

Module 3: Organic Molecules

Comprehension & Critical Thinking Questions

Part 1: Core Concepts

1. The Nature of Organic Molecules

- What makes a molecule "organic"? Why is carbon the "backbone" of life?
- Define functional group and provide an example (e.g., hydroxyl, amino, carboxyl).

2. Building Blocks

- Explain the relationship between monomers and polymers.
- Describe dehydration synthesis (releases water, builds polymers) and hydrolysis (uses water, breaks polymers).

3. The Four Classes of Biomolecules

- Create a summary table comparing Carbohydrates, Lipids, Proteins, and Nucleic Acids. Include monomer names, key functions, and example molecules.

Part 2: Application

1. Protein Folding

- Protein function depends on its three-dimensional shape. Explain the four levels of protein structure:
 - **Primary:** Linear amino acid sequence.
 - **Secondary:** Alpha helices and beta pleated sheets (hydrogen bonding).
 - **Tertiary:** 3D folding (R-group interactions, disulfide bridges).
 - **Quaternary:** Multiple polypeptide subunits.
- **Apply:** What is denaturation? Why doesn't a cooked egg unfold when cooled?

2. Lipids and Health

- Distinguish between saturated and unsaturated fatty acids in terms of structure and physical state at room temperature.

Part 3: Analysis & Evaluation

1. Structure Determines Function

- Cellulose and starch are both glucose polymers. Why can humans digest starch but not cellulose? Analyze the role of glycosidic linkage orientation.

2. ATP as Energy Currency

- ATP is derived from a nucleotide. Explain where the energy is stored (phosphoanhydride bonds) and why ATP is called the "energy currency" of the cell.