CHAPTER 4
CARBON AND THE
DIVERSITY OF LIFE

THE IMPORTANCE
OF CARBON

- Organic Chemistry is the study of carbon compounds.
- Living and synthetic materials.
- Stanley Miller's investigations.
- Primitive Earth/organic compounds
- Vitalism vs. mechanism theories.
CARBON ATOMS AS BUILDING BLOCKS

- COVALENT-BONDING CAPACITY OF 4 LENDS TO ORGANIC DIVERSITY.
- CARBONS CAN BOND TO A VARIETY OF ATOMS; O, H, N, \, ETC.
- C CAN BOND TO OTHER CARBON ATOMS
- FORMS SKELETAL COMPOUNDS

Figure 4.2 The shapes of three simple organic molecules

<table>
<thead>
<tr>
<th>Molecular Formula</th>
<th>Structural Formula</th>
<th>Ball-and-Stick Model</th>
<th>Space-Filling Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH₄</td>
<td>H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₂H₂</td>
<td>H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₃H₆</td>
<td>H</td>
<td></td>
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</tr>
</tbody>
</table>

Figure 4.4 Variations in carbon skeletons

- (a) Length
- (b) Branching
- (c) Double bonds
- (d) Rings

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CARBON SKELETON VARIATION

- Carbon skeletons vary in shape and length.
- Have bonding sites for other atoms.
- Hydrocarbons consist of H and C.
- Basis for isomers: structural, geometric and enantiomers.

Figure 4.6 Three types of isomers

Figure 4.7 The pharmacological importance of enantiomers

L-Dopa (effective against Parkinson’s disease)  D-Dopa (biologically inactive)
**FUNCTIONAL GROUPS**

- CONTRIBUTE TO MOLECULAR DIVERSITY
- HYDROXYL GROUP/ALCOHOLS
- CARBONYL GROUP/ALDEHYDE/KETONES
- CARBOXYL GROUP/CARBOXYLIC ACIDS
- AMINO GROUP/AMINES
- SULFHYDRYL GROUP/THIOLS
- PHOSPHATE GROUP/PO4

![Functional Groups Diagram](image)