

AP Biology Unit 3: Cellular Energetics

Chapter 8: An Introduction to Metabolism

Metabolism and Energy

-Metabolism: the totality of an organism's chemical reactions

- Metabolic Pathway: begins with a specific molecule and ends with a product, each step catalyzed by a specific enzyme (the product of the first reaction becomes the reactant for the second reaction, and so on)

-Catabolic Pathways: release energy by breaking down complex molecules into simpler compounds

- cellular respiration (glucose is broken down to CO_2 and H_2O in the presence of O_2)

-Anabolic Pathways: consume energy to build complex molecules from simpler ones

- the synthesis of a protein from simpler amino acids

-Energy exists in various forms, some of which can perform work in the cell (transport, chemical, mechanical, structural)

- thermal energy: kinetic energy associated with the random movement of molecules or atoms (when kinetic energy is increased, molecules begin to move faster and can overcome the activation energy barrier needed to break substrate bonds)
- chemical energy: potential energy available for release in a chemical reaction when bonds are broken

The Laws of Thermodynamics

-The First Law of Thermodynamics: energy can be transferred and transformed but it cannot be destroyed

- the energy of the universe is constant (the principle of the conservation of energy)

-The Second Law of Thermodynamics: every energy transfer or transformation increases the entropy (disorder) of the universe

- during every energy transfer, some energy is unusable and is often lost as heat

Biology Energetics Student Study Guide

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