CH 222 Chapter Eight Study Guide

- Be able to describe the main features of <u>valence bond theory</u>. Realize that valence bond theory views bonding as arising from the idealized overlap between two atomic orbitals; the electron density remains localized along the bond axis, but the overall energy of the system does not change.

- Be able to describe the main features of <u>molecular orbital theory</u>. Realize that the number of molecular orbitals always equals the number of atomic orbitals used in the combining atoms. Know that some of the bonds will be <u>bonding</u> and others will be <u>antibonding</u>.

- Understand how a <u>sigma bond</u> forms. Know the three types of sigma bond formation (s+s, p+s, p+p).

- Understand the concept of <u>pi bonds</u> under both molecular orbital and valence bond theories.

- Be able to use the concept of <u>orbital hybridization</u> to describe the bonding form of atoms in molecules. Know how to assign sp, sp^2, sp^3, sp^3d, and sp^3d^2 hybridization to the appropriate atoms, and know what <u>geometry</u> each of these hybridization forms will give the molecule (ex: sp = linear, etc.)

- Be able to draw molecular orbital diagrams for all diatomic molecules (Li_2, O_2, etc.) up to neon. Know how to handle a charged diatomic molecule (ex: O_2^{2-}) using molecular orbital theory. Realize that you will be expected to determine the **correct** molecular orbital diagram for oxygen, fluorine and neon diatomics.

- Be able to apply <u>Hund's Rule</u> and the <u>Pauli Exclusion Principle</u> when assigning electrons to molecular orbitals.

- Be able to predict <u>paramagnetic</u> behavior and the <u>bond order</u> from molecular orbital diagrams. Know what these predictions mean for the molecule.

- Realize the implications of the application of molecular orbital theory to solids (<u>band theory</u>), especially for industrial processes.

- Be able to solve and understand the assigned problems in problem set #2.