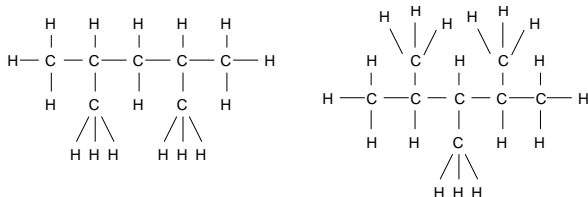


Chemistry 105

Homework Set # 6 (20 pts - All questions attempted = full credit)

Due by Exam 3

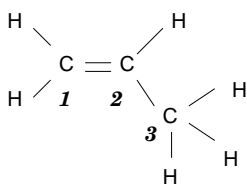
1. Are the following compounds isomers, identical, or neither?



2. For main group atoms, the hybridization exhibited is determined by the number of atoms bonded to it and the number of lone pairs. A hybrid orbital is needed for each bond and each lone pair. Some examples are below:

# atoms + lone pairs	hybridization	examples
4	sp^3	carbon in CH_4 nitrogen in NH_3 oxygen in H_2O
3	sp^2	carbon in COH_2 oxygen in COH_2 the carbons in $H_2C=CH_2$
2	sp	the carbon in HCN the carbon in CO_2

An example of the hybridization exhibited in propene is included below:



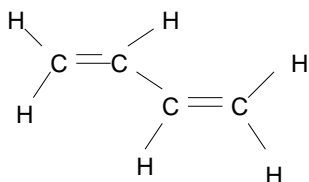
carbon 1: bonded to three atoms – sp^2 hybridized
carbon 2: also bonded to three atoms – sp^2 hybridized
carbon 3: bonded to four atoms – sp^3 hybridized

shape around carbon 1: sp^2 = trigonal planar
shape around carbon 2: sp^2 = trigonal planar
shape around carbon 3: sp^3 = tetrahedral

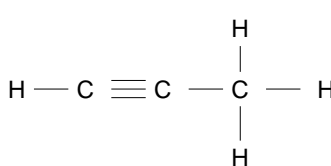
Note that sp^3 carbons are tetrahedral in shape and sp^2 carbons are trigonal planar. This is not in the above example, but we also know that sp carbons are linear.

Consider the following organic molecules. Identify the hybridization exhibited by each of the carbon atoms. Also indicate the shape around each.

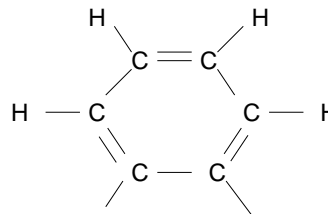
- (a) butadiene
 (b) propyne
 (c) benzene



butadiene



propyne



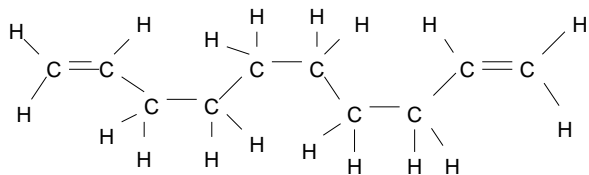
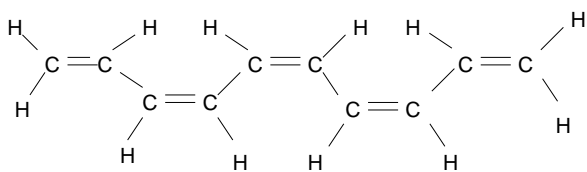
benzene

3. Describe the processes of fluorescence and phosphorescence using words and diagrams.

4. How does the number of alternating (also called conjugated) double bonds influence the wavelength of light absorbed by a molecule?

5. What is the difference between a molecule's ground electronic state and an excited electronic state in the same molecule?

6. Which of the following molecules will absorb light of a longer wavelength?



7. Describe how fireflies produce their glow, including correct chemical names.