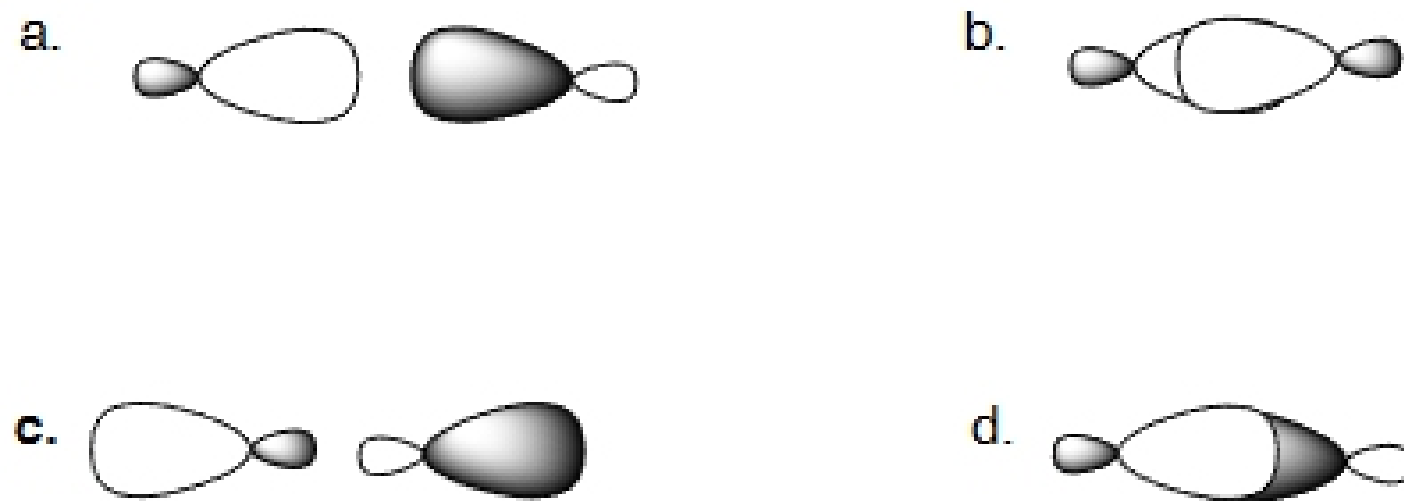


CHEM 343, Quiz 2

1. Which of the following is an accurate depiction of the antibonding orbital in  $\text{Br}_2$ ?



2. Put the following  $\sigma$  bonds in order of increasing energy (lowest to highest):

CO, CBr, CF, CS

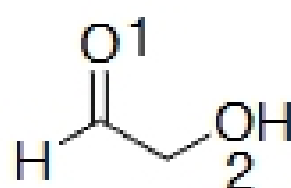
a.  $\text{CS} < \text{CO} < \text{CBr} < \text{CF}$     b.  $\text{CF} < \text{CO} < \text{CS} < \text{CBr}$     c.  **$\text{CF} < \text{CO} < \text{CBr} < \text{CS}$**     d.  $\text{CBr} < \text{CS} < \text{CO} < \text{CF}$

3. Consider the bonds shown below, and select the correct statement from the following:

H-O    H-N    H-Cl    H-C

- a. HCl would have the lowest energy  $\sigma$  bond, and therefore be hardest to break.  
**b. HC would have the highest energy  $\sigma^*$ , and therefore be hardest to break.**  
 c. HN would have the highest energy  $\sigma^*$ , and therefore be hardest to break.  
 d. HO would have the lowest energy  $\sigma^*$ , and therefore be hardest to break.

4. Consider the molecule shown below, and select the correct statement from the following:

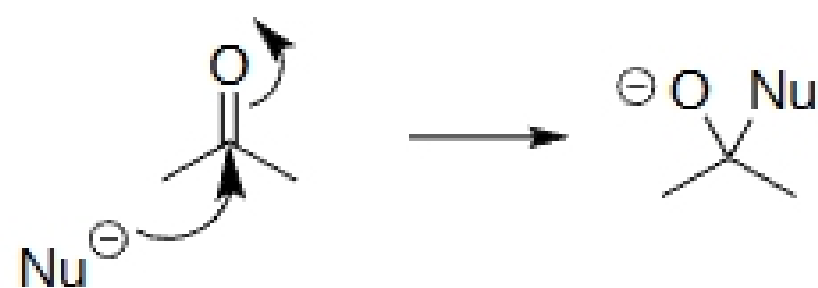


- a. The highest energy non-bonding electrons surround oxygen 2.**  
 b. The highest energy  $\sigma$  bond is the C-C bond.  
 c. The highest energy antibonding orbital is OH  $\sigma^*$ .  
 d. The lowest energy  $\sigma$  bond is the OH bond.

5. Which of the following is an accurate depiction of the CC  $\pi$  bond in ethene?



6. Consider the reaction shown below, and select the correct statement from the following:



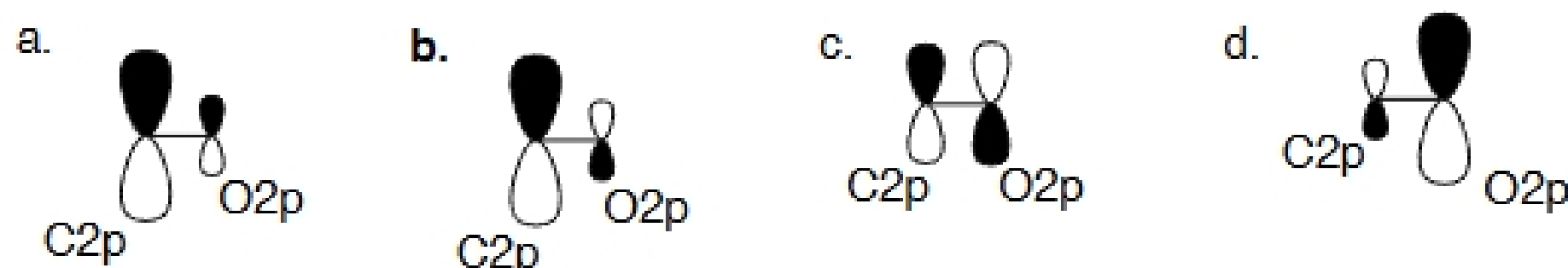
- The electrons from the nucleophile populate CO  $\sigma^*$ , causing the CO  $\sigma$  bond to break.
- The electrons from the nucleophile populate CO  $\sigma^*$ , causing the CO  $\pi$  bond to break.
- The electrons from the nucleophile populate CO  $\pi^*$ , causing the CO  $\pi$  bond to break.**
- The electrons from the nucleophile populate CO  $\pi^*$ , causing the CO  $\sigma$  bond to break.

7. How many nodes are present in the highest energy filled  $\pi$  orbital in the molecule shown below?



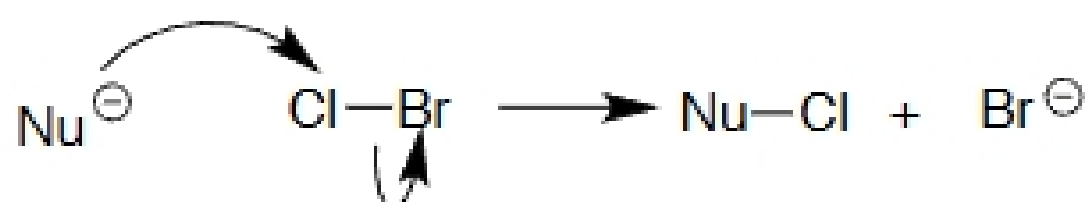
- 0
- 2**
- 3
- 5

8. Which of the following is an accurate depiction of the CO  $\pi^*$  orbital in formaldehyde?

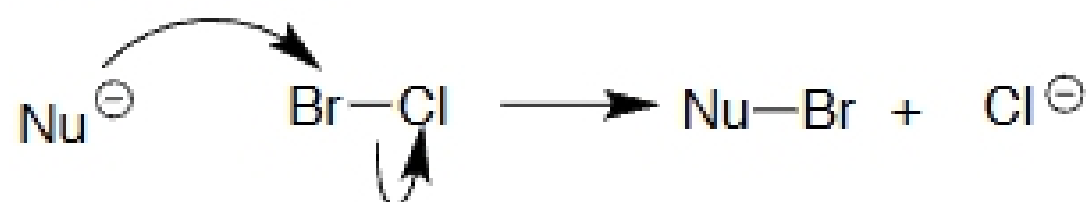


9. Consider the two reaction pathways below, and select the correct statement.

**Pathway 1**



**Pathway 2**



- Pathway 1 is more likely because  $\sigma^*$  is closer in energy to Cl, and the ClBr  $\sigma$  electrons are closer in energy to Br.
- Pathway 2 is more likely because  $\sigma^*$  is closer in energy to Br, and the ClBr  $\sigma$  electrons are closer in energy to Cl.**
- Pathway 1 is more likely because  $\sigma^*$  is closer in energy to Br, and the ClBr  $\sigma$  electrons are closer in energy to Cl.
- Pathway 2 is more likely because  $\sigma^*$  is closer in energy to Cl, and the ClBr  $\sigma$  electrons are closer in energy to Br.

10. Which of the orbitals below is highest in energy?

