**CHM 1321**

**Problem set 1**

1. Draw Lewis structures, showing all unshared electrons, for the following molecules:

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| (a) CH3NH2 | (b) CH2CH2 | (c) C2H2 |
| (d) CH3CH2CHO | (e) CH3CH2OH2+ | (f) (CH3)3N |
| (g) CH3CN | (h) CH3CH(OH)CH3 | (i) CH3NCO |
| (j) CH2CHCH(OH)CH2CO2H | (k) NCCH2COCH2CHO | (l) CH3CH(CH3)CH2C(CH2CH3)2CHO |
| (m) (CH3)3C+ | (n) CH3CH2O- | (o) CH3CHCHCH2CHCHCOOH |
| (p) HC(O)N(CH3)2 |  |  |

1. There is a small portion of the periodic table that you must know to do organic chemistry. Construct this from memory including the group numbers, numbers of valence electrons, and electronegativities.
2. Draw structures for
   1. Two compounds with the formula C4H10
   2. Three compounds with the formula C3H8O2
   3. Two compounds with the formula C2H7N
   4. Five compounds of formula C3H6O
3. Name all the compounds in Question 3.
4. Show the direction of the dipole moments of the following bonds. Use two methods.

(a) C-Cl (b) C-H (c) C-N (d) C-O (e) C-B (f) N-H (g) O-H (h) C-Br

1. Draw the shape of s and p orbitals including phasing. Show the resulting shapes following sp, sp2 and sp3 hybridization.
2. For each molecule below:
   * 1. Draw complete molecular orbital structures using the LCAO method.
     2. Label the atomic orbitals used to make the bonds (p, sp, sp2, sp3)
     3. Label the bonds ().
     4. Indicate the geometry of each atom (linear, trigonal planar, tetrahedral).

(a) CH3CH2NH2 (b) CH3CO2H (c) CH3CHCHCH2CH3 (d) CH3NO2 (e) CH3CN

(f) CH3OCH3