



## Lesson Overview

### 2.4

# Chemical Reactions

**chemical reaction** - process that changes one set of chemicals into another

- Mass is conserved

elements or compounds used in a chemical reaction are **reactants**.

elements or compounds made by a chemical reaction are **products**.

## Energy Changes

Energy is released or absorbed during chemical reactions.

Energy changes help determine if a chemical reaction will occur.

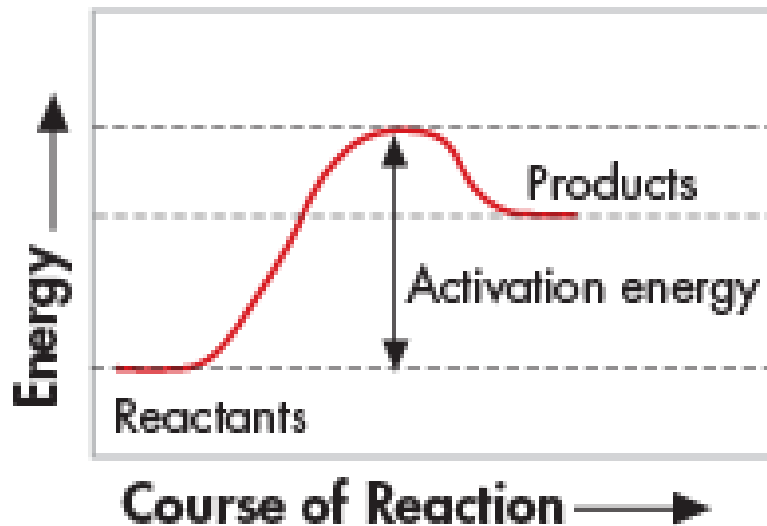
Chemical reactions that release energy sometimes occur spontaneously.

Chemical reactions that absorb energy will not occur without a source of energy.

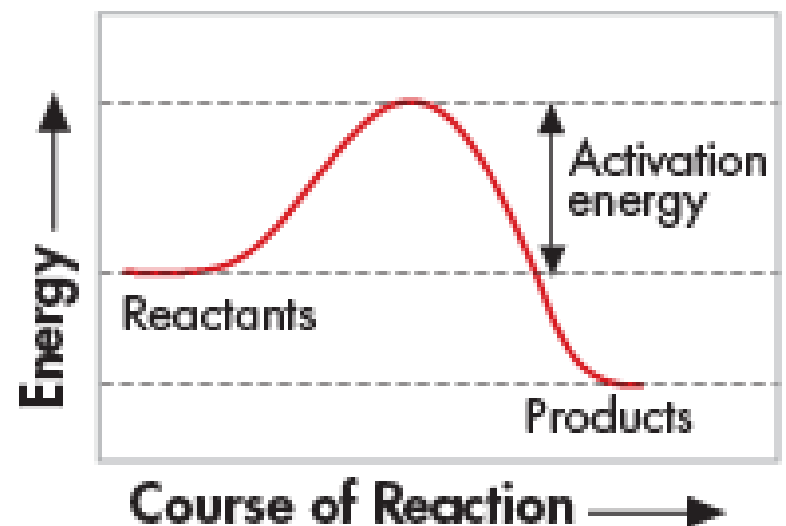
# Activation Energy

**activation energy** - energy needed to start a reaction

## Energy-Absorbing Reaction



## Energy-Releasing Reaction



# Enzymes

Some reactions are too slow or have activation energies that are too high to make them practical for living tissue.

These reactions use catalysts.

**catalyst** - substance that speeds up a reaction but isn't changed by the reaction

Catalysts lower a reaction's activation energy.

## Nature's Catalysts

**Enzymes** - proteins that are biological catalysts.

- speed up reactions occurring in cells.
- very specific, generally catalyzing only one reaction.

Part of an enzyme's name is usually derived from the reaction it catalyzes.

# The Enzyme-Substrate Complex

Usually reactants must collide with enough activation energy to perform reaction.

If the reactants lack enough energy, the collision will not produce a reaction.

Enzymes provide a site that reduces the energy needed for reaction.

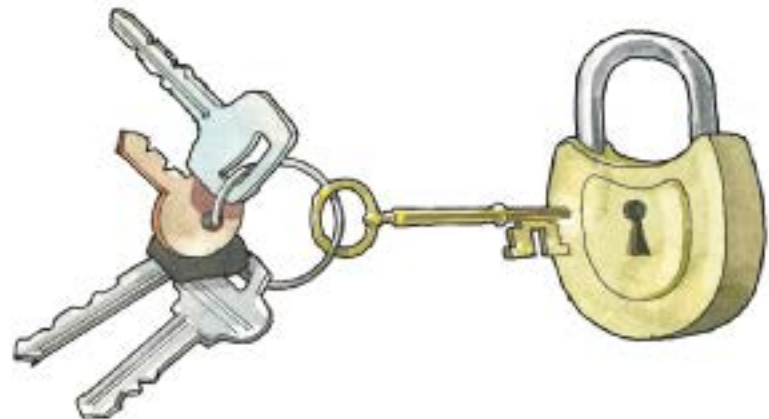
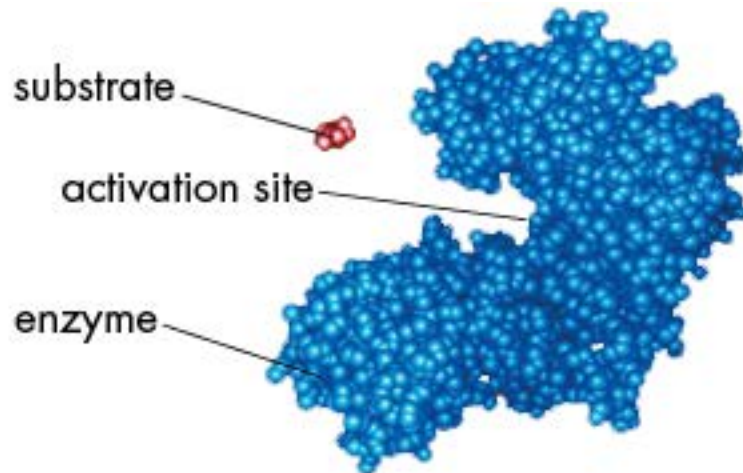
# The Enzyme-Substrate Complex

**substrates** - reactants of enzyme-catalyzed reactions

Substrates bind to active site on the enzyme.

The active site and the substrates have complementary shapes.

- “lock and key” mechanism





## Regulation of Enzyme Activity

Temperature, pH, and regulatory molecules affect the activity of enzymes.

Human enzymes generally work best close to 37° C (or 98.6 F) = normal human body temperature.