CONCEPT: MO THEORY: BOND ORDER

- Molecular Orbital Diagrams can be used to determine the *bond order* of a molecule.
  - □ **Bond Order**: a measurement of the number of electrons involved in bonds between two elements.
  - □ A bond order of ____ means that the compound is stable and exists.
    - As bond order ⇧, the stability and strength of the bond ____ , and the length of the bond ____.
  - □ A bond order of ____ means that the compound is unstable and doesn't exist.

Bond Order Formula

$$\text{Bond Order} = \frac{1}{2}(\underline{\qquad\qquad} \text{ Electrons} - \underline{\qquad\qquad} \text{ Electrons})$$

EXAMPLE: Determine the bond order of the NO^- ion.

Bond Order & Type of Bond

- Recall, the bond order can determine how many bonds form between two elements in a compounds.
  - □ Single bond = Bond Order of _____
  - □ Double bond = Bond Order of _____

EXAMPLE: Using MO Theory and bond order, determine the number of bonds connecting the nitrogen atoms within the N_2^{2-} ion.

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PRACTICE: Apply Molecular Orbital Theory to determine the bond order of HHe^+ ion.

a) 2 b) 1.5 c) 4 d) 3 e) 1

PRACTICE: Apply molecular orbital theory to predict which species has the strongest bond.

a) O_2 b) O_2^- c) O_2^+ d) All the bonds are equivalent

PRACTICE: Using Molecular Orbital Theory, answer the following questions dealing with carbon mononitride, CN.

a) CN is diamagnetic.

b) CN^- is paramagnetic.

c) If an electron is removed to give CN^+, the bond length decreases.

d) The π^*_{2p} orbital is the highest energy orbital containing an electron in CN.

e) If an electron is added to give CN^-, the bond order increases.