

Biology 101 The Working Cell

Metabolism: The ability of living systems to acquire and use energy for growth and repair.

Energy: The capacity to do work.

Types:

- 1) *Kinetic Energy* = energy actually performing work.
Ex. heat, light, momentum
- 2) *Potential Energy* = stored energy.
Ex. gravity, chemical

Two Laws Govern Energy Reactions

- Life depends on energy; it can be changed from one form to another

1) **The First Law of Thermodynamics (Law of Conservation)**

2) **The Second Law of Thermodynamics (Law of Entropy)**

Entropy: the measure of the amount of disorder in a system.

Chemical reactions either store or release energy.

Reactions may be:

- Endergonic (endothermic)
- Exergonic (exothermic)

Activation Energy: The energy needed to kick-start a chemical reaction. All reactions have activation energy.

Enzymes: Are organic catalysts that speed up chemical reactions.

Properties of Enzymes: The Basic Rules

1. Enzymes only speed up reactions, they cannot make a reaction occur if it would not occur on own.
 2. Enzymes are not consumed, used up, destroyed, altered, or harmed in anyway by the reaction. They are recycled.
 3. Enzymes are very selective about their substrate. One to one rule.
 4. Enzymes will work both the forward and reverse reactions of a particular type of reaction.
- Enzymes are **organic**, they are made of proteins.
 - They speed up reactions by lowering the **activation energy**.
 - Enzymes are embedded in the cell's membranes.
 - They perform many of the body's functions.

Factors That Affect the Enzyme

1. Temperature
2. pH
3. Salt concentration
4. Pressure
5. Substrate concentration
6. Enzyme concentration
7. Electronegativity
8. Inherent enzyme function

Enzyme Control and Inhibition

Role of negative feedback

Positive feedback

Competitive Inhibitors

Non-competitive Inhibitors

Terms:

Substrate = that which an enzyme acts upon

Active Site = the working point or region of an enzyme

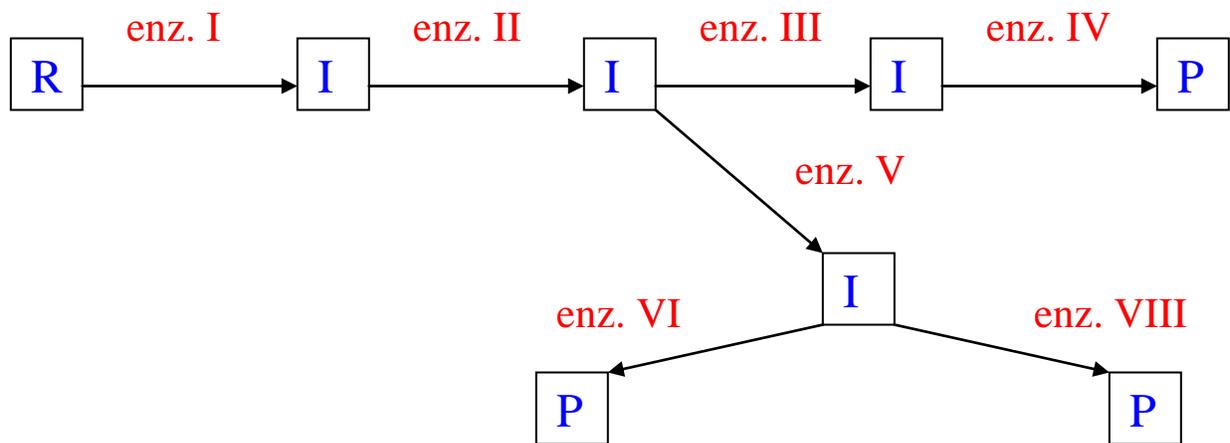
Reactants = starting materials

Products = ending materials

Intermediates = compounds in between start and finish

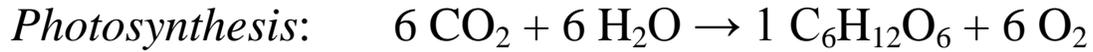


Metabolic Reaction vs. Metabolic Pathway



Chloroplasts and Mitochondria

- Make energy available for work
- Photosynthesis and Cellular Respiration are circular processes



ATP and Its Role in Energy Reactions

- Energy currency of cell
- Recycled process
- Redox reactions
 - Something reduced = gained electrons
 - Something oxidized = lost electrons
- Oxidation-Reduction reactions always coupled