

# Comprehensive Exam Guidelines

*For Students in the Department of Chemistry*

*List of Revisions:*

*January 2022, November 2021, April 2017, March 2014, May 2008*

## Overview

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### Timing

All PhD students must complete the comprehensive exam **within 40 months** of starting their graduate program. For most students, this means you should start preparing for your exam in **September of your fourth year** of study. Exceptions will be granted only in the most extenuating of circumstances.

### Format

There are three main components to the comprehensive exam: a **report** (that contains both a *literature review* and a *research proposal*), a **presentation**, and the **question period**.

Report	Presentation	Question Period
<ul style="list-style-type: none"> <li>• <b>Part 1:</b> a mini-review on a topic from the current literature</li> <li>• <b>Part 2:</b> a proposal for future research</li> <li>• 3,000 - 6,000 words total (not including references)</li> </ul>	<ul style="list-style-type: none"> <li>• A presentation that covers both your review and your research proposal</li> <li>• Open to everyone, but the primary audience is your advisory committee</li> <li>• 25 - 30 min</li> </ul>	<ul style="list-style-type: none"> <li>• Two rounds of questions based on your report and presentation</li> <li>• Most questions will come from your advisory committee, but all faculty present may ask questions</li> <li>• Approx. 60 - 120 min</li> </ul>

**Figure 1.** Components of the comprehensive examination.

## Proposing a Topic

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### Choosing a Topic

- The topic of your comprehensive exam should be a new direction for you, **distinct from both your current and past research** and the research done by other members of your research group.
- You should choose a topic that has **not been reviewed recently**. The important thing is to make your topic *distinct* from other existing reviews, either by focusing on more recent literature or making it somehow unique. For example, if your topic was last reviewed in 2017, your review could focus on papers published in 2017 or later.
- Try to **avoid topics that are overly broad** (e.g., metal catalysis) **or very narrow** (e.g., ring-opening polymerization of lactide catalyzed by six-coordinate samarium complexes containing only nitrogen donor atoms). Broad topics require lengthy reviews to cover adequately, but with very narrow topics you risk not having enough to talk about! Aim for a topic that encompasses about 20-30 primary references.

## Submitting a Topic Proposal

Your comprehensive exam topic needs to be approved by your advisory committee. To request approval, you should **submit a proposal to the graduate program coordinator** (via e-mail). You may submit proposals for up to three different topics, although most students submit only one or two. Proposals should include:

- Your proposed title.
- A statement on how your review will be distinct from other reviews on the same (or similar) topics. If there are no existing reviews, simply state that here.
- References to any other reviews on the same (or similar) topics.
- The majority of the primary references. All references should be in *Journal of the American Chemical Society* format and contain titles.

The proposal will be distributed to your advisory committee for approval. Your committee is given two weeks to review your proposal and respond with their comments and/or approval.

## Writing the Report

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### Deadlines

Once your topic is approved by your committee, you will have **four weeks** to write your report (the graduate program coordinator will let you know the exact deadline when they e-mail you with your topic approval).

Once the topic has been approved, **you are expected to work independently**. Faculty should not provide input on the written report or presentation prior to the conclusion of the exam. Students are encouraged to consult with their supervisor and advisory committee when choosing a topic and preparing the proposal, but should work independently once the topic has been approved.

### Length and Format

The report (including both literature review and research proposal) should be 3000 – 6000 words in total, not counting references. It should adhere to the following general formatting guidelines:

- Main text should be in 12 point, Times New Roman font and double spaced.
- Pages should be 8 ½" × 11" (letter size) with minimum margins of ¾".
- All pages should be numbered in the bottom-right corner.
- Citations and references should be in *Journal of the American Chemical Society* format; references should include titles.

## Title and Abstract

Your report should have a title and an abstract. The abstract should be a clear, concise, one-paragraph synopsis (100–200 words) placed directly after the title. It should indicate the subject and scope of the review, the major topics covered, as well as the overall objectives.

## Part I: Literature Review

The first part of your report is a literature review on your topic. To get a good sense of how review articles are written, look at recent reviews from the literature. Articles in *Chemical Reviews* and *Chemical Society Reviews* are a good place to start.

Your **Introduction** should precisely state the purpose and goals of the review and its scope and limitations, as well as the years of literature covered. Historical material and references to earlier pertinent reviews may be included.

Material in the **Body** of the review should be logically arranged and presented in a clear and concise style. You may find headings and sub-headings to be helpful in organizing your material. Your primary references should be discussed here. The best reviews include a critical analysis of the field and insights about the remaining challenges and future directions.

## Part II: Research Proposal

The second part of your report is a section entitled **Research Proposal**. This section should be **1000 – 2000 words in length** (approx.  $\frac{1}{4}$  –  $\frac{1}{3}$  of the overall report). You should propose new research that will extend what is known about your topic. In this section, a clearly defined scientific question (or questions) must be posed, along with a justification of why the proposed research is important. Include a clear and concise description of how you will answer your research question, whether experimentally or computationally. As you write this section, consider the following points:

- Your review will have just summarized the state-of-the-art in the field. But what are the unanswered questions or unmet challenges? Why are they important?
- What unanswered question or unmet challenge will your research address? Can you frame it in terms of a testable hypothesis? (**This is often where students run into difficulties!**)
- How will you test your hypothesis experimentally? Try to think about the details. Are materials available commercially? If not, how will you synthesize them? What techniques will you use? What might your results show? What will you do if something doesn't work?

## Conclusions

- A short summary of your review and your research proposal.

## Presentation

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Approximately **1 – 2 weeks after you submit your report**, you will give a **25 – 30 min presentation** summarizing your literature review and your research proposal. The exact scheduling will depend on the availability of you and your advisory committee and will be organized by the graduate program coordinator.

Your presentation should cover both your literature review and your proposal. You won't have time to go through every literature paper in detail, but remember that your committee has already read your report. Summarize, using carefully selected examples to highlight your points. Remember to present your research proposal, highlighting your research question and proposed methodology.

Your presentation is open to the entire department, but your primary audience will be your advisory committee.

## Question Period

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**Two rounds of questions** follow immediately after the presentation. Each member of your advisory committee is given the opportunity to ask questions, followed by other faculty and students who may be present. The first round is open to everyone, after which students in the audience are asked to leave; only your committee and faculty are present in round two. The length of the question period is variable, but **typically runs 60 – 120 min.**

## Evaluation

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### Exam Components

There are four distinct components of the exam: the **literature review**, **research proposal**, **presentation**, and **question period**. Each is evaluated separately as either pass or fail. To pass the exam, all four components must be deemed satisfactory.

### Decision Making

All faculty will be invited to submit written comments on the report to the chair of the advisory committee; comments should be received prior to the presentation. At the end of the question period, all faculty in attendance will meet briefly to determine the outcome. A report on this meeting (prepared by the chair of the advisory committee) will be circulated to both the committee and the student by the graduate program coordinator.

### Possible Outcomes

- **Pass.** The committee believes that all components of the exam were satisfactory.

- **Deferred decision.** A student may be asked to correct a **limited number** of **specific** deficiencies in **up to two** exam components. The final decision is deferred while the student makes the necessary corrections. The exam is generally resumed **within two weeks**, at which time a final decision is reached.
- **Fail.** The committee believes that there were **significant deficiencies** in one or more exam components.

The final pass / fail decision will be circulated to all faculty for ratification under the 48 hour rule.

A failed examination may be repeated once, with the permission of the Dean of the CGPS (which is almost always granted). The advisory committee may ask the student to repeat the same topic, or it may ask that the student choose a new topic. A second failure will result in the student being required to discontinue from the program. This failure may be appealed to the PhD Committee of the CGPS on substantive or procedural grounds.

## Comprehensive Exam – Quick Reference

### Exam Components

Literature Review	Research Proposal	Presentation	Question Period
<ul style="list-style-type: none"> <li>• Short review on a topic from the current literature</li> <li>• A critical analysis of the field and insights about remaining challenges</li> <li>• 3,000 - 6,000 words total (including the proposal, not including references)</li> </ul>	<ul style="list-style-type: none"> <li>• Proposal for future research</li> <li>• Must contain a clear research question</li> <li>• Describe your methodology and experimental approach</li> <li>• 1,000 - 2,000 words (approx. ¼ - ⅓ of report)</li> </ul>	<ul style="list-style-type: none"> <li>• A presentation that covers both your review and your research proposal</li> <li>• Open to everyone, but the primary audience is your advisory committee</li> <li>• 25 - 30 min</li> </ul>	<ul style="list-style-type: none"> <li>• Two rounds of questions based on your report and presentation</li> <li>• Most questions will come from your advisory committee, but all faculty present may ask questions</li> <li>• Approx. 60 - 120 min</li> </ul>

### Timelines



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