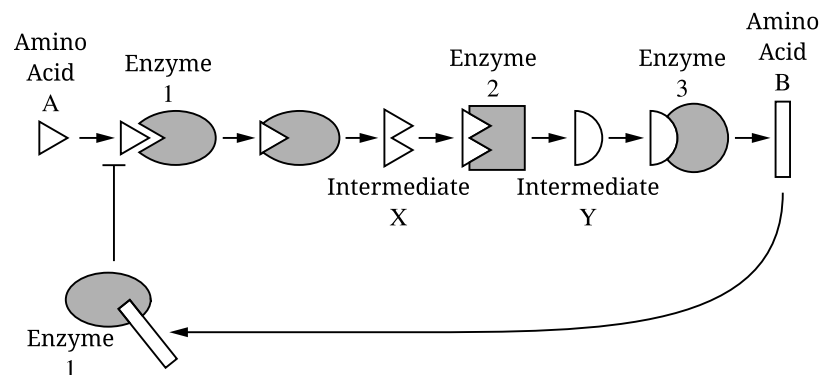


5. Figure 1 shows the reactions of the metabolic pathway used to synthesize amino acid B from amino acid A in cells.

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.

3. Fireflies emit light when the enzyme luciferase catalyzes a reaction in which its substrate, D-luciferin, reacts to form oxyluciferin and other products (Figure 1). In order to determine the optimal temperature for this enzyme, scientists added ATP to a solution containing D-luciferin, luciferase, and other substances needed for the reaction. They then measured the amount of light emitted during the first three seconds of the reaction when it was carried out at different temperatures.

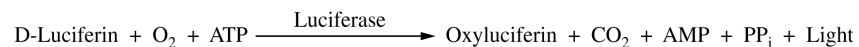


Figure 1. Light is emitted as a result of the reaction catalyzed by luciferase.

- (a) **Describe** a characteristic of the luciferase enzyme that allows it to catalyze the reaction.
- (b) **Identify** the dependent variable in the experiment.
- (c) **State** the null hypothesis for the experiment.
- (d) A student claims that, as temperature increases, there will be an increase in the amount of light given off by the reaction in the first three seconds. **Support** the student's claim.

Write your responses to this question only on the designated pages in the separate Free Response booklet.