Study Guide

Chapter 3: Carbon molecules and the building blocks of life.

Campbell Biology in Focus 3.1-3.6

**Chapter Main Ideas:**

1. Carbon’s unique properties as an element make it fundamental in constructing important molecules.
2. Polymerization is the chemical act of building larger molecules of monomers.
3. Proteins, carbohydrates, and lipids are built from various monomers, which help determine macromolecule function.
4. Nucleic acid structure and order is critical for gene expression.

IMPORTANT FIGURES AND IDEAS: Link the text and key words into explaining most important figures.

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Chapter 3.1: Organic Compounds

* Figure 3.2: organic compound, molecular and structural formula, carbon’s valence shell, hydrocarbons.
* Figure 3.5 A,B: Isomer, structural isomer, *cis-trans* isomer
* Figure 3.6: Linking the name of the chemical group to the atoms/elements the group.

Chapter 3.2: Polymers

* Figure 3.7: polymer, monomer, dehydration reaction, hydrolysis, role of enzyme

Chapter 3.3: Carbohydrates

* Figure 3.10: monosaccharide, disaccharide, glycosidic linkage
* Figure 3.11: Polysaccharides, starch, glycogen, cellulose (focus on broad shape of each).

Chapter 3.4: Lipids

* Figure 3.13: fat, triacylglycerol, fatty acid
* Figure 3.14: saturated fatty acid, unsaturated fatty acid, trans fatty acid
* Figure 3.15: phospholipids, polar head, nonpolar tails, phospholipid bilayer

Chapter 3.5: Proteins

* Figure 3.18: components of an amino acid (amino group, R group, carboxyl group) and how the R group can change.
* Figure 3.19: peptide bond, polypeptide, focus on which atoms are lost for each bond.
* Figure 3.20: primary structure, secondary structure (alpha helix and beta-pleated sheets, hydrogen bonds), tertiary structure (R group interactions, hydrophobic and disulfide bridges), quaternary structure.
* Figure 3.23: Look at the link between primary and quaternary structure, function and form.

Chapter 3.6: Nucleic Acids

* Figure 3.26: gene expression, amino acid sequence, nucleic acid.
* Figure 3.27: nucleic acid, 5’ and 3’ sugar, components of a nucleoside, purine and pryimidine bases.

CONCEPTUAL UNDERSTANDING:

1. **I can explain** how carbon’s unique **atomic structure** enables it to create various, distinct chemical bonds.
2. **I can model** how **polymerization** is the chemical reaction of **adding monomers to a larger polymer**.
3. **I can understand and interpret** the **form and function** of **polysaccharides**.
4. **I** **can interpret** how the number of **saturated or unsaturated fatty acids** can influence **polysaccharides’ appearance and function.**
5. **I can explain** the **interacting forces** in determining the **form and function** of the **primary through quaternary structure of proteins.**
6. **I can link** the importance of **nucleic acid sequence** to the **form and function of proteins.**

Links to the AP Biology Curriculum and Big Ideas:

* Big Idea #4: Biological systems interact, and these interactions possess complex properties.
  + Enduring Understanding 4.A.1: The subcomponents of biological molecules and their sequence determine the properties of that molecule.
  + Enduring Understanding 4.A.2: The structure and function of subcellular components, and their interactions, provide essential cellular processes.
  + Enduring Understanding 4.B.1: Interactions between molecules affect their structure and function.