

Format for the general examination in the Molecular and Cellular Biology Graduate Program

Format of the written proposal

Only a single proposal (formerly known as the 'primary' proposal) is to be prepared. This proposal is explicitly focused on the student's thesis research. This proposal **must** be in the thesis committee's hands two (2) weeks prior to the general exam. A copy of this description of the proposal and exam format should be provided to each committee member at the time that the proposal is submitted.

The proposal should be written by the student. The student's mentor may provide feedback on the Specific Aims and on a preliminary draft of the Approach. However, it is expected that the final version reflects the student's ideas.

The written format is similar to that of an NIH R01 grant with a few exceptions described below. There are many resources for examples and advice on R01 grant writing. For example, the following link from NIAID has samples and advice:

<http://funding.niaid.nih.gov/researchfunding/grant/cycle/pages/part05.aspx>

The written proposal should follow the following format:

1. ABSTRACT
2. SPECIFIC AIMS (list Aims, followed by a 1-2 sentence description of each) and SIGNIFICANCE
3. RESEARCH STRATEGY for Aim 1
 - Background and Preliminary Results (if available)
 - Approach
- RESEARCH STRATEGY for Aim 2
 - Background and Preliminary Results (if available)
 - Approach
- RESEARCH STRATEGY for Aim 3
 - Background and Preliminary Results (if available)
 - Approach

Begin with an **abstract** of not more than 300 words, which encapsulates the primary goal(s) and motivation of the research, the significance of the research, and the choice of experimental approach in broad, general language. This abstract should be written in the style used on 'page 2' of an NIH proposal, and should be accessible to any molecular-cellular biologist. Technical jargon and acronyms should be avoided.

This will be followed with your **Specific Aims** page (one page) that also highlights the **Significance** of the problem you are addressing.

The core of the written proposal is your Research Strategy. The Research Strategy should include important Background, and any Preliminary Results you have.

The longest part of the Research Strategy will describe your Approach. Be sure to include possible pitfalls, alternatives, and talk about how you will interpret results. **You should design experiments that roughly correspond to the amount of work one person can accomplish in a 3 year time span.**

The proposal should be 12 point font, 1 inch margins, single spaced with double space between paragraphs. In general, this should correspond to no more than 10 typed pages including References and figures. We are not strict about page limits, but your committee does not want to read anything longer than this, and may well appreciate something shorter. No “supplemental” material should be supplied.

After handing in the proposal to their committee, the student is encouraged to contact committee members to inquire about possible areas of questioning.

Format of the exam

- Two and one-half hours are allotted for the general exam.
- A committee member other than the P.I. or the GSR should chair the exam. The traditional 'discussion period with the student or advisor outside the room' is only held after the exam. The research advisor does not 'set the stage' for the exam with comments about the student's activities and performance in the lab. The P.I. does not ask or answer questions during the exam.
- The basic premise of the exam format is that the first part is reserved strictly for presentation and discussion of the student's research area (concepts, background, significance, questions, and the current state of knowledge) and of related, basic principles of molecular and cellular biology. In the 2nd half of the exam, presentation and discussion of experimental approaches is encouraged and expected. *Additional questions on background and fundamental areas of understanding are still allowed at any time during the 2nd half of the exam.*

The exam should follow the following format:

1. **The student should briefly introduce themselves** and inform the committee of the

following: (a) Their academic and research background (years and location of

undergraduate training; degree obtained; years and location of research experience)

(b) A list of classes and number of credit hours taken to date, with corresponding grades, and the number of credit hours remaining to be taken.

(c) T.A. assignments completed

(d) The number of slides and anticipated delivery time for the two halves of their presentation.

2. **A presentation of 20 minutes or less** by the student consisting **solely** of an introduction and summary of the area of investigation in the proposal, corresponding to section 1 ("Introduction and presentation of background information") of the written proposal. **Detailed** discussion of experimental strategies that are intended specifically for the student's research project, and/or presentation of unpublished data, are not allowed at this point. However, summaries of previously published experiments that are key to a general understanding of the research field, and general questions about such strategies, are fine.

Note: The student is not interrupted during this 20 minute introduction. Questions may be asked only for clarification.

3. **A question and answer period**, focused in general principles and concepts in molecular and cellular biology, related to the area of biological study presented in the proposal. Questions about details of experimental methods should be avoided at this time; rather an opportunity to examine the quality of a student's knowledge and understanding of their general area of study. The committee is encouraged to prepare questions that truly test the breadth of a student's knowledge in the broader areas of molecular and cellular biology that surround their thesis work.

A FIVE MINUTE BREAK IS SUGGESTED AT THIS POINT-

4. **A minute presentation of 20 minutes or less** by the student consisting of:

(a) A statement of the specific aims of the project, including a definition of the extent to which the work is 'discovery' based vs. 'hypothesis' based.

(b) Proposed experiments, with a logical sequence and timeline.

(c) Justification and defense of the chosen experimental strategy relative to possible alternative methods. (d) Description of any unusual, novel, or innovative experimental strategies or methodologies.

(e) Published and/or unpublished preliminary experiments that indicate feasibility, with interpretation of the resulting data as desired.

Notes:

- Again, it is preferable to not interrupt the student during this presentation except for important points of clarification.

- If the project is primarily 'discovery' based (a genetic screen, a structure determination, etc), some explanation of if and how the data generated by the project will lead to novel, revised or expanded understanding of the field and the problem is expected and appropriate.

- Preliminary data generated by the student is not a requirement for taking the general exam, nor for evaluation of a student's performance. However, the student should be expected to describe a well designed 'flow chart' of experiments that progress from initial characterization and trouble-shooting of the experimental system to well controlled tests of experimental hypotheses and/or collection of data for long-term analyses. The student is free to describe any recent experiments by others and/or by him or herself that indicate feasibility.

5. **A question and answer session that usually lasts ~ 1hour** surrounding the student's understanding of experimental methodologies, and his/her ability to defend and rationalize the choice of experimental system, techniques and strategies. The questions should cover both published precedents and examples of similar studies, and interpretation of any available experimental results. *Questions on general areas of biological understanding are still permitted at this time and for the remainder of the exam.*

6. **The student and the advisor should leave the room and the thesis committee discusses the student's performance**, focusing evenly and comprehensively on strengths and deficiencies in understanding and knowledge of the research area, and on the student's defense and rationalization of experimental strategies and goals.

7. **The advisor is invited back into the room to join in the discussion of the committee's decision.**

8. **The student is invited back into the room and given an oral summary of the committee's decision**

The committee can, at their discretion, require the student to be reexamined in six months for any of the following reasons:

1. Deficiencies in understanding and/or presentation of basic principles, core knowledge and/or biological context of the project within the boundaries of historical molecular and cellular biology.
2. Deficiencies in rationale and/or defense of experimental strategies, including the ability to engage in a detailed critique of strengths and weaknesses of published and unpublished methods, including proposed thesis experiments.

Reexamination can include all elements of the exam, **or** just the part deemed deficient by the committee. The committee may also request resubmission of a revised written proposal, without an additional oral exam, if only the written proposal itself is deficient in quality (including clarity, logic, grammar, organization, or presentation)

