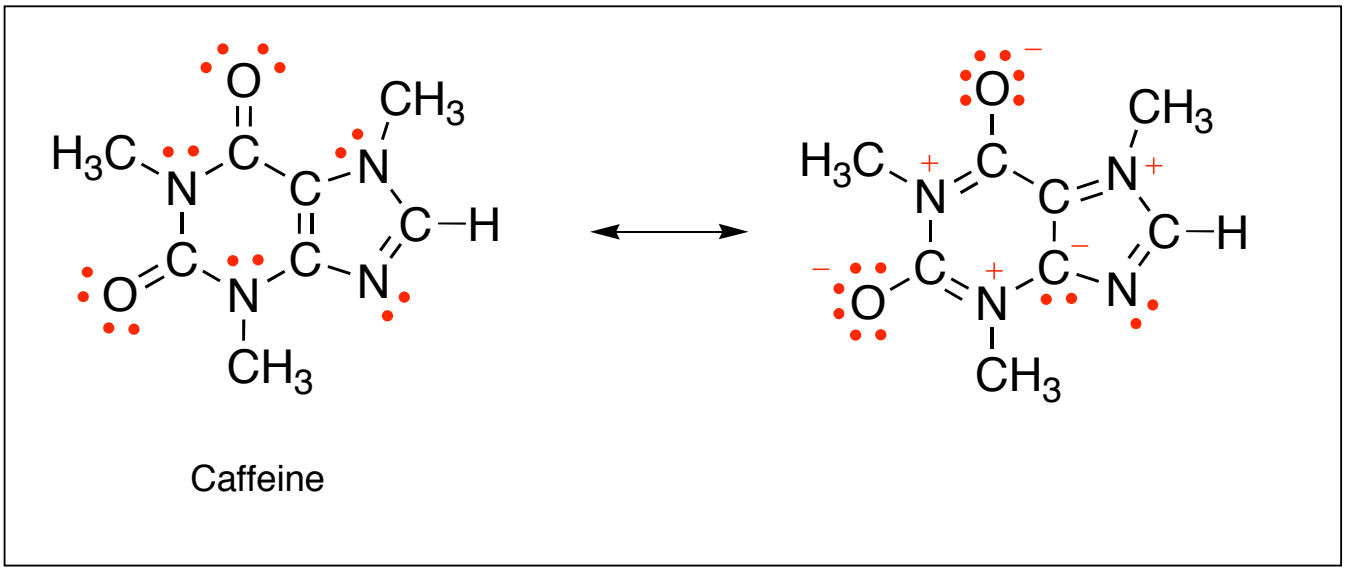
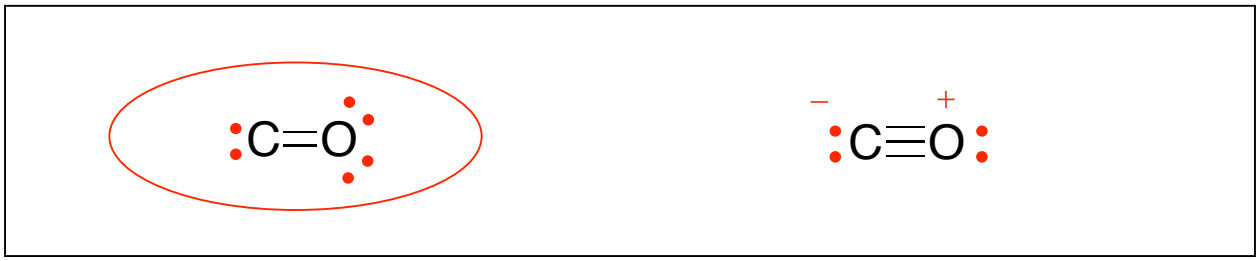
Name: _____

CHEM116L Section 1 Mini-Test ANSWER KEY
September 14, 2005

1) A partial Lewis structure of caffeine is shown below. Draw in the nonbonding electrons to complete its Lewis structure. Then provide a resonance structure in which all of the nitrogens are sp^2 hybridized. In all cases, indicate positive or negative charges where applicable. (10 points)



2) **A.** Carbon monoxide, CO, has two major resonance contributors, one containing formal charges on its atoms and one with no formal charges. Provide both resonance structures below, showing all nonbonded electrons and formal charges where applicable. Then answer the question that follows. (8 points)



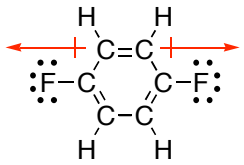
B. Circle the structure that is *most* likely to react with a Lewis base such as  and indicate where the Lewis base is most likely to react below. Provide a short explanation for your choice using only the space provided below. (5 points)

The carbon atom of the circled resonance structure is 2 electrons short of an octet. The Lewis base, an electron donor, can satisfy this deficiency by donating its electrons to the carbon atom.

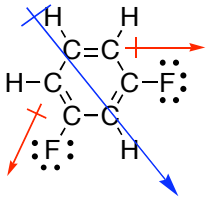
Name: _____

3) For each pair of molecules shown below, select the one that best fits the accompanying description by circling it. Provide a concise but thorough rationale for each of your decisions using words and pictures. *Note: a picture is required to receive full credit on most of these. Do not exceed the space provided.* (5 points each)

A. The higher melting point?



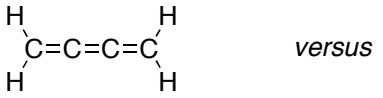
versus



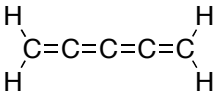
Bond dipoles cancel, making the molecule nonpolar.

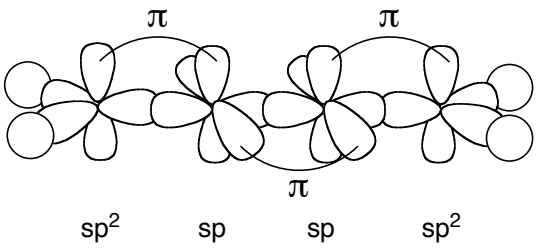
The sum of the bond dipoles produces a dipole moment as shown. This compound is more polar than the other, and thus will have greater dipole-dipole interactions between molecules. More heat (energy) will be required to disrupt these intermolecular interactions in this compound than in the nonpolar compound.

B. The molecule in which all hydrogens lie in the same plane?

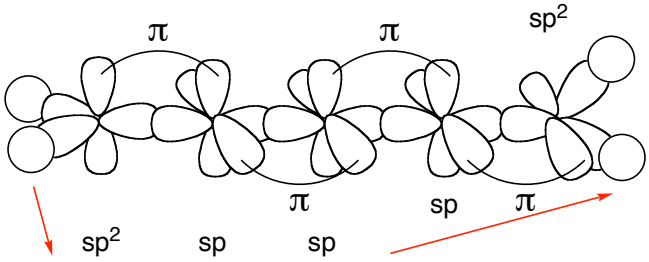


versus





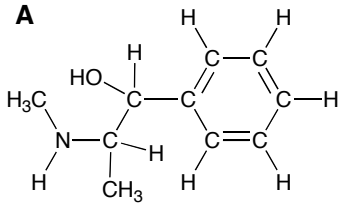
The H's (cirlces) lie in the same plane.



These H's are ⊥ to these H's.

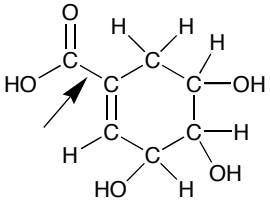
4) Following are two compounds that have been studied in the Poon research group. Refer to the structures shown and answer the questions that follow. (2 points for part **A**, 3 pts each for parts **B** & **C**)

A



sudafed

B



shikimic acid

A. Which compound contains a ring in which the carbons of the ring lie in the same plane? **A** **B** **both**
Because B's ring contains sp3 (tetrahedral) carbons, they are not required to be in the same plane.

B. What atomic or hybridized orbitals participate in the bond indicated by the arrow? ___**sp^2-sp^2**___

Is this bond longer or shorter than 1.54 Å ? **longer** **shorter** **not enough info** (circle one)

C. Which compound has the higher melting point and why (assume that their masses do not differ significantly)? **B has the higher m.p. b/c it has more H-bond donor & acceptor groups. The more H-bonding, the stronger the intermolecular attractions between molecules & the more energy needed to melt the compound.**