

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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Table of Contents Biology Energetics Student Study Guide

1. Understanding the eBook Biology Energetics Student Study Guide
 - The Rise of Digital Reading Biology Energetics Student Study Guide
 - Advantages of eBooks Over Traditional Books
2. Identifying Biology Energetics Student Study Guide
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Biology Energetics Student Study Guide
 - User-Friendly Interface
4. Exploring eBook Recommendations from Biology Energetics Student Study Guide
 - Personalized Recommendations
 - Biology Energetics Student Study Guide User Reviews and Ratings
 - Biology Energetics Student Study Guide and Bestseller Lists

5. Accessing Biology Energetics Student Study Guide Free and Paid eBooks
 - Biology Energetics Student Study Guide Public Domain eBooks
 - Biology Energetics Student Study Guide eBook Subscription Services
 - Biology Energetics Student Study Guide Budget-Friendly Options
6. Navigating Biology Energetics Student Study Guide eBook Formats
 - ePub, PDF, MOBI, and More
 - Biology Energetics Student Study Guide Compatibility with Devices
 - Biology Energetics Student Study Guide Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Biology Energetics Student Study Guide
 - Highlighting and Note-Taking Biology Energetics Student Study Guide
 - Interactive Elements Biology Energetics Student Study Guide
8. Staying Engaged with Biology Energetics Student Study Guide
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Biology Energetics Student Study Guide
9. Balancing eBooks and Physical Books Biology Energetics Student Study Guide
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Biology Energetics Student Study Guide
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Biology Energetics Student Study Guide
 - Setting Reading Goals Biology Energetics Student Study Guide
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Biology Energetics Student Study Guide
 - Fact-Checking eBook Content of Biology Energetics Student Study Guide
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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