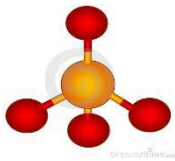
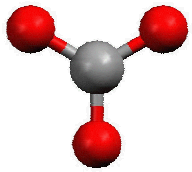
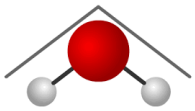
Shapes and Intermolecular Forces

Name: _____

Period: _____

Complete the following table: <u>You may want to draw the Lewis structure first</u>.

Molecule	Shape	Angle	3-D Image	Bond Polarity	Molecular Polarity	Hybrid	Intermolecular Force
PO_4^{3-}	Tetrahedral	109.5		Polar	Non polar	Sp^3	London Dispersion
BF_3	Trigonal Planer	120		Polar	Non Polar	Sp^2	London Dispersion
H_2S	Bent	104.5		Polar	Polar	Sp^3	Dipole/Dipole

Answer the following questions.

1. **In methane (CH_4) what type of attractive forces exist between the atoms ___covalent bonds_____. What type of attractive forces exists between the methane molecules ___london dispersion forces_____.**

2. **In water (H_2O) what type of attractive forces exist between the atoms ____covalent bonds_____. What type of attractive forces exists between the molecules __hydrogen bonds_____.**

3. **In Nitrogen triflouride (NF_3) what type of attractive forces exist between the atoms ____covalent bonds_. What types of attractive forces exists between the molecules _____dipole/dipole forces_____**

4. **In NaCl what type of attractive forces exist between the atoms ___ionic bonds_____. Why would one not ask what type of forces exist between the molecules? __Because a crystal lattice forms in which every ion is bonded to another ion_____.**

5. **In Diamond what type of attractive forces exist between the carbon atoms ___covalent bonds_____. Why would asking what type of forces exist between molecules not make sense? _Because a covalent network of bonds is formed_____.**

6. **In a sample of Iron what type of attractive forces exist between the atoms___metalic bonds_____.**

7. **In CS_2 what type of attractive forces exists between C and S ___covalent bonds_____. What is the total number of electrons shared between C and S _____4_____. What is the force between carbon disulfide molecules? ____london dispersion force_____. How many sigma bonds exist in the entire molecule ___2__. What is the total number of pi bonds that exist in the molecule _____2_____.**

8. **In Oxygen (O_2) how many sigma bonds exist ___1_____. How many pi bonds_____1____. What is the type of force between the oxygen atoms ____covalent bonds_____ between the oxygen molecules ____london dispersion forces_____.**

9. **In Nitrogen (N_2) how many sigma bonds exist? ____1_____ Pi Bonds? _____2_____. Which bond is longer the N_2 or the O_2 ____O_2_____. Why? ___O_2 shares 4 electrons which makes is longer than Nitrogen which shares 6 electrons. More electrons that are shared the shorter the bond__.**

10. **Rank the following molecules from highest boiling point to lowest (Strength of intermolecular forces): CH_4, H_2O, PH_3, LiBr, C (Diamond)? __C (Diamond), LiBr, H_2O, PH_3, CH_4_____**

11. **What has a higher melting point? $SiCl_4$ or SBr_2? ___SBr_2_____ Why? _____SBr_2 has Dipole Dipole force which is stronger than the dispersion forces in Silicon tetra chloride_____**

12. **In Nitrate (NO_3^-), how many sigma bonds are present ____3_____. Pi Bonds? _____1_____**

13. **Sulfur forms bonds with oxygen in multiple ways. SO_3, SO_2, SO_3^{2-} and SO all exist. Rank them from longest bond to the shortest. ___ __ SO_3^{2-}__ SO_3__ SO_2____ SO _____**