

Name: _____

Period: _____

Energy of Reactions

Energy is required to start a chemical reaction. The minimum amount of energy needed for reactants to form products in a chemical reaction is called the **activation energy**. For example, a candle will not burn until you light the wick. The flame from a match provides the activation energy for the candle wick to react with oxygen in the air. Some reactions need higher activation energy than others.

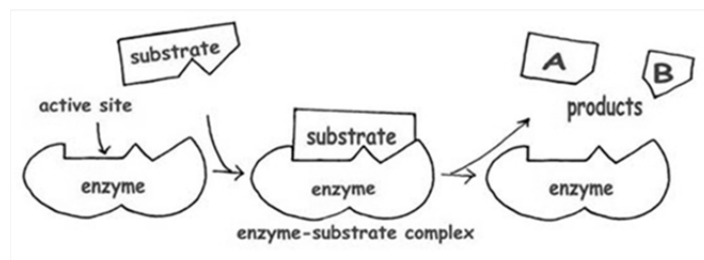
Enzymes are Biological Catalysts

Some chemical reactions occur slowly in a laboratory because the activation energy is high. To speed up the chemical reaction scientists use catalysts. A **catalyst** is a substance that lowers the activation energy needed to start a chemical reaction. A catalyst does not increase how much product is made and it does not get used up in the reaction.

In living things special proteins called **enzymes** act as biological catalysts. Enzymes speed up the rate of chemical reactions in the body. Like all catalysts, enzymes are not used up by the chemical reaction. For example the enzyme **pectinase** breaks down pectin, a polysaccharide found in plant cell walls. It is useful because pectin is the jelly-like material which helps cement plant cells together. Therefore pectinase enzymes are commonly used in speeding up the extraction of fruit juice from fruit such as apples. As with all enzymes, pectinase has an optimum temperature and pH at which it is most active. A commercial pectinase might be activated at 45 to 55°C and work well at a pH of 4.5 to 5.5.

The figure below shows how an enzyme works. The reactants that bind to the enzymes are called **substrates**. The specific location where a substrate binds on an enzyme is called the **active site**. The substrate and active site are shaped in such a way that they fit together exactly. Only substances with the proper shape will fit into the active site and bond with the enzyme.

The bond between the enzyme and the substrate helps to break bonds in the reactants and form new bonds, changing the substrates into **products**. The enzyme



then releases the products due to their altered shape. Enzymes are the chemical workers of the cell.

The actions of enzymes make it possible for the cell to release energy from food as long as the pH and temperature are within the proper range.

Name: _____

Period: _____

1. Select five key vocabulary words from the article and define them.

- a.
- b.
- c.
- d.
- e.

2. Summarize this article in **three** complete sentences.

3. Find the following sentence in the fourth paragraph "The substrate and active site are shaped in such a way that they fit together exactly." What are two other examples from your day to day life where objects have to fit together exactly in order to work. Make sure to explain how their structure is important to their function.

- a.
- b.