Module 6: Metabolism

Comprehension & Critical Thinking Questions

Part 1: Understanding Core Concepts

1. **Energy Basics**
    - Differentiate between **Kinetic** and **Potential** energy using biological examples (e.g., a concentration gradient vs. muscle movement).
    - State the **First and Second Laws of Thermodynamics**. How do living things obey the second law (entropy) while creating ordered structures?
2. **Enzymes**
    - What is **Activation Energy**? How do enzymes lower it?
    - Explain the difference between **Competitive** and **Non-competitive** inhibition. Where does the inhibitor bind in each case?
3. **ATP Structure**
    - Draw or describe the structure of ATP (Adenosine Triphosphate). Which bond is the "high energy" bond that is broken to release energy?

Part 2: Applying Biological Principles

1. **Metabolic Pathways**
    - Compare **Anabolic** (building up) and **Catabolic** (breaking down) pathways.
    - **Application**: Is photosynthesis anabolic or catabolic? Is cellular respiration anabolic or catabolic? Explain your reasoning.
2. **Enzyme Regulation**
    - **Scenario**: You have an enzyme that functions best in the human stomach (pH 2).

- **Apply**: What happens to this enzyme's activity if it is moved to the blood (pH 7.4)? Explain *why* in terms of protein structure (denaturation).

Part 3: Analyzing & Evaluating

1. **Redox Reactions**
    - "OIL RIG" stands for *Oxidation Is Loss, Reduction Is Gain* (of electrons). Analyze the following generic reaction: A- + B -> A + B-. Which molecule was oxidized? Which was reduced?
2. **Feedback Loops**
    - Explain the concept of **Feedback Inhibition**. Why is it efficient for the end-product of a pathway to shut down the first enzyme in that pathway?