WKS 8-5 Name_____

Hybridization and Orbital diagrams Period_____ Date_____

Part A: Valence Bond Theory; sp^3 Orbitals

1) What is a sigma bond?

2) What is a pi bond?

3) Why are sp^3 (and sp^2 & sp) orbitals all called *hybrid* orbitals?

4) How many orbitals are combined to form sp^3 hybrid orbitals? What orbitals are they?

5) How many sp^3 orbitals does an sp^3 hybridized atom have? ____What is the bond angle between them?___

Part B: sp^2 & sp Orbitals; Multiple Bonds

6) How many orbitals are combined to form sp^2 hybrid orbitals? What orbitals are they?

7) How many sp^2 orbitals does an sp^2 hybridized atom have? ___What is the bond angle between them?___

8) How many orbitals are combined to form sp hybrid orbitals? What orbitals are they?

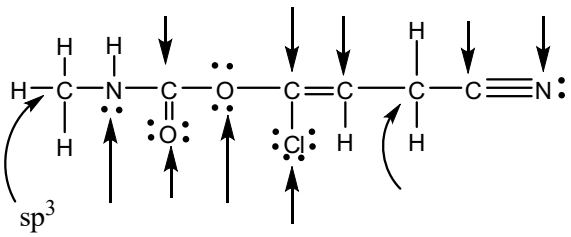
9) How many sp orbitals does an sp hybridized atom have? ____What is the bond angle between them?____

10) If the overall shape is tetrahedral, there are ***(4, 3, 2)*** regions of e^-s. Therefore, the orbitals are **(sp^3, sp^2 , sp)** hybridized.

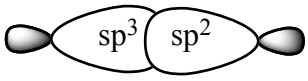
11) If the overall shape is trigonal planar, there are **(4, 3, 2)** regions of e^-s. Therefore, the orbitals are ***(sp^3, sp^2, sp)*** hybridized.

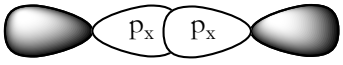
12) If the overall shape is linear, there are **(4, 3, 2)** regions of e^-s. Therefore, the orbitals are **(sp^3, sp^2 , sp)** hybridized.

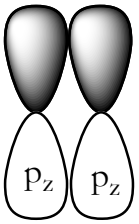
13) Label the hybridization (sp^3, sp^2 or sp) of all elements except for hydrogen in the molecule to the right.
(The first atom is done for you.)

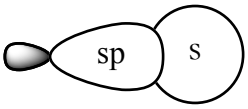


14) When any two orbitals overlap and make a covalent bond, the orbitals either overlap as a sigma bond (σ) or as a pi bond (π). Describe which type of bond (σ, or π) is being represented by the orbital overlaps in the following situations:

a) 

b) 

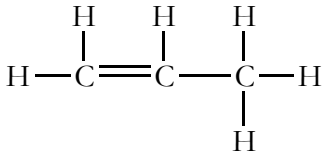
c) 

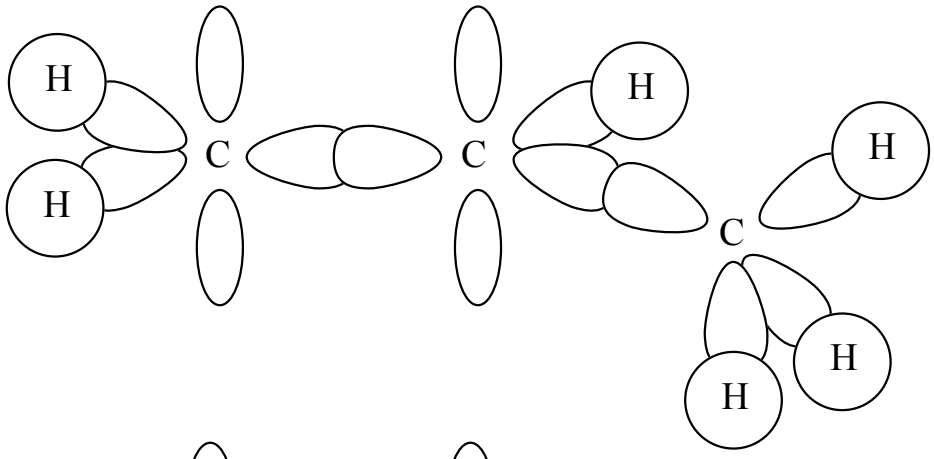
d) 

[over]

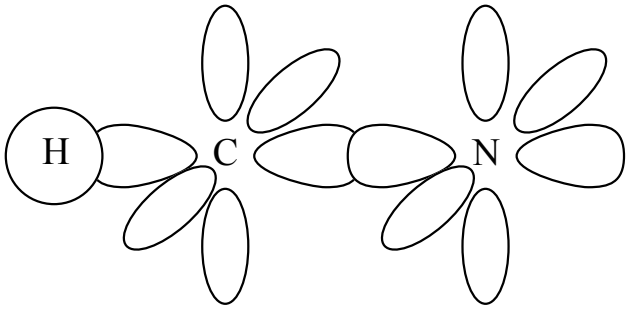
15) Label all of the orbitals (s, p, sp^3, sp^2, or sp) in these orbital diagrams, show all electrons (including lone pairs), and label all bonds as sigma (σ) or pi (π). It may be helpful to label the Lewis structures with the hybridization as in #12.

a) Orbital representation of

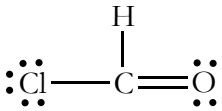


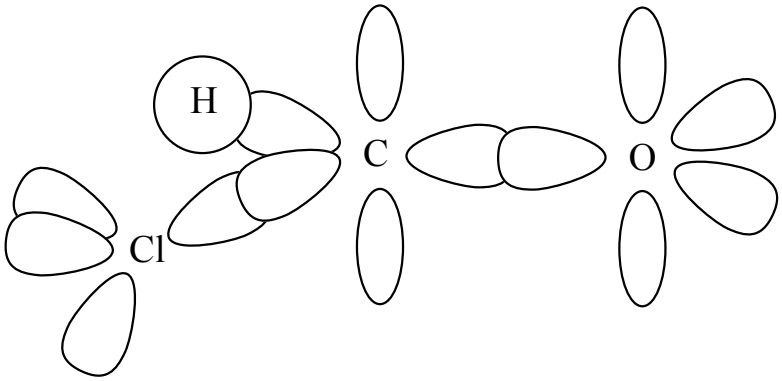


b) Orbital representation of



c) Orbital representation of





d) Orbital representation of