Name: _____ *Date:* _____

Unit 2.6

Resonance Structures & Formal Charge

1. Calculate the formal charge on each atom in O_3. Draw the Lewis Diagram of O_3 to aid in your calculations.

2. There are two possible structures for CO_2. One has two double bonds and the other has a single and a triple bond.
   a. Find the formal charge on every atom in each structure.

   b. Select the most likely structure. Justify your choice.

3. There are three possible structures for the cyanate ion, NCO^-. Carbon is the least electronegative, so it is always in the center. The different structures result from the placement and choice of multiple bonds (double or triple).
   a. Find the formal charge on every atom in each structure.

   b. Which structure is most likely to occur in nature? Justify your answer.

4. Draw Lewis diagrams for the following compounds:
   a. SO_4^{2-}

   b. $POCl_3$

5. The following questions pertain to the phosphate ion, PO_4^{3-}.
   a. Draw the resonance structures for the phosphate ion.

   b. What is the bond order between the phosphorus atom and each oxygen atom in the phosphate ion?

6. The following questions pertain to the carbonate ion and carbon dioxide.
   a. Draw all of the resonance structures for the carbonate ion.

   b. What is the effective bond order between the carbon atom and each oxygen atom in the carbonate ion?

   c. What is the effective bond order between the carbon atom and each oxygen atom in carbon dioxide?

   d. In which structure, carbonate or carbon dioxide, is the bond length between the carbon atom and each oxygen atom the shortest? Explain.

   e. In which structure, carbonate or carbon dioxide, is the bond energy between the carbon atom and each oxygen atom the greatest? Explain.

   f. Which structure has the most potential energy associate with its individual bonds? Justify your answer.