CHM 1045 Ch 10 Homework

1. Use the valence shell electron repulsion (VSEPR) method in order to depict the electron pair arrangement and molecular geometries of CF_4. Show all four steps for the molecule, including the AXE formula. Draw the molecule in 3D. Name its geometry and include the bond angle as well. Finally, explain in complete sentences whether or not CF_4 can have a nonzero net dipole moment based on its geometry. Refer to page 1 of the chapter 10 class notes. (1 pt.)

2. Use the valence shell electron repulsion (VSEPR) method in order to depict the electron pair arrangement and molecular geometries of H_3O^{+1}. Show all four steps for the molecule, including the AXE formula. Draw the molecule in 3D. Name its geometry and include the bond angle as well. Finally, explain in complete sentences whether or not H_3O^{+1} has a net dipole moment based on its geometry and electronegativity differences. Refer to page 1 of the chapter 10 class notes. (1 pt.)

3. Depict the Lewis structure, including all bonding and nonbonding electron pairs, for $COCl_2$. Determine the AXE formula. Draw and name the correct geometry. Include the bond angle as well. Remember that double bonds count exactly the same as single bonds for determining the AXE formula and geometry. Finally, determine the hybrid orbital type for the carbon atom. Assume that C uses an unhybridized p orbital for its pi bond with O, leaving the remaining p orbitals to hybridize with the s orbital for the three sigma bonds. Refer to dot structures and formal charges from the chapter 9 class notes, as well as the hybridization chart. (2 pts.)

4. Depict the Lewis structure, including all bonding and nonbonding electron pairs, for $SOCl_2$. Determine the AXE formula. Draw the molecule in 3D. Name its geometry and include the bond angle as well. Finally, determine the hybrid orbital type for the sulfur atom. Assume that S uses an unhybridized d orbital for its pi bond with O, leaving all of the s and p orbitals only to hybridize for the three sigma bonds and the lone pair. Refer to Example 9.11 and the hybridization chart. (2 pts.)

5. Use Lewis symbols to write the chemical reaction between one B atom and three H atoms to form the BH_3 molecule (borane). Include both reactants and products, each with the correct number of dots. Determine the AXE formula for the product. Draw and name its correct geometry. Include the bond angle as well. Finally, explain in complete sentences whether or not BH_3 can have a nonzero net dipole moment based on its geometry. Refer to the molecular geometry charts. (2 pts.)

6. Use Lewis symbols to write the chemical reaction between one N atom and three H atoms to form the NH_3 molecule (ammonia). Include both the reactants and products, each with the correct number of dots. Determine the AXE formula for the product. Draw the molecule in 3D. Name its geometry and include the bond angle. Explain in complete sentences whether or not NH_3 has a net dipole moment based on the electronegativity differences and the geometry. Refer to the molecular geometry charts. (2 pts.)