

Chapter Two: The Chemistry of Life

Lesson 2.4: Chemical Reactions and Enzymes

Everything that happens in an organism is based on chemical reactions.

Chemical reaction: process that changes, or transforms, one set of chemicals into another set of chemicals

- Change in the chemical bonds that join atoms in compounds
- Mass and energy are conserved

Reactants: elements or compounds that enter a chemical reaction

Products: elements or compounds produced by a chemical reaction

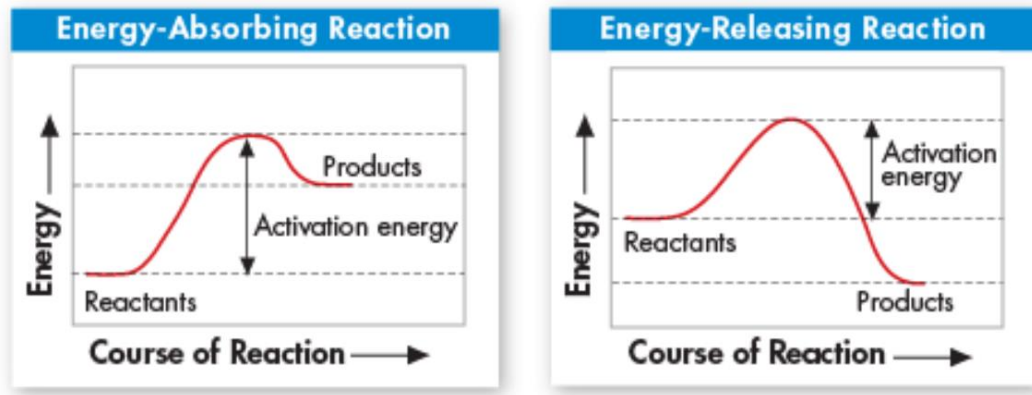
Example of a chemical reaction:

- $4 \text{ Fe (s)} + 3 \text{ O}_2 \text{ (g)} \rightarrow 2 \text{ Fe}_2\text{O}_3 \text{ (s)}$
- Iron plus oxygen gas produces rust

Chemical reactions can release or absorb energy.

- Release energy
 - Called exothermic
 - Occur on its own or spontaneously
- Absorb energy
 - Called endothermic
 - Requires a source of energy
 - We get our energy from the food we consume

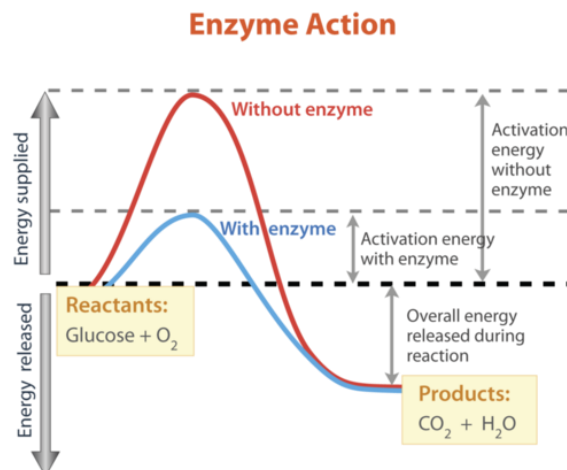
Activation energy: energy input that is needed for a reaction to begin



Catalyst: substance that speeds up the rate of a chemical reaction

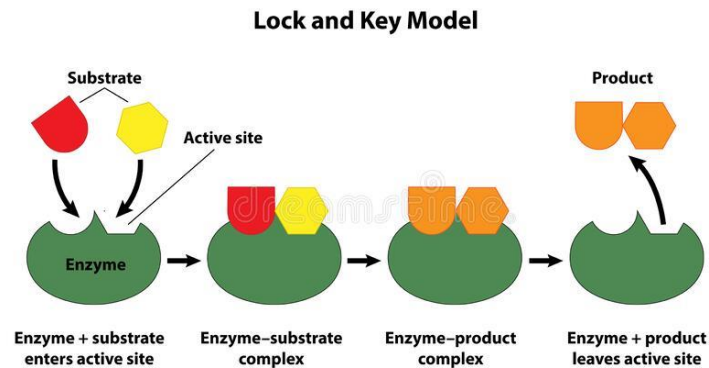
Enzymes: protein catalyst that speeds up the rate of specific biological reactions

- The role of the enzyme is to speed up chemical reactions that take place in cells.
- The reaction of removing carbon dioxide from the body is so slow that it would build up in the body faster than the bloodstream could remove it
 - The enzyme called carbonic anhydrase speeds up the reaction and removes CO_2 quickly from the blood.
 - Enzymes are very specific and are only used for one chemical reaction hence are named from the reaction it catalyzes.



Substrate: reactant of an enzyme-catalyzed reaction

- Substrates bind to a site on the enzyme called the active site
 - Think of these 2 as a lock and key.



- Enzymes work best at temperatures close to 37 °C (98.6 °F) or the conditions it is familiar with (pepsin works best in acidic conditions because it is a digestive enzyme in the stomach)