HOMEWORK ASSIGNMENT #2 ORGANIC CHEMISTRY I (25 pts)

More Lewis Modeling, the Pauling Model (Hybridization)

& Polarity Effects **(due Wed 10 September 2012)**

**Your name:\_\_\_\_\_\_\_\_\_\_\_answers\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Consider the 4 compounds below: (4 pts)

A B C D

.... .. .. ..

H-C=N=O: H-C≡N-O: H-C≡N-O: H-C=N-O:

.. ..

1. which contain positively charged C \_\_\_D\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. which contains positively charged O \_\_A\_B\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. which contains negatively charged N \_\_\_none\_\_\_\_\_\_\_\_\_\_\_\_\_
4. which contains negatively charged O \_\_\_C,D\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Draw all the possible structures that obey the Lewis rules for a compound that has the empiric formula C2H4O. Make sure to indicate where lone pairs and formal charges are present in order for the octet rule to apply. (3 pts)



Ethenol ethylene oxide acetaldehyde

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↔

Equivalent resonance pair non-equivalent resonance

1. Which of the compounds below, would you expect to be most reactive based on

simple Lewis structure modelling ? (CIRCLE /1 pt)

NO2  CH2O NO+ COOH-

**Free radical**

5. Determine the hybridization on the **bolded** atoms below : (1 pt ea/5 pt total)

H2 C=**O** H2**C=**O H2C=**C**=O **C**FBr3 C**F**Br3

\_\_\_\_sp2\_\_ \_\_\_\_sp2\_\_\_\_ \_\_\_sp\_\_\_\_\_\_ \_\_\_sp3\_\_\_\_\_\_\_ \_\_\_\_sp3\_\_\_\_\_

6a. Determine the number of of H assumed to be present on the Carbons in the skeletal

organic structure below.

**\* \***

6b Determine the hybridization on the indicated **C** and on **N**

\* \* \* \* \*

C-C≡C-C=C=NH

#H 3 0 0 1 0

Hybridization sp3 **sp sp2 sp sp2** (1/2 pt ea, 5 pts total)

on \*

1. Using gross reactivity rules (see supplement 2) circle the molecule in each pair below which is more reactive and briefly explain why you made your choice:

(hint: draw the Lewis structure including formal charges and lone pairs and include the VSEPR geometry for both to aid explanation) 4 pts total

* 1. CH3Cl vs H2N-CH3

Can argue that Cl has 3 lone pairs vs. N’s one lone pair. Both have dipoles and satisfy octet rule so CH3Cl wins. However, in reality, the N is very reactive since NH2 group makes an unsually strong base and undergoes H-bonding, hence H2N-CH3 is more realistically the stronger

* 1. CO2 vs NO3‑

*NO3- has many more lone pairs than CO2 , as well as a formal charge ≠ 0*

* 1. NO2 vs NO2-

*NO2 is an odd electron count species hence a radical that doesn’t follow the octet rule*

* 1. NO vs CO

*NO is a free radical that doesn’t follow the octet rule while CO still obeys the octet rule*