

Question 5: Analyze Model or Visual Representation of a Biological Concept or Process

4 points

Figure 1 shows the reactions of the metabolic pathway used to synthesize amino acid B from amino acid A in cells.

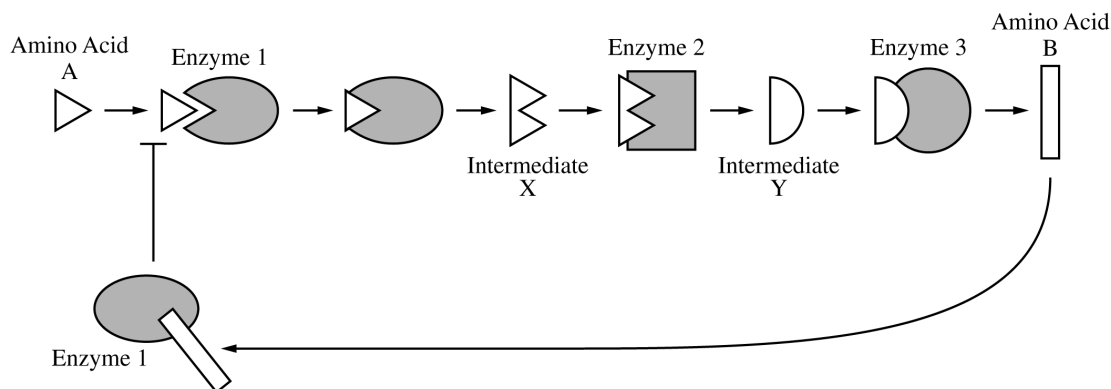


Figure 1. Synthesis of amino acid B from amino acid A

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| A | <p>Describe a characteristic of an enzyme's active site that allows it to catalyze a specific chemical reaction.</p> <p>Examples of acceptable responses may include the following:</p> <ul style="list-style-type: none"> • (The active site) is able to bind to a (specific) <u>substrate/amino acid</u>. • The <u>shape/charge</u> of the active site of an enzyme is compatible with a (specific) <u>substrate/amino acid</u>. • (The active site) positions the <u>substrate/amino acid</u> in a way that makes the reaction more likely. • Induced fit stresses bonds so that a reaction is more likely to occur. | 1 point |
| B | <p>Based on Figure 1, explain how the binding of amino acid A to enzyme 1 is regulated by amino acid B.</p> <p>Examples of acceptable responses may include the following:</p> <ul style="list-style-type: none"> • Amino acid B inhibits the binding of amino acid A to enzyme 1. • Amino acid B binds to an allosteric site of enzyme 1 and prevents amino acid A from binding to enzyme 1. • The binding of amino acid B causes the enzyme to change shape and prevents amino acid A from binding to enzyme 1. | 1 point |
| C | <p>Using the information in Figure 1, identify the product of the reaction catalyzed by enzyme 2: intermediate X, intermediate Y, or amino acid B.</p> <ul style="list-style-type: none"> • (Intermediate) Y | 1 point |
| D | <p>Based on Figure 1, explain how a change in pH could affect enzyme 3 in such a way that amino acid B cannot be produced.</p> <p>Examples of acceptable responses may include the following:</p> <ul style="list-style-type: none"> • (A change in pH) could change the <u>structure/active site/enzyme</u> so that <u>intermediate Y/the substrate</u> cannot bind. • (A change in pH) could denature (enzyme 3) so that <u>intermediate Y/the substrate</u> cannot bind. | 1 point |