

## Quiz 9.2 – Molecular Orbital Theory: Diatomic Molecules

Name: \_\_\_\_\_

**Homonuclear Diatomics**

$\text{O}_2^{4+}$  and  $\text{N}_2^{2+}$  have the same number of electrons, so you might expect them to have identical electronic structure

○ Draw the molecular orbital energy level diagram for these two molecules, filled with the proper number of electrons

○ Give the bond order of both molecules

○ Describe how both molecules might interact with a strong magnetic field

### Heteronuclear Diatomics

Consider the molecule HF. Because of the much higher nuclear charge on F, the  $H1s$  orbital actually aligns best energetically with the  $F2p_z$  orbital, so they are the two which combine to form a molecular orbital.  $\alpha_{H1s} = -7.2\text{eV}$ ,  $\alpha_{F2p} = -10.4\text{eV}$ , and  $\beta_{H1s-F2p} = -1.0\text{eV}$

○ Calculate the energies of the two molecular orbitals, and draw an energy-level diagram which includes both the energies of the atomic orbitals and molecular orbitals. Remember that for heteronuclear diatomics we usually assume that the overlap integral  $S = 0$

○ Calculate the coefficients for both MOs and sketch how they might look considering the unequal contributions from both atoms

*Good Bones*

By Maggie Smith

Life is short, though I keep this from my children.  
Life is short, and I've shortened mine  
in a thousand delicious, ill-advised ways,  
a thousand deliciously ill-advised ways  
I'll keep from my children. The world is at least  
fifty percent terrible, and that's a conservative  
estimate, though I keep this from my children.  
For every bird there is a stone thrown at a bird.  
For every loved child, a child broken, bagged,  
sunk in a lake. Life is short and the world  
is at least half terrible, and for every kind  
stranger, there is one who would break you,  
though I keep this from my children. I am trying  
to sell them the world. Any decent realtor,  
walking you through a real shithole, chirps on  
about good bones: This place could be beautiful,  
right? You could make this place beautiful.