Module 6: Metabolism

Comprehension & Critical Thinking Questions

Part 1: Core Concepts

1. **Energy Basics**
    - Differentiate between kinetic and potential energy using biological examples.
    - State the First and Second Laws of Thermodynamics. How do living systems obey the second law while maintaining order?
2. **Enzymes**
    - What is activation energy? How do enzymes lower it?
    - Explain competitive inhibition vs. non-competitive (allosteric) inhibition.
3. **ATP Structure**
    - Describe the structure of ATP. Which bonds contain the most energy (phosphoanhydride bonds)?

Part 2: Application

1. **Metabolic Pathways**
    - Compare anabolic (biosynthetic) and catabolic (degradative) pathways.
    - Is photosynthesis anabolic or catabolic? Is cellular respiration anabolic or catabolic?
2. **Enzyme Regulation**
    - **Scenario**: Pepsin functions optimally at pH 2 (stomach).
    - **Apply**: What happens to pepsin activity in the blood (pH 7.4)? Explain in terms of denaturation.

Part 3: Analysis & Evaluation

1. **Redox Reactions**
    - "OIL RIG": Oxidation Is Loss, Reduction Is Gain (of electrons).
    - In the reaction $A^- + B \rightarrow A + B^-$, identify which molecule is oxidized and which is reduced.
2. **Feedback Inhibition**
    - Explain feedback inhibition. Why is it efficient for the end-product of a pathway to inhibit the first enzyme?