

Chemistry 211 - Problem Set I - Due Wednesday September 10<sup>th</sup>

1) Draw a Lewis structure for the following compounds and assign the charges to all the atoms. The atom order is marked in parenthesis (15 points).

- |   |   |
|---|---|
| a) <b>C</b> H <sub>2</sub> Br <sub>2</sub>        | e) CH <sub>3</sub>                              |
| b) CN <sup>-</sup>                                | f) CH <sub>3</sub> NH <sub>3</sub> <sup>+</sup> |
| c) <b>S</b> OCl <sub>2</sub> (Cl <b>S</b> (=O)Cl) | g) CH <sub>2</sub> <b>C</b> O                   |
| d) H <sub>2</sub> <b>O</b> <sub>2</sub> (HOOH)    | h) CH <sub>3</sub> CH <sub>2</sub> SH           |

2) Using electronegativity values from the periodic tables, assign the polarization of the bonds in the compounds of **Problem 2** by labeling the atoms as  $\delta^+$  and  $\delta^-$  (10 points).

3) For compounds (a), (c), (d), and (g) in **Problem 2** describe the geometry around the atoms marked in bold/oversized letters. Explain how you arrived to these geometries (10 points).

4) a) Draw two or three resonance forms for the following species. Indicate the charge distribution around atoms in all resonance forms you propose, and show which resonant form will be the major contributor to the structure. The curly brackets indicate that the charge is delocalized through the whole structure (10 points).

- |                        |  |
|------------------------|--|
| a) {OCN} <sup>-</sup>  | d) SO <sub>2</sub> (OSO)   |
| b) O <sub>3</sub>      | e) {CH <sub>3</sub> C(=O)CHCHCH <sub>2</sub> } <sup>-</sup>                      |
| c) CH <sub>3</sub> CNO | f) {CH <sub>3</sub> OC(=O)CHC(=O)OCH <sub>2</sub> CH <sub>3</sub> } <sup>-</sup> |

b) Repeat what you did for **Part a**, but using this time bond-line structures (10 points).

5) a) Draw the following condensed structures as Kekule and bond-line structures (10 points).

- |  |   |
|--|---|
| a) CH <sub>3</sub> CHCHC(=O)OH   | d) CH <b>C</b> CH(CH <sub>3</sub> ) <sub>2</sub>  |
| b) H <sub>2</sub> <b>N</b> CH <sub>2</sub> <b>C</b> (=O)CH <sub>2</sub> <b>C</b> (CH <sub>3</sub> ) <sub>3</sub> | e) CH <sub>3</sub> CH(Br) <b>CH</b> (Br) <b>CC</b> CHCH <sub>2</sub>                              |
| c) (CH <sub>3</sub> ) <sub>2</sub> CHCH(OH)CHCHCH <sub>3</sub>   | f) CH <sub>3</sub> CH <sub>2</sub> C(=O) <b>N</b> (CH <sub>3</sub> CH <sub>2</sub> ) <sub>2</sub> |

b) What type of hybridization best describes the atoms marked in bold/oversized letters? (10 points).