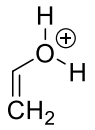
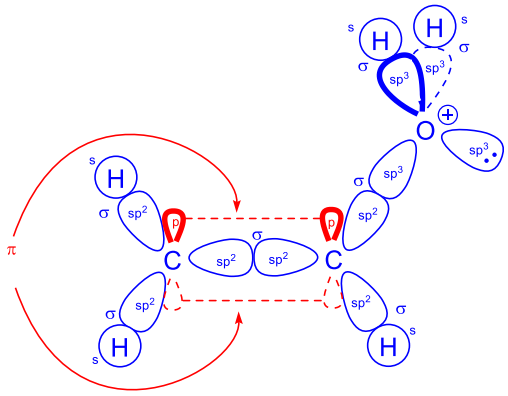
CHM 1321 A
Mid Term 1 Version B answers

1) For the following compound



a) Use the LCAO method to show orbital structure the compound (**6 Points**).



Points for the labels were included in the marking of this question

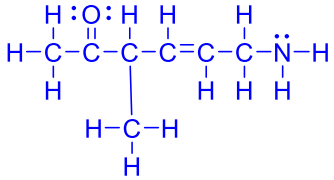
b) Label all the atomic orbitals used and the bonds formed in part a (**0 Points**).
This question was combined with part (a)

2) Draw 6-amino-3-methylhex-4-en-2-one as: (**6 points**)

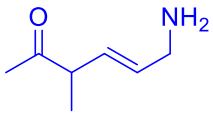
a) A condensed formula

$CH_3C(O)CH(CH_3)CHCHCH_2NH_2$ (parentheses optional)

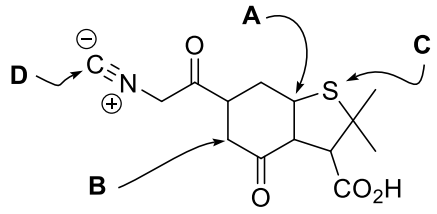
b) A Lewis structure



c) A line structure



3) For the following compound:



a) What is the hybridization of the indicated atoms? (**4 points**)

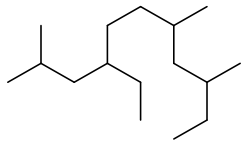
Atom A = __ sp^3_____

Atom B = __ sp^3_____
Atom C = ___ sp^3_____
Atom D = ___ sp_____

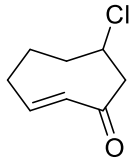
b) What type of molecular orbitals connect the following atoms to other atoms? (**5 points**)

Atom A = ___σ_____
Atom B = ___σ_____
Atom C = ___σ_____
Atom D = __σ + π_____

4) Give IUPAC names for the following: (**4 points**)

a) 

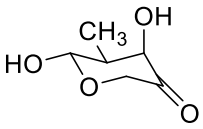
4-ethyl-2,7,9-trimethylundecane

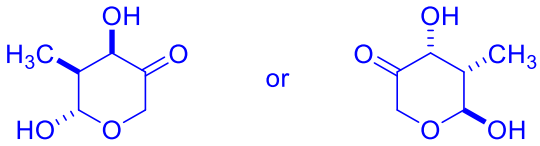
b) 

7-chlorocyclooct-2-en-1-one

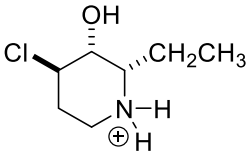
5) For the following:

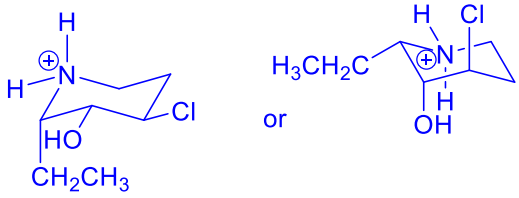
a) Draw the "hexagon" line structure of the following (be sure to indicate stereochemistry). (**3 points**)



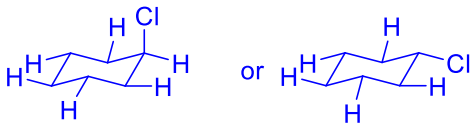


b) Draw <u>one</u> chair conformation of the following compound. (**4 Points**)

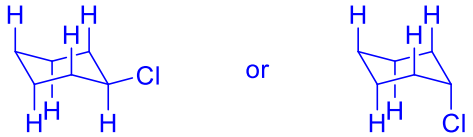




c) Draw <u>one</u> chair conformation of chlorocyclohexane showing ALL OF THE EQUATORIAL HYDROGENS. (**3 Points**)



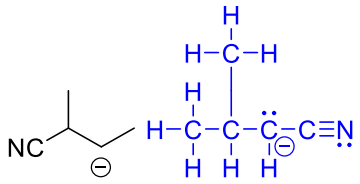
d) Draw <u>the other</u> chair conformation of chlorocyclohexane showing ALL OF THE AXIAL HYDROGENS. (**3 Points**)



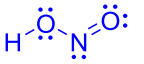
e) Which of the two structures is the least stable and why? (**2 Points**)
The least stable structure will be the one in which the Cl is axial. Whether this is c or d depends on which chair you drew first.
The conformer in which the large group (Cl) is in an axial position is least stable.

6) Draw the following molecules as Lewis structures. (**6 points**)

a)



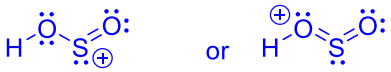
b) HNO_2



(for inorganic acids, leading H is attached to O)

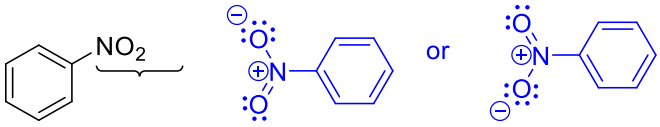
c) $HSO_2^{\oplus}$

(for inorganic acids, leading H is attached to O)

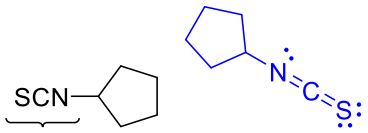


7) Re-draw the following molecules showing the full Lewis structure at the indicated location. (**6 Points**)

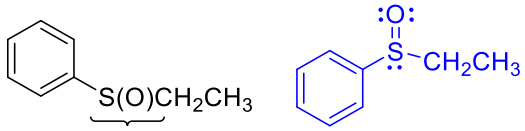
a)



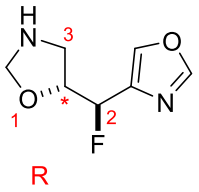
b)

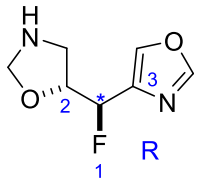


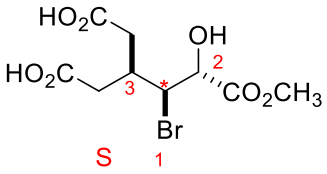
c)

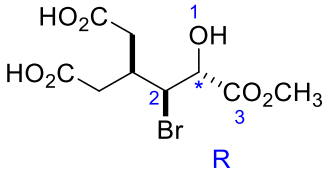


8) For the following compounds
   a) show the stereogenic centre(s) by labeling them with a star (*)(**4 points**)
   b) determine the priorities of the substituents on each stereogenic centre. For compounds with more than one centre, make sure you clearly indicate which priorities refer to which centre. (re-drawing the structure helps) (**8 points**)
   c) Determine the configuration of each stereocentre (**4 points**)

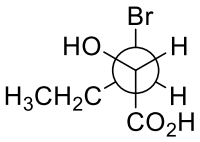
(i) 

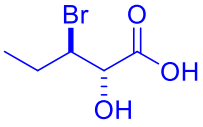


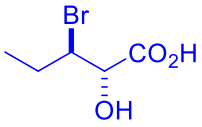
(i) 

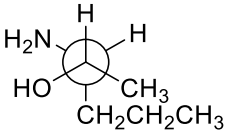


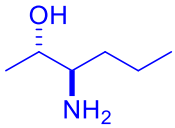
9) For each compound shown below, convert the structure to zig-zag (line) notation (include stereochemistry). (**4 points**)

(a) 

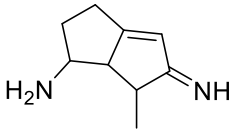




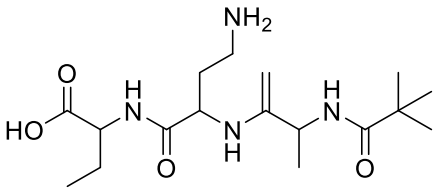
(b) 



10) Provide molecular formulas for each of the following. (**4 Points**)

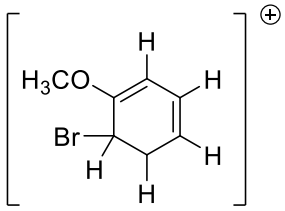
a) 

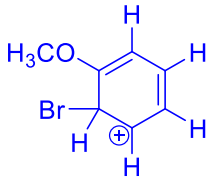
$C_9H_{14}N_2$

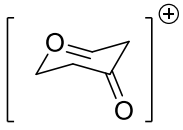
b) 

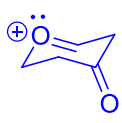
$C_{17}H_{32}N_4O_4$

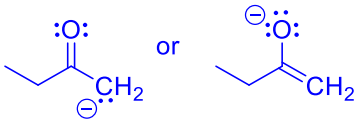
11) Each of the following molecules carries a charge (+ or -). Identify the charged atom in each of them and show the position of any necessary electrons. (**5 Points**)

a) 

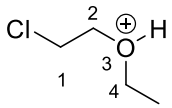


b) 

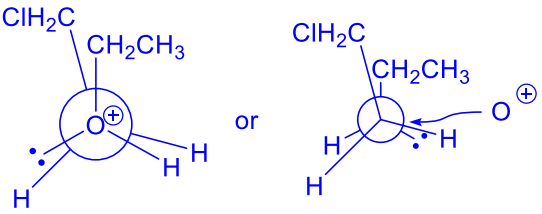


c) $[CH_3CH_2C(O)CH_2]^{\ominus}$ 

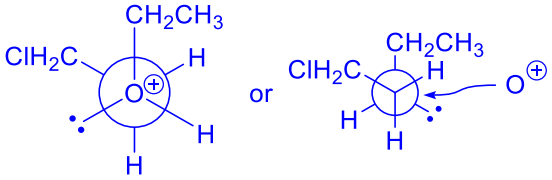
12) For the following compound, draw the appropriate Newman projection along the C2-O3 bond of the following:



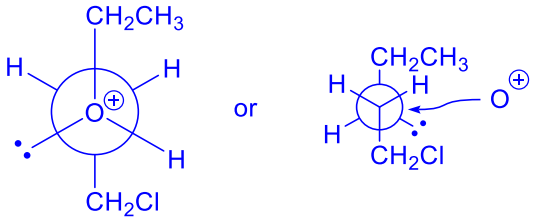
a) The <u>least</u> stable conformer and name the conformer. (**4 Points)**

totally eclipsed 

b) The conformer that results after the structure in part a undergoes a 60° rotation about the C2-O3 bond and name the conformer. (**4 Points)**

gauche 

c) The <u>most</u> stable conformer and name the conformer. (**4 Points)**

anti-staggered 

BONUS! Draw the Newman projection of the following molecule as viewed along the C=O bond (it may be helpful to construct a model). (**2 Points**)