Module 3: Organic Molecules

Keys to Success & Study Guide

Learning Objectives

By the end of this module, you should be able to: 1. **Classify** the four major groups of biological macromolecules and identifying their constituent monomers. 2. **Explain** the chemical reactions (dehydration synthesis/hydrolysis) that build and break polymers. 3. **Correlate** the structural levels of proteins with their specific functions and vulnerability to denaturation. 4. **Differentiate** between DNA, RNA, and ATP in terms of structure and function.

Key Terminology Checklist

Define these terms in your own words to ensure mastery. - [ ] **Macromolecule**: A giant molecule formed by the joining of smaller molecules. - [ ] **Hydrophobic**: Repelling water (characteristic of lipids). - [ ] **Peptide Bond**: The covalent bond between two amino acid units. - [ ] **Nucleotide**: Assembled from a sugar, phosphate, and nitrogenous base. - [ ] **Enzyme**: A protein that acts as a catalyst. - [ ] **Phospholipid**: The key structural component of cell membranes.

Concept Check

1. Carbohydrate Complexity

- **Question**: What is the most main role of carbohydrates?
- **Deep Dive**: How does the structure of a storage polysaccharide (like **Glycogen**) differ from a structural polysaccharide (like **Cellulose**)? Why is branching important for quick energy release?

2. The Lipid Family

- **Question**: What is the solubility of lipids?

- **Deep Dive**: Why are steroids (like cholesterol and testosterone) grouped with fats and oils even though they look completely different (ring structure)? (Hint: Do they mix with water?)

3. Protein Versatility

- **Question**: What are at least 6 roles of proteins?
- **Deep Dive**: Proteins do almost everything (transport, enzymes, defense, structure). If a genetic mutation changes just *one* amino acid in the primary sequence (like in Sickle Cell Anemia), why does it have such catastrophic effects on the whole organism?

4. Nucleic Acid Code

- **Question**: How do the two strands found in a DNA molecule stick together?
- **Deep Dive**: A pairs with T; C pairs with G. If a DNA sample is 20% Adenine, what percentage is Guanine? (Chargaff's Rule).

Study Tips

- **Use your hands**: To understand Protein folding, use a piece of wire or a pipe cleaner.
    - Straight = Primary.
    - Coiled = Secondary.
    - Ballet up into a glob = Tertiary.
- **Suffixes**: Learn to recognize chemical names.
    - *-ose* = Sugar (Glucose, Fructose).
    - *-ase* = Enzyme (Lactase, Amylase).
    - *-in* = Often a protein (Hemoglobin, Insulin).
- **Flashcards for Monomers**:
    - Carbs -> Monosaccharides.
    - Proteins -> Amino Acids.
    - Nucleic Acids -> Nucleotides.
    - Lipids -> (No true monomer, but Glycerol + Fatty Acids).