1. Different isomers of C₅H₁₂ were treated under conditions to replace a single H atom with Cl, forming different isomers of C₅H₁₁Cl. (We’ll discuss this reaction in Chapter 4, but you really don’t need to know any more than what’s just been stated). Identify the isomers in each case below.
   
a. A C₅H₁₂ compound that gives three different C₅H₁₁Cl isomers.
   
b. A C₅H₁₂ compound that gives four different C₅H₁₁Cl isomers.
   
c. A C₅H₁₂ compound that gives only one C₅H₁₁Cl isomer.
   
d. Are there any other C₅H₁₂ isomers? Convince your neighbors.

2. An experimental technique called ¹³C Nuclear Magnetic Resonance Spectroscopy allows chemists to tell how many different kinds of carbons there are in a molecule and whether carbons are primary (1°), secondary (2°), tertiary (3°), or quaternary (4°). Give Kekule structures (i.e., use lines for electron pair bonds) for the following compounds having molecular formula C₆H₁₂. On each structure, identify carbons as 1°, 2°, 3°, or 4°, tell how many different kinds of carbons there are, and designate which carbons are equivalent.
   
a. A compound having only single bonds and only secondary carbons.
   
b. A compound having only single bonds and primary, secondary, and tertiary carbons.
   
c. A compound having only single bonds and only primary, secondary, and quaternary carbons.
   
d. A compound having only single bonds and primary, secondary, tertiary, and quaternary carbons.

3. Draw Kekule structures (show all bonds as lines and show all non-bonding electron pairs) for constitutional isomers with molecular formula C₃H₆O₂. Make sure that the following functional groups are included in these isomers: carboxylic acid, ester, ether, aldehyde, ketone, alcohol. Circle each functional group and indicate its appropriate family name.

4. Can you come up with the structure of a C₈H₁₈ isomer that could only give one isomer of C₈H₁₇Cl?