

1. (8 pts each) Draw Lewis structures for the following condensed structures.



1. _____

2. _____

3. _____

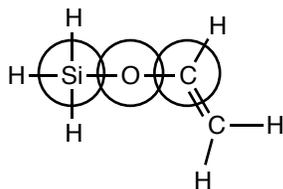
4. _____

5. _____

2. (10 pts.) Determine the hybridization of the circled atoms in the following molecules. Lewis, Kekulé, and condensed structures are provided.

6. _____

a.



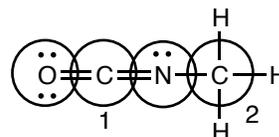
Si ____ O ____
 C ____

b.



N ____ O ____
 C ____

c.



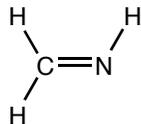
O ____ N ____
 C₁ ____ C₂ ____

7. _____

8. _____

9. _____

3. (10 pts.) A wedge and dashed three-dimensional Kekulé structure of methylimine is drawn below. Using the valence bond model, describe the double bond. Remember to name the orbitals (hybrid or atomic orbitals) that are being used, and remember to specify the symmetry of the bonds that form (σ or π) from the interaction of the hybrid or atomic orbitals.



4. An incomplete MO diagram for the molecule SO is drawn below. Remember, when elements with different electronegativities are involved in an MO diagram, the atomic orbitals for the more electronegative element are drawn lower on the page.

a. (2 pts.) Label the atomic orbitals.

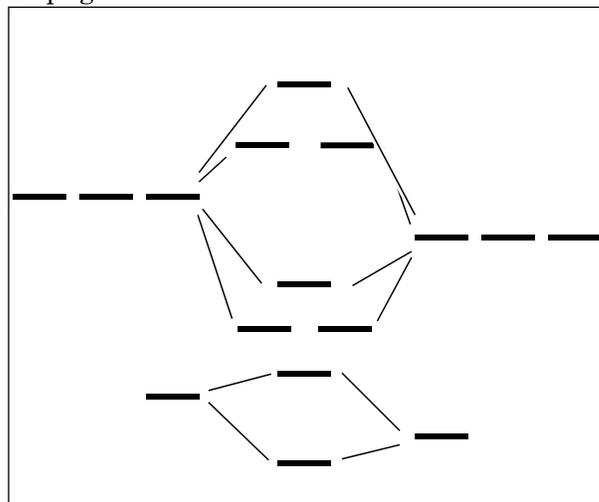
b. (2 pts.) Label the molecular orbitals.

c. (2 pts.) Populate the atomic orbitals with the appropriate number of electrons.

d. (2 pts.) Populate the molecular orbitals with the appropriate number of electrons.

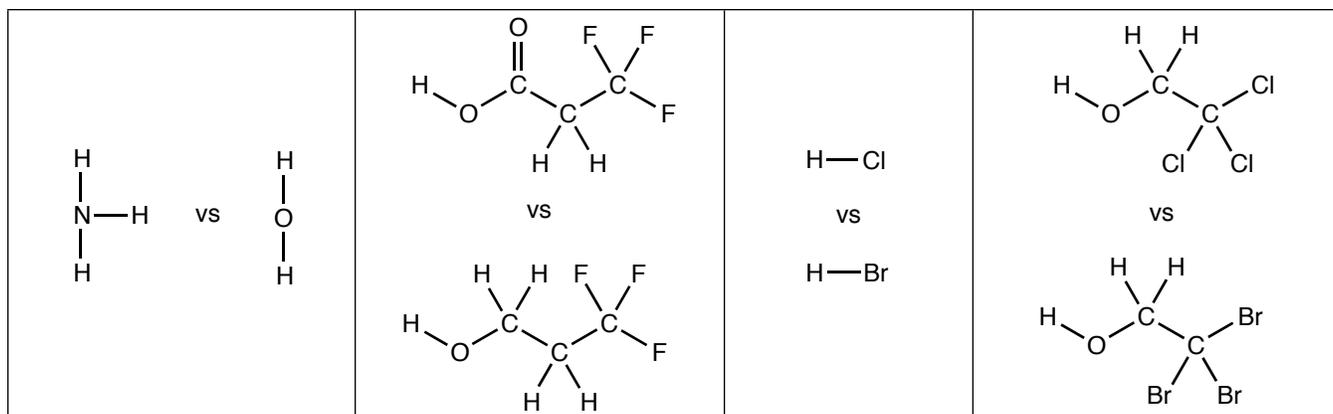
e. (2 pts.) Determine the bond order for SO.

f. (4 pts.) What happens to the strength of the bond when SO loses an electron. Explain your response.

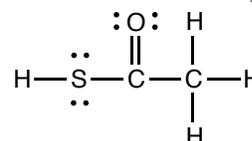


5. a. (4 pts.) For each of the following molecules, identify the acidic proton.

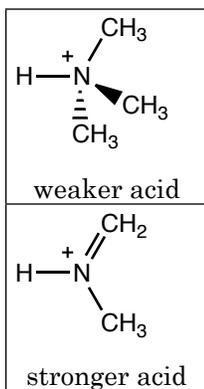
b. (8 pts.) For each pair of molecules below, determine which is the stronger acid.



6. (8 pts.) Using wedge (▴) and dashed (⋯) bonds where appropriate, draw three-dimensional representations of the following molecules. Lewis and condensed structures are provided.



7. (10 pts.) Explain why the top molecule is the weaker acid.



8. (10 pts.) An oxygen atom has more protons, neutrons, and electrons than a carbon atom, yet the oxygen atom is smaller. Explain.

9. (6 pts.) An antibonding orbital is pictured below. Describe the traits that makes this orbital high in energy.

