ORGANIC CHEMISTRY **CH 384, Fall 2012**

WORKSHOP 2

Bonding and Structure

1. **a.** Draw Lewis structures for each of the compounds below. Be sure to show all bonding and non-bonding valence electrons. Also clearly indicate any formal charges on atoms.

b. Consider the molecular geometry information given for each compound below. Based on this information, specify the orbitals that each atom could use in σ– and π–bonding (sp^2, sp^3, p, etc.) and for holding non-bonding electron pairs. Explain how your orbital assignments are consistent with the observed geometries.

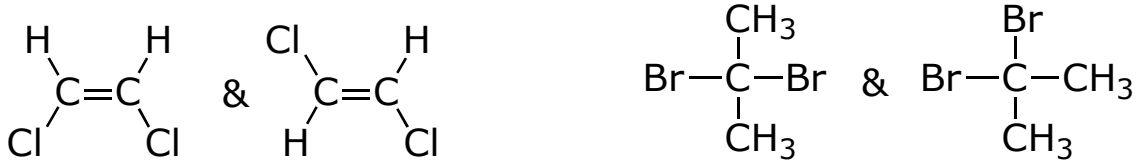
DCH=CHBr (1–bromo–2–deuteroethene)
(two isomers)
(all atoms are coplanar)

$CH_3CO_2^-$ (acetate ion)
HCC ∡ 109°
∡ CCO = OCO = 120 °

H_2CO (formaldehyde)
HCO ∡ = 120°

$(CH_3)_2SO$ (DMSO)
∡ HCS = CSO = CSC = 109°

2. For each compound below, indicate individual bond dipoles (consider C-C and C-H bonds as nonpolar). Indicate the expected net molecular dipole moment. For each pair, predict which would have the higher boiling point.



3. Consider the two molecules CO_2 and SO_2. One has a net molecular dipole moment of zero and the other has a dipole moment of 1.61 D. Predict which is which and explain based on their structure.

4. Predict the relative water solubility of each pair of compounds:

a. pentane vs hexadecane

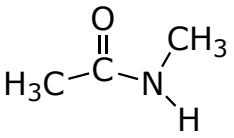
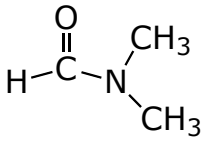
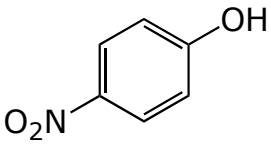
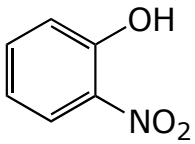
b. pentanoic acid vs hexadecanoic acid

c. sodium pentanoate vs sodium hexadecanoate

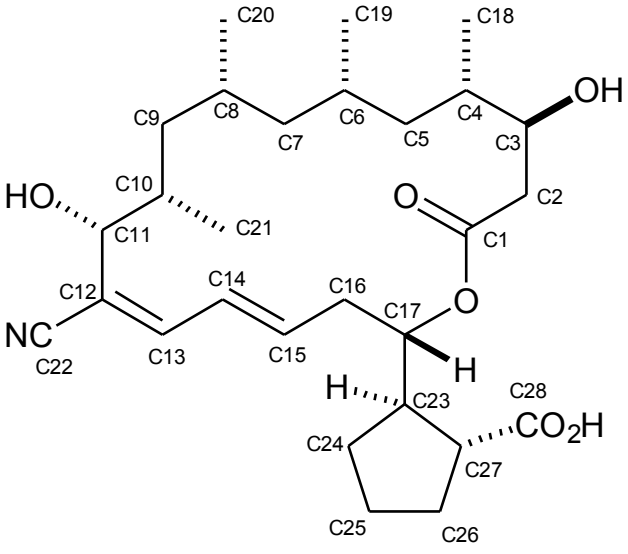
d. pentane vs pentanoic acid vs sodium pentanoate

5. For each of the pairs of compounds below, two boiling points are indicated.

Indicate which is which and explain your choice, based on the structures.

$(CH_3)_2CHCH(CH_3)_2$	$CH_3(CH_2)_4CH_3$	bp 58° and 69°
$(CH_3)_2CHOCH(CH_3)_2$	$CH_3CH_2OCH_2CH_3$	bp 35° and 68°
$CH_3(CH_2)_3CH=CH_2$	$CH_3(CH_2)_3CH=O$	bp 64° and 103°
CH_3I (MW=142)	$CH_3(CH_2)_8CH_3$ (MW=142)	bp 41° and 174°
NaCl	CH_3CH_2Cl	bp 12° and 1413°
		bp 153° and 204°
		bp 217° and 279°

6. Borrelidin (isolated from *Streptomyces*) is macrolide antibiotic that inhibits angiogenesis and has antiviral, antibiotic, insecticidal and herbicidal activity.



Borrelidin contains _____ sp^3 carbons.

Borrelidin contains _____ sp^2 carbons.

Borrelidin contains _____ sp carbons.

Borrelidin contains _____ sp^3 oxygens.

Borrelidin contains _____ sp^2 oxygens.