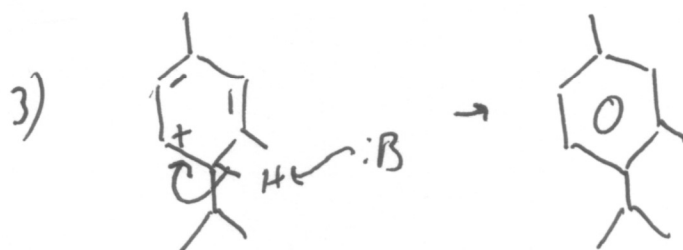
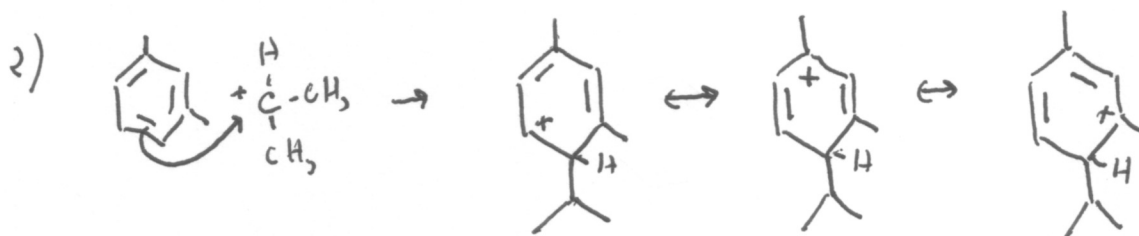
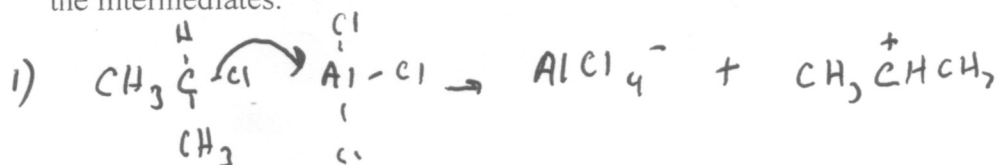
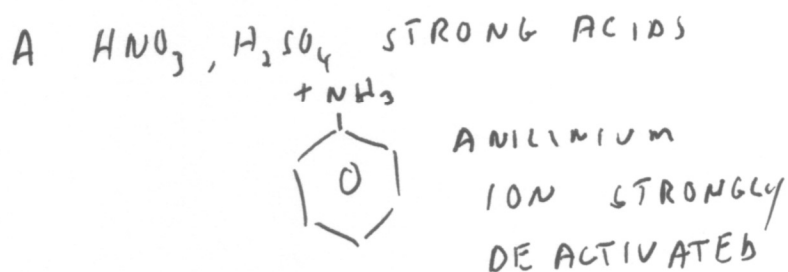


- 1) (20) When m-xylene (1,3-dimethylbenzene) is treated with isopropyl chloride and AlCl_3 , the major product is 1,3-dimethyl-4-isopropylbenzene. Show a complete mechanism for this reaction, including a detailed picture of the intermediates.

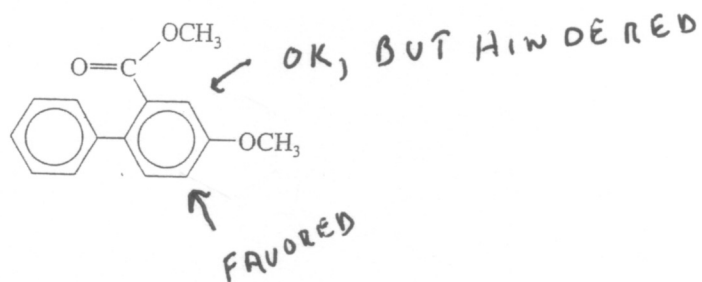


- 2) In aqueous solution containing sodium hydroxide, aniline reacts quickly with bromine to give 2,4,6-tribromoaniline. Nitration of aniline requires very strong conditions, however, and the yields (mostly m-nitroaniline) are poor.

- a) what conditions are used for nitration, and what form of aniline is present under these conditions?
 b) Explain why nitration of aniline is so sluggish and why it gives mostly meta substitution.



- 5) At what position would you expect this compound to undergo electrophilic aromatic substitution?



- 6) Number these compounds in order of reactivity towards electrophilic aromatic substitution. (1 = most, 4 = least reactive)



1



3



2



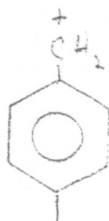
4

F IS e^- WITHDRAWING

- 10) Number the following carbocations in order of increasing stability. (1 = most stable)



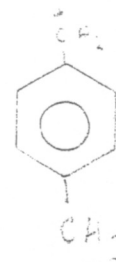
2



3



4



1

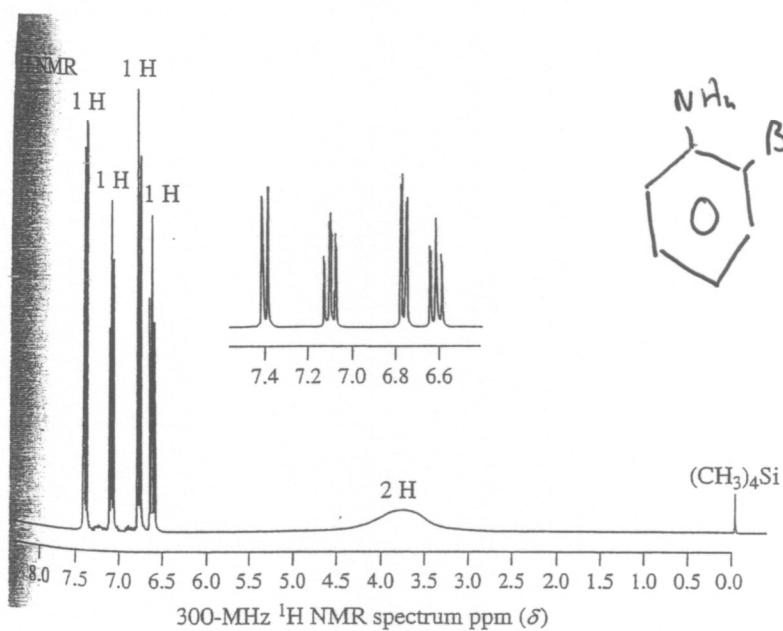
ALL INDUCTIVE EFFECT

11) Which is more stable, cycloheptatrienyl cation or anion? Why?

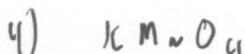
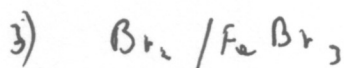
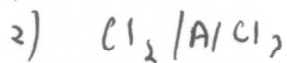
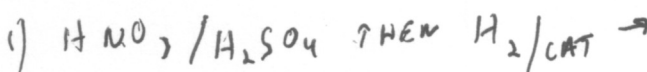
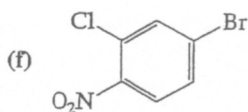
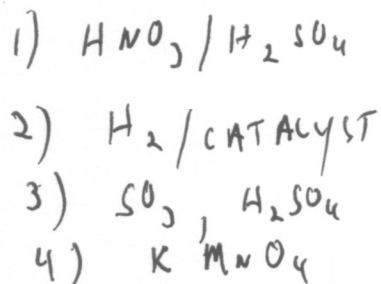
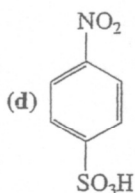
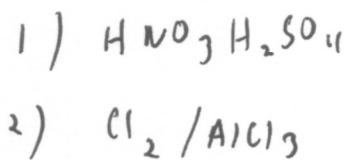
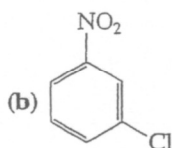
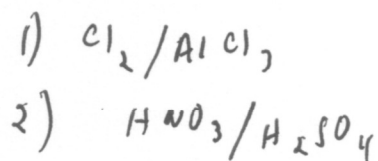
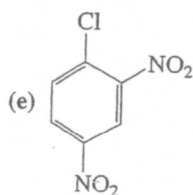
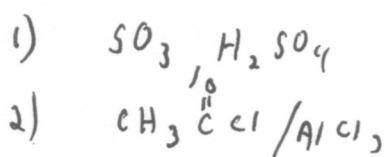
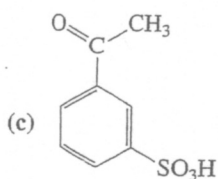
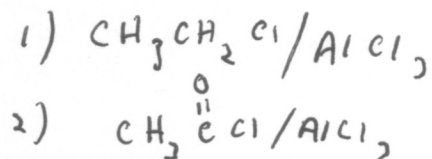
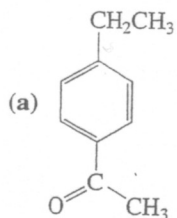
CATION IS AROMATIC $6\pi e^-$

ANION IS ANTIAROMATIC $8\pi e^-$

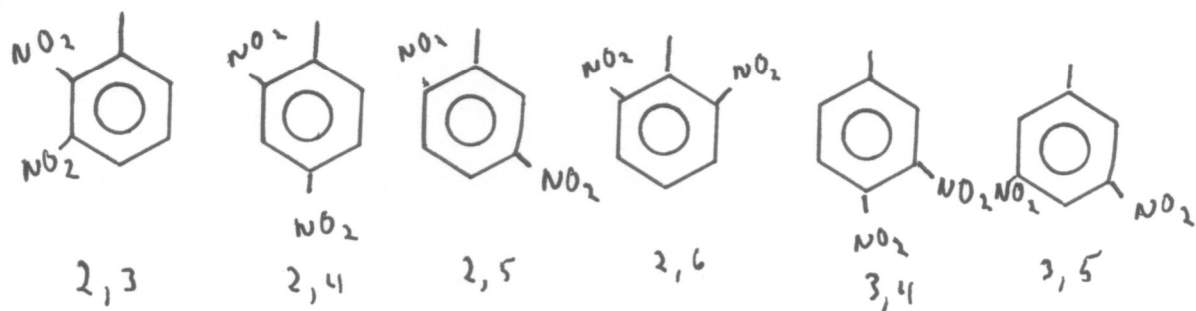
12) What is the structure? The formula is C_6H_6NBr .



13) Devise a synthesis of these compounds from benzene. Show all necessary reagents and reaction conditions

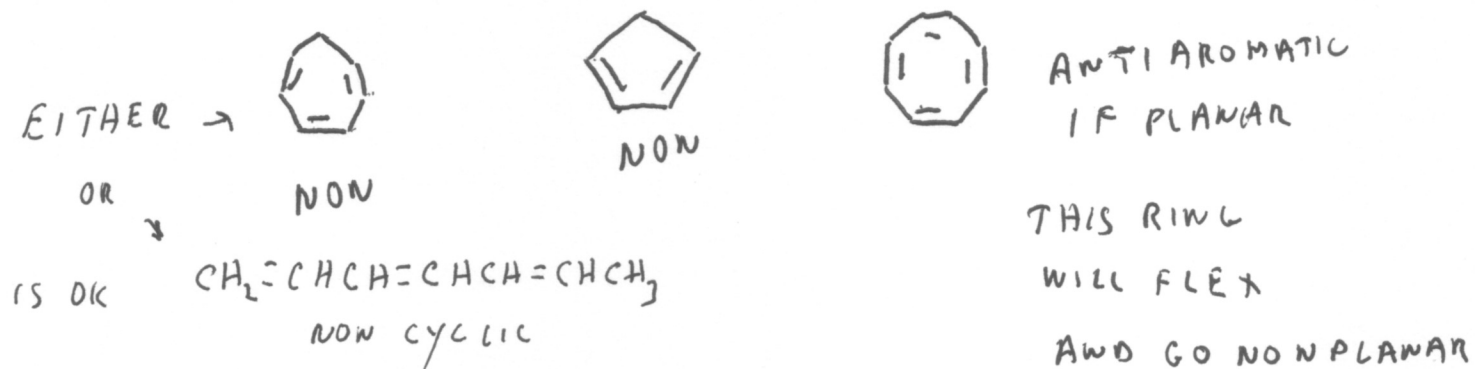


3) Draw all the isomers of dinitrotoluene.



4) Label each compound as either aromatic, nonaromatic or antiaromatic.

1,3,5-heptatriene cyclopentadiene cyclooctatetraene



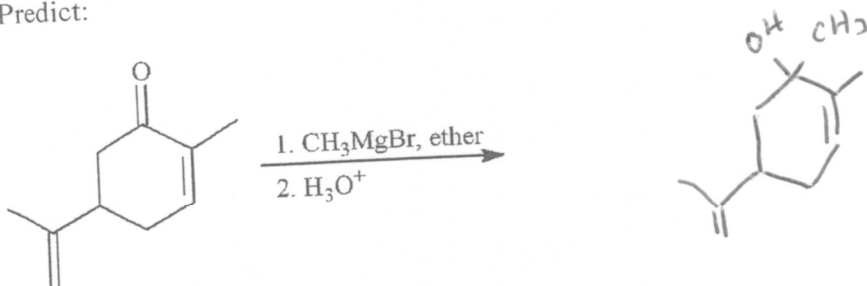
Name: _____

CHM 228 Exam 3 Summer 2017

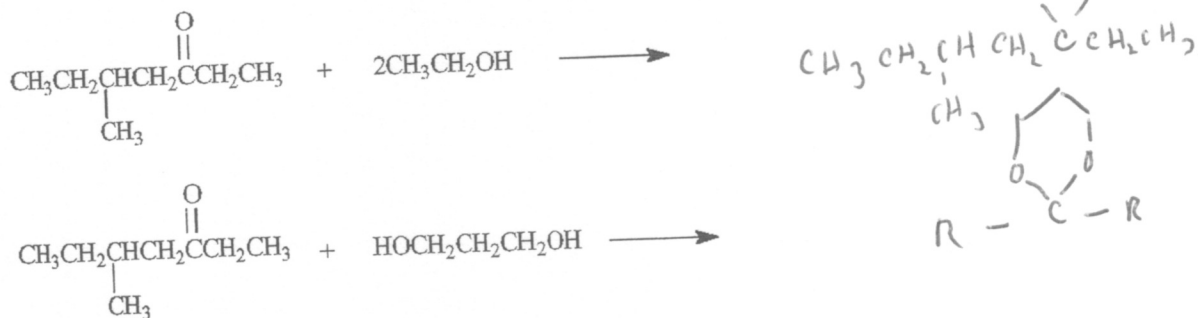
Problem

Instructions: Predict the products from the information given for the following question(s).

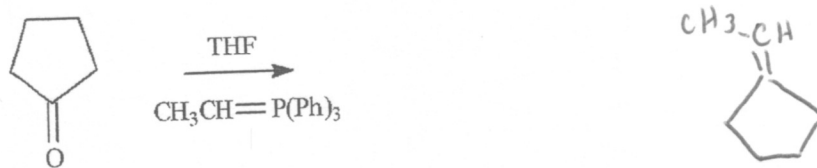
1. Predict:



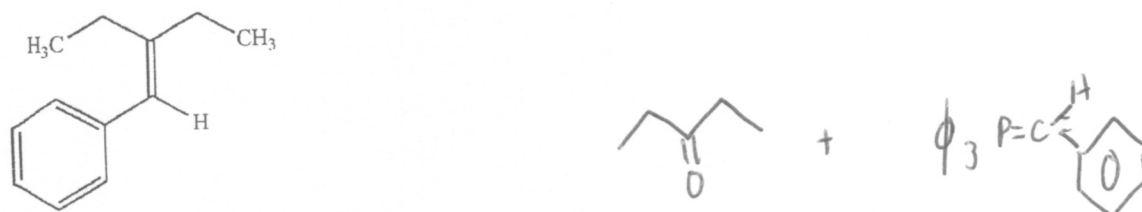
2. Predict the products of the following reactions.



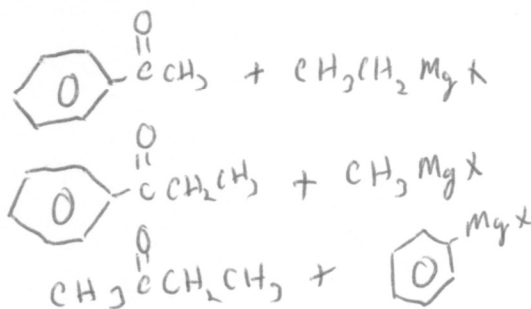
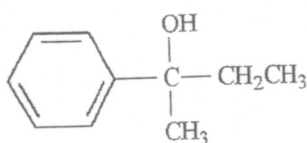
3. Draw the structure of the product obtained from the following reaction.



4. Synthesize the following alkene through the Wittig reaction of a carbonyl compound and a phosphorus ylide.

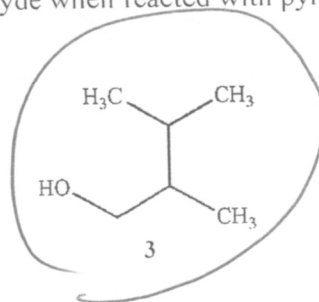
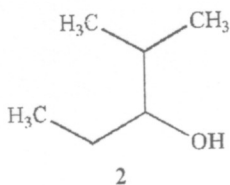
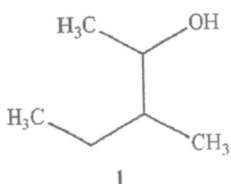


5. A useful and general method for the synthesis of alcohols is the addition of Grignard reagents to carbonyl compounds. Show what Grignard reagent and what carbonyl compound you would start with to prepare each alcohol below. List all possibilities.



6. Answer the following questions.

- a) Which of the following would produce an aldehyde when reacted with pyridinium chlorochromate?

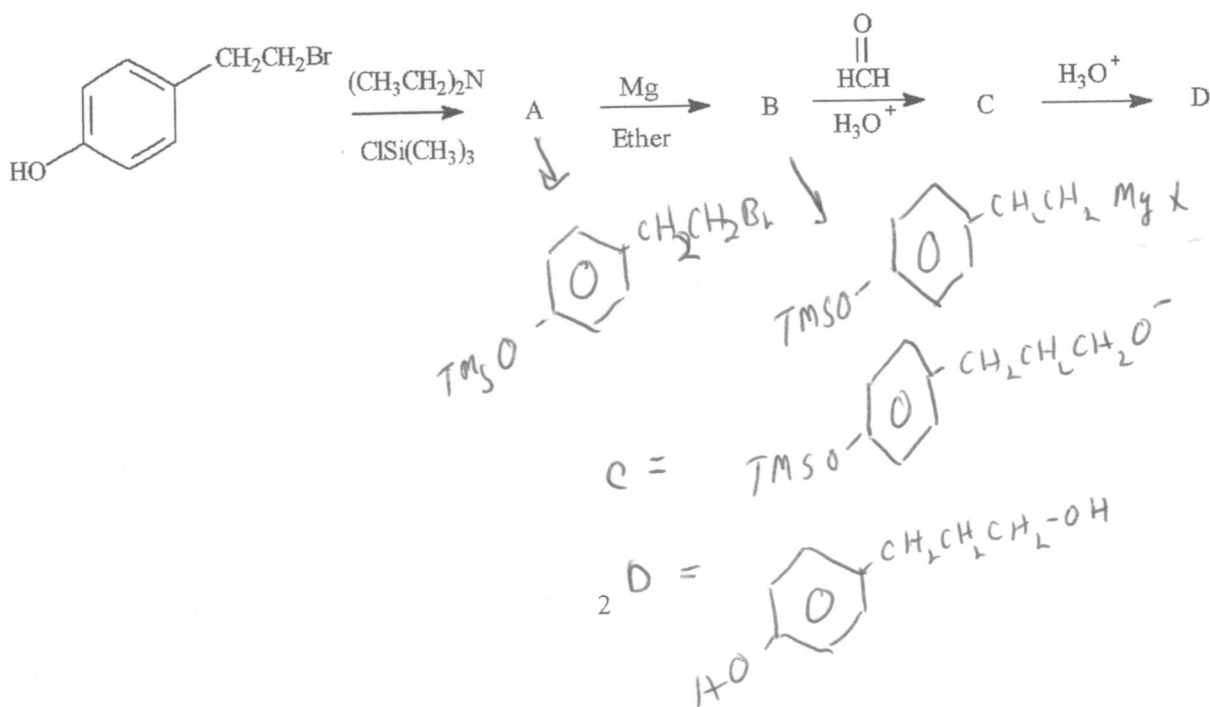


- a. only 1
b. only 3
 c. only 1 and 3
 d. only 2 and 3

- b) If CrO_3 were used in place of pyridinium chlorochromate, how would the product of the reaction differ?

(PCC)
 ACID

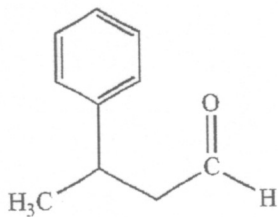
7. Predict the product in each step of the following reaction.



Multiple Choice

Identify the choice that best completes the statement or answers the question.

8. What is the IUPAC name of the following compound?



3-PHENYL BUTANAL

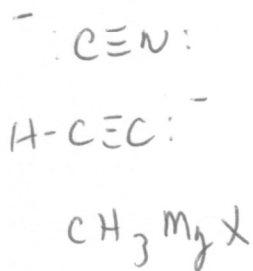
9. What is the best choice of reagent to achieve the following transformation?



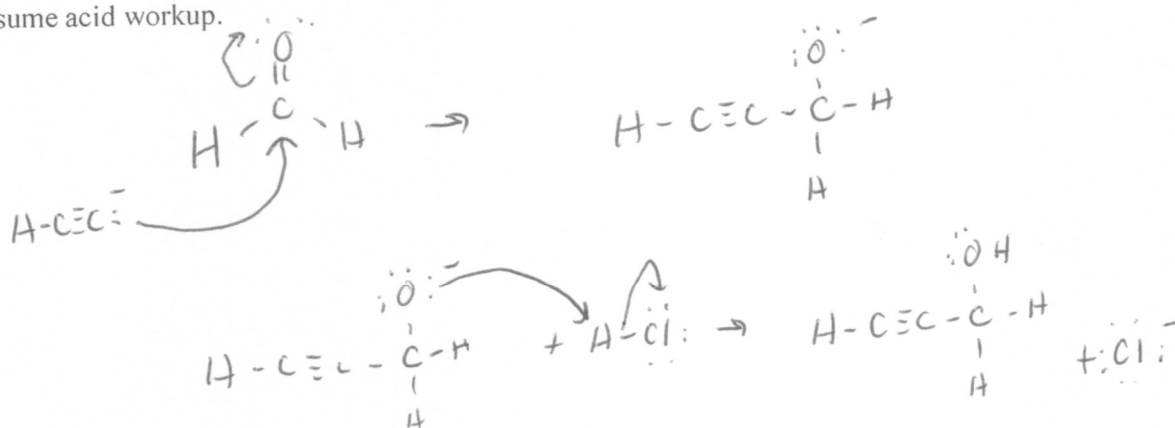
- D 10. Addition of chlorotrimethylsilane to an alcohol
- results in an $\text{S}_{\text{N}}1$ reaction.
 - requires acidic reaction conditions.
 - is sterically hindered by the three methyl groups.
 - results in the formation of an ether.
 - produces a more reactive species.

Short Answer

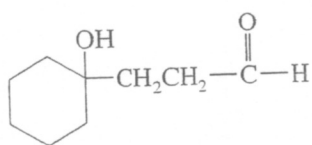
11. Draw Lewis structures for as many carbon nucleophiles as you can.



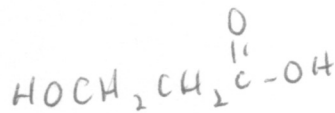
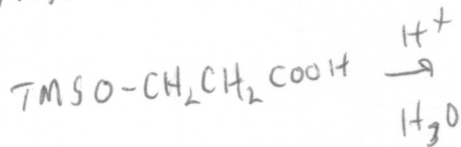
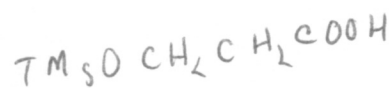
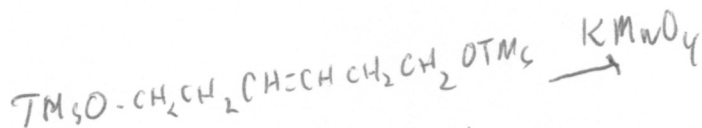
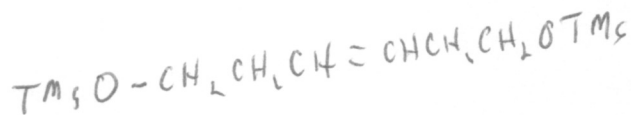
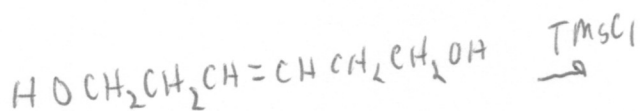
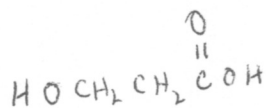
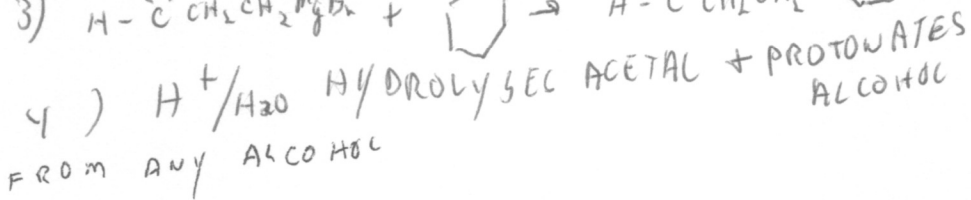
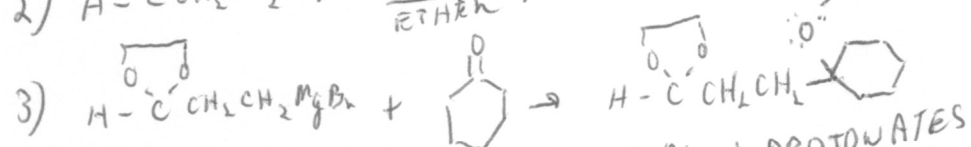
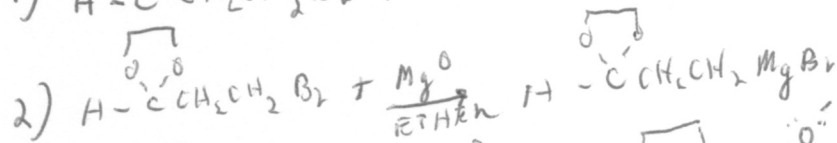
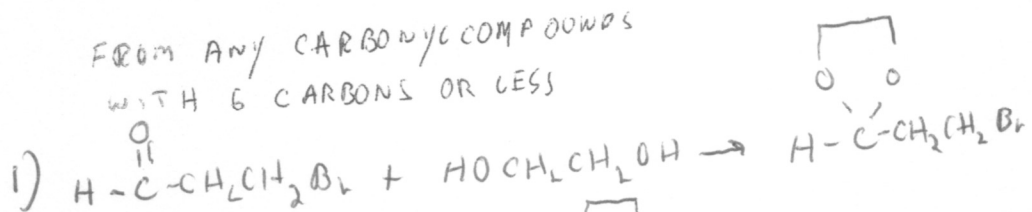
Draw a complete mechanism showing the reaction of one of your nucleophiles and a carbonyl compound of your choice. Assume acid workup.



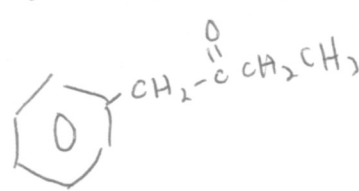
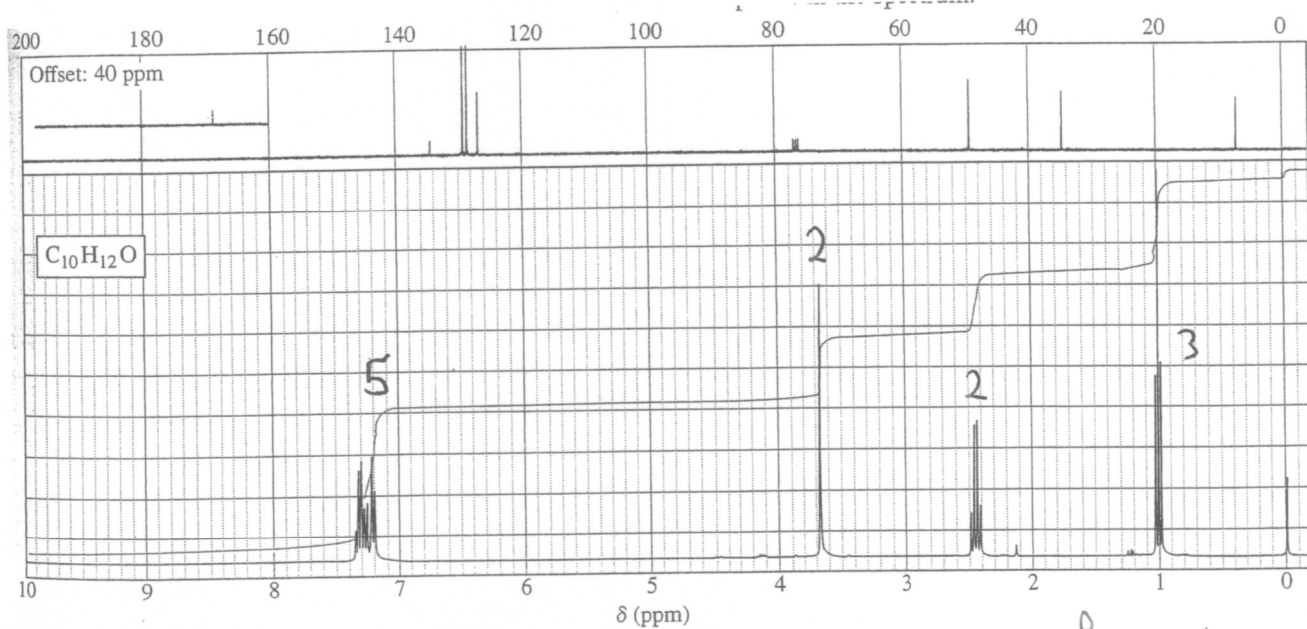
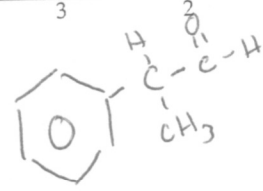
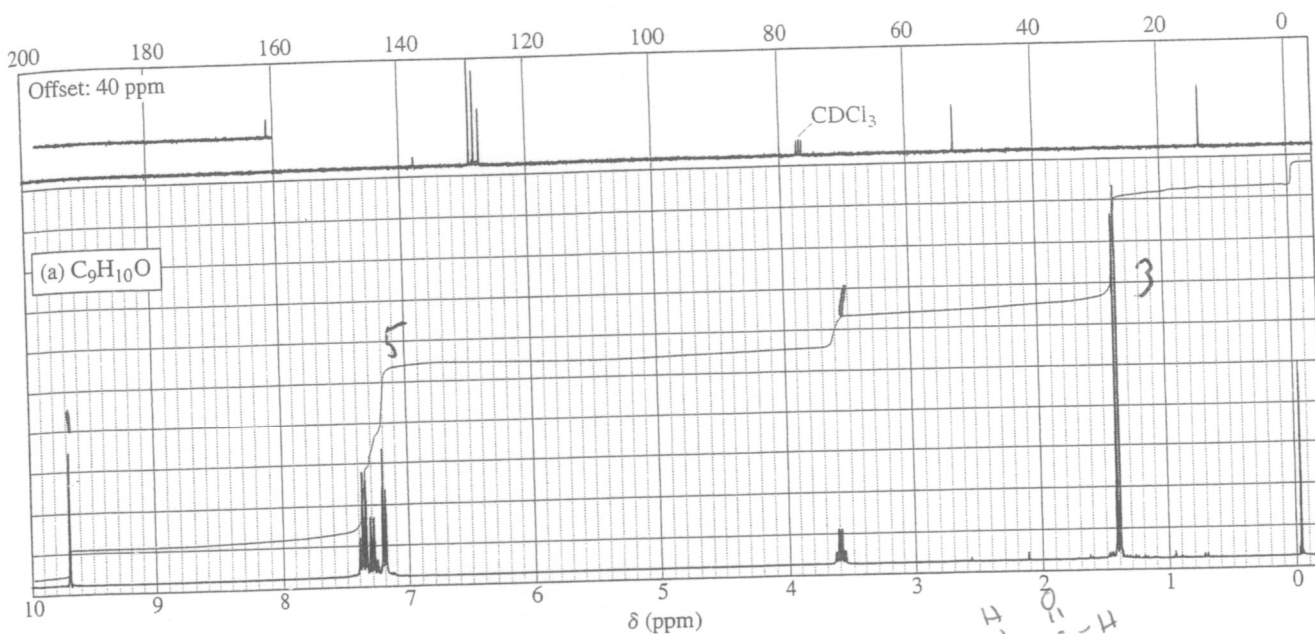
12. Multistep syntheses are required. Show the steps.



FROM ANY CARBONYL COMPOUNDS
WITH 6 CARBONS OR LESS

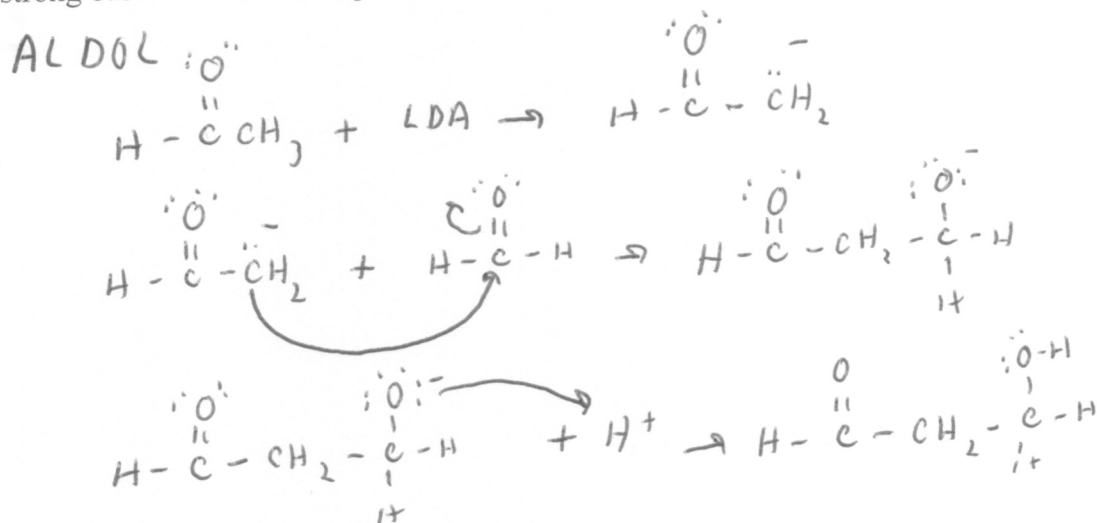


13. Identify the compounds that produce the following spectra.

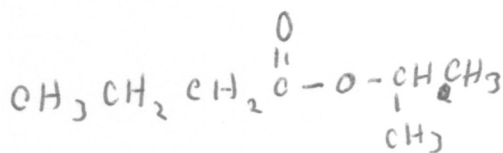


Exam 4

- 1) Acetaldehyde (ethanal) reacts with formaldehyde (methanal), in the presence of strong base. Show the complete mechanism.

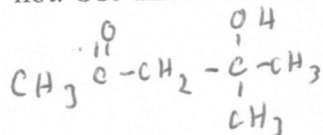


- 2) Draw the structure.
isopropyl butanoate



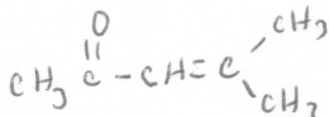
- 3) The products of an aldol condensation frequently dehydrate. Describe three ways spectroscopy could be used to determine that the product had dehydrated or had not. Use three different techniques and give specific examples.

A



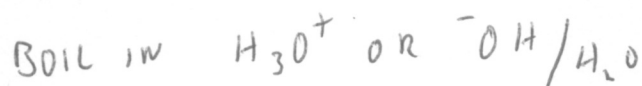
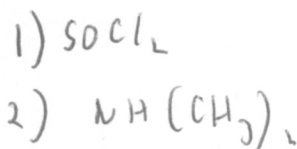
vs

B

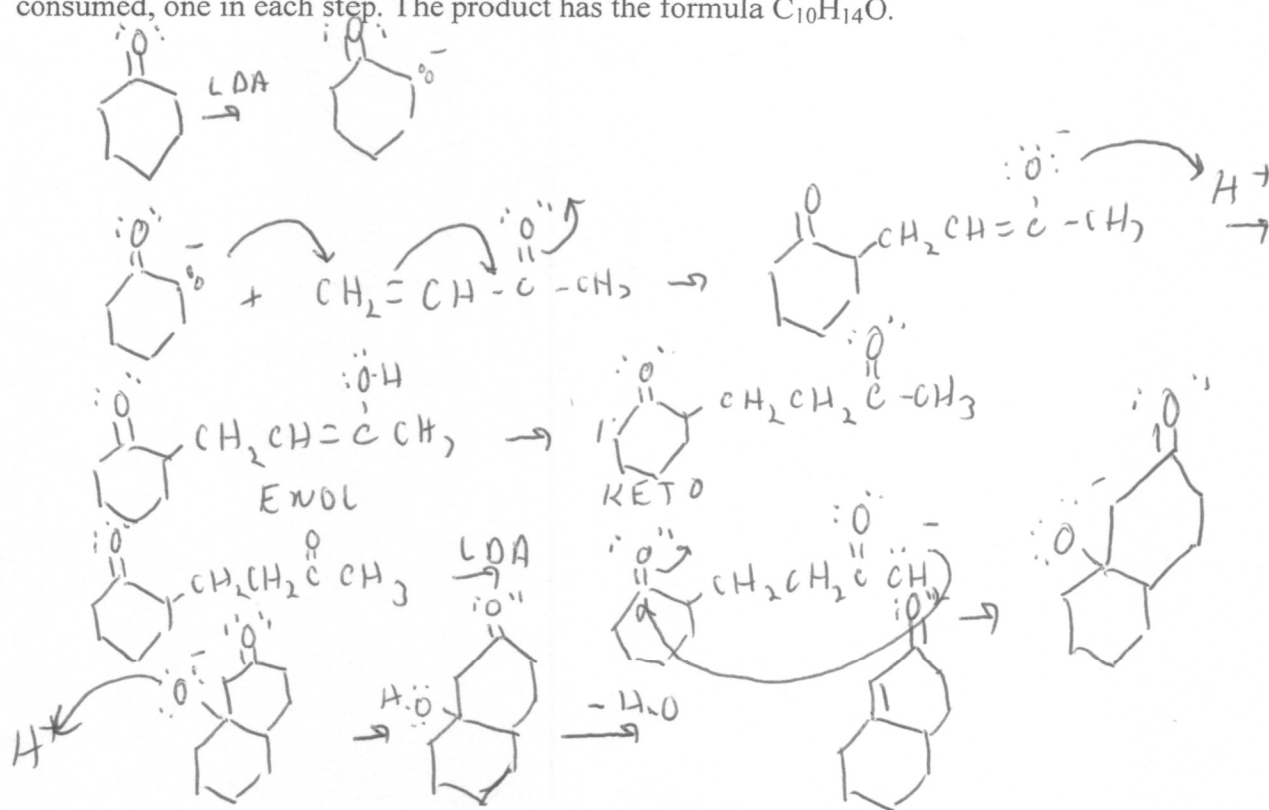


- 1) IR A = 3300 BROAD
2) NMR B = SINGLET 5-6 ppm
3) MASS A = $\text{C}_6\text{H}_{12}\text{O}_2 = 116$
B = $\text{C}_6\text{H}_{10}\text{O} = 98$

8) Show the reagents needed to cause the following transformations.



9) Show the complete mechanism for the Robinson annulation when cyclohexanone reacts with methylvinylketone (but-3-en-2-one). 2 equivalents of LDA will be consumed, one in each step. The product has the formula $\text{C}_{10}\text{H}_{14}\text{O}$.



10) Show how the following syntheses might be accomplished.

3-pentanone from acetone

- 1) LDA
- 2) CH_3Cl
- 3) LDA
- 4) CH_3Cl

$\text{CH}_3\text{CHO} \rightarrow \text{CH}_3\text{CH}(\text{OH})\text{COOH}$

- 1) $\text{:CN}^- = \text{CYANOHYDRIN}$
- 2) BOIL IN H_3O^+

trans-1-bromo-2-butene \rightarrow trans-3-pentenoic acid

- 1) :CN^-
- 2) BOIL IN H_3O^+

3-propylhex-5-en-2-one (3-propyl-5-hexen-2-one) via enolate reactions

- ACETONE +
- 1) LDA
 - 2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
 - 3) LDA
 - 4) $\text{ClCH}_2\text{CH}=\text{CH}_2$