

PEBL Conceptual Question instructions, prompts, and rubric

Conceptual Questions are weekly, low-stakes (informal) short-answer responses that you will complete prior to coming to lab. They are designed to encourage broader conceptual thinking and reflective inquiry by compelling you to consider connections between the material you study, the experiments you perform, and the big ideas and big questions inherent to the course. In other words, answering Conceptual Questions requires you to take a step back, contemplate potential implications of the week's content, and crystallize your own thinking in writing.

To this end, many Conceptual Questions do not have “right” or “wrong” answers, and instead, invite reasonable speculation. Some will probe the ethical consequences of current scientific debates and ask for concise, thoughtful analysis. Others will test your comprehension of material by asking you to summarize salient components of diverse sources.

Grades for Conceptual Question are binary: for each question, you will receive a grade of Unsatisfactory or Satisfactory (0% or 100%) with no partial credit given. While it is a baseline expectation that your sentences will be clear and free of grammatical errors, the focus is not on your prose; rather, it is on the coherence, creativity, and ambition of your ideas and the higher-order thinking inherent to them. Make no mistake: thinking deeply about and answering these questions (in writing) will help you to hone the skills necessary to produce successful Long Assignments this semester, and beyond.

Steps:

1. Compose your answer or response in clear, economical prose of no more than 5 sentences
2. Prior to midnight before class, make a discussion post to your colleagues regarding one of the CQs.
3. Prior to class, reply to TWO of the discussion posts from your peers.
4. Prior to class, upload all of your responses to the CQs to Gradescope.
5. Come to class prepared to share and discuss with your colleagues.

Tips for writing

The first set of CQs may seem difficult because you might not have any idea how to go about writing in “economical prose”. Here are some tips that should help you get started.

- o Try to break down the question to find the parts then work out from there
- o Stick to one idea/theme
- o Keep it simple and concise; avoid run-on sentences
- o Every word you include should have a purpose

Example

Question: “The hydrophobic effect is often described as an entropy-drive force. Explain.”

To break this question down, consider “what is the hydrophobic effect” and “what is entropy”. From there try to find the relationship between the concepts.

The unsatisfactory answer never truly addresses the question, includes unnecessary statements, and uses unsound logic. It is unclear if the student understands the ideas of entropy and the hydrophobic effect and is unable to make the connection between the concepts.

The satisfactory answer is informative, addresses relevant and interesting points, and links the statements in a logical order to build to the conclusion. It is clear that the student understands the concepts at a deep level and how they connect to each other.

As the name implies, the hydrophobic effect involves the fear of water.

This is cyclical reasoning and simply restating the question without adding substance.

An entropy-driven force is a force

that is driven by entropy, which the hydrophobic effect can be.

Water is made of many water molecules

This serves no purpose and adds nothing to the answer.

Because water has entropy,

This is poor and unsound logic. The question is never answered and it is unclear if the student understands the concepts.

the fear of water will also be the fear of entropy. Therefore, the

hydrophobic effect is entropy-driven.

This is informative and extends the issue. It offers a good explanation of the hydrophobic effect.

The hydrophobic effect is responsible for the formation of oil drops in water and for the collapse of

proteins into compact states. It leads to the association of nonpolar atoms when they are in the presence of water.

Further adding substance to the explanation by raising an interesting point.

In this sense it is an organizing force, thus it would seem paradoxical to refer to the hydrophobic effect as an

entropy-driven force.

However, the association of non-polar atoms also minimizes the organization of water on the surface of the non-

polar atoms.

This offers a physical reasoning demonstrating understanding of the link between the concepts.

This is tantamount to maximizing the entropy of water and for this reason, the hydrophobic

effect is described as an entropy-driven force.

The final conclusion here rests on solid logic built from the earlier statements.

We will not have time to discuss all of the questions and responses during class so we will be making use of the discussion boards. To start the conversations and collect feedback, select one of the questions and share your initial response on the discussion board before the day of class. This allows time for others to read and comment on your post (as you will do for other students' responses) before class begins. Some things you might consider commenting on for your replies include the word usage and choices, the connectivity and flow of ideas, and relevance to the original question. Providing constructive feedback for someone else's work is also beneficial to your own writing ability.

Submit a file (.doc, .docx, .pdf, .rtf, or .txt) with your final answers to the following questions to Gradescope prior to the start of class to be graded.

Conceptual Questions for Lab #2

- QUESTION #1: When proteins are first made in the cell they are extended, unfolded, fully hydrated chains but fold into the 3-D shapes you see in their crystal structures. In water-soluble proteins, hydrophobic and charged side chains tend to partition differently. Using what you have learned about the characteristics of the different amino acids in Meeting #1, suggest an explanation for this observation.
- QUESTION #2: How might crystal structures of proteins improve our understanding of living systems?
- QUESTION #3: Millions of dollars are being invested in sequencing the complete genomes of thousands of organisms. How might these data benefit humankind?

	Satisfactory	Unsatisfactory
Analysis	<ul style="list-style-type: none"> ○ Logical reasoning is explicit and sound ○ Addresses the entire question posed 	<ul style="list-style-type: none"> ○ Answers lack clear logic or logic is unsound ○ Answer may not address the entire question
Coherence	<ul style="list-style-type: none"> ○ Each sentence flows naturally into the next ○ Every point relates to those around it and contributes to the overall meaning of the paragraph 	<ul style="list-style-type: none"> ○ Points are presented in a jumbled or illogical order ○ A lack of transitions between ideas makes it hard to see how points are connected to each other or the overall purpose of the paragraph
Clarity	<ul style="list-style-type: none"> ○ Grammar and syntax facilitate reader's comprehension 	<ul style="list-style-type: none"> ○ Spelling, grammar errors, and/or awkward sentence construction impedes reader's comprehension
Other	<ul style="list-style-type: none"> ○ Meets length requirements (5 sentences or fewer) 	<ul style="list-style-type: none"> ○ Exceeds length requirements (more than 5 sentences)
Overall mark	SATISFACTORY	UNSATISFACTORY