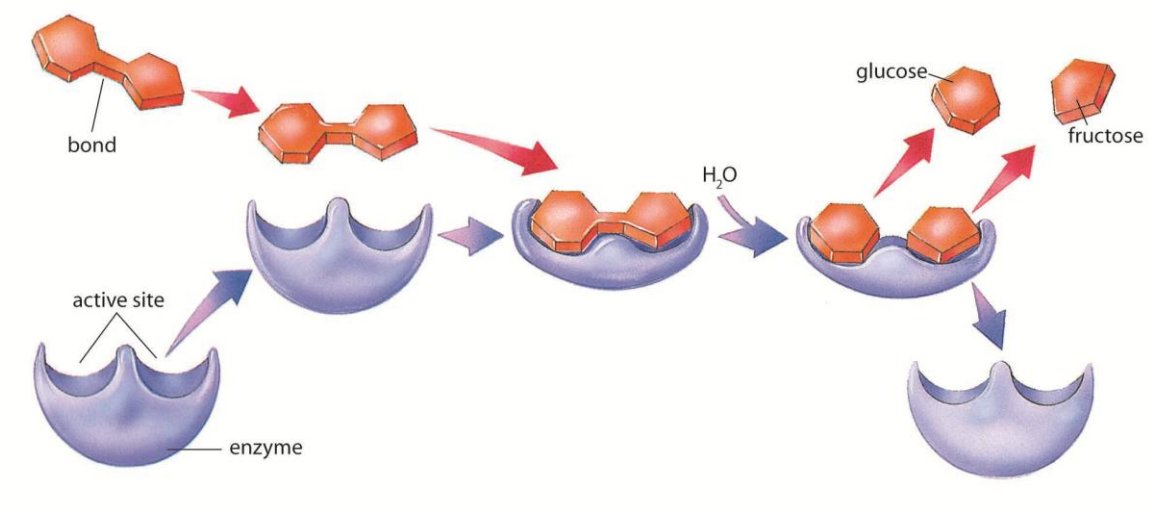
DATE: NAME: CLASS:

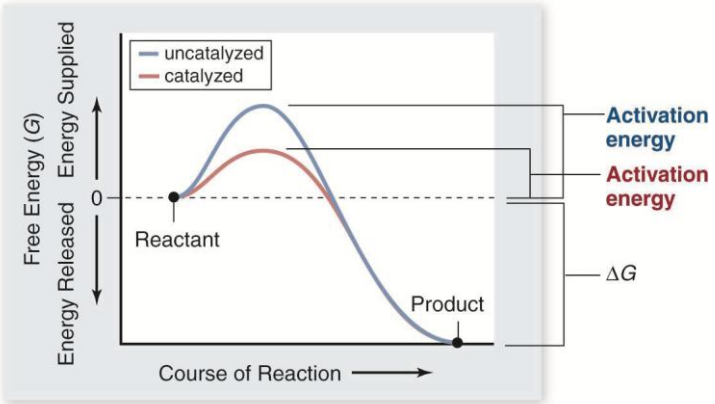
CHAPTER 5 HANDOUT	Enzyme-Catalyzed Reactions	BLM 5-4 ANSWERS

1. Explain the enzymatic reaction in the diagram below:



In this enzyme-catalyzed reaction, the disaccharide sucrose is broken down into glucose and fructose. For this to occur, the active site of sucrose has a very specific shape and size for the enzyme (ie. lock and key model of induced fit model). The enzyme speeds up the reaction by lowering the activation energy.

2. Using the diagram below, explain how enzymes speed up the reaction rate.



Enzymes speed up the rate of a reaction because they lower the amount of energy required. In the diagram above, the activation energy for the uncatalyzed reaction is too high to occur on its own. Therefore, in the presence of an enzyme, the lower activation energy will allow the reaction to take place.

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3. Explain the role of cofactors and coenzymes in enzyme reactions.

Cofactors are inorganic ions, such as zinc, copper and iron metals, that are required by some enzymes to catalyze a reaction. Coenzymes are organic, nonprotein molecules that may accept or contribute atoms to the chemical reaction. Vitamins are often components of the coenzymes. Trace amounts of the metals and vitamins are found in the diet. Deficiencies in the trace metals or vitamins can cause illnesses. For example, a deficiency in riboflavin results in cracks in the corner of the mouth.

4. How does temperature affect reaction rates?

As the temperature increases, the reaction rate increases as more effective collision occur between the enzyme and substrate. However, after a certain temperature, the enzyme will no longer be active as it denatures. At this point, the reaction rate decrease and will eventually become zero as the secondary and tertiary structure of the proteins have changed, making the active sites incompatible.

5. How does pH affect reaction rates?

Enzymes have a preferred pH range. At the preferred pH, the enzyme maintains it's shape and bind with its substrate. A change in pH can alter the bonding between the *R*-groups of the protein. In extreme conditions, the protein becomes denatured. For example, the optimal pH range for trypsin is pH6-10. Outside of this pH, the enzyme will bind with the substrate ineffectively.

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