

LONG ASSIGNMENT #2: Experimental outcomes

Purpose: The purpose of this assignment is to summarize and evaluate the results of experiments you will perform in Meetings #10 - #12 to test your hypothesis. Multiple different types of experiments will allow you to examine different functional or physical aspects of your protein. This 3-part writing assignment (completed over a period of 3 weeks) will help you organize your ideas logically as you summarize and provisionally evaluate the results of your experiment. You will get feedback so that you may improve as you go.

Length: 500 (minimum) to 700 (maximum) words (figures excluded from count), 1-inch margins all around, 12 pt font, Times New Roman. This applies *per* experiment (one write-up per experiment), not in total.

Logistics: Three labs, one write-up for each, so three write-ups total. The experiments that you will conduct for this assignment are:

LA #2a: Enzymatic activity evaluated with the blue-plate assay

LA #2b: Structure evaluated by far-UV CD spectroscopy

LA #2c: Salt effects (ionic strength) on stability monitored with Trp fluorescence (*data from Labs 11 and 12*)

Each of the three write-ups should be composed of multiple paragraphs in an essay-like form and clearly present the important components below. You are not restricted to a specific number or length of paragraphs; however, do not separate your paragraphs with titles or section headers.

Goal: (1) Clearly describe the purpose of the experiment: why did you do this experiment? what did you intend to learn?

(2) Include enough background information to provide sufficient context so that an intelligent, non-specialist reader could understand the nature of the data that were collected for the question your experiment is investigating.

Results: (3) Report your data in a concise, *yet descriptive way*: what did you see? Include all of the data for your variant **and** controls, even if there are multiple data sets or conditions being examined. Occasionally your collected data may not be perfectly clean or ideal. When this happens, it is important to note any noise, outliers, or experimental complications if they are present. Also, be sure to include in-text references to relevant figures/tables showing raw data when appropriate.

Discussion: (4) Interpret your data to explain what your observations say collectively about the protein property being assessed. This is where comparisons between your variant protein and control proteins and/or between different conditions are most helpful. If your data included any anomalous points or significant noise, you should address how this affects your interpretation of the data. Include in-text references to relevant figures/tables when appropriate.

Conclusion: In LA #1, you described your initial hypotheses:

(5) Evaluate the extent to which the outcomes of this experiment support or fail to support your hypothesis. Do not try to revise your hypothesis here. It's fine if your initial ideas were incorrect as long as you are able to explain why/how the new data now informs your thinking about the variant.

(6) Propose the biophysical reasons or mechanisms behind the measured outcomes and what was learned, in general, about proteins within the context of the experimental motive.

Figures: (7) Include relevant figures and/or tables that help support your observations and interpretations. Your figures should be clearly labeled and presented in a manner that is easy to understand (i.e. not crowded, legible text, distinct data sets, etc.) with a separate title and descriptive caption below the image. These should appear at the end of your document, after the text, and be referenced as necessary in your paragraphs as in-line references. The weekly reading materials have many good examples of properly formatted figures and how to reference them in text.

Assessment: All writing assignments are to be completed individually and will be submitted via Turnitin.com on Blackboard by midnight, 3 days after the corresponding Quick Check deadline. Please consult your lecturer with any questions. This assignment, in total, will be worth about 20% of your grade. Your 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).

	Unsatisfactory	Satisfactory	Excellent
<i>Assignment criteria</i>			
Goal	<ul style="list-style-type: none"> ○ Explanation of the experimental goals contains major inaccuracies or gaps. ○ Fails to relate the technique and goal or connection contains major inaccuracies. ○ Experimental description is incomplete or contains major inaccuracies that hinder understanding of the method ○ Fails to mention experimental controls or conditions. 	<ul style="list-style-type: none"> ○ Explains the purpose of the experiment with minor inaccuracies or fails to discuss the additional variables being tested. ○ The connection between the technique and experimental goal is present but underdeveloped or inaccurate. ○ Describes the procedure of the experiment, but is missing critical aspects or has minor inaccuracies. ○ Introduces the proteins/controls that will be tested, but description may be vague or shallow. 	<ul style="list-style-type: none"> ○ Fully and accurately explains the purpose of the experiment(s) including any additional variables being tested. ○ Introduces the experimental technique as it relates to the goal (e.g. connects what is measured by the assay to the property– such as function–being studied). ○ Fully and accurately describes the mechanics/technical aspects of the experimental technique that are relevant for interpreting the data. ○ Introduces the specific variant and any controls that will be tested.
Observations	<ul style="list-style-type: none"> ○ Fails to describe the results, or is missing description of conditions/proteins. ○ Fails to identify technical issues that may have affected outcomes. ○ Frequently or consistently misreferences figures/tables or fails to reference figures/tables appropriately. 	<ul style="list-style-type: none"> ○ Describes results observed, but may be missing some conditions/proteins or the description is too technical to be understood. ○ Identification of technical issues or reliability of data is present, but minimal or vague. ○ Figures and tables may be referenced inconsistently or in inappropriate locations or manner. 	<ul style="list-style-type: none"> ○ Clearly describes results for all proteins and conditions for a non-expert audience. ○ Addresses the reliability of data and any technical issues in data collection. ○ Appropriately references figures and tables.
Outcomes	<ul style="list-style-type: none"> ○ Fails to make relevant comparisons between experimental outcomes ○ Does not discuss the implications of results or discussion contains major errors. ○ Fails to discuss the impact of outliers/noise on results or fails to identify outliers or inconsistent data. ○ Frequently or consistently misreferences figures/tables or fails to reference figures/tables appropriately. 	<ul style="list-style-type: none"> ○ Missing some important comparisons between controls/conditions and/or includes irrelevant ones. ○ Explains the implications of results, but is lacking details or contains minor errors. ○ Identifies outliers or inconsistent data, but fails to fully explain the impact on results. ○ Figures and tables may be referenced inconsistently or in inappropriate locations or manner. 	<ul style="list-style-type: none"> ○ All relevant comparisons are made between controls and conditions to interpret the phenomena assessed. ○ Explains in detail the implications of results on the protein property being studied. ○ Provides a reasonable explanation for outliers or inconsistent data and discusses the extent to which errors/noise interferes with the analysis. ○ Appropriately references figures and tables.

<p style="text-align: center;">Evaluation</p>	<ul style="list-style-type: none"> ○ Outcomes are not included in evaluation of hypothesis and/or analysis is severely underdeveloped. ○ Explanation of results is missing or implausible ○ Discussion of finding or implications for broader class goals is missing. 	<ul style="list-style-type: none"> ○ The outcomes are included in the evaluation of the preliminary hypothesis, but analysis is incomplete or underdeveloped. ○ Biophysical explanation of observed results is plausible, but may be incomplete or underdeveloped. ○ Discusses the findings and their implications within the broader class goals, but may be shallow or incomplete. 	<ul style="list-style-type: none"> ○ Identifies which portions of the hypothesis are supported or refuted by the results and to what extent, with respect to the protein property being tested. ○ Proposes a plausible, biophysical explanation for the measured outcomes in detail. ○ Generalizes the findings and discusses the implications within the broader goals of the class.
<p style="text-align: center;">Support with Figures/Tables</p>	<ul style="list-style-type: none"> ○ Missing most or all data for variant and/or control(s). ○ Figures are missing or too difficult to interpret and/or units are absent ○ Tables are missing or too difficult to interpret and/or units are absent ○ Figures/tables lack captions and/or informative titles. ○ Figures/tables are embedded within the paragraphs. 	<ul style="list-style-type: none"> ○ Includes data for variant and control(s), but is missing some conditions tested. ○ Figure data may be difficult to see due to style choices (color/size) or inappropriate axes ranges; May be improved with minor changes. ○ Tables have insufficient organization for their size/complexity; Units are present and appropriate. ○ Figure/table captions are present, but incomplete or includes details/analysis that should be in the text; Titles are present but uninformative. ○ Figures/tables appear after the text, but in a disorganized manner 	<ul style="list-style-type: none"> ○ Includes all data sets collected for the variant and control(s) under all conditions tested. ○ Figures are relevant, clear, have distinguishable data sets, and appropriately sized texts and symbols; Axes have appropriate ranges and units. ○ Tables are organized to clearly relate data; Units are present and appropriate. ○ Each figure/table has a separate descriptive, informative title (i.e. not just “Figure 1”) <u>and</u> caption that is concise and fully describes the data presented without analysis. ○ Figures/tables appear after all paragraphs in an organized manner.
	<p>Unsatisfactory</p>	<p>Satisfactory</p>	<p>Excellent</p>

<i>Global criteria</i>			
	Unsatisfactory	Satisfactory	Excellent
Analysis and contextualization	<ul style="list-style-type: none"> ○ Analysis frequently lacks a clear logical connection to previous ideas. ○ Most points need further explanation or support; lack of contextualization impedes readers' understanding. ○ Discussion of key ideas is missing or contains major inaccuracies. ○ Extraneous or inaccurate material is frequently used to support arguments; key concepts are missing. 	<ul style="list-style-type: none"> ○ Logical reasoning is generally explicit and sound but fails to extend ideas beyond what is presented in class. ○ Analysis is generally clear, but may often benefit from further support, explanation, or contextualization ○ Most concepts are addressed, but some key ideas are discussed superficially or with minor inaccuracies. ○ Supporting statements are incomplete or contain extraneous material not relevant to the argument being made. 	<ul style="list-style-type: none"> ○ Logical reasoning extends ideas presented in class in an original way. ○ Each point is fully explained, supported, and contextualized as appropriate for audience who is scientifically literate but not expert in biophysics. ○ All key concepts are fully addressed ○ Supporting statements are connected to the main ideas of the paragraph and overall piece without extraneous material.
Coherence	<ul style="list-style-type: none"> ○ Order of ideas within paragraphs is jumbled or illogical to the point that it obscures the overall argument. ○ Transitions within or between paragraphs are very weak or absent; abrupt changes in topic/focus. ○ Ideas often repeat or may contradict information found elsewhere in the text. 	<ul style="list-style-type: none"> ○ Overall organization is present, but the argument(s) could be improved by minor reordering. ○ Transitions within or between paragraphs are present, but may be rough. ○ Ideas generally build on each other with only minor repetition or gaps. 	<ul style="list-style-type: none"> ○ Logical order of ideas within and between paragraphs where each idea flows naturally into the next. ○ Graceful transitions within and between paragraphs. ○ Ideas build on each other without repetition or gaps.
Style and mechanics	<ul style="list-style-type: none"> ○ Numerous spelling or grammar errors suggesting no proofreading was done. ○ Frequent awkward sentence construction or word choice impedes readers' comprehension. ○ Goes over or vastly under word limit ○ Does not follow instructions for formatting or is missing required components of assignment as outlined in assignment sheet. 	<ul style="list-style-type: none"> ○ May contain a few minor spelling or grammar errors ○ Writing is generally clear and easy to understand, but contains awkward phrases or wording. ○ Over/under the word limit by 10%. ○ Meets word count, formatting, and other requirements outlined in assignment sheet. 	<ul style="list-style-type: none"> ○ No spelling or grammar errors. ○ Writing demonstrates exceptional clarity and precision of language. ○ Meets formatting and other requirements outlined in assignment sheet; assignment appears polished. ○ Meets word limit of assignment