

**CHM 1321 B**  
**Midterm 1**  
**February 4, 2014**

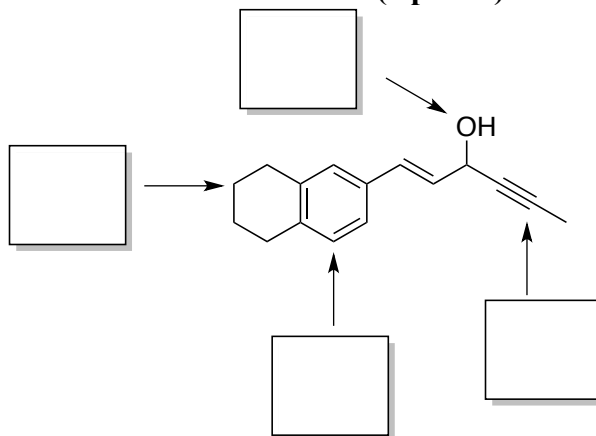
**Note:** The points are given as a guide and are subject to minor changes.

Surname: \_\_\_\_\_ First name: \_\_\_\_\_

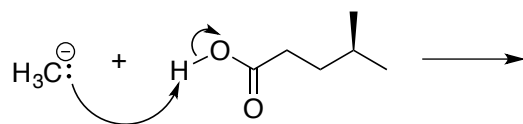
Student Number: \_\_\_\_\_ Seat number: \_\_\_\_\_

																Key																																		
																11	Atomic number																																	
																Na	Element symbol																																	
																Sodium	Element name																																	
																22.99	Average atomic mass*																																	
1	1A	1	2													13	14	15	16	17	18	3A	4A	5A	6A	7A	8A																							
1	H															B	C	N	O	F	He	Li	Be													Al	Si	P	S	Cl	Ar									
2	3	4													5	6	7	8	9	10	11	12			13	14	15	16	17	18	Li	Be													Al	Si	P	S	Cl	Ar
3	11	12													13	14	15	16	17	18	Na	Mg													Al	Si	P	S	Cl	Ar										
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr														
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe														
	85.47	87.62	88.91	91.22	92.91	95.94	98	101.07	102.91	106.42	107.87	112.41	114.82	118.71	121.76	127.60	126.90	131.29																																

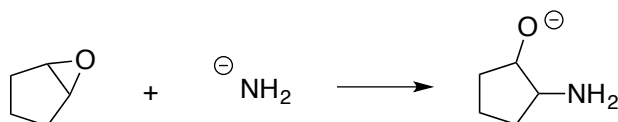
1. Identify the hybridization of the indicated atoms: (4 points)



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

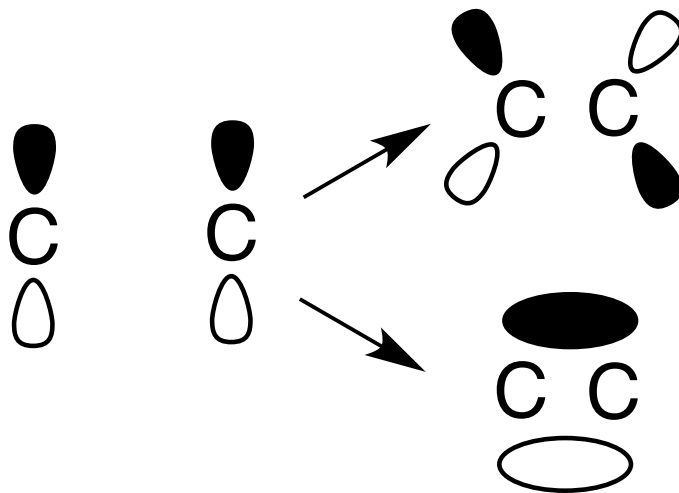


3. Draw a mechanism to explain the following reaction. (2 points)



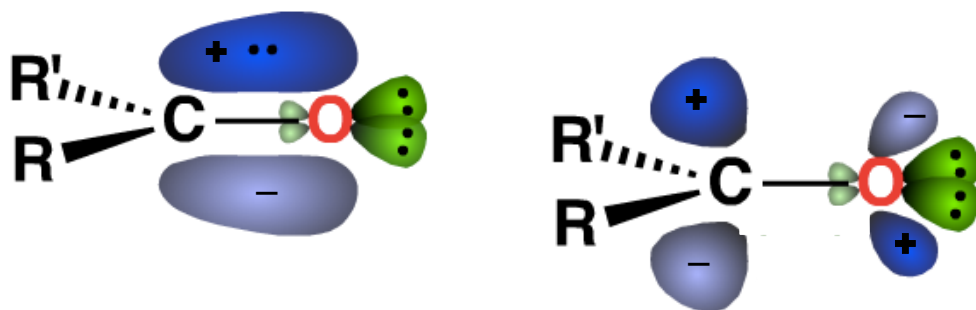
4.

- Which is stronger, a  $\sigma$  bond or a  $\pi$  bond? Circle your answer. (1 point)
- Label all the atomic and molecular orbitals below. (3 points)
- Are the atomic orbitals below in phase or out-of-phase? Circle your answer. (1 point)
- Circle the molecular orbital formed by the combination of atomic orbitals shown below. (1 point)



5.

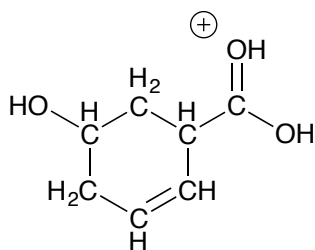
- Label all the molecular orbital(s) drawn below. (2 points)
- Label the orbitals drawn on the oxygen on the left. (1 point)



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

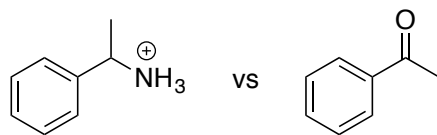


b.

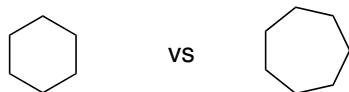


7. Circle the compound in each pair that would: **(4 points)**

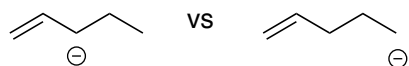
a. Be most soluble in water.



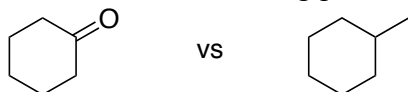
b. Have the highest boiling point.



c. Be most stable.



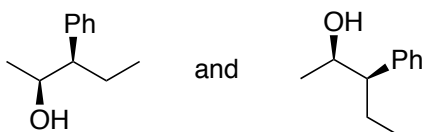
d. Have the lowest melting point.



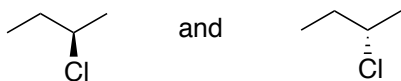
8. Circle the isomeric relationship between each of the pairs of molecules. (4 points)



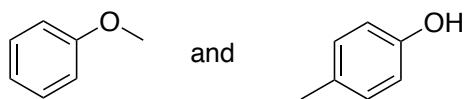
Same molecule  
Constitutional isomers  
Enantiomers  
Diastereomers



Same molecule  
Constitutional isomers  
Enantiomers  
Diastereomers



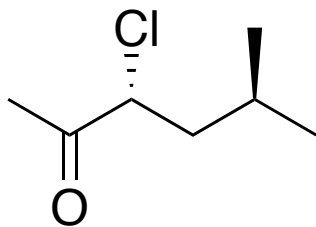
Same molecule  
Constitutional isomers  
Enantiomers  
Diastereomers



Same molecule  
Constitutional isomers  
Enantiomers  
Diastereomers

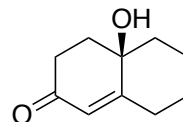
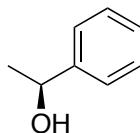
9. For the following molecule:

- Identify the stereocentre(s) with a star (\*). (2 points)
- Determine the priorities of all the groups on the stereocentre(s). (2 points)
- Assign the configuration of the stereocentre(s). (1 point)



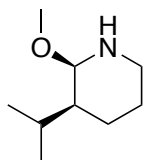
d. Name the molecule using IUPAC nomenclature. (3 points)

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



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

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

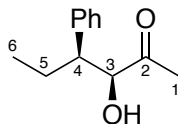


b. Draw the other chair conformation of the molecule. (2 points)

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

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

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)**

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

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

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

**BONUS:**

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

