

BCHM 4901 – ADVANCED ELECTIVE OPTION

Students wishing to complete independent research in BCHM 4901 Independent Study may apply up to 3 credit hours towards the Advanced Elective requirement for the BCHM Bachelor's degree. The requirements for the BCHM 4901 Advanced Elective Option are as follows:

- Before you can be eligible to apply for BCHM 4901 as an Advanced Elective, you must first complete a minimum of 120 hours of independent research with a faculty advisor. Your 120 hours of prior research may be performed in conjunction with enrollment in BCHM 4901 (non-Advanced Elective), or without enrolling in any course.
- BCHM 4901 - Advanced Elective Option must be taken as a 3 credit course in one semester, and can only count once as an advanced elective.
- Your application for the BCHM 4901 - Advanced Elective Option must be approved by the Biochemistry Associate Chair for Undergraduate Affairs, Dr. Natalie Ahn. Please contact Dr. Ahn to set up a meeting to discuss your planned project (Natalie.ahn@colorado.edu).
- A final written paper on your independent research is required at the end of the semester. You must follow the format below or the paper will not be approved. The final paper must be submitted to your faculty advisor and Dr. Ahn before the last day of the semester. The faculty advisor will assign the final grade and Dr. Ahn will determine if the written paper satisfies the requirement for the Advanced Elective Option.

REQUIRED FORMAT FOR THE RESEARCH PAPER - ADVANCED ELECTIVE OPTION

The written paper must be at least 5 pages long, single spaced, with 1 inch margins. The font should be Arial 11 pt or Times 12 pt. The following eight sections are required. You should work closely with your faculty advisor and obtain their continual feedback while you write your paper.

- 1. Title page.** Write the title of your Research Paper, your name, and your faculty advisor's name.
- 2. Goal.** In a short paragraph (1-2 sentences), state the goal of your research project. For example, state the hypothesis you wish to test and/or the specific question you set out to answer.
- 3. Significance.** In a short paragraph (2-5 sentences), state the significance of your research project. For example, explain why the question you have set out to answer is important. What is the gap in knowledge that you are trying to fill, i.e., what aspect of the problem is unanswered?
- 4. Introduction.** Provide the background for your research project. Do not write an exhaustive review of your field. Instead, include only the information that a reader would need to know in order to understand the specifics of the problem you are studying and the reason for the experimental approach that you've chosen to take. Cite research articles that you need to support the points you are making in the introduction and throughout the rest of the paper.
- 5. Results.** Describe the results of your research. To do this, describe each experiment you wish to include one by one. In each experiment, describe the question you are asking and the reason for the experimental strategy that you used. Describe the data and result(s) of the experiment. Explain how you interpreted the data, and describe what each result told you about the problem. If appropriate, describe any statistical analyses that were needed to allow you to draw quantitative conclusions.
- 6. Discussion.** This is the section where you summarize the outcomes of your research, and describe your analysis and interpretation of the results. In the first paragraph, summarize the main findings from your research and present the conclusion(s) from your research. Explain the importance of your main findings and conclusions with respect to your overarching goal, articulated in the Goal section. For example, what big question did your research answer? Describe the significance of your findings, articulated in the Significance section. In the later paragraphs of the Discussion, go into more detail about your analysis and interpretation. For example, describe additional results outside the main findings, and any unexpected outcomes. Describe problems that you had with any experiments that may have affected the interpretation, and alternative strategies that might improve the outcomes if they were repeated. Discuss how the results of your research fit in with previous work, articulated in the Introduction section. Finish the Discussion with a final paragraph that sums up what your work means, and how it has added new knowledge to your field.

7. References. List the research articles that you cite throughout the paper. Use a formal citation format for each, which lists: (i) names of the authors (last name first, followed by initials); (ii) year of publication; (iii) title of the research article; (iv) journal; (v) journal volume; (vi) page numbers; (vii) DOI (digital object identifier). Number each citation in the order that they are mentioned in the paper.

8. Figures and Figure Legends. For each experiment include a data figure (labeled Fig. 1, Fig. 2, Fig. 3...). Figures can have multiple panels (labeled A, B, C...) showing different experiments that each address a question in common. Under each figure, include a caption with a title and brief description of each panel. Briefly summarize the main finding from the figure. You can either organize the figures + captions in one section after the References section, displaying each figure on a separate page. Alternatively, you can embed the figures + captions in text boxes and display them in the Results section, placing each near the paragraph describing that figure.