CHEM106 PS-1: **Due at the beginning of class on Thursday.**

1. Complete these tables; bond angles refer to angles around the central atom.

Molecule	OPF_3	ClO_3^-	ICl_5	SF_6	CH_3CHO
Number of Valence Electrons					
Lewis Structure (include all nonzero formal charges)					
Electron Arrangement					
Molecular Geometry					
Bond Angle(s)					
Hybridization					
Polar or Nonpolar					
# of sigma (σ) bonds					
# of pi (π) bonds					
Bond Order					

2. Draw Lewis structures for each of the following show all bonds, nonbonding pairs, atoms, and nonzero formal charges:

   a. $N(CH_3)_4^+$

   b. $[P_2O_7]^{4-}$

   c. Glycerol

   d. $CH_3CH_2CH_2CH_2CH_2CH_2CH_2COOH$

   e. $CH_3(C{=}O)OCH_2CH_2N(CH_3)_3^+$

   f. CCl_3COOH

   g. CF_2HCHO

   h. NH_2NH_2

3. Use the exponential portion of the Arrhenius equation to calculate the fractions of gaseous argon atoms that have a kinetic energy greater than 100 kJ/mole at a temperature of 10,000 K and at a temperature of 298K.

4. Sketch a kinetic molecular distribution plot for two temperatures and shade in the areas having a kinetic energy greater than an arbitrary activation energy. Then use this illustration to clearly explain why chemical reactions occur faster at higher temperatures.

5. Draw Lewis structures for the given bases and their respective conjugate acids:

    a. Trimethyl amine

    b. Cyanide ion

    c. Hydrogen phosphate ion

6. Calculate the amount of energy (J) required to melt 20.0 g of ice at 273.15 K. The enthalpy of fusion for ice is 6.009 kJ/mole.

7. For the combustion of methane at a temperature of 298K, write a balanced chemical equation and determine the change in enthalpy, entropy, and Gibbs free energy for this reaction.

8. Calculate the vapor pressure of ethanol at a temperature of 298 K using the Gibbs free energies of formation for C_2H_5OH (l) (-174.78 kJ/mol) and C_2H_5OH (g) (-168.49 kJ/mol). Write an equation for the vaporization process and compare your prediction to the known vapor pressure.