1. a) Draw Lewis structures for sulfurous acid (H_2SO_3) and sulfuric acid (H_2SO_4) which obey the octet rule. Do the formal charges follow what you know about the electronegativity of S and O?

   b) What arguments would you advance for a valence shell expansion about S? Draw the expanded Lewis structures.

2. It is known from experiments that N_2O is a linear molecule with a dipole moment.

   a) Draw the Lewis structure of N_2O consistent with these facts. Be sure to include all resonance structures and give the formal charge on all atoms having any.

   b) Which of the resonance structures that you have drawn is likely to be the least important? Explain your reasoning.

3. In each set circle the molecule having the smallest bond angle and briefly explain your choice.

a) CH_4, H_2O, NH_3

b) $OSBr_2$, $OSCl_2$, OSF_2 (S is central atom)

c) AsI_3, PI_3, SbI_3
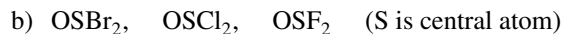
4. Draw the molecular structure, give the electron-pair (electronic) and molecular (shape) geometries, give formal charges for those atoms having any, and estimate the bond angles. Which molecules, if any, have a dipole moment?

a) ICl_2^+

b) XeO_3

c) ClO_4^-

d) CNO^-

5. Draw the Lewis structure for acetic acid CH_3COOH. Give the electronic and molecular geometries about the two C atoms and about the two O atoms.

6. For each of the following pairs circle which

a) is the more electronegative   Rb vs Cs   H vs F   Br vs I
b) is the more polar   HCl vs HBr BH_3 vs NH_3 CO_2 vs H_2O
c) is the larger K^+ vs Ca^{2+} C vs O   N vs P
d) has the longer bond length   HCl vs HBr Li_2 vs B_2 F_2 vs Cl_2

5. Oxygen fills a 250 -L reaction vessel at $100^{\circ}C$ at 1.00 atm pressure

    a) What is the density of the oxygen gas?   [1.05 g L^{-1}]

    b) Determine the volume of the same quantity of oxygen at $0^{\circ}C$, 1.50 atm.   [122 L]

    c) What would be the pressure of an equal mass of argon in the same vessel at $100^{\circ}C$?   [0.801 atm]

    d) How many moles of oxygen need to be removed if the pressure is to remain at 1.00 atm when the vessel is heated to $200^{\circ}C$?   [1.73 mol]

    e) Calculate the volume of hydrogen at $20^{\circ}C$ and 740 mm Hg needed to react with all of the oxygen to form water.   [403 L]