WKS

Hybridization and Orbital diagrams

Name_____

Period_____ Date_____

Part A: sp^3 Orbitals & Sigma (σ) Bonds

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

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

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

4) What is a sigma bond?

Part B: sp^2 & sp Orbitals; Pi (π) bonds

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

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

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

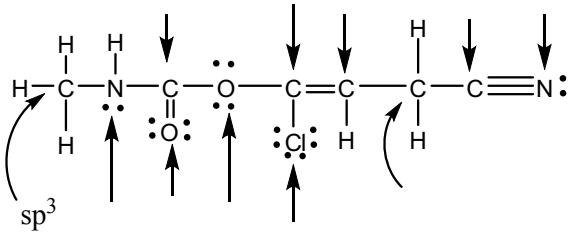
8) How many sp orbitals does an sp hybridized atom have? ____What is the bond angle between them?____

9) 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.

10) 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.

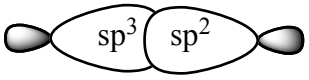
11) If the overall shape is linear, there are **(4, 3, 2)** regions of e⁻s. Therefore, the orbitals are **(sp^3, sp^2, sp)** hybridized.

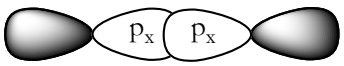
12) Label the hybridization (sp^3, sp^2 or sp) of all elements except for hydrogen in the molecule to the right.
(The first atom is done for you.)

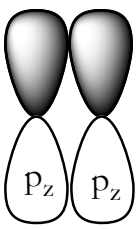


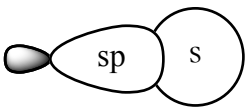
13) What is a pi bond?

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) 

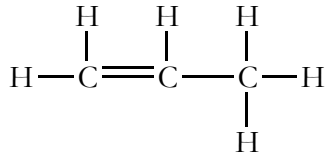
c) 

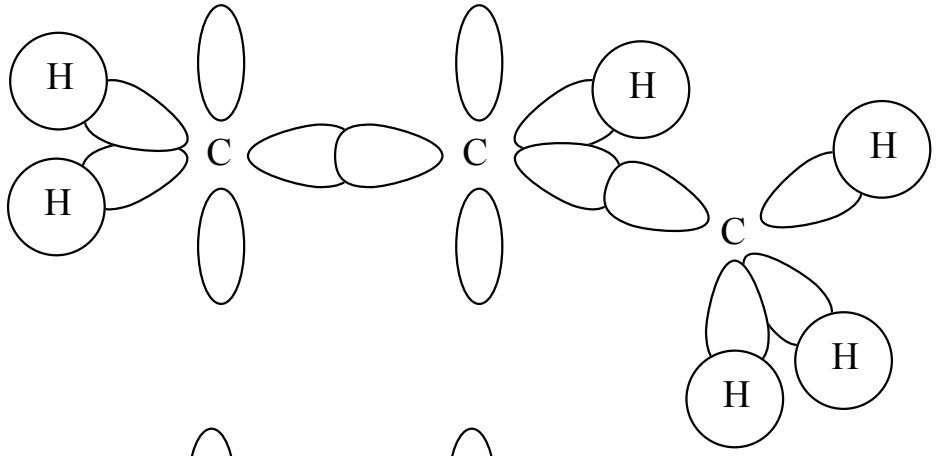
d) 

[over]

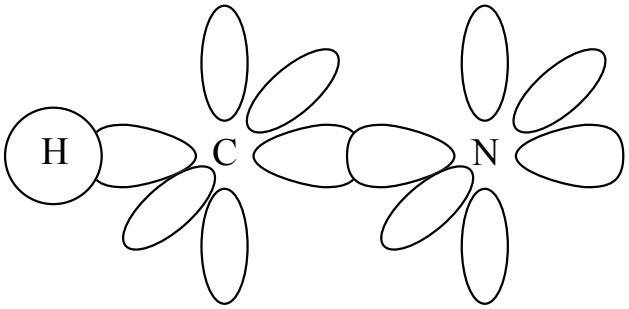
15) Label all of the orbitals (s, p, sp^3, sp^2, or sp) in these orbital diagrams, show all electrons, and label all bonds as sigma (σ) or pi (π). It may be helpful to label the Lewis structures as in #9.

a) Orbital representation of

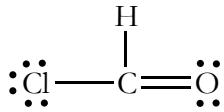


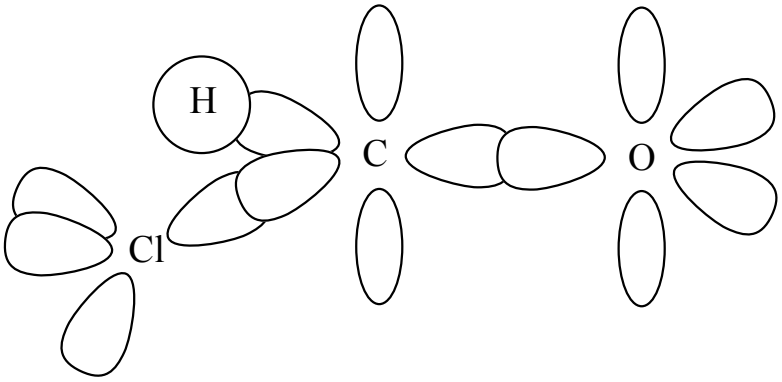


b) Orbital representation of



c) Orbital representation of





d) Orbital representation of