

# 2-4 Chemical Reactions and Enzymes



# Chemical Reactions

A process that changes one set of chemicals into another set of chemicals.

Reactions can occur slowly or quickly.

Elements or compounds that enter into a chemical reaction are known as **reactants**.

Elements or compounds produced by a chemical reaction are known as **products**.

# Chemical Reactions

This is how a chemical reaction is written.

**Reactant + Reactant → Product**



**What happens to chemical bonds during chemical reactions?**

**Chemical reactions can either make or break bonds between atoms or compounds**

## Energy in Reactions

When bonds are **broken**, energy is **released** from the reaction.

When bonds are **formed**, energy is **absorbed** by the reaction.

**How do energy changes affect whether a chemical reaction will occur?**

Chemical reactions that release energy often occur **spontaneously**.

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

Organisms must carry out reactions that require energy to stay alive.

Every organism must have a source of energy to carry out chemical reactions.

Plants get their energy from the sun.

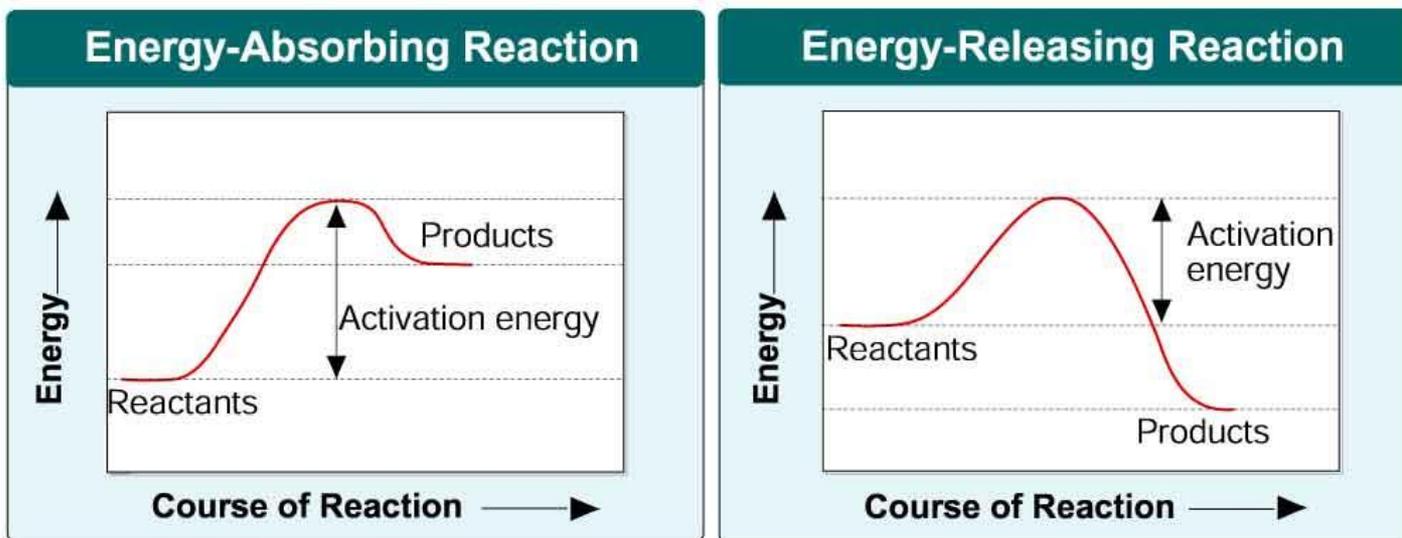
Animals get their energy from eating plants or other animals.

## Activation Energy

Chemical reactions that release energy do not always occur spontaneously.

The energy that is needed to get a reaction started is the **activation energy**.

Pg. 50



# Enzymes

Some chemical reactions for life are too slow and need help to speed up.

**Catalyst-** a substance that speeds up the rate of a chemical reaction by lowering a reaction's activation energy.

**Enzymes** are biological catalysts.

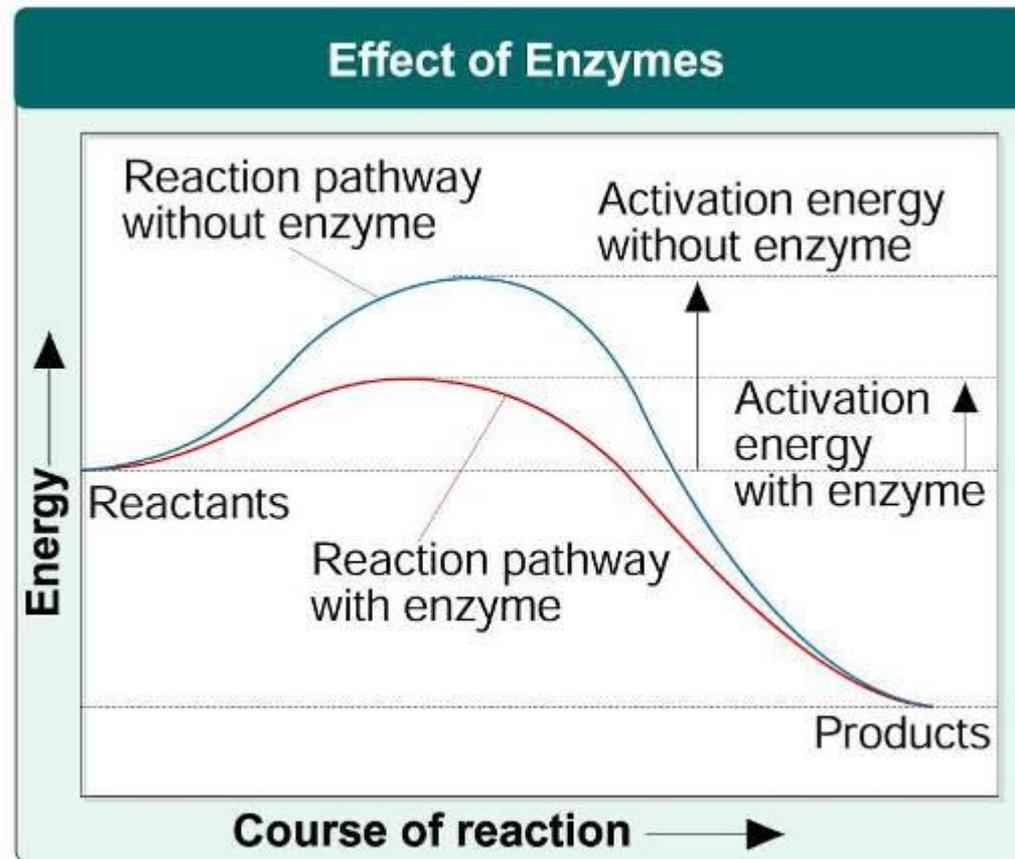


**Enzymes speed up chemical reactions by lowering the activation energy of a reaction.**

Enzymes are very specific, catalyzing only one chemical reaction.

Lowering the activation energy speeds up a reaction.

Pg. 51



# Enzyme Action

For a chemical reaction to take place, the reactants must collide with enough energy so that existing bonds will be broken and new bonds will be formed.

If reactants do not have enough energy, no reaction will take place.

# The Enzyme-Substrate Complex

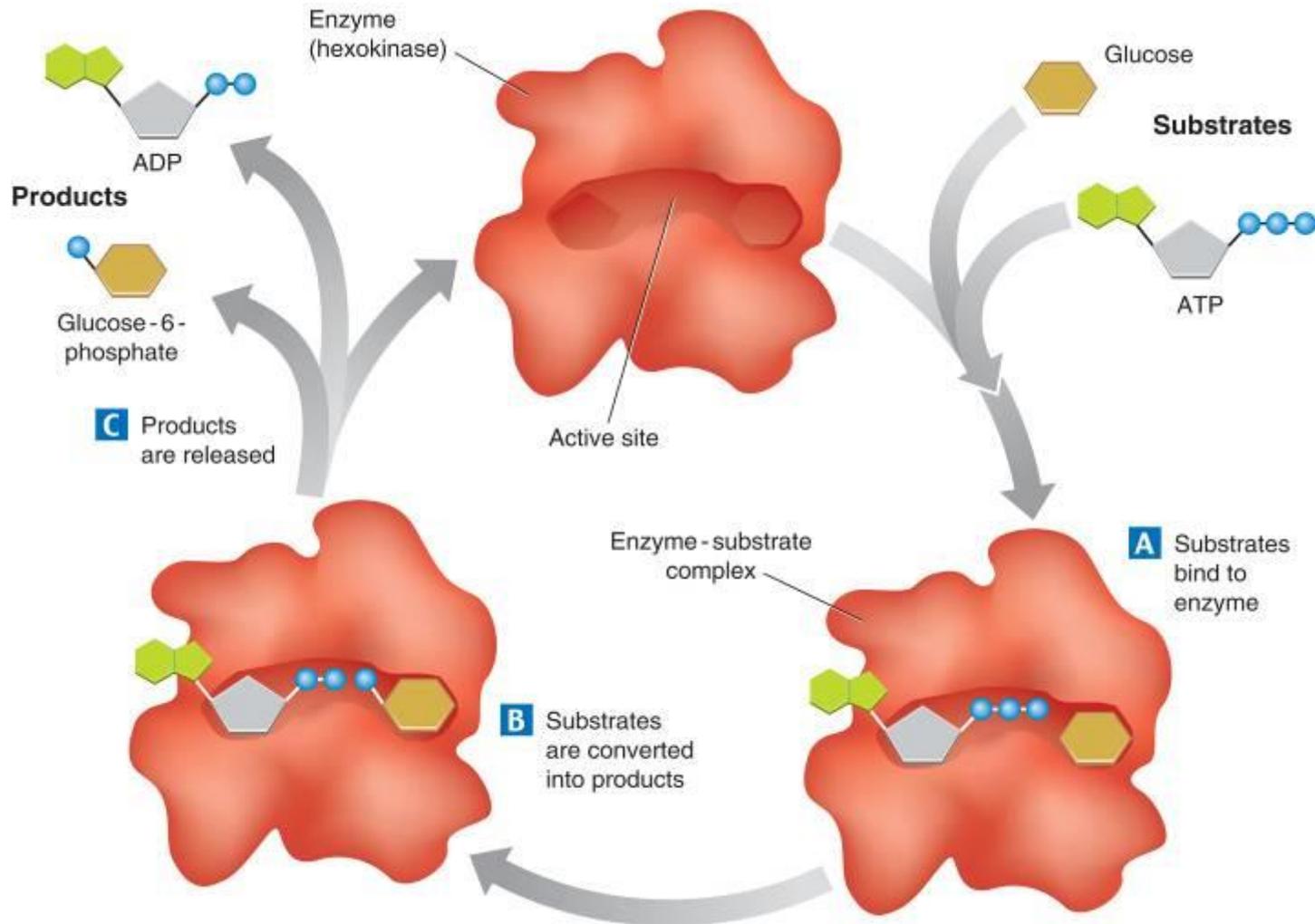
Enzymes provide a site where reactants can be brought together to react.

**Substrates** are reactants of enzyme-catalyzed reactions.

The enzyme and substrates remain bound together until the reaction is done and the substrates are converted to products.

The products of the reaction are released and the enzyme is free to start the process again.

## An Enzyme-Catalyzed Reaction (pg. 52)



## Regulation of Enzyme Activity

Enzymes can be affected by:

1. Certain pH (acid or base) values.
2. Changes in temperature.

Enzymes play essential roles in:

- regulating chemical pathways.
- making material that cells need.
- releasing energy.
- transferring information.