

In general, enzymes are protein molecules which must be folded in a specific three-dimensional shape in order to function properly. Certain environmental parameters can affect enzyme activity, including pH and temperature. If an enzyme's shape changes significantly and it can no longer function, the enzyme is said to have become denatured.

The enzyme pancreatic amylase is manufactured and secreted by the pancreas into the duodenum (the large, beginning portion of the small intestine). Pancreatic amylase breaks down starch into maltose, a disaccharide. Pepsin is an enzyme that is released by the epithelium of the stomach, and functions in the stomach to break down proteins into smaller polypeptide units. The following graphs show the activities of various enzymes under various environmental conditions.

Figure 1

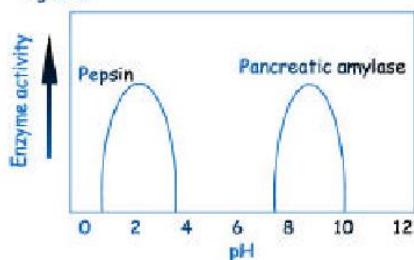
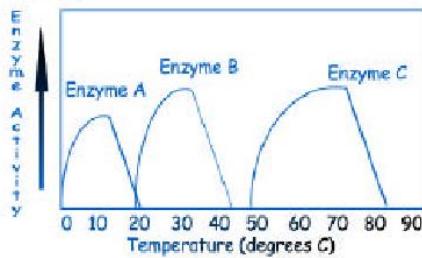


Figure 2



Circle the letters of the statements that are true for the next two questions

- 1) Which of the following statements is true with respect to Figure 1?
 - a) Pepsin and pancreatic amylase could never function together in the same part of the body at the same time.
 - b) Pancreatic amylase could function in the stomach, but its activity would be low.
 - c) The optimum pH for the functioning of pepsin is approximately 8.5.
 - d) Normally, the small intestine must be slightly acidic.

- 2) Trypsin is a protein digesting enzyme that functions in the small intestine. Which of the following statements should be true about trypsin?
 - a) The optimum pH for the functioning of trypsin is approximately 2.
 - b) Both trypsin and pepsin would be expected to be found working together in the same part of the body.
 - c) The optimum pH for the functioning of trypsin is approximately 8.5.
 - d) Trypsin could function well in a solution containing 1 molar hydrochloric acid.

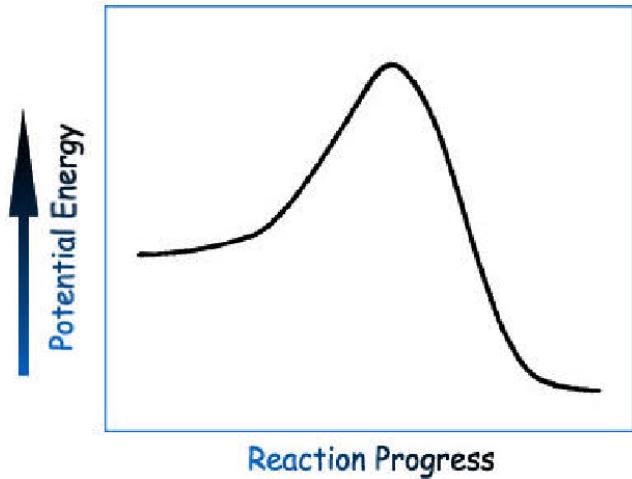
- 3) Figure 2 depicts the activities of three enzymes. Which curve illustrates the functioning of human DNA polymerase, which functions in the nucleus of cells?
 - a) Enzyme A
 - b) Enzyme B
 - c) Enzyme C
 - d) None of the above could represent the activity of human DNA polymerase.

- 4) Which curve illustrates the functioning of DNA polymerase from a shark?
 - a) Enzyme A
 - b) Enzyme B
 - c) Enzyme C
 - d) None of the above, since sharks, like all fish, do not contain DNA polymerase.

- 5) At what temperature would enzyme B be completely denatured?
- 37°C
 - 15°C
 - 5°C
 - 50°C

Part B: Energy

- 1) The following graph depicts the relationship between the potential energy of reaction and reaction progress:



- Draw the path that the reaction would follow in the presence of a catalyst.
- Label the activation energy, E_a of both the catalyzed reaction and the uncatalyzed reaction.