

<b>Rubric for exam/lab/homework questions on cellular or organismal processes.</b>		<b>Most questions will have have an "Identify" component and then focus in on one of the other three dimentions for a follow-up question.</b>				
<b>Example processes from Biobonds: DNA synthesis, protein synthesis, steps of mitosis or meiosis, steps of cell cycle, steps of cellular respiration, steps of blood sugar regulation</b>						
<b>Discipline specific critical thinking goals</b>	<b>Brief example/explanation of type of question this dimention would be applied to.</b>	<b>CT dimention</b>	<b>Accomplished</b>	<b>Proficient</b>	<b>Developing</b>	<b>Beginning</b>
Students understand sequences of events that happen at the cellular and/or organismal level in the human body. Students need to be able to use relevant vocabulary and explain the process at a level of detail that is appropriate to the question.	<b>Student describes or illustrates steps in any of the processes above. More challenging questions may involve transfer, for example describing steps of protein synthesis, modification, and transport for a protein they are given information about but haven't worked with before.</b>	<b>Identify</b> the steps in the sequence. CT is needed when transferring/adapting to a new situation based on work w/ similar (but not identical examples).	Clearly, accurately, and appropriately describes the sequence of events that is a part of the target process. Uses scientific vocabulary and a level of detail that suggests a sophisticated and complete understanding of the process.	Appropriately identifies a sequence of events within the target process. Minor inaccuracies or omissions may be present, but do not interfere with meaning. Uses scientific vocabulary and a level of detail that is generally appropriate.	Identifies some of the sequence of events needed for the target process, but there are major omissions or inaccuracies. Some scientific vocabulary is used appropriately. Detail may be lacking in some areas.	May attempt to identify a few of the events from the target process and/or may identify events from different area biology. Scientific vocabulary is attempted; may not be accurately employed; major details are overlooked.
Students can explain how and why one step leads to the next in the target process. Students correctly identify assumptions and limits of the process itself (and/or of their explanation of the process). Students can describe assumptions about conditions needed in the body for the target process to occur.	<b>Students would describe the process of mitosis in part 1 (evaluated / dimention 1 of "Identify"). Student must explain why metaphase must precede anaphase in mitosis (chromosomes wouldn't be organized enough to split evenly). Assumptions would be about resources needed for cells that divide, types of cells that divide, etc.</b>	<b>Analyze</b> why one step leads to the next. Consider context of sequence and analyze for assumptions about the body or other interacting processes.	Clearly, accurately, and logically explains how and why one step leads to the next. Can correctly identify several reasonable, relevant, likely assumptions about conditions needed in the body for the target process to occur.	An appropriate and generally logical explanation of how and/or why one step leads to the next is given. Minor inaccuracies or omissions may be present, but do not interfere with representing a general understanding. Can identify some reasonable assumptions about the conditions needed in the body for the target process to occur, but these may not be the most likely or relevant ideas.	Provides some logic for how and/or why one step leads to the next. There may be gaps in the explanation or minor misinterpretations. Identifies a few assumptions about the conditions needed in the body for the target process to occur, but ideas are a brainstorm of possible, unlikely and/or irrelevant ideas.	Provides limited logic about how/why one step leads to the next, making the analysis incomplete. There are major inaccuracies in the explanation. Offers limited likely or relevant assumptions about the conditions needed in the body for the target process to occur.
Students need to understand the context of these sequences of events or processes. How often or seldom does this process occur? Does it happen in some or all cells? What other processes in the body are connected to this process?	<b>Students would describe the process of producing a protein (insulin) in part 1 (evaluated w/ dimention 1 "Identify"). A follow-up question would ask what would happen to the body when this protein is produced. Students would most likely focus on the role of insulin in blood sugar regulation, discussing how some cells respond insulin signal by mobilizing Glut-4 proteins to increase uptake of blood glucose lowering blood sugar. Alternate questions could also be about which cells are doing the producing of insulin (beta-cells of pancreas, not all cells) and when the process is going on (responds to high blood sugar).</b>	<b>Contextualize</b> the process. Consider interactions and the size and scale of the process.	Clearly, accurately, and comprehensively describes connections from the target process in cell or organismal physiology to other cellular and organismal level processes. Can logically explain where, when, how fast and how frequently this process occurs in the body.	Describes major connections from the target process in cell or organismal physiology to other cellular and organismal level processes. Can suggest where, when, how fast and how frequently this process occurs in the body.	Describes at least one connection from the target process in cell or organismal physiology to other cellular and organismal level processes. There may be gaps in the explanation or minor misinterpretations. Provides suggestions, some of which may be unlikely or irrelevant, of where, when, how fast and how frequently this process occurs in the body.	No connections from the target process in cell or organismal physiology to other cellular and organismal level processes are made. Offers limited likely or relevant assumptions about where, when, how fast and how frequently this process occurs in the body are relevant.
Students need to logically explain how deviations from the process impact the body. Pathology draws heavily from understanding (or hypothesizing) the conditions in the body from errors in the major cell biology processes. Solutions (cures) can be proposed to address the breakdown in the process and/or reduce its impacts.	<b>Students would describe the process of producing a protein (insulin) in part 1 (evaluated w/ dimention 1 "Identify"). A follow-up question would ask what would happen to the body when this protein is not produced. Students would most likely focus on the role of insulin in blood sugar regulation, discussing how some cells respond insulin signal by mobilizing Glut-4 proteins to increase uptake of blood glucose lowering blood sugar and without this signal blood sugar would remain high. A potential solution would be to use synthetic insulin in the blood to replace the missing signal, students may also be thinking about genes being the instructions for proteins and propose/consider the gene therapy and its challenges (many of which involve uncertainty).</b>	<b>Solve problems</b> when there is a deviation from the steps. Hypothesize solutions (cures) to changes in the sequence resulting in disease.	Clearly, accurately, and with relevant detail, describes the result(s) of deviation from steps in target process (pathology). Reasoning for result is logical, complete and correct. Appropriate possibilities for multiple or alternate results are acknowledged. Assessment for uncertainty of result(s) and consequences of result are appropriately evaluated. Solutions to address the breakdown in the process and/or reduce its impacts (may be therapies/cures) are detailed, well-reasoned, and may be creative or unique.	Demonstrates a general understanding of major result(s) of deviation from steps in target process (pathology). Minor inaccuracies or omissions may be present, but do not interfere with meaning. Reasoning for result is logical and generally correct. Possibilities for alternate plausible results may be acknowledged. Assessment of uncertainty of result(s) and consequences of result are thoughtful. Solutions to address the breakdown in the process and/or reduce its impacts (may be therapies/cures) seem possible.	Describes the basic result(s) of deviation from steps in target process (pathology), but there are major omissions or inaccuracies. Reasoning for result is incomplete. Possibilities for alternate plausible results aren't fully considered. Assessment of uncertainty of result(s) and consequences of result include possible, unlikely and/or irrelevant ideas. Solutions to address the breakdown in the process and/or reduce its impacts (may be therapies/cures) are unlikely but are related to the target process.	Results of deviation from steps in target process (pathology) are not understood. Reasoning for result is absent. Possible alternate results aren't considered. Assessment of uncertainty of result(s) and consequences of result is incomplete. Solutions to address the breakdown in the process and/or reduce its impacts (may be therapies/cures) aren't plausible.