

Name: _____

Date: _____

- [4 pt] 1. What are two flaws in Valence Bond Theory that led to Molecular Orbital Theory?
- [4 pt] 2. Define the terms (1) Paramagnetic and (2) Diamagnetic
- [4 pt] 3. What is the difference between where electrons are located in Atomic Orbitals and where electrons are located in a Molecular Orbital?
- [6 pt] 4. Discuss the difference between bonding (BO) and nonbonding (NBO) molecular orbitals as defined in molecular orbital theory. Draw a picture illustrating the combination of orbitals, label it showing each type of orbital, and show whether the energy increases or decreases.
- [4 pt] 5. In Molecular Orbital theory what is the driving force for the formation of bonds between atoms. For instance why does hydrogen form a diatomic molecule (H_2) while helium does not (ie no He_2 exists)?
- [4 pt] 6. Discuss the difference in the location of electron density between sigma and pi bonding molecular orbitals as defined in molecular orbital theory. Draw a picture, and label it, showing each type of orbital.

[4 pt] 7. What is meant by the term Bond Order? Include the equation in your discussion.

[4 pt] 8. Sketch a picture of the MO diagram (similar to Fig on page 293 or Figure 5.35) for the He_2^+ molecule. What is the Bond Order? Is it likely to be stable?

[6 pt] 9. Use the MO diagram provided below to describe the bonding in N_2^+ , N_2 , and N_2^- (You may ignore the inner shell electrons). For each molecule, calculate the BO and whether it is diamagnetic or paramagnetic. Circle the most stable molecule.

