



CARROT: ANSWER

Answering the Question

If your grades aren't high even though you're attending class, paying attention and doing your homework, you may be having trouble answering the questions presented to you during tests. Getting good grades is dependent on your ability to correctly retrieve and communicate what you have learned.

Pressure, stress and information overload can lead you down the wrong path during a test. Taking a minute to understand exactly what is being asked can go a long way towards getting the question right.

The following explanation is based on information provided by the Department of Biology at the University of Wisconsin in La Crosse, Wis. I think it gives an excellent overview of how to interpret test questions. Don't worry if you don't drink beer or know anything about fermentation, pay attention to how to decipher the question.

The Question:

Your roommate decides to try his hand at home-brewing beer. He adds baker's yeast, malt, hops, and sugar into a gallon of water. He then puts this mix into a gallon bucket without a lid. You wait to see if he will cover the bucket, but he leaves the mixture exposed to the air. "You know you'll never get any alcohol or carbonation produced like that," you advise your roommate.

"What do you mean?" He replies. "I've got the right proportions of yeast and sugar. It should start fermenting any time now." Help your roommate, and explain why he will not get enough fermentation to produce alcohol and carbonation.

Step One: Figure out what is being asked:

When reviewing the question you will need to separate what is useful from what is not useful. In this question the professor highlights a detail that is probably useful:

“He then puts this mix into a gallon bucket without a lid. You wait to see if he will cover the bucket, but he leaves the mixture exposed to the air.”

The professor makes a big deal out of this lid thing so the answer probably has something to do with the lid. He does not outline the specific measurements of the ingredients which means the answer probably does not have anything to do with the mixture itself. In fact, the professor calls attention to this by including the roommate’s line, “I’ve got the right proportions of yeast and sugar.” Note he didn’t reiterate the other ingredients including malt and hops. The answer is probably not about these two ingredients.

The last sentence tells you what you are supposed to do. You will need to explain why the mixture will not ferment sufficiently. To do this you will need to let the professor know that you learned something about fermentation and aerobic metabolism and can explain why alcohol and CO₂ will not be produced.

Your two clues on how to answer the question are:

1. It has something to do with the exposure to the air (no lid)
2. It has something to do with yeast and sugar

The remainder of the question is filler. Do not be distracted by extraneous details such as the measurements or the malt and hops.

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Step Two: Outline your answer

For me, the *most important part* of answering the question and providing the right answer is the outline. An outline ensures you have your thoughts organized and an outline works for a short answer test, a long term paper, a multiple choice test or any kind of test in any kind of subject.

If you don't know how to outline then find someone who can show you. I learned from a tutor in high school that my parents hired to help me make better grades. I learned to outline, but I largely ignored the advice so it didn't help me improve my grades- if only I had listened! I did use the technique to prepare for a history test my sophomore year- I got the *highest* grade in the class on the test. I didn't attribute my success to the outlining process, but I should have. I got lazy and ignored outlining until I rediscovered its value years later. Even today my work is much better when I prepare a quick outline before I start the work. A good outline will make your work easier, faster and better.

Using the important points from your breakdown in Step One, apply what you know about the topic and make an outline.

A possible outline for your answer:

- The yeast and the sugar ferment
- Yeast are facultatively anaerobic (which means they don't use air).
- Bucket left open to air (oops!).
- With oxygen (O₂) present (air) yeast will do electron transport.
- Alcohol & CO₂ are only produced under anaerobic conditions.

Step Three: Write out your answer

Now that you have a nice outline for your answer, explaining it will be a breeze. Many people spend all their time writing and no time thinking and outlining. This leads them to create long, irrelevant “answers” that are, in fact, not an answer at all. Here are some sample good and bad answers based on the outline we created. Unless you have taken chemistry or biology you may find terms in the answers you don’t understand. That’s okay. This isn’t a science lesson, it’s a question-answering lesson.

Good and Bad Answer Sample One:

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| <p>A Good Answer</p> <p>Yeast are facultatively anaerobic which means that they perform fermentation only under anaerobic conditions. In the presence of O_2, the yeast will perform aerobic metabolism. The roommate has left the bucket open to the air, so the yeast will have access to a continuous supply of O_2. With O_2, the yeast will replenish their NAD^+ through electron transport in the mitochondria. Alcohol and CO_2 (which produces carbonation) are produced by the fermentation pathway which occurs significantly only in the absence of O_2.</p> | <p>A Bad Answer</p> <p>Yeast are facultatively anaerobic which means that they perform fermentation only under anaerobic conditions. Certain bacteria are obligately anaerobic and can exist only in O_2-free circumstances. In contrast, many organisms can only survive in aerobic conditions. Humans need O_2 to survive, but their cells can utilize fermentation when O_2 levels are low. In the presence of O_2, the yeast will perform aerobic metabolism. The roommate has left the bucket open to the air, so the yeast will have access to a continuous supply of O_2. With O_2, the yeast will replenish their NAD^+ through electron transport in the mitochondria. In the mitochondria, even more NAD^+ are converted to $NADH$ by the TCA cycle. However, all these $NADH$, including those from glycolysis, will be converted back to NAD^+ when they donate their electrons to the electron transport chain. The electron transport chain pumps H^+ across the mitochondrial inner membrane to create a H^+ gradient. This proton gradient is then used to make ATP energy. Because yeast only produce alcohol and CO_2 (which produces carbonation) through the fermentation pathway, the presence of O_2 will prevent any build up of either alcohol or CO_2.</p> |
| <p>What Makes This a Good Answer</p> <ul style="list-style-type: none"> • Irrelevant information is left out. • The key points are clearly stated in the | <p>What Makes This a Bad Answer</p> <ul style="list-style-type: none"> • A lot of the information is extraneous. The question is about yeast only and fermentation only. |

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| <p>first two sentences.</p> | <ul style="list-style-type: none">• Much of the pertinent information is buried between two large sections of irrelevant information. |
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Good and Bad Answer Sample Two:

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| <p>A Good Answer</p> <p>Yeast are facultatively anaerobic which means that they perform fermentation only under anaerobic conditions. In the presence of O_2, the yeast will perform aerobic metabolism. The roommate has left the bucket open to the air, so the yeast will have access to a continuous supply of O_2. With O_2, the yeast will replenish their NAD^+ through electron transport in the mitochondria. Alcohol and CO_2 (which produces carbonation) are produced by the fermentation pathway which occurs significantly only in the absence of O_2.</p> | <p>A Bad Answer</p> <p>Yeast can choose between using oxygen and not using oxygen. They will ferment stuff (1) only when there is not enough oxygen around. In the presence of O_2, the yeast want to use the oxygen (2), so they do. The roommate has left the bucket open to the air, so the yeast will have access to a continuous supply of O_2. With O_2, the yeast will do what they need to do without making alcohol and carbonation. Alcohol and carbonation are produced by the pathway that does not require O_2, and this obviously only occurs significantly in the absence of O_2.</p> |
| <p>What Makes This a Good Answer</p> <ul style="list-style-type: none"> • The appropriate technical terms (highlighted) are used when pertinent. | <p>What Makes This a Bad Answer</p> <ul style="list-style-type: none"> • A lack of scientific terms makes the answer less clear. • Use of slang. • Teleology and anthropomorphism. |

Good and Bad Answer Sample Three:

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| <p>A Good Answer</p> <p>Yeast are facultatively anaerobic which means that they perform fermentation only under anaerobic conditions. In the presence of O_2, the yeast will perform aerobic metabolism. The roommate has left the bucket open to the air, so the yeast will have access to a continuous supply of O_2. With O_2, the yeast will replenish their NAD^+ through electron transport in the mitochondria. Alcohol and CO_2 (which produces carbonation) are produced by the fermentation pathway which occurs significantly only in the absence of O_2.</p> | <p>A Bad Answer</p> <p>Yeast are facultatively anaerobic which means that they perform fermentation only under anaerobic conditions. In the presence of O_2, the yeast will perform aerobic metabolism. With O_2, the yeast will replenish their NAD^+ through electron transport in the mitochondria. Alcohol and CO_2 (which produces carbonation) are produced by the fermentation pathway which occurs significantly only in the absence of O_2.</p> |
| <p>What Makes This a Good Answer</p> <p>Cause and effect relationships are made obvious by the sentence.</p> | <p>What Makes This a Bad Answer</p> <p>Without the sentence about the bucket, the answer does not attempt to solve the problem outlined by the question. Without this sentence, you would have explained facultative anaerobic metabolism, but would not have demonstrated that you could use this knowledge in a practical setting to answer the question.</p> |

Good and Bad Answer Sample Four:

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| <p>A Good Answer</p> <p>Yeast are facultatively anaerobic which means that they perform fermentation only under anaerobic conditions. In the presence of O_2, the yeast will perform aerobic metabolism. The roommate has left the bucket open to the air, so the yeast will have access to a continuous supply of O_2. With O_2, the yeast will replenish their NAD^+ through electron transport in the mitochondria. Alcohol and CO_2 (which produces carbonation) are produced by the fermentation pathway which occurs significantly only in the absence of O_2.</p> | <p>A Bad Answer</p> <p>Yeast are facultatively anaerobic which means that they perform fermentation only under anaerobic conditions. Certain bacteria are obligately anaerobic and can exist only in O_2-free circumstances. In contrast, many organisms can only survive in aerobic conditions. Humans need O_2 to survive, but their cells can utilize fermentation when O_2 levels are low.</p> |
| <p>What Makes This a Good Answer</p> <p>It addresses the question.</p> | <p>What Makes This a Bad Answer</p> <p>It addresses a different question.</p> <p>The answer above could be considered a good answer to a question which asks you to compare different organisms that use different types of metabolism. However, it is a poor answer to the question that was asked.</p> |

Good and Bad Answer Sample Five:

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| <p>A Good Answer</p> <p>Yeast are facultatively anaerobic which means that they perform fermentation only under anaerobic conditions. In the presence of O₂, the yeast will perform aerobic metabolism. The roommate has left the bucket open to the air, so the yeast will have access to a continuous supply of O₂. With O₂, the yeast will replenish their NAD⁺ through electron transport in the mitochondria. Yeast perform the following reaction only in anaerobic conditions.</p> $\text{pyruvate} + \text{NADH} \rightarrow \text{ethanol} + \text{CO}_2 + \text{NAD}^+$ | <p>A Bad Answer</p> $\text{pyruvate} + \text{NADH} \rightarrow \text{ethanol} + \text{CO}_2 + \text{NAD}^+$ |
| <p>What Makes This a Good Answer</p> <ul style="list-style-type: none"> • It uses a diagram to convey information. • There is adequate text to address the question. | <p>What Makes This a Bad Answer</p> <ul style="list-style-type: none"> • There is only a diagram without any explanation of how it relates to the question. • The instructor is left wondering if you know how this relates to the question. |