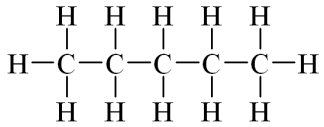
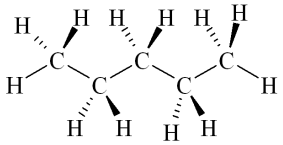
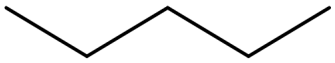
Organic Compounds

Part I: Writing Organic Structures

We have examined how to write Lewis structures and VSEPR structures in a previous lab. Because organic compounds have many central atoms, organic chemists use two other ways of writing organic compounds; condensed structures and line angle drawings commonly called stick figures.

Please examine four ways of writing pentane.

Lewis	VSEPR
	
Condensed $CH_3CH_2CH_2CH_2CH_3$	Stick Figure 

In condensed formulas, the hydrogens are written to the right of the atoms they are attached to with the appropriate subscript.

The stick figures are based, in part, on the VSEPR structure. If one removes the hydrogens, you get the top picture, and if you then remove the letter C, you get the stick figure. The rules for writing stick figures and shown below.

Stick Figures (Rules)

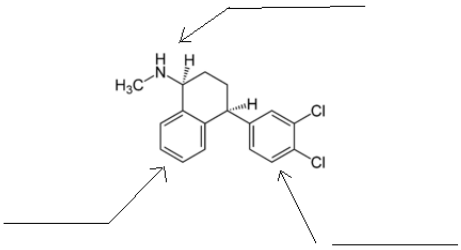
- Hydrogens attached to carbons are not shown.
  (Hydrogens attached to hetero-atoms are shown)
- Each vertex and terminus is a carbon.
- All hetero-atoms are shown explicitly.

As a group, please draw and name three isomers with a formula C_5H_{12}

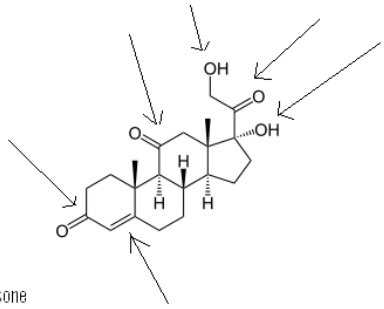
Isomer	1	2	3
name		2-methylbutane	
Stick figure			
Condensed formula	$CH_3CH_2\ CH_2\ CH_2\ CH_3$		

Part II:

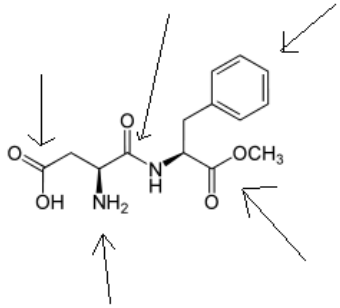
You instructor has identified a number of functional groups for you to know. As a group, please look at the following compounds and identify the functional groups in them.



Zoloft



Cortisone



Aspartame

Part III: More organic compounds.
Look at your model for C_2H_6. Notice that the hydrogens spin freely around the single bond like a helicopter (at right).

Please make the structure $CH_3CH=CHCH_3$. Notice that the double bond does not spin around. In fact, you can make a molecule two different ways. The molecule with the CH_3's on the same side of the double bond is called *cis* and the molecule with the CH_3's on the opposite side of the double bond is called *trans*. Please draw the *cis* and *trans* isomers of this compound. Draw the stick figures and the VSEPR diagrams for the *cis* and *trans* isomers.

cis	trans

Part IV: Structural Isomers.
Structural isomers are compounds that have the same chemical formula but different arrangements of the atoms. They are connected together differently. Can you draw 3 structural isomers for the 2-butenes you made above? Restated, can you find three other combinations of C_4H_8 that is consistent with the octet rule. *Hint: Not all isomers will have double bonds*. Draw VSEPR diagrams for structural isomers.

Isomer 1	Isomer 2	Isomer 3

Part V. Chirality
A chiral carbon is a carbon bonded to four different groups. A chiral carbon has two enantiomeric forms commonly called right and left handed. In a compound name these two forms are identified as d or l. Enantiomers are non- superimposable mirror images. Your hands have two enantiomeric forms, left and right. Pencils only have one form.

Superimposable means two things are the same; they are exactly the same when you stack one on top of the other. You will note that your right and left hands are not superimposable but your left hand and your partner's left hand are superimposable. Any two pencils you put together are superimposable.

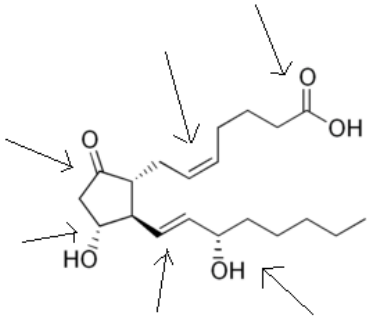
A second test for chirality is that the compounds are mirror images of each other. Your hands are mirror images of each other.

Make a model with carbon in the center and four different colored balls (red, white, green and blue) attached to it. Now make its enantiomer. Note that these will be mirror images of each other but not superimposable. Draw the two models in VSEPR form showing that they are mirror images.

Part VI. Post-Lab Questions.

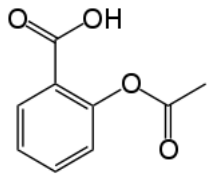
1. Draw and name 4 structural isomers with the chemical formula C_6H_{14}.

2. Identify the functional groups in the following compound.

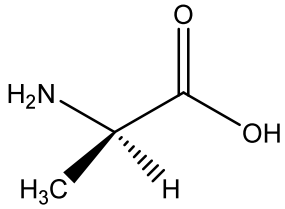


Prostoglandin E2

3. What is the chemical formula of aspirin? C_ H_ O_



4. Identify the chiral carbon in the molecule below by circling the chiral carbon or by putting a star by the chiral carbon. Identify the two functional groups in this molecule.



For extra credit, what is the class of biological compounds that this compound belongs to?