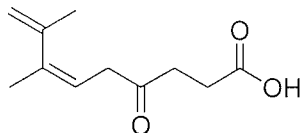


Organic Chemistry 335  
Final Exam  
March 19, 2013

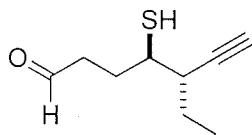
In-class # \_\_\_\_\_  
Name \_\_\_\_\_  
(Last, First)

Key

1. Name the following compounds (12 points)

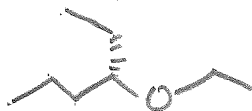


(Z)-7,8-dimethyl-4-oxonona-6,8-dienoic acid



(4R,5S)-5-ethyl-4-mercaptohept-6-ynal

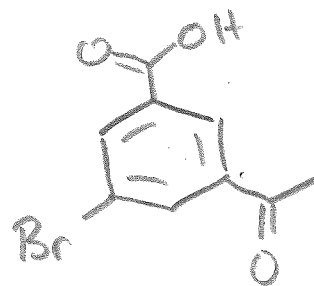
2. Draw the following compounds. (12 points)



(S)-3-ethoxyhexane



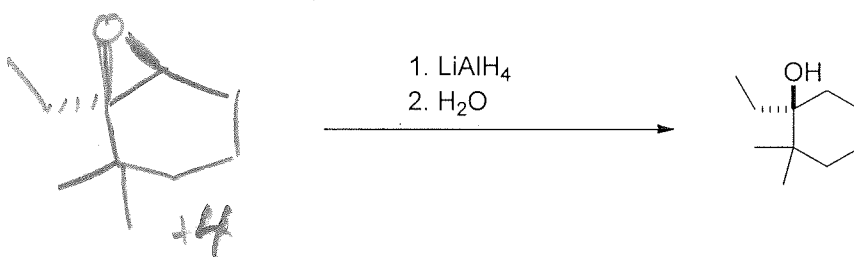
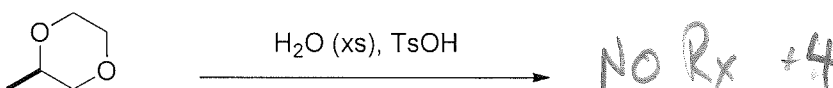
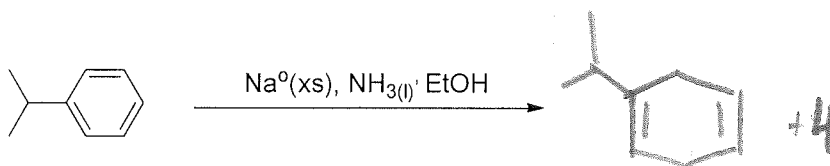
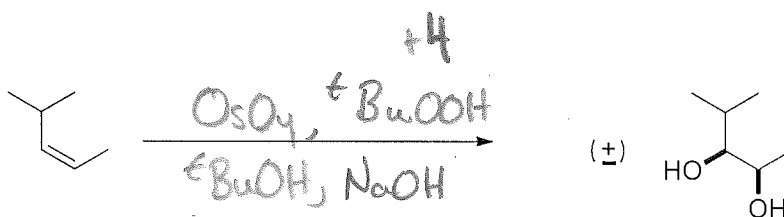
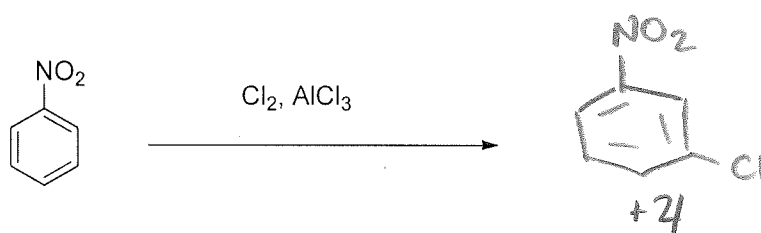
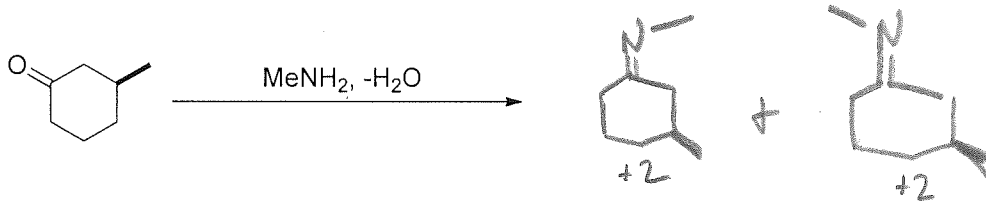
(2S,3S)-2,3-dimethyloxetane



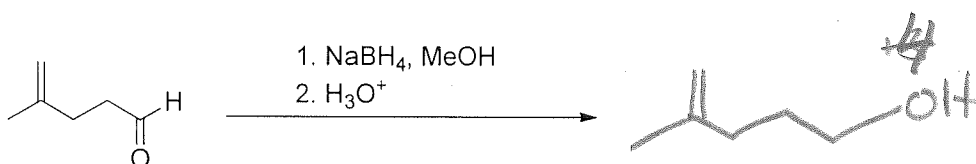
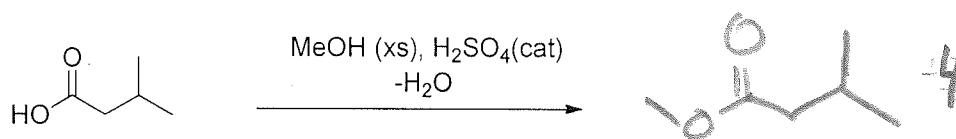
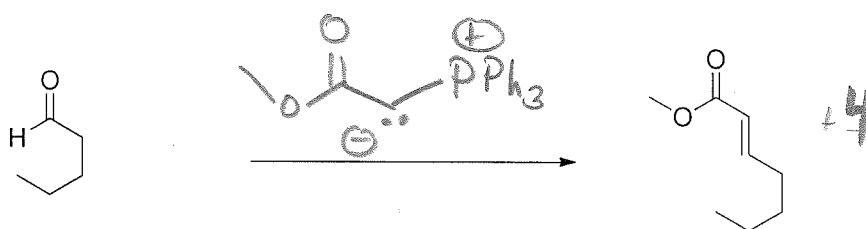
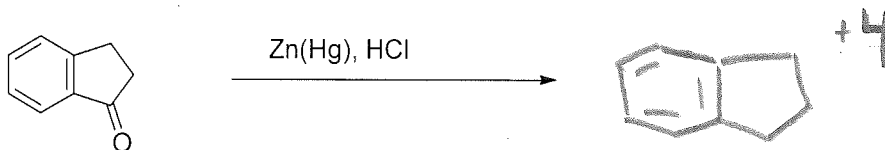
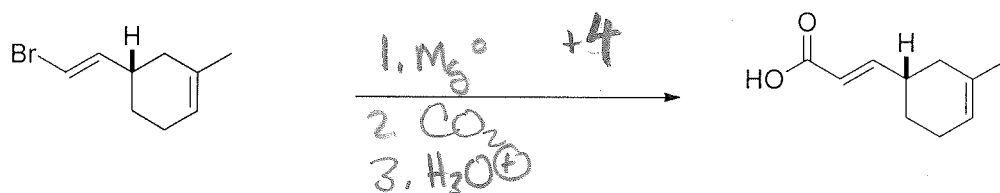
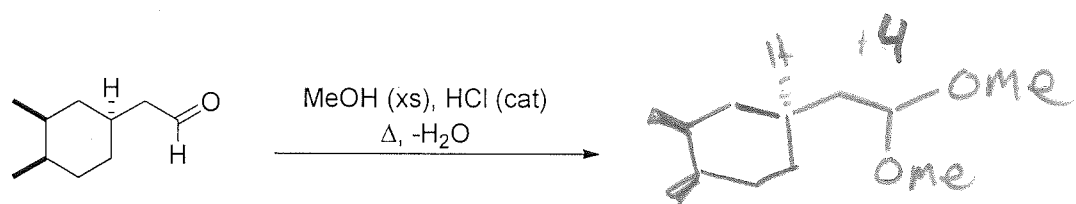
3-acetyl-5-bromobenzoic acid

3. What was the starting material, reagents, or product/s for the following chemical transformations? If there is no reaction write "no reaction"

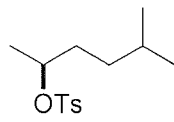
Do not forget about stereochemistry (84 points)



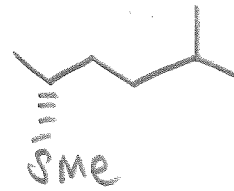
3. Continued



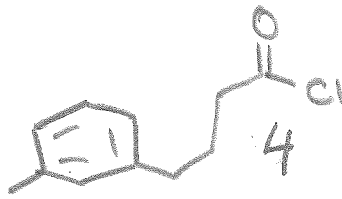
Problem 3 continued.



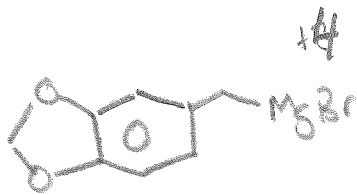
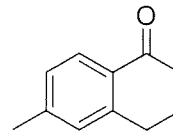
NaSMe, DMF



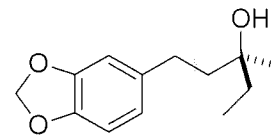
+4



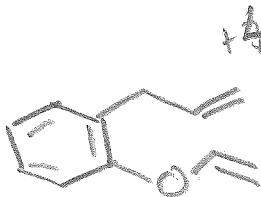
AlCl<sub>3</sub>



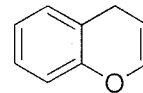
1. CC1OC1
2. H<sub>3</sub>O<sup>+</sup>



+4



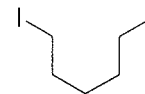
ClC(Cl)(PCy3)Ru(=CHPh)PCy3 Grubbs' cat



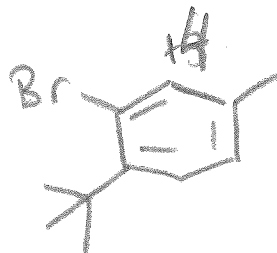
+4



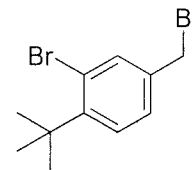
HI(x5), Δ



+4

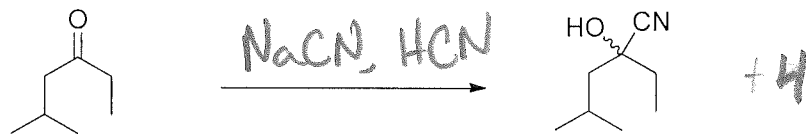
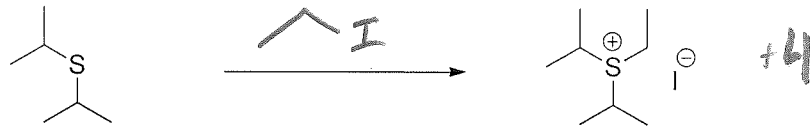
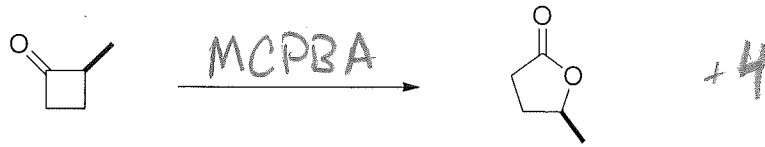


NBS  
(n-bromosuccinimide)  
Δ, Peroxides

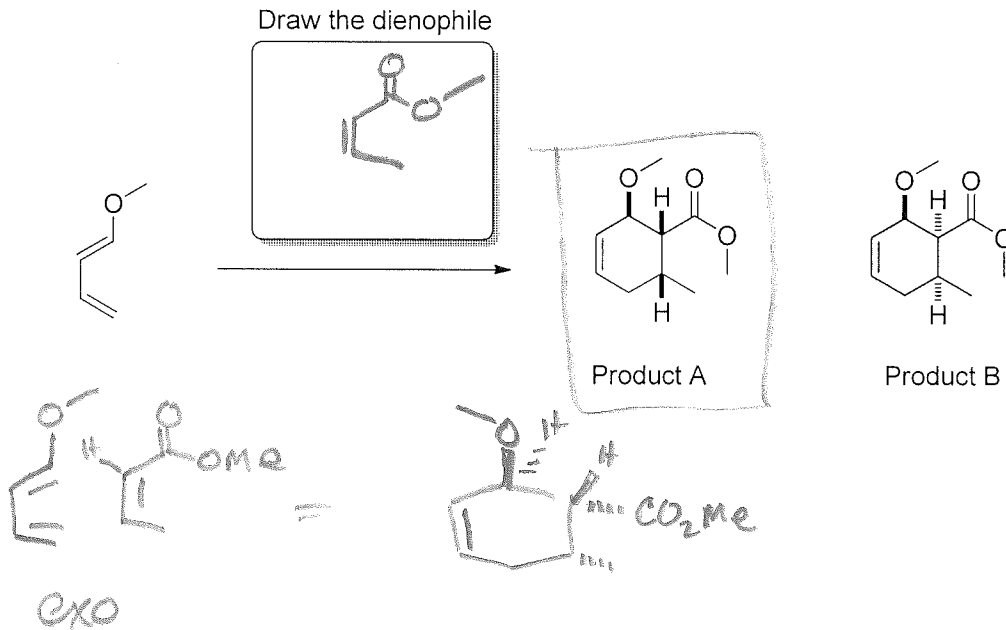


+4

Problem 3 continued.

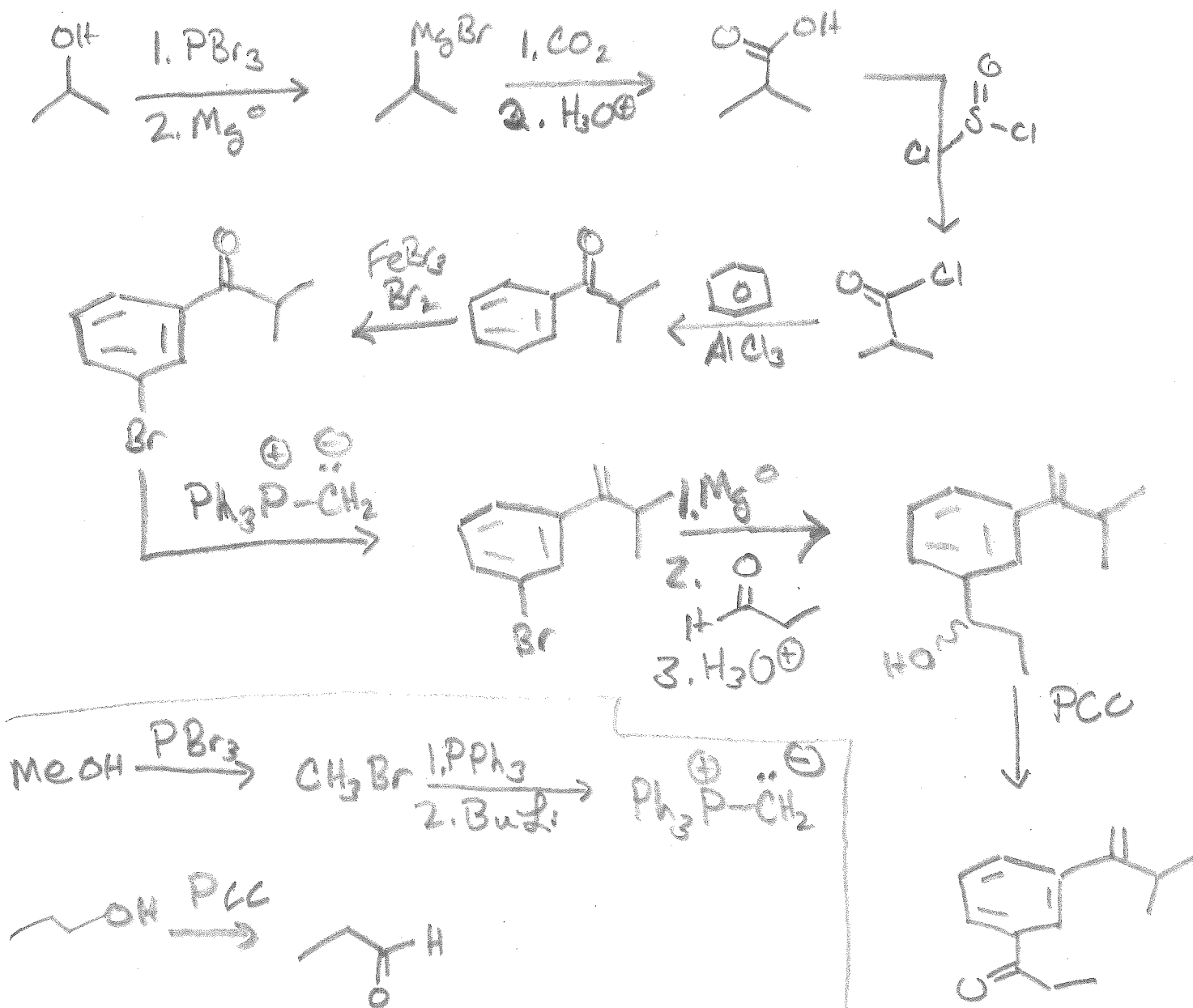
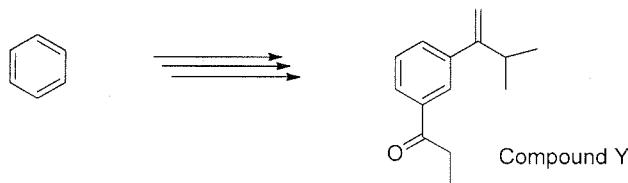


4. a. Draw the dienophile for the following reaction. 3 points  
 b. **Circle** the product that is formed from an *Exo* transition state. 3 Points

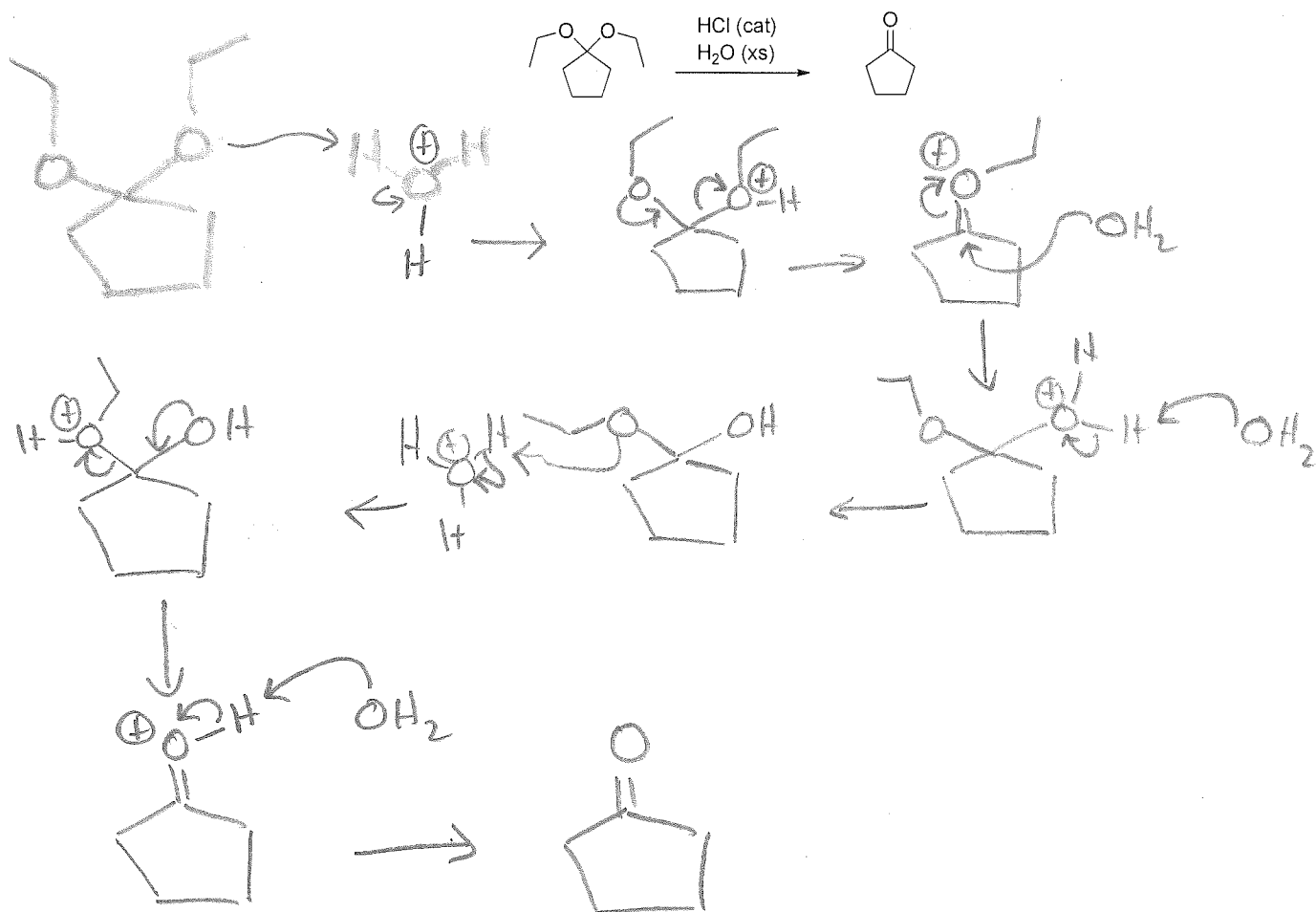


5. Design a synthesis of compound Y. (16 points)

- \* The synthesis must start with benzene.
- \* You can use any reaction you have learned this year.
- \* **All carbons (except benzene) that end up in the product must start from carbon dioxide and/or alcohols that has three carbons or less.**
- \* **You need to show the how you make the reagents and intermediate products.**
- \* The major product must be carried on to the next step.
- \* You do not need to show the mechanisms.



6. Draw the complete mechanism acid catalyzed removal of the diethyl ketal. (16 points)



7. What is the following structure?  $C_7H_{12}O_4$  (17 points: these 17 point are broken up in the problem)

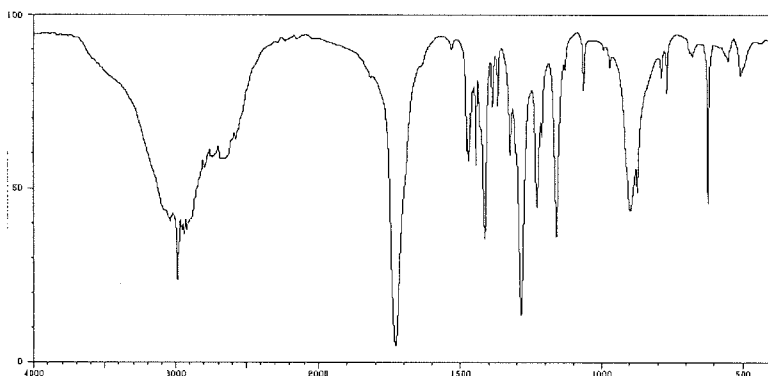
What are the degrees of unsaturation or IHD? (3 point)

$$7 \times 2 + 2 \Rightarrow 16 - 12 \Rightarrow 4 / 2 \Rightarrow 2$$

degrees of unsaturation or IHD

2

IR: 3041, 2994, 1729, 1285  $cm^{-1}$



$^{13}C$  NMR data (ppm)

185  
178  
44  
35  
34  
25

List four types of bonds the IR show this molecule has. (4 points)

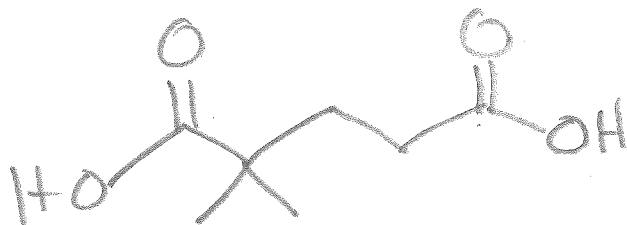
1. O-H    2.  $sp^3$ C-H    3. C=O    4.  $sp^2$ -C-O

Please tell me what you think each peak in the  $^1H$  NMR represents ( $CH_x$ , OH,  $NH_x$  ...) and how you get its splitting pattern (5 points)

$^1H$  NMR

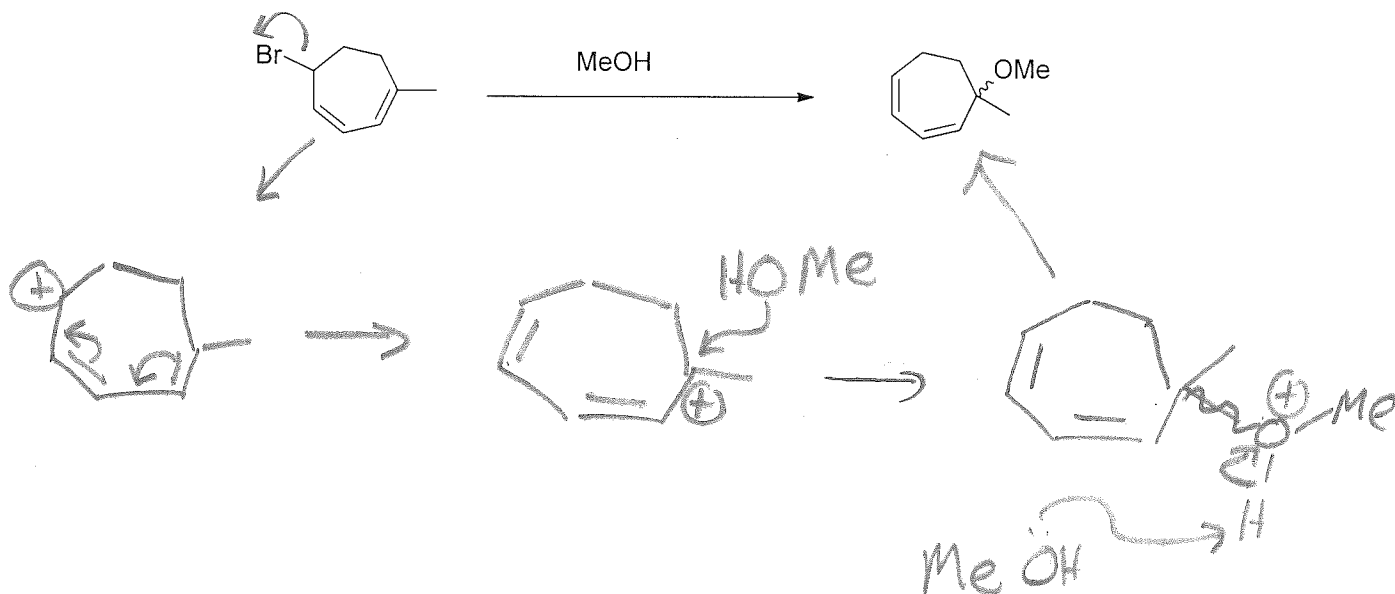
- |              |                                   |
|--------------|-----------------------------------|
| 11.9 (s, 1H) | O-H of a C. Acid ; NO vicinal H's |
| 11.7 (s, 1H) | O-H of a C. Acid ; NO vicinal H's |
| 2.4 (t, 2H)  | $CH_2$ next to $CH_2$             |
| 1.9 (t, 2H)  | $CH_2$ next to $CH_2$             |
| 1.1 (s, 6H)  | $2 \times CH_3$ ; NO vicinal H's  |

Draw the structure that best fits all the data. (5 Points)



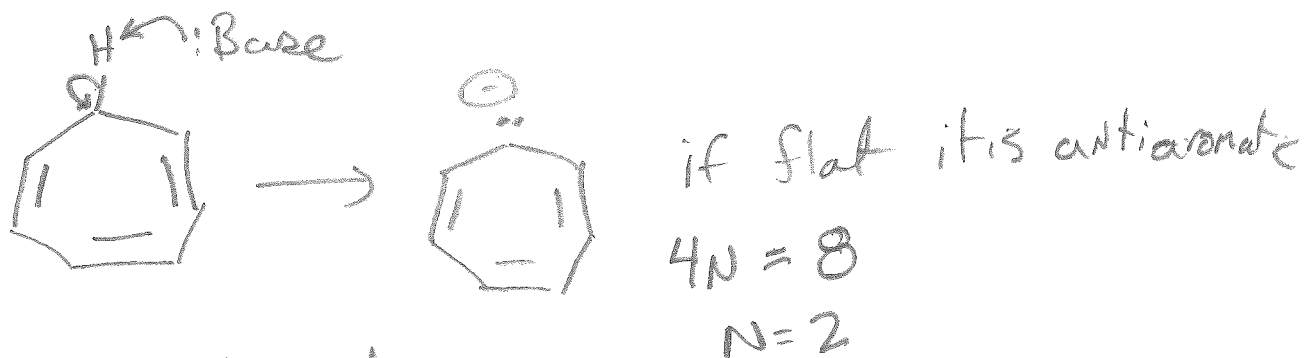


8. Draw a complete mechanism for the following  $S_N1$  reaction. (6 points)



9. Provide a **short** explanation (pictures are worth a 1000 words) why there is a drastic difference in the acidity of the methylenes of cyclopentadiene and cycloheptatriene. (6 points)

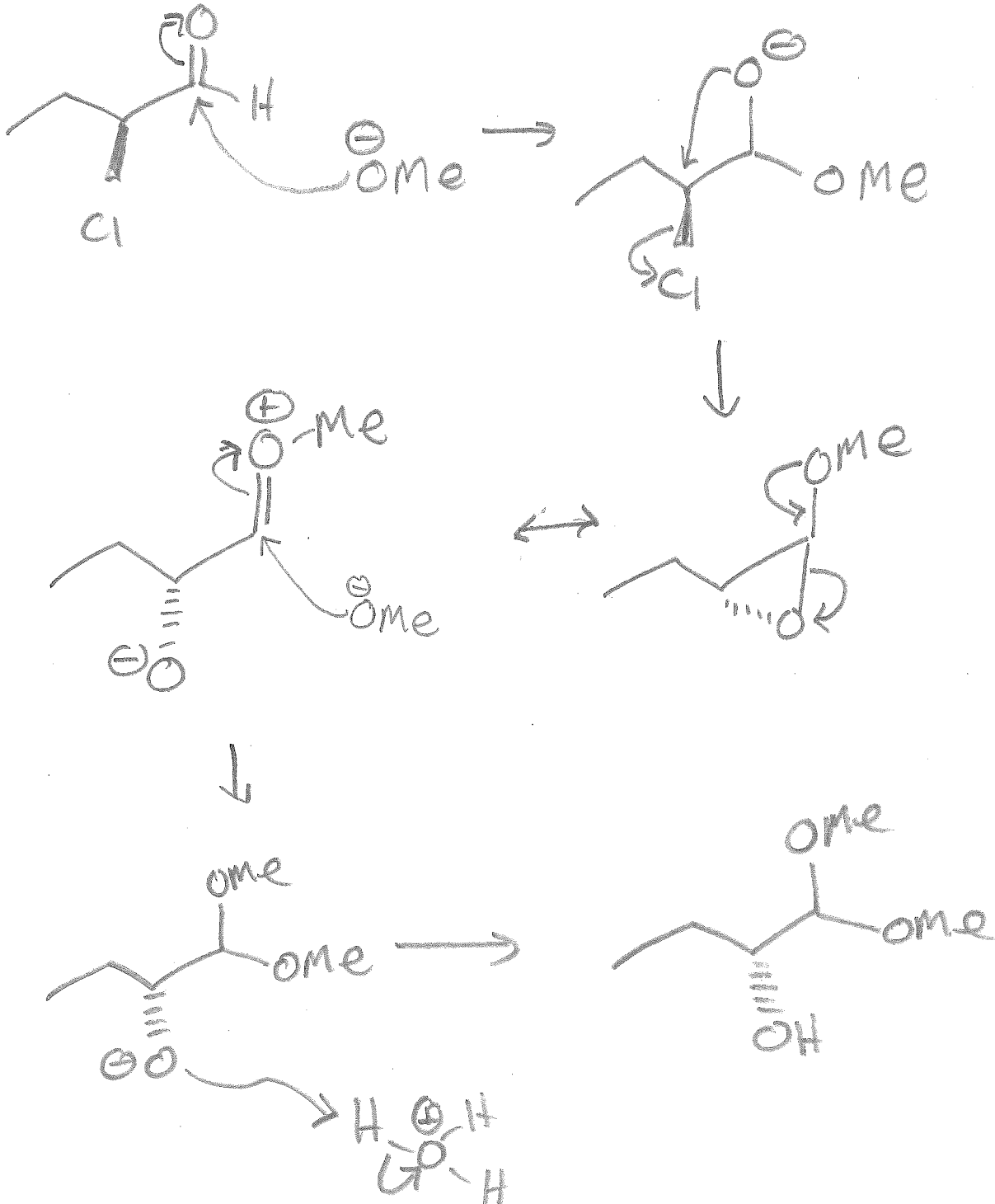
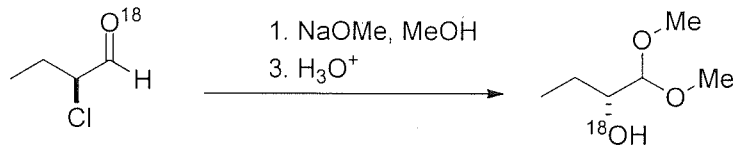
cyclopentadiene  $\text{pK}_a = 16$  vs cycloheptatriene  $\text{pK}_a = 36$



as compound want to be aromatic, cyclopentadiene "wants" to lose a proton, More acidic

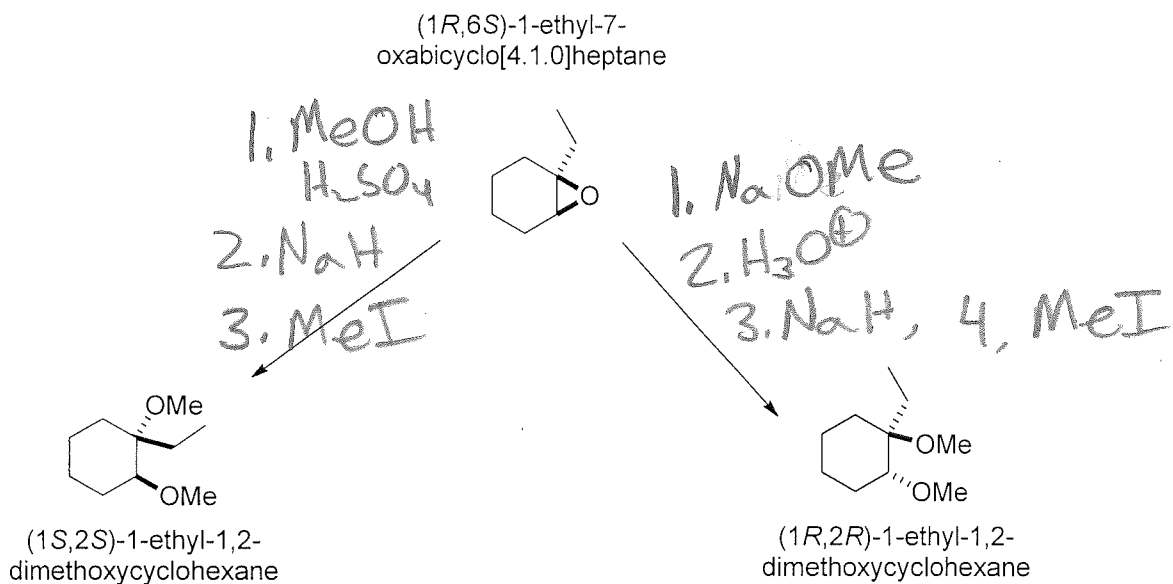
Book Problem  
17.38.b

10. Draw a mechanism for the following reaction. (5 points)



\*\*\*\*\*Insurance question: 10 points\*\*\*\*\*

IQ1. Starting from pure (1R,6S)-1-ethyl-7-oxabicyclo[4.1.0]heptane X design a synthesis of pure (1S,2S)-1-ethyl-1,2-dimethoxycyclohexane and pure (1R,2R)-1-ethyl-1,2-dimethoxycyclohexane . (4 points)



IQ2. Draw the complete mechanism for the following reaction. (6 points)

