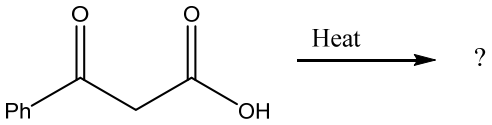
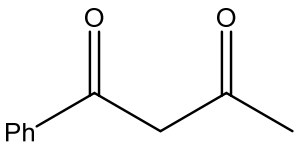
Chem 1315-100 points Name: _____
Exam 6 Practice Test 4

I. Circle the correct answer to the following questions: (30 points)

1. Which of the following statements is *not* true?
A. Reaction of benzophenone with methanol in the presence of acid gives a ketal
B. Reaction of butanal with ethanol in the presence of base gives an acetal
C. Reaction of benzaldehyde with ethanol in the presence of acid gives an acetal
D. Reaction of acetone with methanol in the presence of base gives a hemiketal

2. What is the major organic product obtained from the following reaction?





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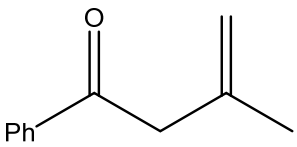

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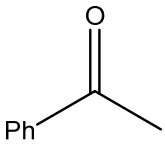

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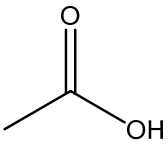


H.

3. Which of the following statements is *not* true?
I. The reaction of a ketone with methanol in the presence of acid to give a ketal proceeds via a resonance stabilized cation
J. Protonation of a ketone increases its electrophilicity
K. The conversion of a hemiacetal to an acetal under acidic conditions proceeds via an S_N1 mechanism
L. The conversion of a hemiacetal to an acetal is catalyzed by both acid and base

4. Which of the following best describes the mechanism for the formation of an acetal by the reaction between an aldehyde and an alcohol in the presence of an acid?
M. nucleophilic addition followed by an S_N1 reaction
N. electrophilic addition followed by an elimination
O. An S_N1 reaction followed by a dehydration
P. electrophilic addition followed by an S_N2 reaction

5. Which of the following reactions does *not* give a primary alcohol as the major product?
Q. Reduction of a carboxylic acid with $LiAlH_4$ R. Reduction of an aldehyde with $NaBH_4$
S. Reduction of a ketone with $LiAlH_4$ T. Reaction of a primary alkyl halide with NaOH

6. Which is *not* true concerning the acid catalyzed esterification of carboxylic acids with alcohols to form esters?
U. It is an equilibrium reaction
V. There is a tetrahedral intermediate in the reaction
W. The reaction is driven towards completion by the addition of excess water
X. The reaction is driven towards completion by the addition of excess alcohol

7. Which of the following is the correct order of decreasing reactivity with nucleophiles (most reactive > less reactive)
Y. acyl chloride > acyl anhydride > ester > amide Z. ester > acyl anhydride > acyl chloride > amide
AA. acyl anhydride > acyl chloride> amide > ester BB. acyl chloride > ester > amide > acyl anhydride

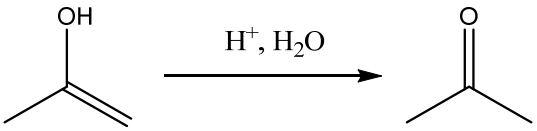
8. When treated with NaOH, which of the following pairs of compounds would produce a high yield of a single compound?
CC. ethyl acetate and ethyl propionate DD. ethyl acetate and propyl acetate
EE. ethyl acetate and ethyl benzoate FF. ethyl benzoate and ethyl formate

9. Which of the following does ***not*** describe β-keto esters?
GG. They can undergo 1,4-addition. HH. They have a pK_a of ~11.
II. They can be formed using a Claisen condensation. JJ.They can lose CO_2 when treated with base, then acid and heat.

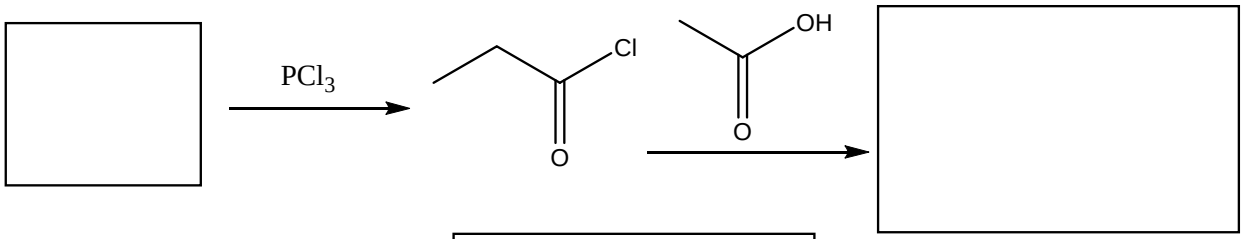
10. Which reaction type best describes the Claisen condensation (e.g. ethy acetate reacting with itself in the presence of NaOH)?
KK. S_N2 LL. elimination MM. nucleophilic addition NN. acyl substitution

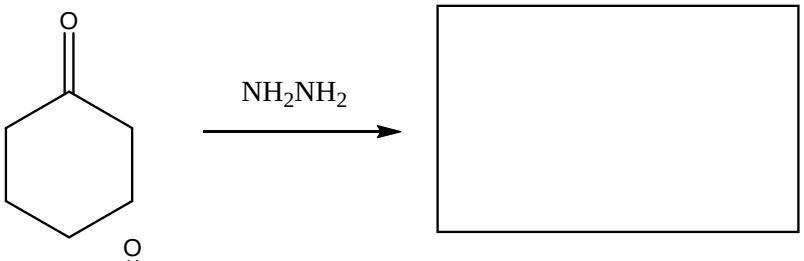
Short Answer:

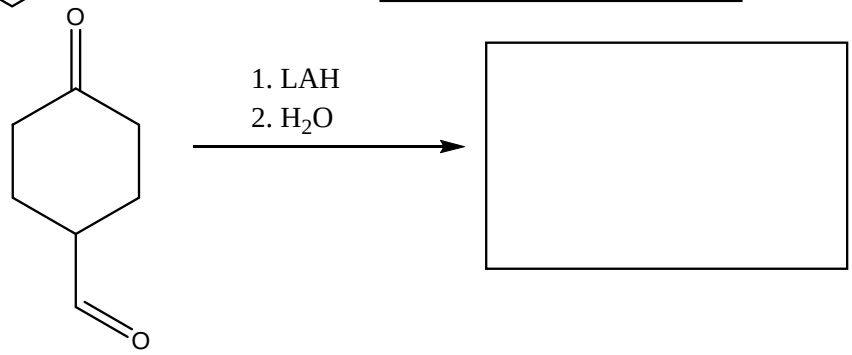
II. Provide a detailed mechanism for the below tautomerization. (10 points)

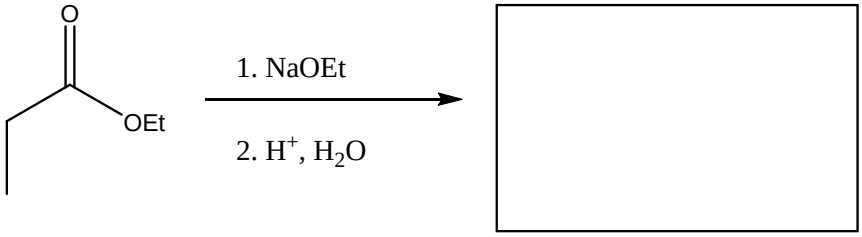


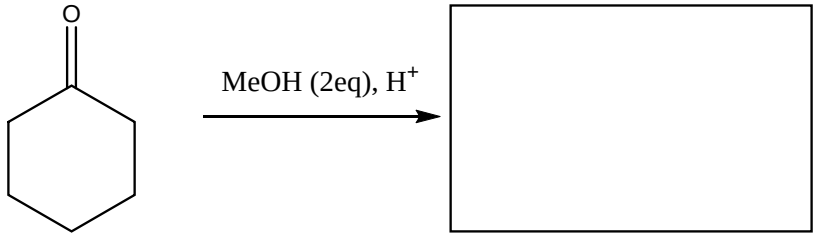
III. Show the **Major** Product for the following reactions: (30 points)



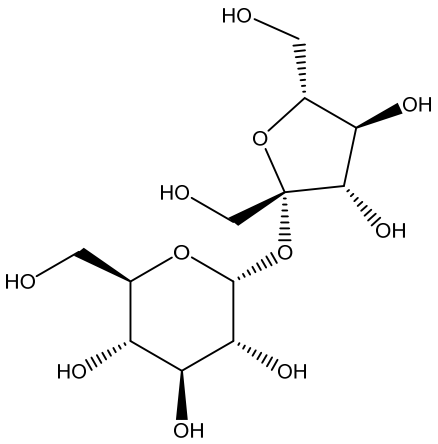






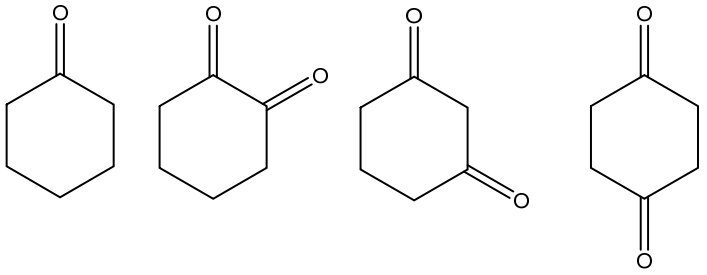


IV. Circle the acetal bonds in the molecule of sucrose (common table sugar) shown below. (10 points)



sucrose

V. Which of the following has the highest K_{eq} for enolization? Circle your answer and provide a brief explanation(10 points)



VI. Synthesize following molecules. These transformations cannot be performed in a single step. Provide a sequence of reactions to perform each transformation, showing reagents and structures of isolated intermediates. **All carbon atoms in the product must be obtained from the given starting materials, methylbenzene (toluene) or other starting materials of four carbons or less. (10 points)**