Chapter 15 Student Learner Outcomes

Describe the principle atomic properties of carbon. What is the electronic structure of atomic carbon? Describe what happens to the atomic structure of carbon when carbon is viewed in a molecular structure.

The Structures and Classes of Hydrocarbons:
1. Give the names and structural formulas for the straight and branched-chain alkanes up to 10 C atoms.
2. Given structural formulas, name alkanes; given names, write structural formulas for alkanes.
3. Give names, structural formulas, and polygon notation for cycloalkanes.
4. Draw the boat and chair configurations of cyclohexane.
5. Write equations with structural formulas for light-catalyzed reactions of Cl₂ and Br₂ with alkanes.

Unsaturated Hydrocarbons:
1. Give names and structural formulas for alkenes and alkynes.
2. Write equations to illustrate the addition of hydrogen, halogens, and hydrogen halides to hydrocarbons with double and triple bonds.

Aromatic Hydrocarbons:
1. Give the structural formulas of benzene, naphthalene, and various substituted benzenes.
2. Identify substituents on a benzene ring as ortho, meta, or para.

Important Classes of Organic Reactions: Identify and write equations to represent
1. Substitution Reactions (including free-radical substitution)
2. Addition Reactions
3. Elimination Reactions
4. Oxidation-Reduction Reactions

Properties and Reactivity of Common Functional Groups:
1. Identify the functional groups in a structural formula.
2. Give names and structural formula of the common functional groups.

Isomerism: Identify structural formulas that are
1. Constitutional (structural) isomers
2. Geometric isomers
3. Stereoisomers

Synthetic Macromolecules: Monomer-Polymer
1. Write formulas for addition polymers.
2. Write formulas for condensation polymers.

Biological Macromolecules: Monomer-Polymer
1. Sugars and Polysaccharides
2. Amino acids and Proteins
3. Acids, Alcohols and Lipids, Fats
4. Write the structural formula of a triglyceride formed from given fatty acids and predict whether it is a fat or an oil at room temperature.
5. Explain what is meant by primary, secondary, tertiary, and quaternary components of protein structure.
6. Describe the glycosidic linkage, and show how two hexoses condense to form a disaccharide.
7. Describe the occurrence and biochemical function of starch, glycogen, and cellulose.
8. Describe the difference between amylase and amylase, the components of starch.
9. Explain the difference in the properties of starch and cellulose on the basis of structure.
10. List the structural components of a nucleotide molecule.
11. Distinguish between nucleotides and nucleic acids.
12. Discuss the role of ADP and ATP in the storage and release of energy.
<table>
<thead>
<tr>
<th>Functional Group</th>
<th>Name</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="C" /></td>
<td>Alkane</td>
<td>CH₃CH₂CH₃ (propane)</td>
</tr>
<tr>
<td><img src="image" alt="C=C" /></td>
<td>Alkene</td>
<td>CH₃CH=CH₂ (propene)</td>
</tr>
<tr>
<td><img src="image" alt="C≡CH" /></td>
<td>Alkyne</td>
<td>CH₃C≡CH (propyne)</td>
</tr>
<tr>
<td>F, Cl, Br, or I</td>
<td>Alkyl halide</td>
<td>CH₃Br (methyl bromide)</td>
</tr>
<tr>
<td><img src="image" alt="OH" /></td>
<td>Alcohol</td>
<td>CH₃CH₂OH (ethanol)</td>
</tr>
<tr>
<td><img src="image" alt="O" /></td>
<td>Ether</td>
<td>CH₃OCH₃ (dimethyl ether)</td>
</tr>
<tr>
<td><img src="image" alt="NH₂" /></td>
<td>Amine</td>
<td>CH₃NH₂ (methyl amine)</td>
</tr>
<tr>
<td><img src="image" alt="CHO" /></td>
<td>Aldehyde</td>
<td>CH₃CHO (acetaldehyde)</td>
</tr>
<tr>
<td><img src="image" alt="COCH₃" /></td>
<td>Ketone</td>
<td>CH₃COCH₃ (acetone)</td>
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<tr>
<td><img src="image" alt="CO₂H" /></td>
<td>Carboxylic acid</td>
<td>CH₃CO₂H (acetic acid)</td>
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<tr>
<td><img src="image" alt="CO₂CH₃" /></td>
<td>Ester</td>
<td>CH₃CO₂CH₃ (methyl acetate)</td>
</tr>
<tr>
<td><img src="image" alt="CONH₂" /></td>
<td>Amide</td>
<td>CH₃CONH₂ (acetamide)</td>
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