Molecular Orbitals (MOs) Rule

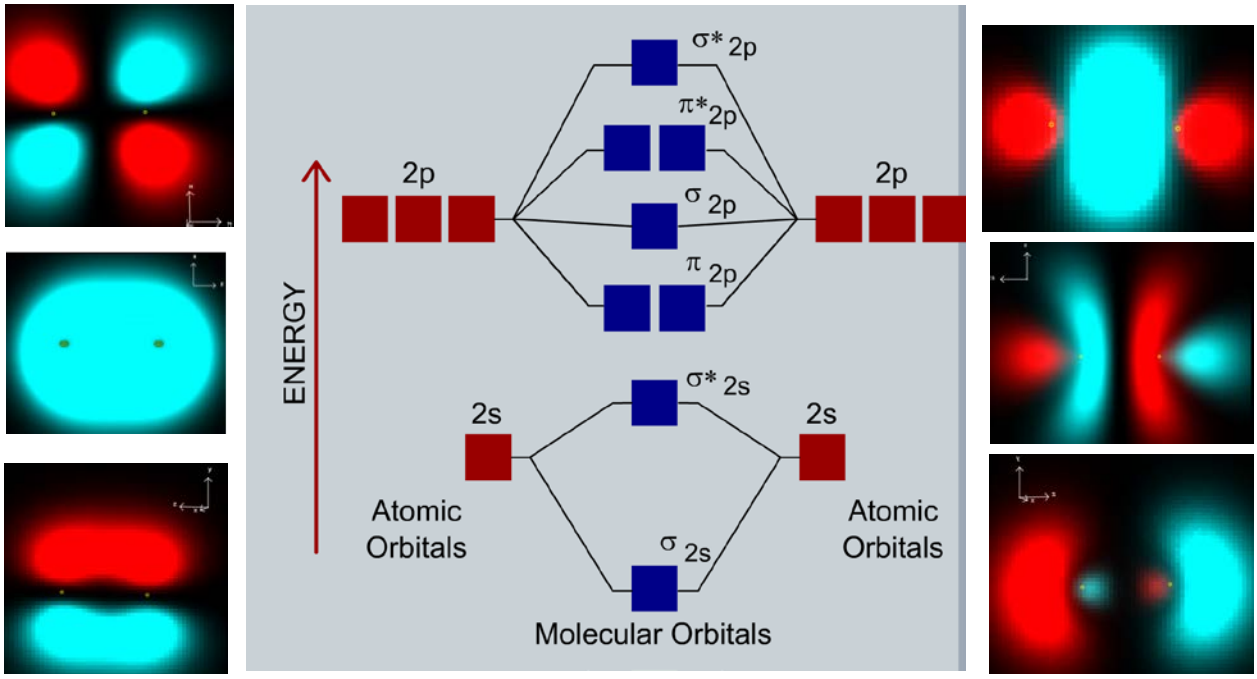
It's time we take a deeper look at bonding. We noted that bonds form because they are lower in energy and, therefore, exhibit a more stable electronic configuration. We have looked at electron distributions in covalent molecules and we noted that a filled valence shell provides a basic explanation. Now we will use our understanding of atomic orbitals to better understand 'why' bonds form. In the MO model, the atomic electron wavefunctions combine (constructive or destructive interference). The combination of two atomic orbitals will result in two MO wavefunctions—one lower and one higher than the atomic orbital wavefunctions.

During this activity, take notes (**that will make sense when you go back to them later!**) that include observations, and correct results regarding MO pictures and MO electron diagrams.

1. Go to the following interactive MO tutorial and complete the first 14 questions.

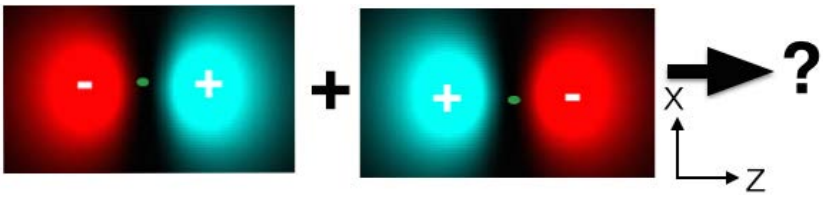
2. Now complete the MO energy diagrams. For these problems, you will need to calculate bond order.

3. Draw an arrow to the correct molecular orbital shape (some MOs may be used more than once. Do not worry about orientation).

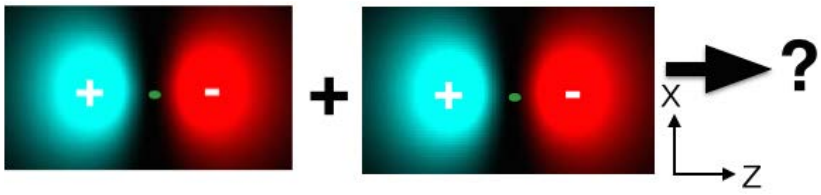


4. Complete the following combination of atomic orbitals by indicating the Roman numeral that will describe the resulting MO (note: the central dot on the AOs indicates the position of the atomic nucleus). In each case label the AOs and MOs.

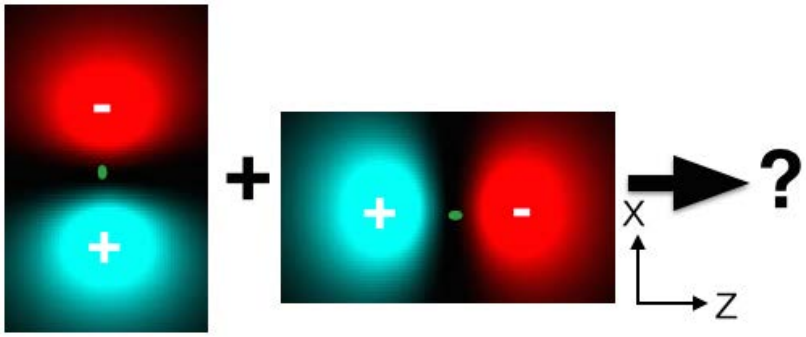
a. _____ + _____ → _____



b. _____ + _____ → _____



c. _____ + _____ → _____



d. _____ + _____ → _____