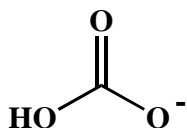


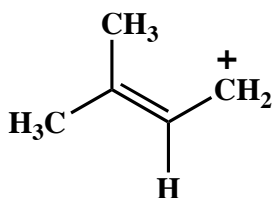
Problem Set 2

1. Draw all the important resonance structures for both of the following species. Include all unshared electrons and nonzero formal charges for each resonance structure.

A.



B.



2. Draw a Lewis structure for both of the following compounds. Draw each bond clearly. Specify the orbitals that overlap to form each bond (e.g., “s/p” for the overlap of an s orbital with a p orbital). Then label each bond as a σ or π bond. Finally, draw and specify all nonbonding hybrid orbitals.

A. HCCCH₂OH

B. H₃CCOCH₃

3. Draw the Lewis structure for both of the following compounds. Then use the VSEPR rules to determine the corresponding molecular geometry for each compound. Describe your reasoning clearly by specifying the hybridization and electron-domain geometry of the central atom, and the basis for the observed electron-domain geometry. Finally, draw a three-dimensional structural formula for each compound.

A. BF₃

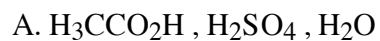
B. H₂O

4. Which specific bonds of the following compounds are polar covalent bonds? Draw vector-annotated three-dimensional chemical structures and vector-sum diagrams to determine which compounds have a nonzero molecular dipole moment.

A. HCCCH₂OH

B. H₃CCOCH₃

5. Rank each of the following lists from the most to least acidic compound. Describe your reasoning by explaining the relative stabilities of the corresponding conjugate bases.



6. Which solvent(s) (choices: water, a polar organic solvent, or a nonpolar organic solvent) would one use to dissolve each of the following compounds? Describe in detail what must occur at the molecular level for each solute to dissolve. In particular, describe the specific interactions that are broken and those that are formed.

