

The Preliminary Examination

Passing the oral preliminary examination establishes each student's candidacy for the PhD degree. The preliminary exam should be completed and defended by the end of the fifth semester (fall and spring) of graduate study, unless an extension is granted by the Graduate Studies Committee. In the Department of Chemistry, this examination consists of two parts, an Original Proposal (OP) and a Required Research Assessment (RRA). Each part will include written components and an oral presentation to the examining committee.

For most students, the entire preliminary exam process will happen over several months. A typical schedule is:

- Summer following second year: begin to plan and outline Original Proposal topic.
- August of second year: one-page "specific aims" document on the OP topic (see below) and research report due to the advisory committee as part of the second-year annual report.
- Fall of third year: completion of final Original Proposal and Dissertation Research Summary documents, scheduling of examination, distribution of documents to examination committee, and defense (see Scheduling Logistics section below).

Learning Objectives

The Graduate Studies Committee has established the following Learning Outcomes for the Preliminary Exam. Students will receive feedback from their advisor and committee about how well they have demonstrated these outcomes through their Original Proposal and Required Research Assessment Presentation:

Original Proposal Learning Objectives

1. Practice the skill of writing a proposal that is persuasive, thorough, and feasible.
 - a. Articulate a hypothesis related to a problem of your choosing that: 1) has not been previously investigated, 2) does not **directly** relate to your current research, and 3) does not rely solely on techniques you are currently learning/implementing.
 - b. Understand the pertinent literature related to the hypothesis and be able to discuss the merits and shortcomings of the existing work in the field. Be able to correctly cite this literature based on the style of the proposal.
 - c. Suggest 2-3 Specific Aims that are related but independent to address the hypothesis; consider that the work should be achievable on an approximately 3-year timeline.
 - d. Be able to design experiments to collect data for each Aim and propose what preliminary data would look like
 - i. Be able to discuss the appropriate methodologies necessary to address the aims.
 - ii. Be able to consider alternate approaches.
 - iii. Be able to explain how the knowledge gained through the experiments addresses the hypothesis.
2. Practice the skill of orally defending your proposal.
 - a. Be able to explain your proposal using approximately 20 slides.

- i. Be able to share essential background.
 - ii. Be able to articulate how your proposal contributes to the knowledge in that field.
 - iii. Lead a discussion about the content of your proposal.
- b. Be able to respond to questions related to your experimental design and on topics that are foundational for your project (i.e., core concepts in that field).
- c. Understand and expect that not all questions can be answered and to comfortably, but not always, express 'I do not know' and, at the same time, be able to propose predictions or thoughtful answers.
- d. Consider future directions that may be relevant once your goals are achieved.

Required Research Assessment Objectives:

1. Practice the skill of effectively and concisely communicating your research aims and progress, accomplishments, and future plans through a professional presentation.
 - a. Be able to articulate your understanding of the subject and aims of your research clearly and precisely.
 - b. Be able to concisely summarize your research accomplishments and main projects to date.
 - c. Be able to analyze your research progress to date, including your successes and failures.
 - d. Be able to succinctly discuss your research objectives and the steps you might take to achieve your aims in preparation for writing the thesis.
 1. The RRA presentation format is flexible. However, to encourage concise presentations, one possible timeline recommended by the Graduate Studies Committee is: a 20-minute presentation, similar to an ACS conference presentation, which consists of 5-minutes of introduction, 15 minutes of summary of main projects and accomplishments, and 5-minutes of discussion of future research plans.

Documents

The Preliminary Examination consists of three documents: a one-page "specific aims" document, the full Original Proposal (OP) and the Dissertation Research Summary:

Specific Aims Document

Students should submit a "One Page"/Specific Aims page, providing a broad outline of the Original Proposal idea, along with their second-year annual report the August prior to their preliminary exam. The purpose of this document is to help students work towards preparing their original proposal idea early, and to get committee feedback before the formal report is written. This document will also serve as a model/tool for introducing students to the level of academic writing and ideas that the faculty will expect to see in their original proposals.

Committee members will read the Specific Aims document and may provide some feedback to students prior to receiving the final Original Proposal document. There is a check box on the annual report cover sheet where the committee members will acknowledge that they have received and read this plan. It is their option to provide feedback to the student if the topic does not look suitable either due to being overly similar to the thesis research described in their 2nd year report or low significance. Providing feedback to the student is encouraged as identifying issues with topic selection after the full proposal is written is disruptive for students and committee members alike.

The topic of this one-page document is flexible; this document does not bind a student to this topic if they deem it no longer appropriate after additional research and consultation with committee members.

The Original Proposal (OP):

The OP must originate with the student. Some disciplinary research groups require that the OP not be related to their doctoral research or prior research work if the student entered the program with an MS degree. The relatedness of the topic to the group's research should be discussed with the research advisor.

The OP should include a concise statement of the problem or hypothesis to be tested, its significance and originality, why the proposal is superior to previous approaches (if applicable), how it is proposed to address the problem, what difficulties can be expected in the course of the project (and their solutions), and what will be accomplished by addressing the project.

Although the student is expected to have a complete knowledge of the area(s) related to the OP, the written OP document should not include an extensive review of an area.

The OP should outline a research program, as opposed to a single experiment.

Students should format their Original Proposal according to a widely used academic method/model. Each student should check with their advisor to see which formatting method they deem appropriate, but some suggestions are below:

The Graduate Studies Committee recommends the use of either an NIH R21 or NSF format with option for amendments for specific topic areas. Specifically, we encourage students to have a proposal that is between 10-15 pages double spaced or 8 pages single spaced. Images should be factored into the page count, but footnotes and citations should not be counted. The proposal should address the background, significance/intellectual merit, as well as the approach to solving the problem they propose.

Each DRG has their own ideas about whether or not the advisor should be involved in the generation of the original proposal. Each student should clarify with the individual advisor prior to work on the full OP document to determine what the advisor's level of involvement should be.

A Dissertation Research Summary:

The purpose of the dissertation research summary and RRA presentation is to give the student's advisor and committee the opportunity to review their research progress and accomplishments and provide feedback prior to the student's admission to PhD candidacy.

The student's second-year research report will serve as the foundation for the Dissertation Research Summary. However, as appropriate, students should add a supplement to update accomplishments completed after the second-year report but before the preliminary exam and include a discussion of directions that their future research might take. The Dissertation Research Summary should also discuss any improvements noted by the student's Advisory Committee when they received the second-year written report. Students who complete the preliminary exam prior to the fifth semester should submit the second-year research report early.

Proceedings of the Examination

The Examining Committee shall be composed of at least three members, at least two of whom hold appointments in Chemistry. A majority of the Committee must hold "regular" Graduate Faculty appointments with the Graduate School (others may hold "special" Graduate Faculty status, which

is available to outside researchers or PhD-level scientists who are not members of the Purdue faculty). In Chemistry, the Examining Committee is typically composed of the same individuals who serve on the student's Advisory Committee, but this is not required in unusual circumstances (e.g., an Advisory Committee member is on sabbatical or unexpectedly absent due to illness or emergency).

- The examination is typically not open to the public, including only the student and the examining committee.
- The oral examination will begin with an original proposal presentation by the student, followed by the student's required research assessment presentation.
- The committee will discuss the original proposal and RAA presentations and the supplementary documents.
- The committee will feel free to interrupt the student at any time and probe, by detailed questioning, the depth of the student's understanding of the proposal and research.

At the conclusion of the examination, the Committee may consult briefly without the student, and will then inform the student of one of three outcomes:

- **Pass**
- **Fail** – In a failed exam, the examining committee will recommend whether the student should withdraw from the Graduate School or continue in the department with conditions. Among other conditions, the examining committee may choose to recommend that a student be allowed to remain in the PhD program and make a second attempt, or recommend that the student transition to the MS program. However, the second attempt (if approved) may not happen in the same semester as the first attempt.
- **Undecided** – if the committee believes that there are significant corrections or improvements needed, they may choose this option. The committee will then provide the student, in writing, feedback about the deficiencies in the exam and the necessary improvements. The committee must give the student a clear deadline for submitting new documents. The committee will then review and make a final decision. An exam may not remain “undecided” past the end of the current semester; the Graduate School requires a final ruling of “pass” or “fail” before the last day of classes in a semester.

Once the final decision is made, the committee chair will complete the Graduate School's evaluation rubric, which rates the student on a scale of “exceeds expectations / meets expectations / does not meet expectations” based on five items: (1) knowledge and scholarship, (2) communication, (3) critical thinking, (4) ethical and responsible research, and (5) professionalism.

Dress should be professional; snacks and refreshments for the committee are not necessary. The committee would like students to focus on the exam only.

The primary advisor should meet with the student individually within 2 weeks of the completed preliminary exam. The purpose of this meeting is to go over the learning outcomes in relation to the student's original proposal and required research assessment. This should be done regardless of the outcome of the preliminary exam (pass, undecided, or fail).

Scheduling Logistics

Students should plan the examination several weeks in advance. Specifically:

- We recommend that students confirm a time for the exam with their committee members at least six weeks prior to the exam date. Faculty schedules are complex, and finding a time for all members of the committee can be difficult. Typically, a period of two hours should be scheduled for the exam (including both the OP and the RRA presentations).
- The Main Office should be informed via email to chemoffice@purdue.edu of the proposed exam date at least three weeks prior to the exam. The email should also include the exam time and list the three members of the examining committee. The Main Office will assist in reserving a room, and will complete the Graduate School Form 8.
- The Graduate School requires all approvals on the Form 8 by two weeks before the exam date; starting early ensures time for your major advisor and Department Head proxy to sign.
- Your OP document and dissertation research summary must be emailed to Marybeth Perdomo, mperdomo@purdue.edu, in the Main Office at least two weeks before the exam date.