

Written Examination – Template
Department of Chemistry, University of Florida

General Instructions: Answer the questions below about your topic using clearly delineated sections. If appropriate, up to one original (not copy/pasted) graphic can be included with each response.

Formatting: Answers to all applicable questions are to be written in paragraph form (single spaced, justified, 11 pt Arial font, 1-inch margins). The document, including figures, must not exceed 5 pages (excluding references).

Grading: The written exam will be graded as Pass/Fail by the Ph.D. committee according to the rubric provided below.

1) Significance

- a) Succinctly describe how the topic addresses an important problem, critical barriers to progress, and/or unmet urgent needs in your field of study.
- b) Is the topic significant to a field/discipline other than your own? Which one and why?
- c) Describe the potential technological and/or commercial significance of the topic, if applicable.
- d) Describe the potential benefit of the topic to human health and/or wellbeing, if applicable.
- e) You have 3 minutes to sell the topic to a panel of non-scientists. Write your pitch (350–400 words).

2) Background

- a) List **10** peer-reviewed publications from the last 10 years that you believe are most relevant to the topic. Only one of the papers can be a review article. Use ACS citation formatting but include the title and the DOI link.
- b) From the 10, choose the **two** most important seminal papers and do the following for each:
 - i) List the principal investigator(s) of the work and indicate their institutions.
 - ii) Describe the key innovative aspect of the study.
 - iii) Identify the most critical piece of experimental or theoretical data from the paper using words, graphics, and equations and state how this was used to support the authors' hypothesis.
 - iv) Propose one experiment that you think the authors missed.

3) Methods and Analysis

- a) Physical methods:
 - i) List the instruments/DFT methods/analytical tools/engineered devices that are workhorses in this area.
 - ii) Choose one of the approaches and describe the fundamental working principles of that method.
 - iii) What are the most important methods your specific work in the topic requires and what information will you obtain?
- b) Synthetic methods:
 - i) If applicable, provide a specific, detailed, and balanced chemical equation, complete with molecular structures, that is most important to your topic. Explain the equation with words and graphics (e.g., a mechanism).

4) Challenges

- a) What do you see as the most challenging aspect of research within this topic?
- b) How will these challenges be managed and what will be the metrics of success?
- c) What can be said about the limitations of this research area?

5) Future Directions

- a) Describe a hypothesis driven, short term research direction that you believe would address an important unanswered question in this field.
- b) Are others working on this? If yes, summarize their approaches.
- c) In the next 10 years, what could be the greatest advance in this research area? What would be the title of the seminal paper that would announce such an advance?