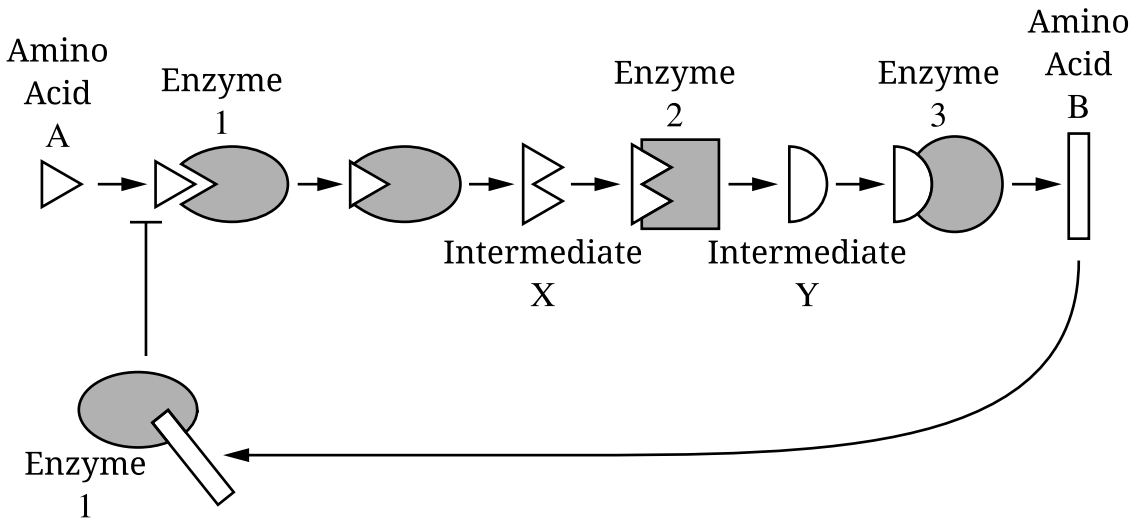
5. Figure 1 shows the reactions of the metabolic pathway used to synthesize amino acid B from amino acid A in cells.

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



A. **Describe** a characteristic of an enzyme's active site that allows it to catalyze a specific chemical reaction.

B. Based on Figure 1, **explain** how the binding of amino acid A to enzyme 1 is regulated by amino acid B.

C. Using the information in Figure 1, **identify** the product of the reaction catalyzed by enzyme 2: intermediate X, intermediate Y, or amino acid B.

D. 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.

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.

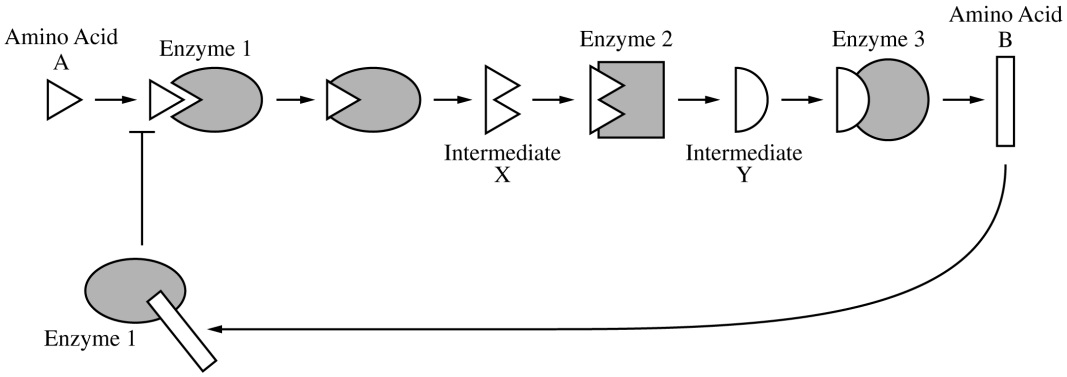


Figure 1. Synthesis of amino acid B from amino acid A

A	**Describe** a characteristic of an enzyme's active site that allows it to catalyze a specific chemical reaction. Examples of acceptable responses may include the following: • (The active site) is able to bind to a (specific) substrate/amino acid. • The shape/charge of the active site of an enzyme is compatible with a (specific) substrate/amino acid. • (The active site) positions the substrate/amino acid 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	Based on Figure 1, **explain** how the binding of amino acid A to enzyme 1 is regulated by amino acid B. Examples of acceptable responses may include the following: • 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	Using the information in Figure 1, **identify** the product of the reaction catalyzed by enzyme 2: intermediate X, intermediate Y, or amino acid B. • (Intermediate) Y	**1 point**
D	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. Examples of acceptable responses may include the following: • (A change in pH) could change the structure/active site/enzyme so that intermediate Y/the substrate cannot bind. • (A change in pH) could denature (enzyme 3) so that intermediate Y/the substrate cannot bind.	**1 point**