ORGANIC CHEMISTRY **CH 384, Fall 2010**

WORKSHOP 1

Bonding and Structure

1. Different isomers of C_5H_{12} were treated under conditions to replace a single H atom with Cl, forming different isomers of $C_5H_{11}Cl$. (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 C_5H_{12} compound that gives three different $C_5H_{11}Cl$ isomers.

b. A C_5H_{12} compound that gives four different $C_5H_{11}Cl$ isomers.

c. A C_5H_{12} compound that gives only one $C_5H_{11}Cl$ isomer.

d. Are there any other C_5H_{12} isomers? Convince your neighbors.

2. An experimental technique called ^{13}C 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 C_6H_{12}. 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 $C_3H_6O_2$. 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 C_8H_{18} isomer that could only give one isomer of $C_8H_{17}Cl$?