

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: _____

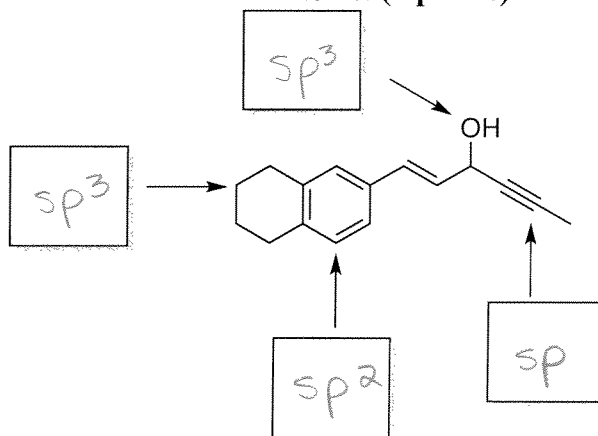
Student Number: _____ Seat number: _____

1A												3A					2										
1	2											3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	2											3A	4A	5A	6A	7A	8A										
H Hydrogen 1.01	He Helium 4.00											B Boron 10.81	C Carbon 12.01	N Nitrogen 14.01	O Oxygen 16.00	F Fluorine 19.00	Ne Neon 20.18										
Li Lithium 6.94	Be Beryllium 9.01											Al Aluminum 26.98	Si Silicon 28.09	P Phosphorus 30.97	S Sulfur 32.07	Cl Chlorine 35.45	Ar Argon 39.95										
Na Sodium 22.99	Mg Magnesium 24.31	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18										
K Potassium 39.10	Ca Calcium 40.08	Sc Scandium 44.96	Ti Titanium 47.87	V Vanadium 50.94	Cr Chromium 52.00	Mn Manganese 54.94	Fe Iron 55.85	Co Cobalt 58.93	Ni Nickel 58.69	Cu Copper 63.55	Zn Zinc 65.39	Ga Gallium 69.72	Ge Germanium 72.61	As Arsenic 74.92	Se Selenium 78.96	Br Bromine 79.90	Kr Krypton 83.80										
Rb Rubidium 85.47	Sr Strontium 87.62	Y Yttrium 88.91	Zr Zirconium 91.22	Nb Niobium 92.91	Mo Molybdenum 95.94	Tc Technetium (98)	Ru Ruthenium 101.07	Rh Rhodium 102.91	Pd Palladium 106.42	Ag Silver 107.87	Cd Cadmium 112.41	In Indium 114.82	Sn Tin 118.71	Sb Antimony 121.76	Te Tellurium 127.60	I Iodine 126.90	Xe Xenon 131.29										

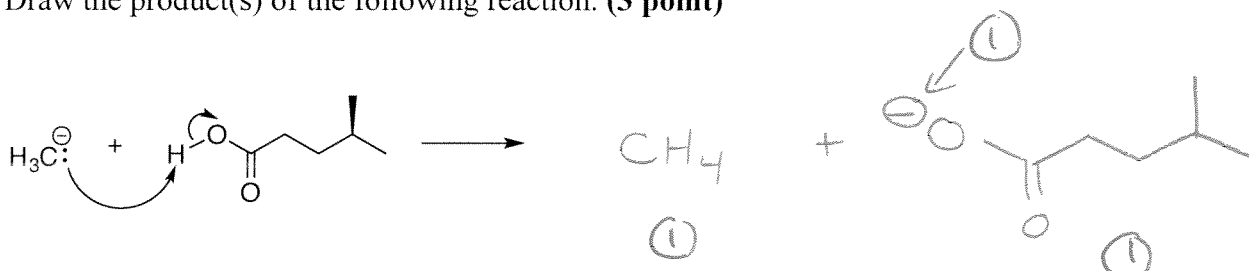
Key

11	Atomic number
Na	Element symbol
Sodium	Element name
22.99	Average atomic mass

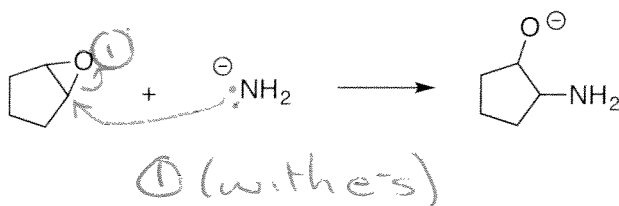
1. Identify the hybridization of the indicated atoms: (4 points)



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

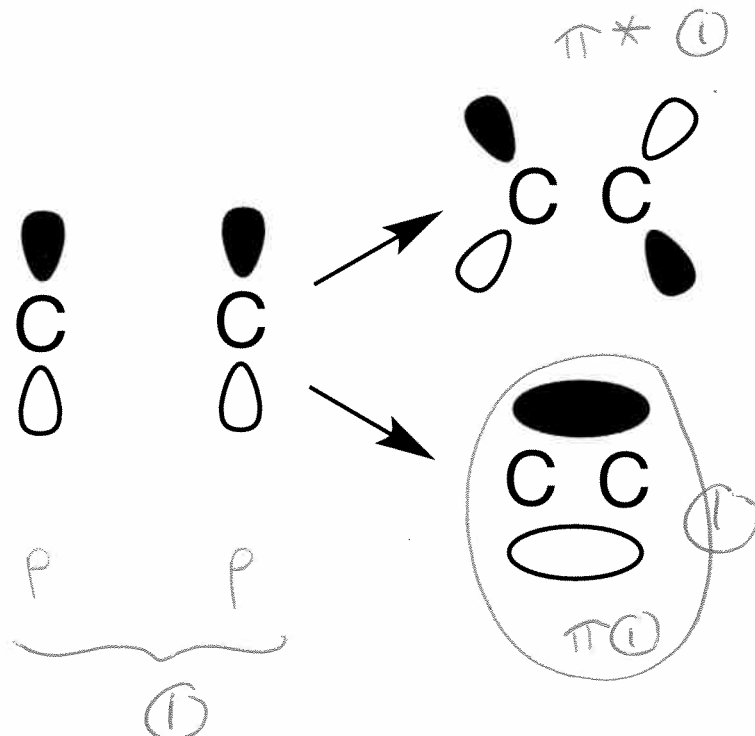


3. Draw a mechanism to explain the following reaction. (2 points)



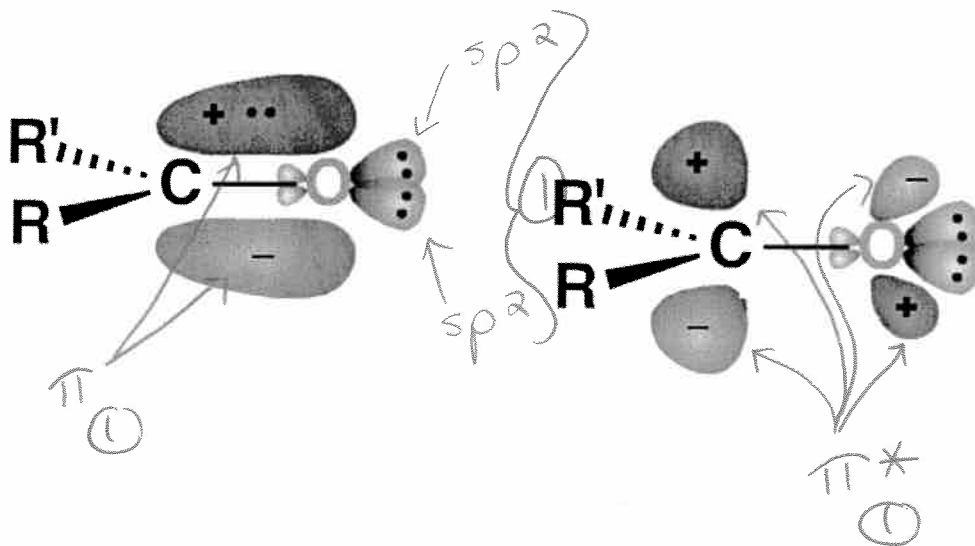
4.

- 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)

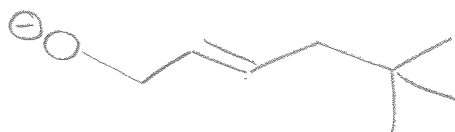
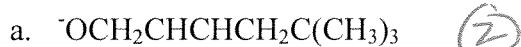


5.

- a. Label all the molecular orbital(s) drawn below. (2 points)
- b. Label the orbitals drawn on the oxygen on the left. (1 point)

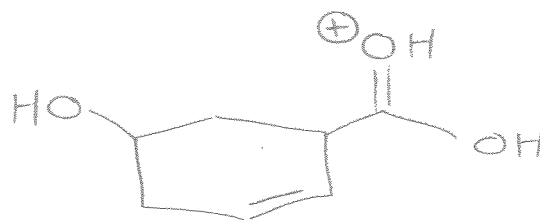
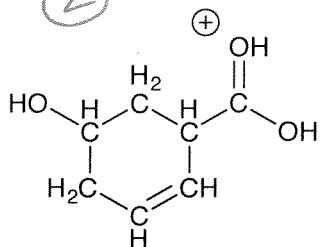


6. Draw the line structure for each of the following molecules: (4 points)



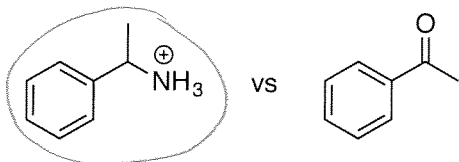
-1 per error.

b. (2)



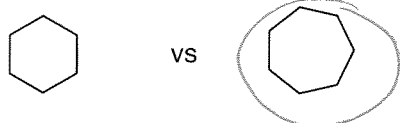
7. Circle the compound in each pair that would: (4 points)

a. Be most soluble in water.

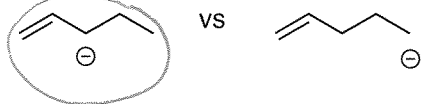


(1) pt each.

b. Have the highest boiling point.

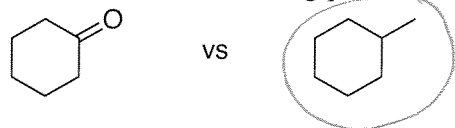


c. Be most stable.



Bonus.

d. Have the lowest melting point.



X not covered yet in 2014

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



Same molecule

Constitutional isomers

Enantiomers

Diastereomers

(1)



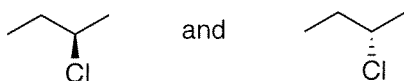
Same molecule

Constitutional isomers

Enantiomers

Diastereomers

(1)



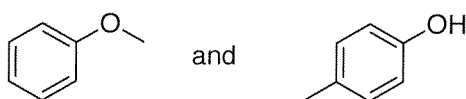
Same molecule

Constitutional isomers

Enantiomers

Diastereomers

(1)



Same molecule

Constitutional isomers

Enantiomers

Diastereomers

(1)

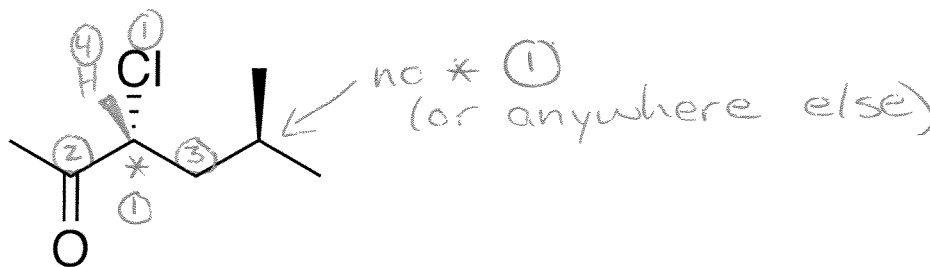
9. For the following molecule:

a. Identify the stereocentre(s) with a star (*). (2 points)

b. Determine the priorities of all the groups on the stereocentre(s). (2 points)

c. Assign the configuration of the stereocentre(s). (1 point)

-1 per error



R (1)

(based on their priorities).

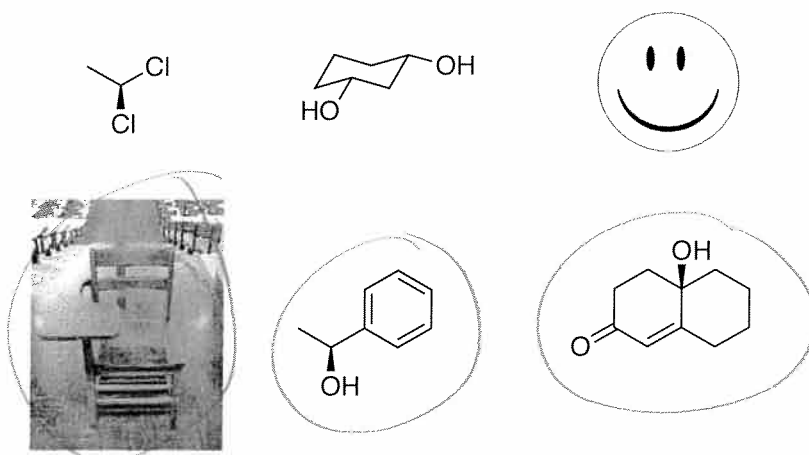
d. Name the molecule using IUPAC nomenclature or accepted common names. (3 points)

-1 per error.

R-3-chloro-5-methylhexan-2-one 4 of 6

or R-3-chloro-5-methyl-2-hexanone

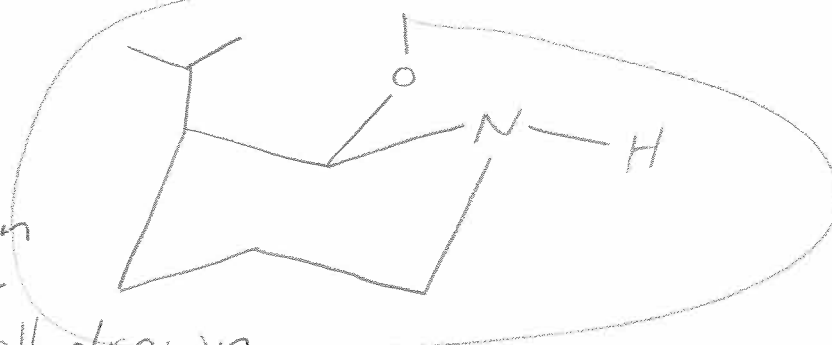
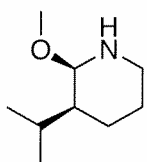
10. Circle all of the chiral molecules/objects from among the following choices. (6 points)



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)

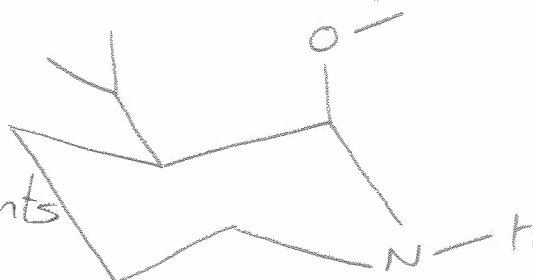


① chair well-drawn
 ① correct molecule
 ② substituents well-drawn

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

① correct conformer

① chair + substituents well-drawn



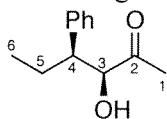
c. Circle the ~~most~~ least-stable chair conformation. (1 point)

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

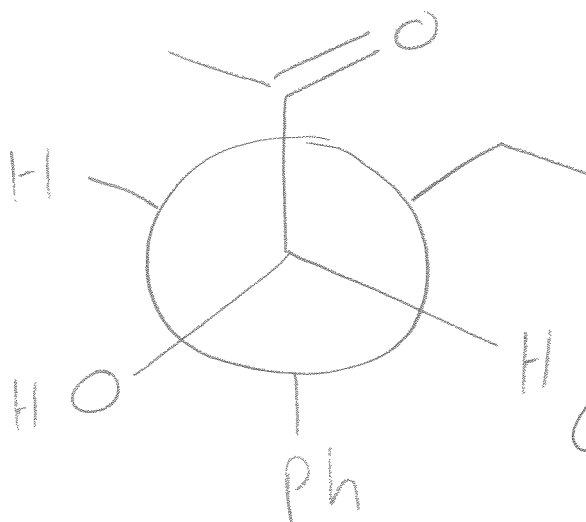
① comparison:- iso propyl (iPr) is larger than OMe
 - when iPr is axial, it experiences more severe 1,3-diaxial interactions with the Hs on the same than does the

nMo

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)



① correct constitution
al isomer

① correct configuration
① Newman well-drawn

① Most stable conformation

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

Anti-staggered

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

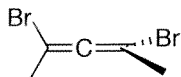
Ketone

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

alcohol (hydroxyl)

BONUS:

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



chiral