Module 06: Metabolism — Keys to Success

Key Learning Objectives

1. Energy and Metabolism Fundamentals

- Define metabolism and distinguish between catabolism and anabolism
- Explain the laws of thermodynamics as they apply to living systems
- Describe the role of ATP as the energy currency of cells
- Understand the ATP cycle (ATP ↔ ADP + Pi)

2. Enzymes and Catalysis

- Define enzymes and explain how they lower activation energy
- Describe the induced fit model of enzyme-substrate interaction
- Identify factors that affect enzyme activity (temperature, pH, substrate concentration)
- Explain enzyme inhibition (competitive and noncompetitive)
- Understand allosteric regulation and feedback inhibition

3. Cellular Respiration Overview

- Write the overall equation for cellular respiration
- Identify the three main stages: glycolysis, citric acid cycle, electron transport chain
- Explain where each stage occurs in the cell
- Understand the role of oxygen as the final electron acceptor

4. ATP Production

- Describe how chemiosmosis and ATP synthase produce ATP
- Compare substrate-level phosphorylation and oxidative phosphorylation
- Calculate the theoretical ATP yield from one glucose molecule

5. Fermentation

- Describe what happens when oxygen is not available
- Compare lactic acid fermentation and alcoholic fermentation
- Explain why fermentation produces less ATP than aerobic respiration

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Study Tips

1. **Memorize the ATP cycle** and where ATP is used/produced
2. **Draw metabolic pathways** showing inputs and outputs
3. **Create enzyme diagrams** showing substrate-enzyme interactions
4. **Practice balancing equations** for respiration and fermentation
5. **Connect concepts** to real-world applications (exercise, food production)