

# Inorganic Chemistry

## Chapter 2 Homework-DUE Friday Sept. 17, 2010 @ 8 AM

*For your own benefit do Chapter 2 Problems 1-10,15, 17, 19, 22bc, 23, 24ac, 28 (these will not be collected)*

Answer the following on a separate page to turn in for a grade. **Please do your own work.**

1. Write the electron configuration for each of the following. Also, sketch a diagram of the HOMO in each case.

- (a)  $\text{Be}_2$
- (b)  $\text{C}_2^-$
- (c)  $\text{F}_2^+$

2. What are the expected changes in **bond order** and **bond distance** that accompany the following ionization processes? Exact values for bond distance are not necessary, just comment on the bond length increasing or decreasing for the ionic form compared to the neutral form.

- (a)  $\text{O}_2 \rightarrow \text{O}_2^+ + e^-$
- (b)  $\text{N}_2 + e^- \rightarrow \text{N}_2^-$

3. Draw the **MO diagram** and **calculate the BO** for NO (nitric oxide). Be sure to take into account the relative energy of nitrogen and oxygen 2s and 2p orbitals when setting up your diagram. Be sure to populate the diagram with the correct number of electrons.

4. (a) What is the **charge distribution (q)** for HCl? Use Appendix 6 in your book to calculate the covalent bond length (which values should you use?). Assume the dipole moment is 1.084 D.

(b) What is the **dipole moment (D)** of  $\text{CO}_2$ ? Assume the C-O bond has a charge distribution of  $\pm 0.16$ .

5. Consider the first and second period elements as diatomic species:  $\text{H}_2, \text{He}_2, \text{Li}_2, \text{Be}_2, \text{B}_2, \text{C}_2, \text{N}_2, \text{O}_2, \text{F}_2, \text{Ne}_2$

- (a) Based on Lewis structures/valence bond theory, which of these would be paramagnetic?
- (b) Based on MO theory, which of these would be paramagnetic?
- (c) Based on MO theory, which of these would NOT be expected to exist? Briefly explain your answer.