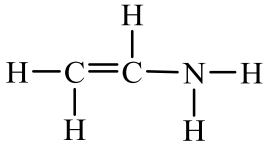
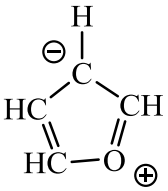
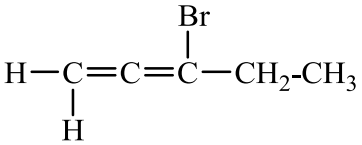
Knowing the 3D shape of a molecule will help you to understand how it will and will not react in many situations, and what physical properties the molecule possesses (for example polarity). This shape is often referred to as the molecular geometry. The molecular geometry can be found if you know the hybridization and bond angles around the individual atoms within the molecule.

1. (a) What hybridization do you predict for the carbon atom in $CH_3^{\oplus}$, $CH_3^{\ominus}$, and $\bullet CH_3$?
   (b) What do you predict for the H-C-H bond angle for each of these species?
   (c) What do you predict for the molecular geometry?
   (d) Based on your answers, what affect does the presence of non-bonding electrons have on the geometry/hybridization of an atom?

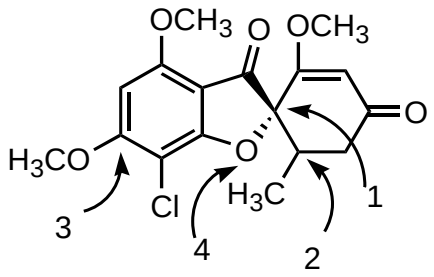
2. a. For the molecules below, fill in the lone pairs (as needed) in each structure.
   b. Give the hybridization for each multivalent atom in each structure.
   c. Give the bond angles you would predict around each of these multivalent atoms.
   d. Name the molecular geometry you would predict at each of the sites based on VSEPR theory.







3. The molecule shown below is Griseofulvin, an antifungal compound.



   a. Fill in all nonbonding electrons and H's on the structure above.
   b. Give the hybridization of carbons 1, 2, 3 and oxygen 4.

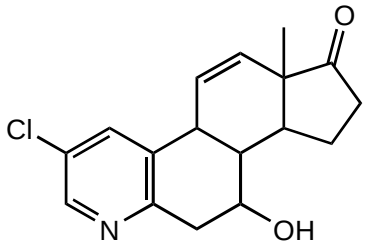
      C1: _____ C2: _____ C3: _____ O4: _____

   c. What is the geometry at each of these atoms?

      C1: _____ C2: _____

      C3: _____ O4: _____

4. In the following molecule, identify all atoms that have a trigonal planar geometry. Can you make any correlations between obvious structural features and the geometries? Explain.



5. **Applications:** Consider the Lewis structures for water (H_2O) and carbon tetrachloride (CCl_4). (a) What value do you predict for the H-O-H bond angle? (b) What value do you predict for the Cl-C-Cl bond angle? (c) What geometry do you predict for each molecule? (d) Which liquid do you predict will be a better solvent for sodium chloride (NaCl)? Explain. What role does hybridization/shape play in your answer?