your candidacy exam, your Examining Committee may recommend that you bypass the M.S. degree. If the committee recommends such a bypass and this recommendation is approved by the Academic Standards Committee, you will proceed directly on to your post-candidacy Ph.D. studies without writing and defending an M.S. thesis.

Exam Day Guidelines

During the oral exam, you will not be allowed to refer to any notes or reference materials. No phones are allowed in the exam room.

Retaking the Exam

1. If you don’t pass the oral exam the first time you are allowed to retake the exam only once.
2. If you retake the exam you will need to do so within the next three months.
3. You will need to re-defend the same proposal as previously submitted unless fatal flaws are found in the experiments proposed that necessitate a new selection of experiments.
4. The retaken exam will be graded on a pass/fail basis. If you fail the retake exam you will not advance to candidacy.

Sample Proposals

We recommend that you look at past NIH grant proposals to help you prepare as well as example abstracts and proposals that are stored in the Neuroscience Program Office.

Proposal Writing Tips

A number of grant writing books are available for checkout from the Neuroscience Program office (MSB 7.262).

The research proposal should include Title, Abstract (350 words or less), Specific Aims, Background and Significance, Research Design and Methods, Predictions and Interpretations, and References as described below:

- **Specific Aims:** State concisely and realistically what the research is intended to accomplish and/or what hypothesis is to be tested. Using single sentences, enumerate the Specific Aims. For each aim, use no more than a few sentences to describe how it relates to the hypothesis. For each aim describe the approach, the rationale for doing the experiment, and the anticipated results. Do not exceed one page.
- **Background and Significance:** Briefly sketch the background to the present 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 longer term objectives. Do not exceed five pages.
- **Research Design and Methods:** 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 the methodology in enough detail to allow a knowledgeable reviewer to understand what you will do (don't list buffer compositions, PCR temperatures, oligonucleotide sequences, etc.!) Discuss the potential difficulties. Include a description AND examples of the types of data to be obtained and how they will be analyzed to accomplish the specific aims.
- **Predictions and Interpretations:** Summarize the predicted outcomes of experiments and your interpretation of these data. Discuss alternative experiments or strategies that might be utilized. This section should be completed for each Aim and be included as part of the discussion of that Aim.
- **Literature Cited:** Each reference must include the title, names of all authors, book or journal, volume number, page numbers, and year of publication for all cited works. The reference should be limited to relevant and current literature. There is no page limit, but it is important to be concise and to select only those literature references pertinent to the proposed research.

*Evidence of plagiarism is cause for failure and dismissal.*