Conducting and Evaluating the Senior Oral Exam

Each thesis is read by two faculty members in addition to the student's advisor. The two faculty readers will conduct a 25 minute oral examination where the student presents and discusses their thesis work.

The oral exam is designed to evaluate the student in three areas: 1) Mastery of the thesis topic and related information from the larger field of molecular biology; 2) Ability to explain the experimental approaches the student used, results obtained, and the relevance of these results to the question(s) proposed in the thesis; and 3) Ability to synthesize information and suggest new hypotheses or approaches to fill gaps in or extend their results.

During the exam, the faculty can use the following guidelines to explore these areas:

1. “What don’t we know that is important?” The student should be able to place their research in a broad context of why the work is relevant and what implications it has for moving the field forward. This may include medical relevance, filling important gaps in knowledge, and/or resolving contradictions or complexities in existing research. A student performing outstandingly in this area is able to place the importance of their work beyond the immediate focus of the laboratory’s body of work.

2. “What did you do, and what did you learn?” The student should be able to describe both the details of their research as well as its meaning and context. A student performing outstandingly in this area has a broad knowledge base beyond the specific topic of their thesis. It should be clear that they have read and synthesized primary literature on their topic. An outstanding student should also be able to defend their interpretations of their results if alternative interpretations are provided and/or suggest experiments to explore alternative interpretations.

3. “What is missing and what more would you like to have done or see done in the future?” The student should be asked to propose new experiments based on gaps in the thesis work, or from interesting points that emerge during the discussion. A student performing outstandingly in this area will be able to suggest new hypotheses or experiments that would substantially move their project and/or the field forward.
Evaluation of the Oral Exam

The oral exam is designed to evaluate the student in three ways. First, the faculty will examine the student's mastery of the specific topic of the thesis, as well as the larger field of molecular biology related to the research topic. The student should be able to describe both the details of his/her research as well as its meaning and context; they should be able to answer the questions “What did you do, and what did you learn?” Second, the faculty will investigate how well the student is able to synthesize their understanding by suggesting new hypothesis and/or experimental tests to resolve ambiguities, gaps in their research or alternate interpretations of their results. This part is: “What is missing and what more would you like to have done?” The third part concerns the bigger context of the research topic and asks the student to propose future research that would substantially move the field forward. This part is: “What don’t we know that is important and how would you study it?”

Evaluation of the oral exam (1 is highest, 5 is lowest) for the criteria listed below. Most students should get a 2 or 3 for each criterion.

**Ability to place their research in a broader context:**
1 – Outstanding. The student framed their research question in terms of relevance to the larger field as a whole. They understood how their question/work moved the field forward. Their understanding of context clearly went beyond the immediate focus of their advisor’s work.
2 – Excellent. The student framed their research question in terms of relevance to the larger field and understood how their question/work moved the field forward. However, their understanding was not as compelling or clear as a student performing outstandingly.
3 – Average. The student had a reasonable understanding of the broader context of their work, but stayed primarily within the focus of their advisor’s work.
4 – Below average. The student had some idea of the context of their work but couldn’t expand further than what was written in the thesis.
5 – Poor. The student was unable to articulate the importance of their work or the broader context.

**Factual/Conceptual Knowledge:**
1 – Outstanding. The student demonstrated mastery of the larger area of their thesis topic. he student was able to explain their experimental approach and defend interpretations of their results clearly. The student was able to provide alternative explanations for their results and/or propose ways to test alternatives provided by examiners.
2 – Excellent. The student mastered the basis of the thesis and showed at least some mastery of the larger field. The student was able to explain their experimental approach and interpretations of their results. The student could defend their interpretation of results, but may not be able to provide alternative interpretations and/or propose ways to test alternatives provided by examiners.
3 – Average. The student has mastered the basic facts and concepts for the thesis, but is not able to clearly defend their experimental interpretations and/or propose ways to test alternatives provided by examiners.
4 – Below average. The student did not know or understand some of the basic material for their thesis. A student who is clearly unfamiliar with the laboratories previous work should not score higher than this.
5 – Poor. The student exhibited serious deficits in understanding/knowledge of the basis of their thesis.

**Ability to Integrate Knowledge/Formulate Hypotheses:**
1 – Outstanding. The student was adept at formulating specific hypotheses as well as suggesting well-controlled tests of his/her ideas. The student could easily integrate material to formulate a fundamental mechanistic model to explain observations.
2 – Excellent. The student could independently formulate several hypotheses, or integrate disparate concepts. The student could suggest experiments to test the hypothesis, however their ability to do so fell short of being Outstanding.
3 – Average. With help, the student could be led to formulate a specific hypothesis to explain a set of
observations. The hypotheses were narrow or simple extensions of given paradigms, or required little integration of additional concepts. The student could be led to suggest a test of their hypothesis.

4 – Below average. The student was able to understand hypotheses provided to explain observations but was unable to provide either a test or an extension of the hypothesis.

5 – Poor. The student was unable to understand provided hypotheses or to suggest either tests or extensions of the hypotheses.

**Ability to Propose Future Directions/Experiments:**

1 – Outstanding. The student had strong/creative ideas about the new/best directions to pursue in areas related to their research.

2 – Excellent. The student had a good grasp of the gaps in our understanding related to the thesis and was able to suggest ways to approach its study.

3 – Average. The student was able to suggest the obvious next steps in the thesis.

4 – Below average. The student could be aided to propose the next step or the proposals were lacking in understanding.

5 – Poor. The student had serious difficulty in identifying directions for future research.