

Biology 20 Bioenergetics

Bioenergetics:

Energy:

- **Potential energy:**

Examples:

- **Kinetic energy**

Examples:

Energy can be transformed:

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-

Thermodynamics:

First law of Thermodynamics:

Second law of Thermodynamics

Types of Energy in reactions (p. 89; Fig. 5.10)

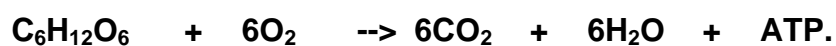
- **Endergonic reactions:**

Example:



- **Exergonic reactions:**

Example:



Cellular Metabolism:

Includes:

Two types of metabolic pathways:

- **Anabolic pathway:**

Example: photosynthesis



- **Catabolic pathway:**

Example: cellular respiration



The role of ATP in metabolism (p. 90; Fig. 5.12)

What is ATP?

Components of ATP: a)
b)
c)

How does ATP work?

Hydrolysis of ATP: $\text{ATP} + \text{H}_2\text{O} \rightarrow \text{ADP} + \text{P}_i$.
What type of reaction? Endergonic or exergonic?

How is ATP produced?

Dehydration of ATP: $\text{ADP} + \text{P}_i \rightarrow \text{ATP} + \text{H}_2\text{O}$

What are required for the production and use of ATP?

ENZYMES

Enzymes are made of _____, but not all proteins are enzymes!

What are the subunits (building blocks) of proteins?

What two functional groups are always found in aa?

Amino acids (20 different types) bonded together by peptide bonds to form a polypeptide.

- Four levels of protein structure:

1. Primary structure (1°)
2. Secondary structure (2°)
3. Tertiary structure (3°)
4. Quaternary structure (4°)

Enzymes:

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- **Catalysts:**

- How enzymes work? (p. 94; Fig. 5.15)

- Specificity:

- Recycled (reusable)

Catalytic cycle (p. 94; Fig. 5.16) = $E + S \rightarrow ES \text{ complex} \rightarrow E + P$

Substrate:

Active site:

Induced fit model:

Factors that affect enzyme activity:

1. Environmental conditions

a)

b)

c)

2. Cofactors and coenzymes:

- cofactors = inorganic (zinc, iron)
- coenzymes = organic (vitamins)

3. Enzyme inhibitors (p.95, Fig. 5.17)

- **competitive inhibitors:**

- **non-competitive inhibitors:**

Feedback inhibition (p.95, Fig. 5.17)