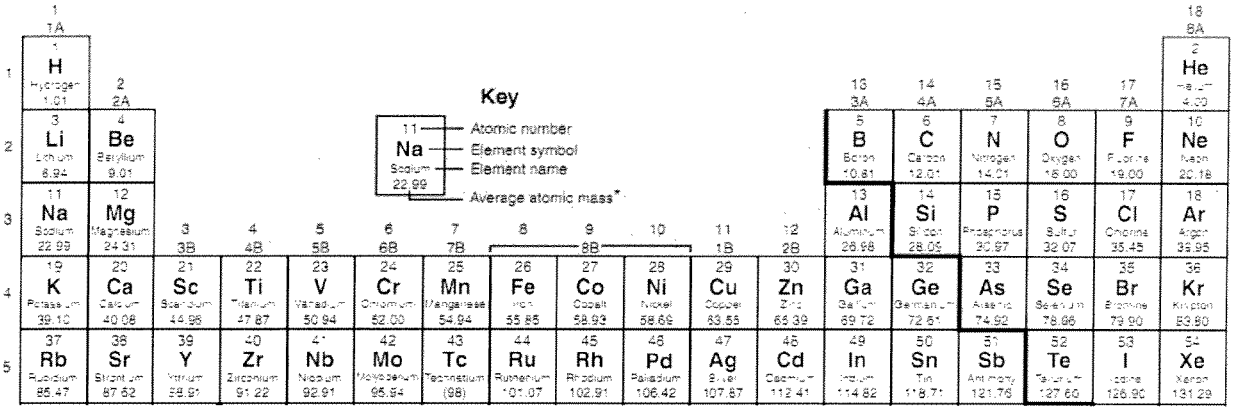
CHM 1321 B
Midterm 1
February 4, 2014

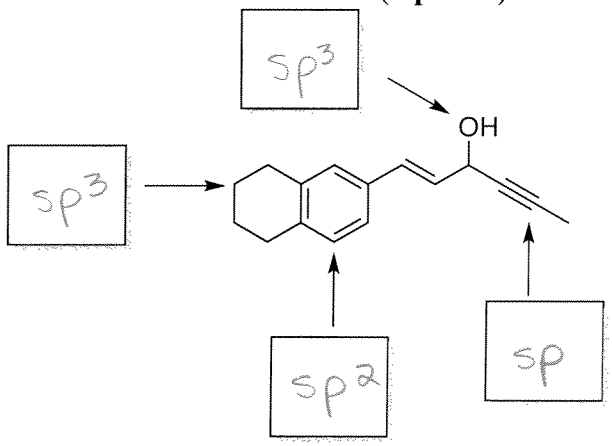
Note: The points are given as a guide and are subject to minor changes.

Surname: _____ First name: _____

Student Number: _____ Seat number: _____

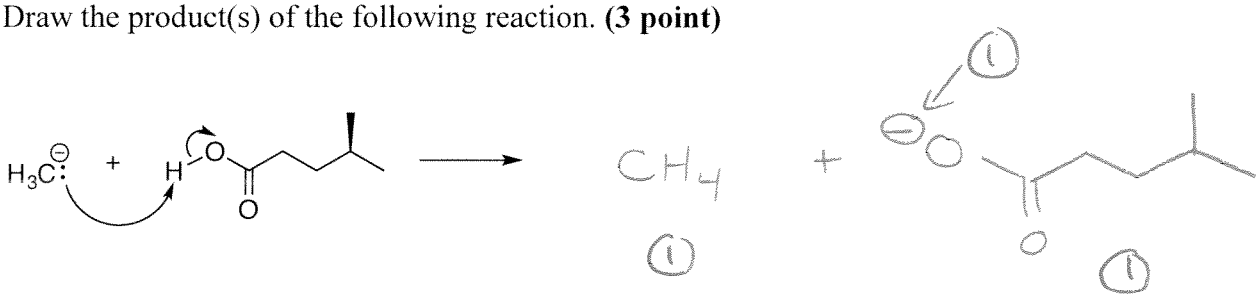


1. Identify the hybridization of the indicated atoms: **(4 points)**

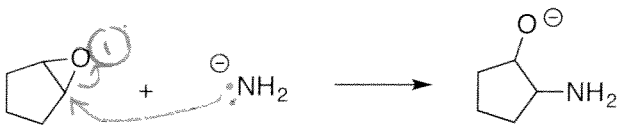


1 pt each

2. Draw the product(s) of the following reaction. **(3 point)**



3. Draw a mechanism to explain the following reaction. **(2 points)**



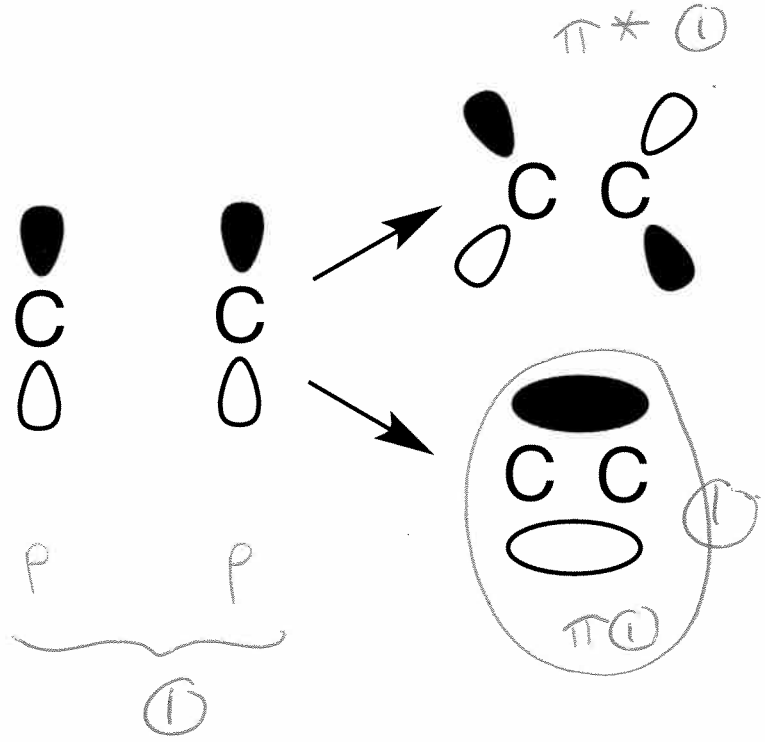
4.

a. Which is stronger, a σ bond or a π bond? Circle your answer. **(1 point)**

b. Label all the atomic and molecular orbitals below. **(3 points)**

c. Are the atomic orbitals below in phase or out-of-phase? Circle your answer. **(1 point)**

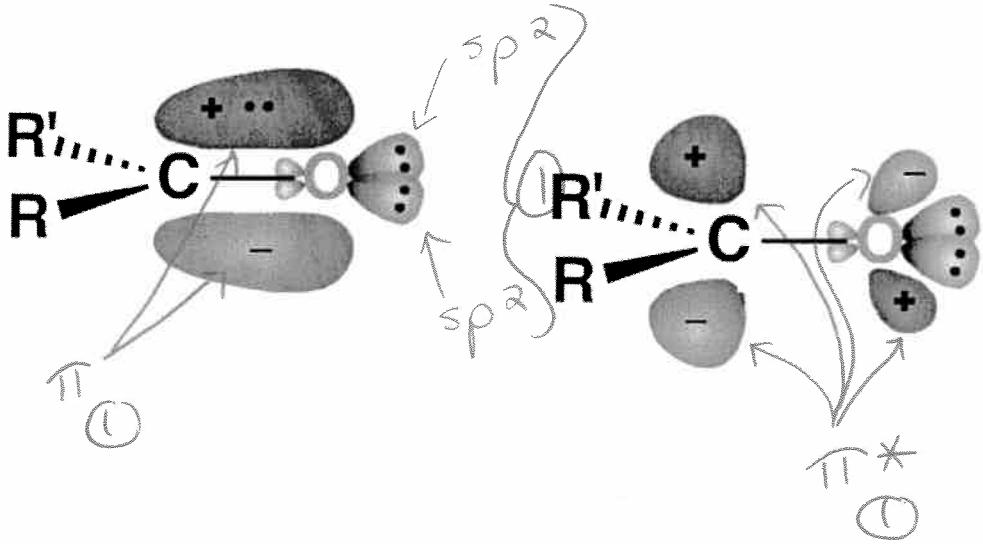
d. Circle the molecular orbital formed by the combination of atomic orbitals shown below. **(1 point)**



5.

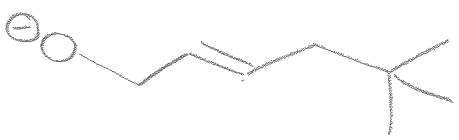
a. Label all the molecular orbital(s) drawn below. **(2 points)**

b. Label the orbitals drawn on the oxygen on the left. **(1 point)**



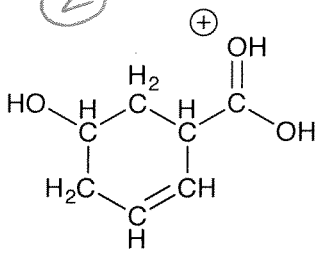
6. Draw the line structure for each of the following molecules: **(4 points)**

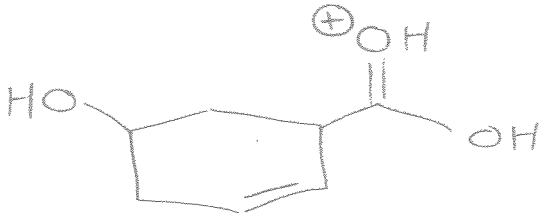
a. $^{-}OCH_2CHCHCH_2C(CH_3)_3$ (2)



-1 per error.

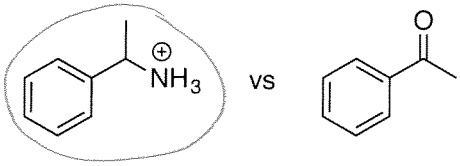
b. (2)





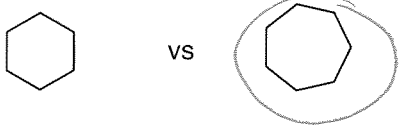
7. Circle the compound in each pair that would: **(4 points)**

a. Be most soluble in water.



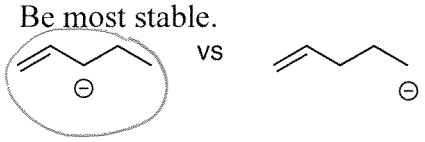
(1) pt each.

b. Have the highest boiling point.



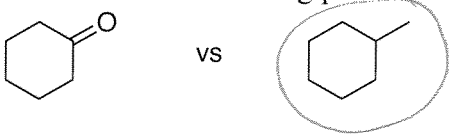
X not covered yet in 2014

c. Be most stable.

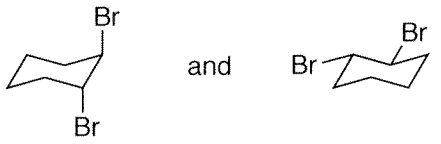


Bonus.

d. Have the lowest melting point.

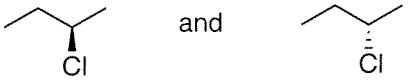


8. Circle the isomeric relationship between each of the pairs of molecules. **(4 points)**

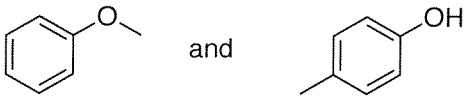


Same molecule
Constitutional isomers
(Enantiomers) (1)
Diastereomers

Same molecule
Constitutional isomers
Enantiomers
(Diastereomers) (1)

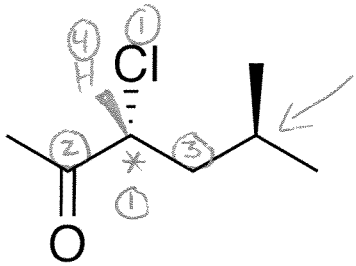


Same molecule
Constitutional isomers
(Enantiomers) (1)
Diastereomers



Same molecule
(Constitutional isomers) (1)
Enantiomers
Diastereomers

9. For the following molecule:
   a. Identify the stereocentre(s) with a star (*). **(2 points)**
   b. Determine the priorities of all the groups on the stereocentre(s). **(2 points)** -1 per error
   c. Assign the configuration of the stereocentre(s). **(1 point)**



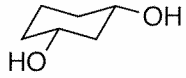
no * (1) (or anywhere else)

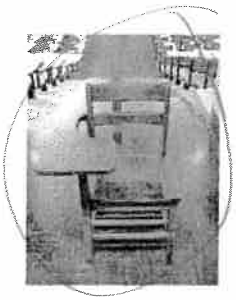
R (1) (based on their priorities).

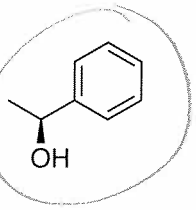
   d. Name the molecule using IUPAC nomenclature or accepted common names. **(3 points)**

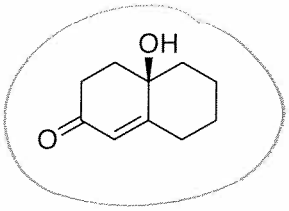
-1 per error.
R-3-chloro-5-methylhexan-2-one
or R-3-chloro-5-methyl-2-hexanone

10. Circle all of the chiral molecules/objects from among the following choices. **(6 points)**





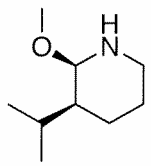


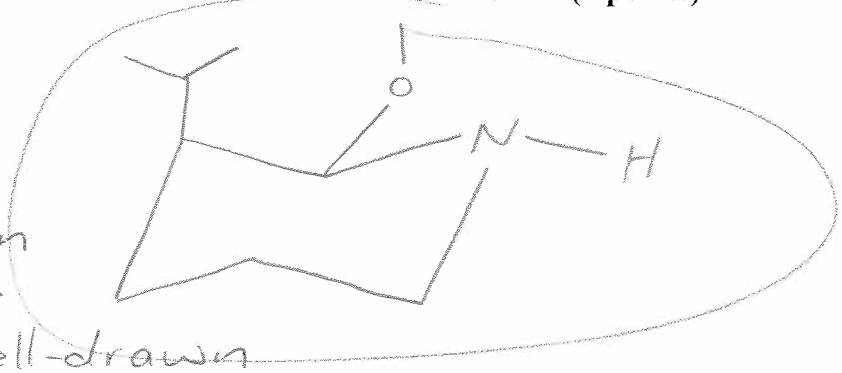


① point each.

11. Note: you don't have to draw lone pairs or the Hs on Cs.

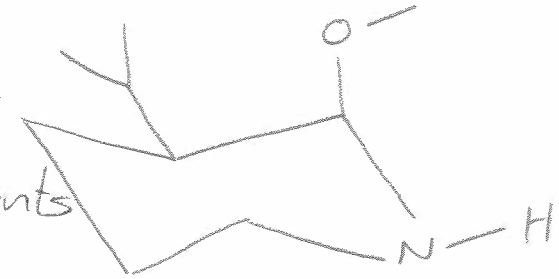
a. Draw the molecule shown below in a chair conformation. **(4 points)**





① chair well-drawn
① correct molecule
② substituents well-drawn

b. Draw the other chair conformation of the molecule. **(2 points)**



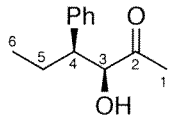
① correct conformer
① chair + substituents well-drawn

c. Circle the ~~most~~ least-stable chair conformation. **(1 point)**

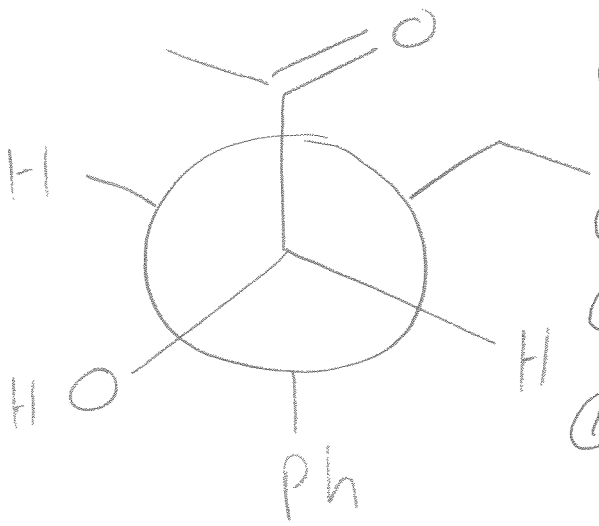
d. Justify your answer in part c. **(3 points)**

① comparison – iso propyl (iPr) is larger than OMe
– when iPr is axial, it experiences more severe 1,3-diaxial ① interactions with the Hs ① on the same than does the OMe

12. Consider the Newman projection of the following molecule down the C3-C4 bond.



a. Draw a Newman projection of the molecule in the most stable conformation. **(3 points)** 4



(1) correct constitutional isomer
(1) correct configuration
(1) Newman well-drawn
(1) Most stable conformation

b. Name the conformation you drew above. **(2 points)**

Anti - staggered (1) (1)

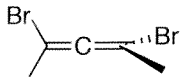
c. What is the functional group centered at C2? **(1 point)** (1)

Ketone

d. What is the functional group centered on C3? **(1 point)** (1)

alcohol (hydroxyl)

BONUS:
Is the following compound chiral or achiral? **(1 point)** (1)



chiral