Candidacy Exam Guidelines for Chemistry PhD Students

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See the College-wide requirements for more detailed information

What is the PhD Candidacy Exam?

The PhD Candidacy Exam is a written and oral examination that should be administered upon completion of the majority of a PhD student's coursework. Per the College-wide requirements, the <u>objectives</u> of the Exam are to "confirm the student's breadth and depth of knowledge in their chosen field of study as well as the student's understanding of the scientific process".

When should you take the Candidacy Exam?

The Exam must be taken within <u>three years</u> from the first date of matriculation, and at least <u>one year</u> prior to the dissertation defense.

Overview of the Candidacy Exam process

Below is a brief overview of the steps of the Candidacy Exam. You will find more information about these steps in later sections of this document.

1. You and your Major Professor (MP) decide you are ready for your Candidacy Exam
2. File Form 6B ("Request for appointment of the candidacy exam committee")
   a. Only after filing this Form will you be assigned a Candidacy Exam Chair by the Graduate Office
3. Set up the Planning Meeting
4. The Planning Meeting occurs
5. The written proposal is submitted
6. The oral exam administered
7. The decision is made

Setting up the Planning Meeting

To set up the Planning Meeting, you should email all the members of your Candidacy Steering Committee. Plan for the meeting to take 30-45 minutes. Included in the email are:

- You
- Major Professor (MP)
- Members of the Steering Committee (appointed from Form 3B, which you should have submitted after your first year)
- One Examiner
  - An Examiner is a faculty member or researcher who is not on the Steering Committee and is recommended by you (usually in consultation with your MP).
  - Two Examiners are required for the PhD dissertation defense, so it might be best to have both Examiners at the Candidacy Exam as well.
- Candidacy Exam Chair
  - Their primary purpose is to ensure that proper and fair procedures are followed.

Note: You cannot set up a time or location for the Planning Meeting without first filing Form 6B, as the Candidacy Exam Chair needs to be present at this Meeting. It might take a few days to get a Chair assigned by the Graduate Office, so please plan ahead.

Planning Meeting

The purpose of the Planning Meeting is to determine the logistics for the Candidacy Exam. At the conclusion of this meeting, you and your Candidacy Exam Committee should determine:

1. The required sections for the written document
2. The date the written document is due
3. The date you can start working on the written document
    a. You are given one month to work on this
4. The date/time of the oral exam (this should be 2 weeks AFTER the written document is due)
    a. Oral exam should last ~2 hrs and should be scheduled for 2.5 hrs
5. Allowable uses of Generative Artificial Intelligence
    a. See "*Policy on Generative Artificial Intelligence (GenAI) use for the written exam*" for more details on acceptable and unacceptable uses of GenAI

Note: Finding a time when everyone on your Candidacy Exam Committee is available to meet for 2.5 hrs can be difficult. It is easiest to schedule the date/time for the oral exam first, backtrack two weeks to when the written exam will be due, and then backtrack another one month before that to set the date when you can start working on the written document.

Note: You are responsible for finding the location for the oral exam and communicating that information to the rest of the Candidacy Exam Committee. It is preferred to use a conference room with access to a whiteboard, such as Jahn 122. To reserve Jahn 122, you should meet with the Department's administrative assistant.

Written Exam
In the Chemistry Department, students will use Form 3 for the written portion of the Exam. For Form 3, you will prepare and defend a proposal of future research likely to be carried out for your PhD project. This proposal should include any preliminary studies supporting the feasibility of the proposed research. The exam will test your understanding of concepts directly related to your immediate area of research, knowledge of prior research that has been conducted by others in the field, your ability to design and interpret experiments in this area of research, and capacity to think and write independently. This is traditionally written in the form of a grant proposal. The technical content of the written document must be your own work. If, during the time you are writing, you have questions about your instructions, you should consult with the Chair or your MP. Otherwise, there should be minimal contact between you and the Committee members during this time. You will have one month to develop this proposal, and it must be provided to the Candidacy Exam Committee two weeks prior to the oral exam.

The proposal may not exceed 15 pages and should be formatted using 1-inch margins, 1.15 spacing, and written using Times New Roman 12-point font. Visual materials including but not limited to graphs, maps, equations, schematics, and tables are included in the 15-page limit, whereas references are not included in this page limit. At the Planning Meeting, the Candidacy Steering Committee will decide on the appropriate sections for the proposal, approval of GenAI use (as applicable), citation style, and if additional materials such as a cover page, table of contents, or resume/CV should be submitted.

Note: Before you begin writing, seek out examples from individuals who have successfully passed their Candidacy Exam using the same format, or from reputable online sources. These examples can help you gauge the appropriate level of detail required and assist you in organizing your thoughts.

At least 3 business days prior to the oral exam, the Major Professor shall confirm with the Chair of the Candidacy Steering Committee that the oral examination should proceed as scheduled. The written exam is thus considered to be "provisionally successful." If the written examination component *does not* meet the standards established for the Candidacy Exam, the Committee has two options:
1. If the deficiencies are *minor*, the oral exam may be postponed, on the recommendation of the Committee Chair, and additional time will be provided to the student to address the deficiencies. This time period could extend up to 5 days and is treated as a suspension and, if ultimately successful,

does not constitute a failure of the Exam nor count towards the number of attempts to pass.

2. If the deficiencies are *major*, the Major Professor, in consultation with the Candidacy Steering Committee, may decide to fail the student without performing the oral exam. This action does constitute a failure of the Candidacy Exam in its entirety, and it does count towards the number of attempts to pass.

<u>Policy on Generative Artificial Intelligence (GenAI) for the written exam</u>. GenAI is artificial intelligence that responds to a user's prompt or request by generating *new and original* content in the form of audio, images, software code, text, and video. Examples of GenAI include ChatGPT, Google Gemini, Microsoft Copilot, Midjourney, Dall-E, and Grammarly (in which the tool generates new sentences and/or paragraphs from prompts, rephrasing sentences, summarizing content, changing tone, etc.).

GenAI differs from AI, which is a technology that enables computers and machines to simulate human learning, comprehension, problem-solving, decision-making, creativity, and autonomy. Examples of AI include voice assistants, spam filters, navigation apps, Turn-it-in, and Grammarly (for grammar and spelling check – actions that do not produce original content).

For the written exam, students are <u>prohibited</u> from using GenAI for the following actions:
- <u>Idea generation</u>: Producing or suggesting new research ideas, hypotheses, or methodologies.
- <u>Writing</u>: Generating text, including paragraphs or sections, that contribute directly to the content of the proposal.
- <u>Editing</u>: Significant rephrasing or restructuring of content that involves generating new ideas, content, or written text.

With unanimous consensus from your Candidacy Exam Committee during your Planning Meeting, students can be permitted to use GenAI for the following actions:
- <u>Image generation</u>: Producing new images, in the form of figures or graphs of data.
- <u>Data analysis</u>: Performing analyses on research data or generating interpretations of data.

The reasons behind this policy include:
1. <u>Reduced originality</u>: Using GenAI could lead to less original work and less demonstration of a student's understanding.
2. <u>Risk of inaccurate information</u>: GenAI may produce inaccurate or outdated information, including for reference generation, undermining the proposal's credibility.
3. <u>Potential bias</u>: GenAI-generated content may reflect inherent biases, leading to skewed or less objective proposals.
4. <u>Privacy concerns</u>: The data input into GenAI tools may be used to train other GenAI models, stored within the platform, and could be vulnerable to unauthorized access, breaches, or misuse.
5. <u>Alignment with current publishing standards</u>: Many publishers and government agencies prohibit or restrict GenAI use for publishing manuscripts and submitting grants, respectively, and this policy is keeping in line with those expectations.

Note: You ARE permitted to use AI, such as grammar and spelling check, when writing your written document.

Note: You ARE permitted to use GenAI research assistance such as performing literature searches and compiling a bibliography.

Note: This policy on GenAI use will be part of an ongoing conversation that occurs on campus and within this Department, as new uses for this technology emerge. If you have any questions about permitted or prohibited use of GenAI or AI while writing your written exam, please talk to your MP.

Oral exam

The oral exam occurs in two rounds of questioning, lasting a maximum of 2 hrs.

1. Round one (1 hr)
   a. Each Committee Member gets ~10-15 min to ask you questions; this time is shared equally with all the Committee Members.
   b. There are to be no interruptions or interjections by other Committee Members when it is not their turn to question.
2. Round two (1 hr)
   a. Each Committee Member gets ~5-10 min to ask you questions.
   b. This portion is less formal, and other Committee Members can interact and build off each other's questions.

Some important questions for you to consider as you prepare for the oral exam:

- What are the core objectives of my research proposal?
- Why is my research question important in the broader context of my field?
- How does my research contribute to or challenge the existing literature in the field?
- What are the key assumptions of my research, and how do I justify them?
- What are the limitations of my proposed methods, and how can they impact my results?
- How could I modify my approach if I encounter unexpected obstacles during my research?
- How will I ensure the validity and reliability of my data?
- What kind of data will I generate, and how will I analyze it?
- What is my timeline for completion of this work?

Silent observers. You can have two silent observers sit in with you during your oral exam. Both observers are excused from the room when the Candidacy Exam Committee determines whether you have passed the exam. If you plan on having silent observers, your MP and Committee Chair should be notified in advance. These two observers are:

1. Silent student observer
2. Silent faculty observer

Evaluation of your performance

You will be evaluated on how well you have satisfied the objectives of the Candidacy Exam, which are, broadly speaking, that you understand fundamental concepts and facts of your field of study and understand how to apply those concepts in the scientific process. More specifically, the Candidacy Exam will test your ability to interpret scientific work in your area, your capacity to think and write independently, and your ability to present ideas orally in a clear manner. Any information provided in the written portion is subject to questioning during the oral exam.

The final decision is made

After the oral exam is complete and there are no further questions, you will be excused from the room so the Candidacy Exam Committee can debate and decide whether you have passed your Candidacy Exam. The decision to pass is based on the Committee Member's overall impressions of both the written and oral portions. The decision to pass must be unanimous. Once a decision is made, you will be asked to come back into the room and will be notified of the decision.

Note: You should stay close to the room the oral exam is in, so you are ready to come back in when a decision is made.

<u>Pass</u>. If you receive a passing grade, congratulations! You can now call yourself a "PhD Candidate".

<u>Fail</u>. If you do not receive a unanimous vote to pass this Exam, this means that you have failed your first attempt. Any student who fails the first Candidacy Exam may <u>request a second exam</u>, which must take place <u>no more than one year</u> from the date of the first examination. The second Candidacy Exam may or may not include a new written component, at the discretion of the Candidacy Exam Committee, in consultation with the Committee Chair. For the second Exam, the vote does not have to be unanimous - you have passed if you receive no more than one negative vote. Any student who is determined to have failed their second Candidacy Exam will be terminated from the doctoral program; at this point, most students will choose to switch to the MS program.

Note: If you fail your first attempt, take a couple days to deal with any negative feelings you might have before talking to <u>every</u> member of the Candidacy Exam Committee about what they saw as the primary weaknesses in your performance and how you can best prepare for the second attempt. Your MP should provide the most guidance, but they have only one vote on the Committee and may not fully understand the concerns of the other Committee members.

Frequently asked questions about the Candidacy Exam
1. *What should I wear to my oral defense?*
   - This is a professional event, so many students will dress the way they would for a conference or job interview.
2. *What other things might I expect during the oral exam?*
   - Most rooms for the oral exams will have a whiteboard. Be prepared to use it if asked.
3. *What if I don't know the answer to a question?*
   - You chose your Committee Members because they are experts in areas related to your research. If you get a question you don't know the answer to, pause and take a breath. It is better to admit that you don't know the answer to a question rather than make up an answer. It might be useful to suggest where you might be able to find the answer at a later date or try to make a connection to another relevant topic.
4. *How do I pick my Candidacy Exam Committee and Examiner/s?*
   - Consult with your MP. You want to have a well-rounded Committee of people that are knowledgeable about (some) aspects of your research. This is also a great way to start building your network.