

**CHM 2120**  
**Test – ANSWERS**  
**September 25, 2007**

**Important notes :**

- The marks are given as a guide and are subject to change
- The test/first midterm change every year. This test should be used only as a guide to approximate format, length and question style.
- This year's test (2010) will cover sections 1-3 of the course syllabus plus material from CHM 1721.

Name : \_\_\_\_\_

Student Number : \_\_\_\_\_

**Section:**

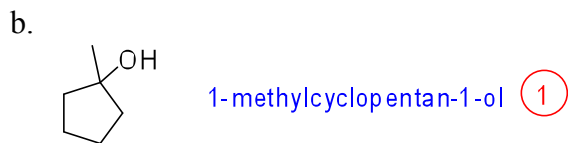
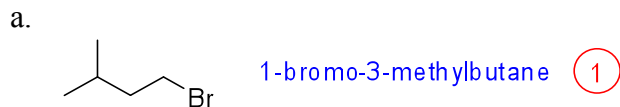
**A** (MRN Aud): \_\_\_\_\_

**B** (MNT 203): \_\_\_\_\_

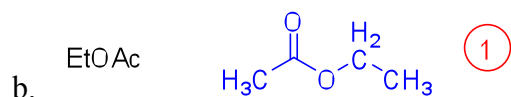
**Total number of marks:**

1a	2a	3b	4b	5b	6b	7b	8	1b	2b	3a	4a	5a	6a	7a	0		
1 H															2 He		
3 Li	4 Be										5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg										13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Rf	105 Ha	106 106												

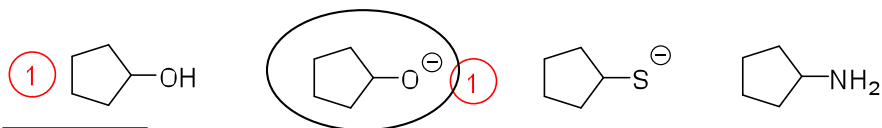
1. Name the following molecules: (2 points)



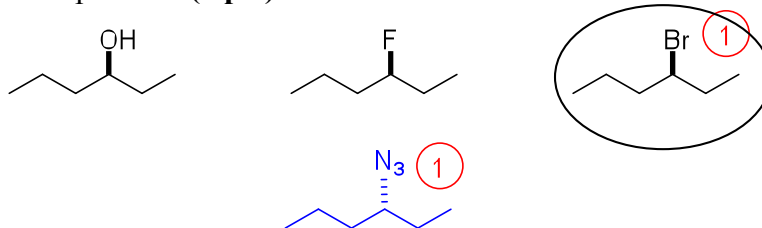
2. Draw the structure of the following molecules: (2 points)



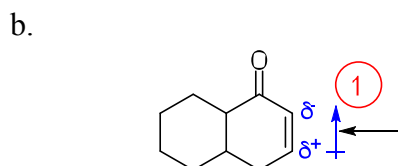
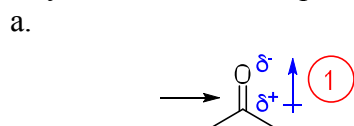
3. Circle the strongest base and underline the weakest base in the following set: (2 points)



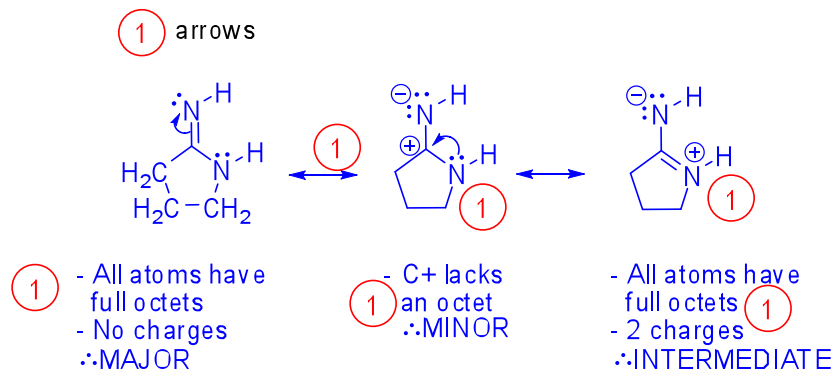
4. Circle the electrophile that will react the fastest with  $\text{NaN}_3$ . Give the structure of the expected product. (2 pts)



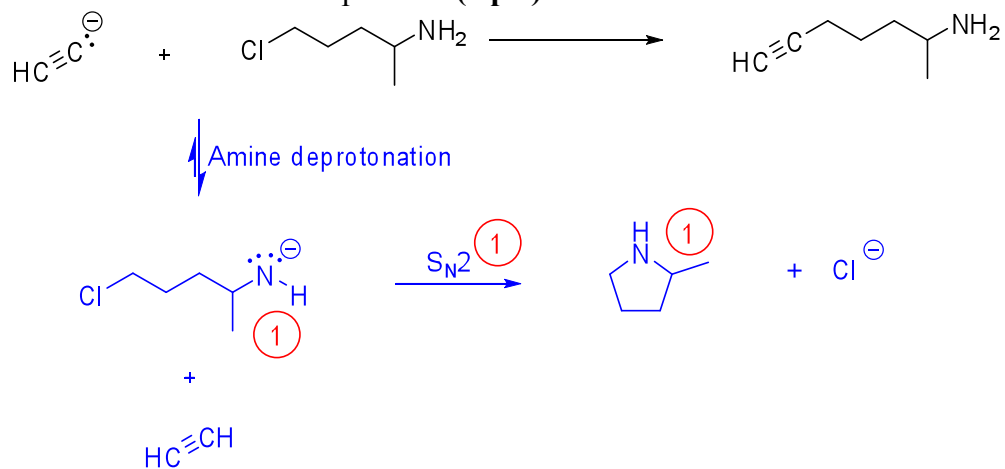
5. Identify direction of the dipole in the indicated bonds: (2 pts)



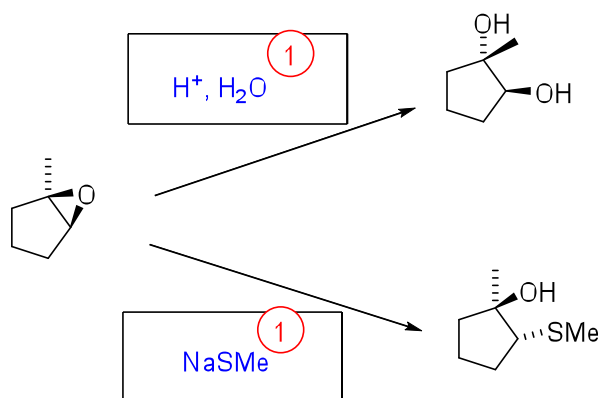
6. a. Draw the important resonance structures of the following molecule using arrows to show the movement of electrons: **(4 pts)**  
 b. Label the structures as major, minor and intermediate, as applicable. **(3 pts)**



7. The following transformation did not work. Explain why not by providing the structure of the actual product. **(3 pts)**

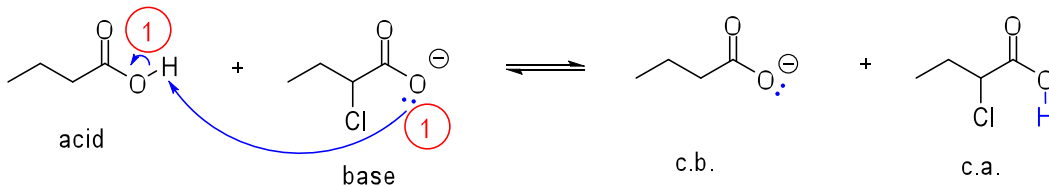


8. Identify the reagents required to effect the following transformations:



9.

- Write a mechanism for the following reaction using arrow notation. (2 pts)
- Will the reaction favor the starting materials or products? (1 pt)
- Justify your choice. (3 pts)



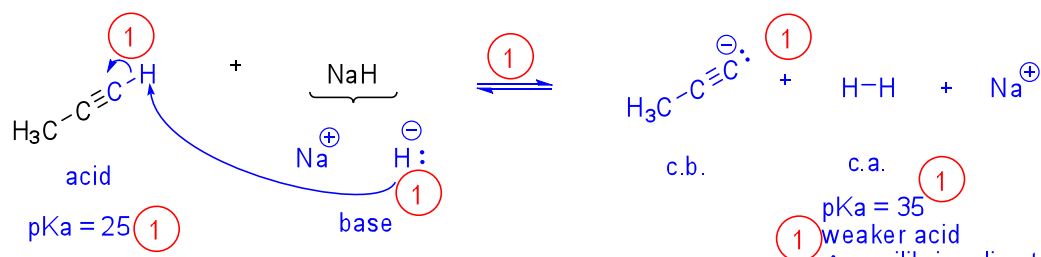
Compare the base with the c.b.:

The base is stabilized by resonance and an inductive effect (with the Cl), making it more stable than the c.b., which is only stabilized by resonance. The base is therefore weaker than the c.b.

The equilibrium lies to the left.

10.

- Write a mechanism for the following reaction using arrow notation. (4 pts)
- Will the reaction favor the starting materials or products? (1 pt)
- Justify your choice. (3 pts)

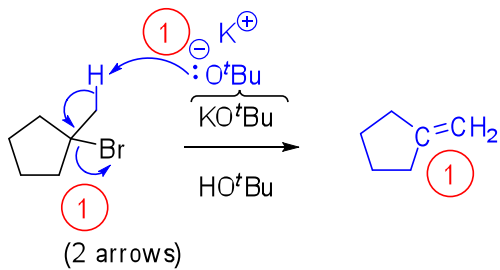


Compare pKa's of acid and c.a.

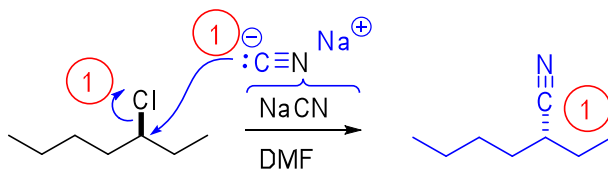
pKa = 25  
pKa = 35  
weaker acid  
∴ equilibrium lies to the right

11. Provide a mechanism for each of the following transformations: (10 pts)

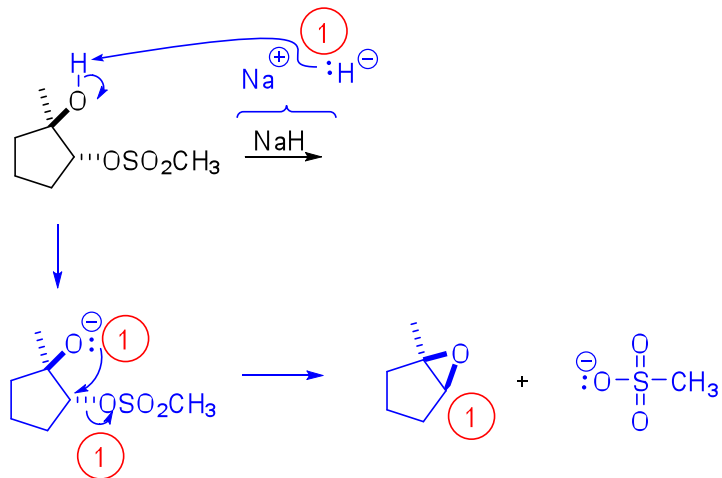
a.



b.



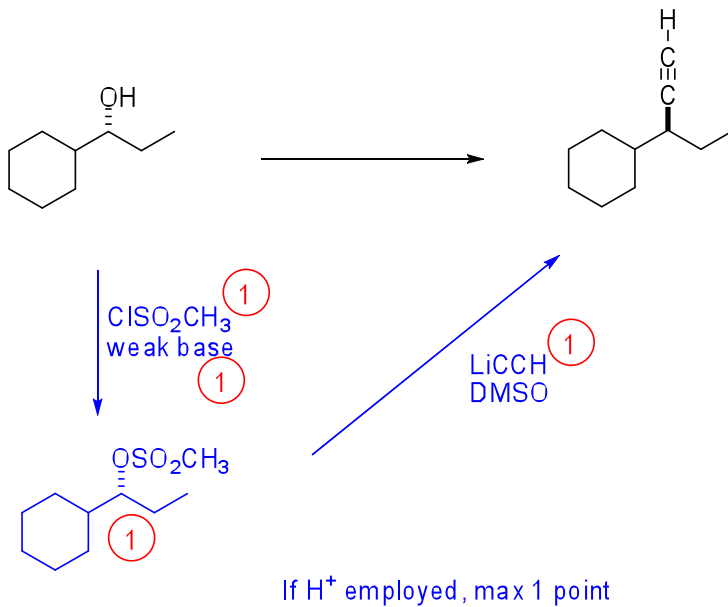
c.



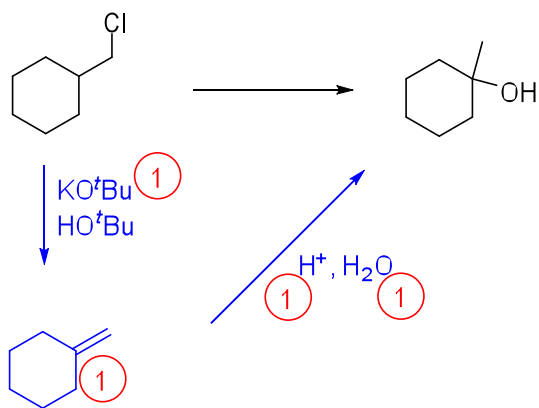
E2 with correct mechanism: 2 pts

12. Show how each of the following transformations could be achieved. Note: Mechanisms are not required, but part marks might be given for incorrect answers with plausible mechanisms. **(8 pts)**

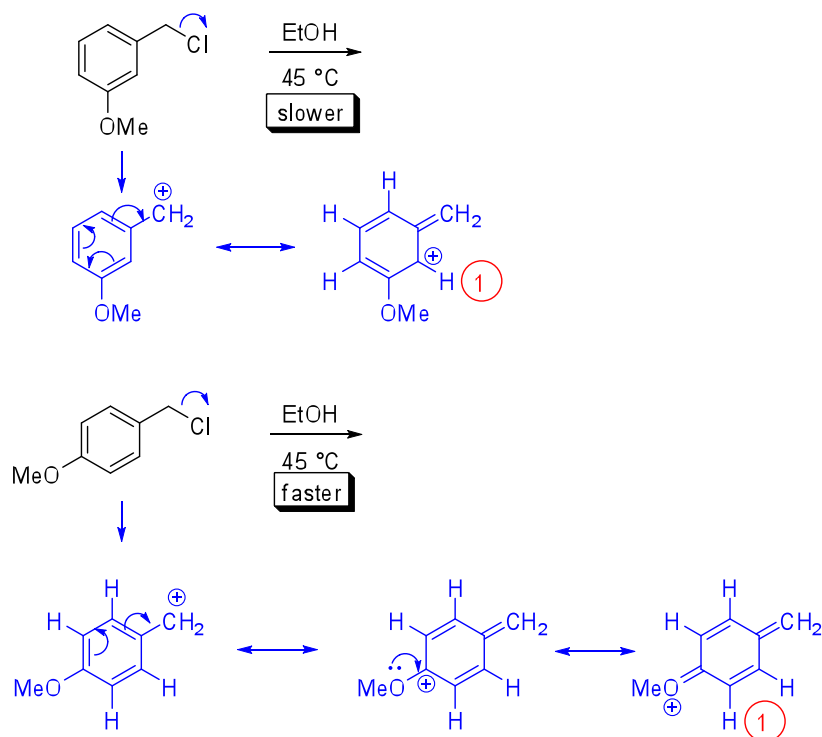
a.



b.



13. 4-Methoxybenzyl chloride reacts much more quickly than 3-methoxybenzyl chloride under the reaction conditions shown. Explain why. (2 pts)



The second carbocation intermediate is stabilized by resonance with the benzene ring AND with the oxygen, whereas the first carbocation is stabilized only by resonance with the benzene ring. (1)

Because the carbocation is more stable (lower in energy) in the second structure, the transition state leading to that carbocation is also lower in energy (Hammond postulate). This results in a faster rate-determining step and consequently a faster reaction. (1)