Exercise 09.1
Hybridization

Name: _____

Date: _____ Per: _____

DIRECTIONS: Answer the following in the space provided:

1. Explain the difference between the following pairs of terms:
   a. electronegativity and electron affinity _____
   b. covalent bond and polar covalent bond _____
   c. polar covalent bond and ionic bond _____
2. The molecules BF_3, CF_4, CO_2, PF_5, and SF_6 are nonpolar even though they contain polar bonds. Why? _____
3. A *sigma bond* (σ) between carbon and oxygen atoms in CO could result from the overlap of carbon and oxygen $2p_x$ atomic orbitals, assuming that the bond axis is the *x* axis. Explain if this statement is true or false. _____
4. Would you expect the electronegativity of titanium to be the same in the species Ti, Ti^{2+}, Ti^{3+}, and Ti^{4+}? Explain. _____
5. How many electrons occupy π orbitals in:
   a. CO_2: _____ b. HCN: _____
6. For each of the molecules below fill in the indicated items in the chart. The central atoms are underlined.

Molecule	$\underline{S}O_2$	$H\underline{B}F_2$	$\underline{Xe}F_4$	$\underline{C}H_2Cl_2$	$\underline{N}F_3$
No. of valence e^-'s					
Lewis structure					
Ideal bond angle(s)					
Hybridization					
Polar or non-polar?					
Geometry					

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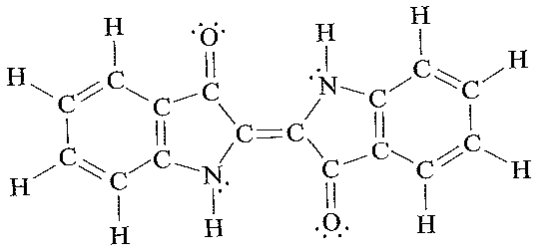
7. Indigo is the dye used in coloring blue jeans. The term navy blue is derived from the use of indigo to dye British naval uniforms in the eighteenth century. The structure of the indigo molecule is

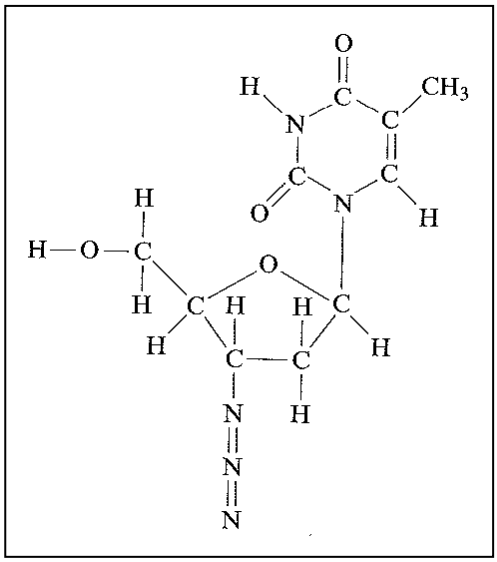


a. How many σ bonds and how many π bonds exist in the molecule? _____

b. What hybrid orbitals are used by the carbon atoms in the indigo molecule? _____

_____

8. One of the first drugs to be approved for use in treatment of acquired immune deficiency syndrome (AIDS) was azidothymidine (AZT). Complete the Lewis structure for AZT (it needs lone pairs!)



a. How many carbons are sp^3 hybridized? _____

b. How many carbons are sp^2 hybridized? _____

c. Which atom is *sp* hybridized? _____

d. How many σ bonds are in the molecule? _____

e. How many π bonds are in the molecule? _____

f. What is the N=N=N bond angle? _____

g. What is the H-O-C bond angle in the side group attached to the five-membered ring? _____

h. What is the hybridization of the oxygen atom in the $–CH_2OH$ group?

_____

9. Predict (a) the *approximate bond angle*, (b) the *hybridization* around the indicated atoms (the atoms to which the arrows are drawn in the structures below). Write your answers near the corresponding labels (1 to 5) in the drawings. (Note: the lone pairs on the F atoms are omitted.)