Energy, Enzymes, and Metabolism

1. Energy Conversions: The Laws of Thermodynamics

    A. Changes in energy are related to changes in matter
    B. The first law: Energy is neither created nor destroyed
    C. The second law: Not all energy can be used, and disorder tends to increase
    D. The third law: The entropy of any pure crystalline substance at absolute zero is equal to zero

2. Chemical Reactions Release or Take Up Energy

    A. Exergonic reactions release free energy
    B. Chemical equilibrium and free energy are related

3. ATP: Transferring Energy in Cells

    A. ATP is rich in energy
    B. ATP couples exergonic and endergonic reactions

4. Enzymes: Biological Catalysts

    A. For a reaction to proceed, an energy barrier must be overcome
    B. Enzymes bind specific reactant molecules
    C. Enzymes lower the activation energy
    D. What are the chemical events at active sites of enzymes?
    E. Substrate concentration affects reaction rate
    F. Some enzymes couple reactions

5. Molecular Structure Determines Enzyme Function

A. Binding at the active site may cause enzymes to change shape
B. To operate, some enzymes require cofactors

6. Metabolism and the Regulation of Enzymes

A. Metabolism is organized into metabolic pathways
B. Enzyme activity is subject to regulation
C. Allosteric enzymes have interacting subunits
D. Catalytic and regulatory subunits interact and cooperate
E. Allosteric effects control metabolism
F. Enzymes are sensitive to their environment