

LONG ASSIGNMENT #1: HYPOTHESIS

Purpose: The purpose of this assignment is to consider and then present your hypothesis about the expected outcomes of your mutagenesis experiment, and to explain its relationship both to the question(s) you ask and to the specific question PEBL asks this semester.

Length: 500 (minimum) to 800 (maximum) words, double-spaced, 1-inch margins all around, 12 pt Times New Roman font.

Preparation: Review Section II of the syllabus as well as the relevant sections of the preparatory readings for Meetings #1 - #3. Please note that while LA #1 is brief, it requires thoughtful consideration of the materials *and* how to present your hypothesis logically and clearly.

Your Assignment: Your assignment should clearly present these important components:

- A. In the first paragraph, (1) introduce and explain the overarching question(s) that PEBL seeks to examine about proteins. In that context, then, (2) explain the *specific* question that the PEBL course asks AND the hypothesis the course seeks to examine this semester. Somewhere in the paragraph, you should also explain (3) why these questions are important to consider, drawing on one or two examples. This paragraph introduces the context in which you are working as well as the motive for your experiment.
- B. In a second paragraph, (4) describe the specific mutation you will introduce to SNase. Explain the reasoning for your mutation with respect to (a) the specific question PEBL asks this semester AND (b) your own examination of the mutation site in the protein. (5) Discuss the factors that could affect the outcome of your experiments, and how these relate to the specific question PEBL examines this semester. This paragraph serves to develop your research question.
- C. In a third paragraph, (6) present a hypothesis (*a speculative yet reasonable projection*) that anticipates the expected outcomes of your mutagenesis experiment. Focus on how the mutation will affect the physical properties of your protein that interest you (i.e. how are noncovalent interactions affected by the mutation?). The PyMOL exercises you have completed thus far have been designed to help guide your thinking. Conclude by (7) explaining the implications of your hypothesis to the specific question that PEBL examines this semester and to the overarching question(s) that PEBL seeks to examine in general.

Figures: Support your hypothesis with two figures. The first one should show the entire SNase molecule and highlight the position(s) that you intend to mutate. The second figure should have two parts: (1) showing a close up of the original side chain and, in the same orientation, (2) a close up of the side chain you will mutate that position to. You should select a view that highlights the details of the microenvironment (Coulomb interactions, groups within hydrogen bonding distance, hydrophobic residues, etc.). Present the figures *after the text* with appropriate titles and captions. The weekly reading materials have many good examples of properly formatted figures.

Assessment: This assignment is worth 10% of your grade. The evaluation will take into account:

- (a) the completeness of your explanation (e.g. the presence of all components outlined in the assignment above);
- (b) the coherence, clarity, and logic of your prose and figures (an intelligent non-specialist should be able to understand your work at the sentence level, and overall); and
- (c) the articulation of the conceptual implications of your work (e.g. your ability to probe the relationship between your questions and hypothesis, and the questions and hypothesis PEBL asks this semester, as well as the course's broader frames of inquiry).

Reminder: This is your hypothesis, not your team's, so you must work individually. It might well be that your view on how the mutation will affect the protein differs from that of the rest of the team. All final writing assignments will be submitted via Turnitin.com on Blackboard. Please consult your lecturer with any questions.

Note on DUE DATES: A draft version of this assignment is due on Gradescope before Meeting #4 to be peer-reviewed during that class. You will be able to give and receive peer feedback during class in a small group discussion. You will then have a chance to apply that feedback to your work before submitting this first version to Turnitin within 3 days after Meeting #4. You will then receive detailed feedback and have the option to resubmit a second version before

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Meeting #10. You are not required to resubmit a second version if you are satisfied with the comments you receive. Your final grade will be based on your final submitted version.

Student name: _____

Paragraph content

	Unsatisfactory	Satisfactory	Excellent
Paragraph 1: Introducing and motivating the research questions	<ul style="list-style-type: none"> Missing introduction and explanation of the overarching question that PEBL seeks to answer or is hindered by major inaccuracies. Missing introduction and explanation of the specific question and hypothesis this PEBL course asks or is hindered by major inaccuracies. Missing examples or is hindered by major inaccuracies. 	<ul style="list-style-type: none"> Introduces the overarching question that PEBL seeks to answer with minor errors or minimal elaboration. Introduces the specific question and hypothesis of PEBL this semester with minor errors or minimal elaboration. Includes examples to contextualize these questions and provide motive, though connection to research questions may be tenuous or underdeveloped. 	<ul style="list-style-type: none"> Accurately introduces and explains the overarching question that PEBL seeks to answer. Accurately introduces and explains the specific question and hypothesis of this PEBL course. Includes relevant examples to contextualize these questions and provide motive (<i>i.e.</i> illustrates why they are significant).
Paragraph 2: Developing the research questions	<ul style="list-style-type: none"> Omits identification OR description of the specific mutation they will introduce Reasoning for the choice of mutation or mutation site is missing or hindered by major inaccuracies or severely underdeveloped. Fails to discuss factors that could affect the outcome of the characterization experiments; or discussion contains major inaccuracies or is severely underdeveloped. 	<ul style="list-style-type: none"> Names the specific mutation they will introduce with limited description. Explains the reasoning for the choice of mutation and site based on their own examination of the protein (Labs 2 & 3), and the specific question PEBL asks this semester, though explanation may contain minor gaps or inaccuracies or is underdeveloped. Discusses factors that could affect outcome of the characterization experiments (UNIT 3). (e.g. factors relevant to structure, function, and stability of proteins), with minor omissions or inaccuracies. 	<ul style="list-style-type: none"> Names and fully describes the specific mutation they will introduce. Fully explains the reasoning for the choice of mutation and mutation site based on their own examination of the protein (Labs 2 & 3), and the specific question PEBL asks this semester. Accurately discusses factors that could affect outcome of the characterization experiments (UNIT 3). (e.g. factors relevant to structure, function, and stability of proteins)
Paragraph 3: Discussing the expected results from the experiment	<ul style="list-style-type: none"> Many or all hypotheses are missing, are unconnected to, or contradict discussion in paragraph 2. Fails to include implications of their hypothesis for the specific question that PEBL examines this semester, or response contains major inaccuracies. Fails to explain the implications of their hypothesis for the overarching question that PEBL seeks to examine (e.g., function, applications), or explanation includes major inaccuracies 	<ul style="list-style-type: none"> Presents most hypotheses OR presents hypotheses stemming from reasoning in paragraph 2, though response may contain minor omissions or inaccuracies. Explains the implications of their hypothesis for the specific question that PEBL examines this semester, though connection may not be fully elaborated or may contain minor inaccuracies. Explains the implications of their hypothesis for the overarching question that PEBL seeks to examine (e.g. function, applications), though connection may not be fully elaborated or may contain minor inaccuracies. 	<ul style="list-style-type: none"> Presents all hypotheses that anticipate the expected outcomes of their mutagenesis experiment, based on the reasoning in paragraph 2 (e.g., how will the mutation affect the protein's physical properties?). Explains the implications of their hypothesis for the specific question that PEBL examines this semester. Explains the implications of their hypothesis for the overarching question that PEBL seeks to examine (e.g., function, applications).

Global criteria

	Unsatisfactory	Satisfactory	Excellent
Analysis and context	○ Analysis frequently lacks a clear logical connection to previous ideas.	○ Logical reasoning is generally explicit and sound but fails to extend ideas beyond what is presented in class.	○ Logical reasoning extends ideas presented in class in an original way.
	○ Most points need further explanation or support; lack of contextualization impedes readers' understanding.	○ Analysis is generally clear, but may often benefit from further support, explanation, or contextualization	○ Each point is fully explained, supported, and contextualized as appropriate for audience who is scientifically literate but not expert in biophysics.
	○ Discussion of key ideas is missing or contains major inaccuracies.	○ Most concepts are addressed, but some key ideas are discussed superficially or with minor inaccuracies.	○ All key concepts are fully addressed
	○ Extraneous or inaccurate material is frequently used to support arguments	○ Supporting statements are incomplete or contain extraneous material not relevant to the argument being made.	○ Supporting statements are connected to the main ideas of the paragraph and overall piece without extraneous material.
Coherence	○ Order of ideas within paragraphs is jumbled or illogical to the point that it obscures the overall argument.	○ Overall organization is present, but the argument(s) could be improved by minor reordering.	○ Logical order of ideas within and between paragraphs where each idea flows naturally into the next.
	○ Transitions within or between paragraphs are very weak or absent.	○ Transitions within or between paragraphs are present, but may be rough.	○ Graceful transitions within and between paragraphs.
	○ Ideas often repeat or may contradict information found elsewhere in the text.	○ Ideas generally build on each other with only minor repetition or gaps.	○ Ideas build on each other without repetition or gaps. (e.g., ending "circles back" to ideas from paragraph 1, discussing motive in a more specific way).
Style and mechanics	○ Numerous spelling or grammatical errors suggesting no proof reading was done	○ Few, minor spelling or grammatical errors	○ No spelling or grammar errors.
	○ Frequent awkward sentence construction OR imprecise use of language sufficient to obscure/impede comprehension.	○ Writing is generally clear, but may contain some awkward or imprecise use of language.	○ Writing demonstrates exceptional clarity and precision of language.
	○ Does not follow instructions for formatting OR is missing required components of the assignment	○ Meets formatting and other requirements outline in assignment description, but overall appears uninteresting or serviceable	○ Meets formatting and other requirements outlined in assignment sheet; assignment appears polished.
	○ Word count exceeds the limit by +/- 10%	○ Word count exceeds the limit but is within +/- 10%	○ Meets word limit of assignment.