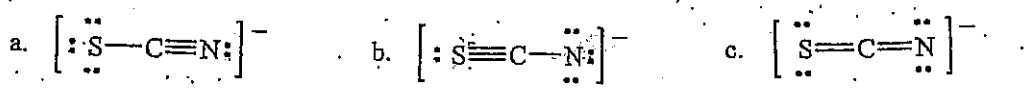
Lewis Structures, Resonance, and Formal Charge Name_____

1. Below are three possible Lewis Structures for the thiocyanate ion. Using principles of formal charge, determine which of the structures the actual species will more closely resemble. Explain how you used the principles of formal charge to select the preferred structure and eliminate the others. (In other words, tell what is favorable and what is unfavorable about each structure.)



2. a. Use Needs, Available, Shared (show work) to draw Lewis structures for sulfur trioxide, the sulfite ion, and sulfur dioxide. Include any resonance structures.

   b. Compare the relative lengths of the sulfur-oxygen bonds in the three molecules. Explain thoroughly.

3. The carbonate ion, CO_3^{2-}, is formed when carbon dioxide, CO_2 reacts with slightly basic cold water.
   a. Draw the Lewis dot structure for the carbonate ion and for carbon dioxide. Include any resonance structures.

   b. Describe the relative bond energy of the three C-O bonds in the carbonate ion.

   c. How does the bond energy of the carbon-oxygen bonds in carbon dioxide compare to the bond energy of the bonds in carbonate?

4. Draw three possible Lewis structures for NO_2^+ (N is the center atom). Using principles of formal charge, determine which of the structures the actual species will more closely resemble. Explain how you used the principles of formal charge to select the preferred structure and eliminate the others. (In other words, tell what is favorable and what is unfavorable about each structure.)

5. A.) Write the balanced equation for the formation of one mole of sodium oxide from its elements.

B.) Use the energies below to calculate **the lattice energy of sodium oxide.** In the table below, write an equation for each reaction step in the process and give the associated energy change. **Give the appropriate sign for the energy change.**

Bond energy for $O_2(g)$ = 495 kJ/mole

First electron affinity of O(g) = -142 kJ/mole

First ionization energy of Na(g) = 495 kJ/mole

Second electron affinity of O(g) = +844 kJ/mole

Enthalpy of sublimation of Na(s) = 109 kJ/mole

Enthalpy of formation of Na_2O = -416 kJ/mole

Reaction	Energy Change (kJ)
1.	
2.	
3.	
4.	
5.	
6.	
Overall reaction:	