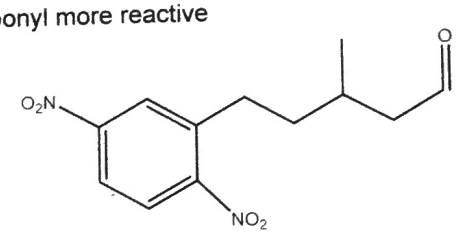
Chem 1315-100 points
Exam 6 Practice Test 1

Name: Key

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

1. Which statement is *not* true concerning the formation of hydrates, hemiacetals and acetals from aldehydes and ketones?
A. All the reactions are reversible
B. All the reactions are acid and base catalyzed
C. Aldehydes generally react more quickly than ketones
D. Electron withdrawing groups on the carbonyl make the carbonyl more reactive

2. What is the IUPAC name for the following molecule?



E. 3-Methyl-1-(2,5-dinitrophenyl)-5-pentanal
F. 3-Methyl-5-(1,4-dinitrobenzyl)-1-pentanal
G. 3-Methyl-5-(2,5-dinitrophenyl)pentanaldehyde
H. 3-Methyl-5-(2,5-dinitrophenyl)pentanal

3. Which of the following best describes the mechanism for the formation of an imine from the reaction between an aldehyde and a 1° amine (RNH_2)?
I. electrophilic addition followed by an S_N1 reaction
J. addition followed by an S_N2 reaction
K. an S_N1 reaction followed by a dehydration
L. nucleophilic addition followed by an elimination

4. The carbon of a carbonyl is susceptible to attack by which of the following?
M. radical N. nucleophile O. electrophile P. carbocation

5. Which of the following is the correct order of decreasing reactivity (most reactive > less reactive)
Q. acyl chloride > acyl anhydride > ester > amide
R. ester > acyl anhydride > acyl chloride > amide
S. acyl anhydride > acyl chloride> amide > ester
T. acyl chloride > ester > amide > acyl anhydride

6. Which of the following best describes the mechanism of an acyl substitution reaction?
U. Addition followed by elimination
V. Bimolecular nucleophilic substitution
W. Elimination followed by addition
X. Substitution followed by elimination

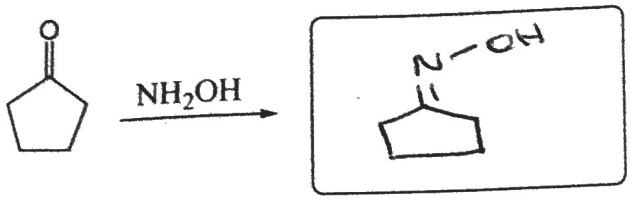
7. Which is *not* true concerning the acid catalyzed esterification of carboxylic acids with alcohols to form esters?
Y. It is an equilibrium reaction
Z. There is a tetrahedral intermediate in the reaction
AA. The reaction is driven towards completion by the addition of excess water
BB. The reaction is driven towards completion by the addition of excess alcohol

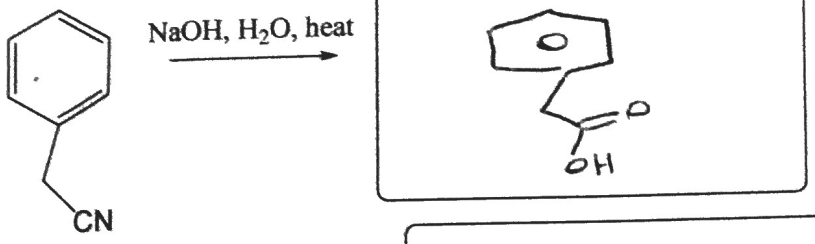
8. Which of the following pairs of compounds would produce a high yield of a single compound in a Claisen condensation (hint: draw the mechanism for each pair reagents reacting)?
CC. Ethyl acetate and ethyl propionate
DD. Ethyl acetate and propyl acetate
EE. Ethyl acetate and ethyl benzoate
FF. Ethyl benzoate and ethyl formate

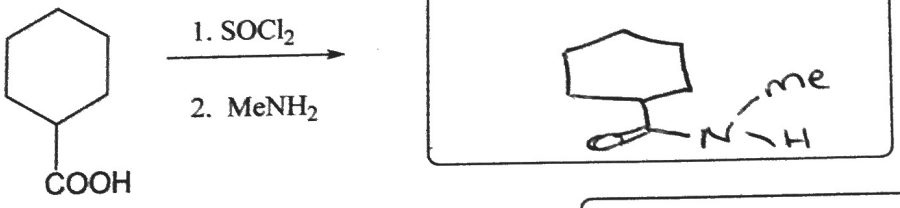
9. Decarboylation of a β-ketoester involves which of the following intermediate?
GG. a resonance stabilized cation
HH. an enol
II. a tetrahedral intermediate
JJ. a hyperconjugated cation

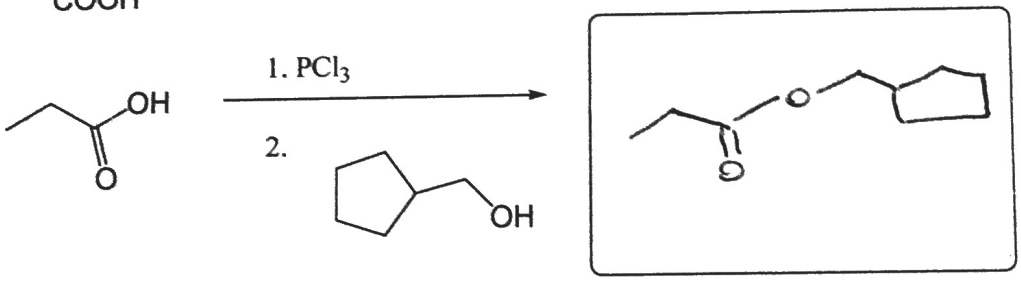
10. Which of the following has the greatest equilibrium constant for enolization?
KK. acetone LL. 2,4-cyclohexadienone MM. acetaldehyde NN. Methanol

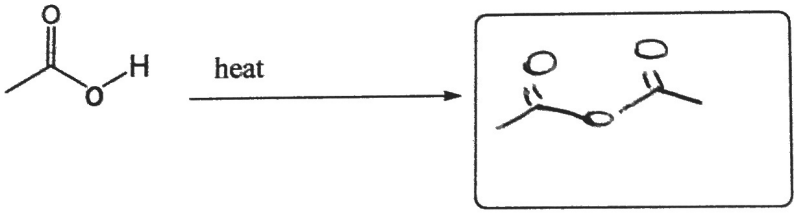
II. Show the **Major** Product for the following reactions: (30 points)

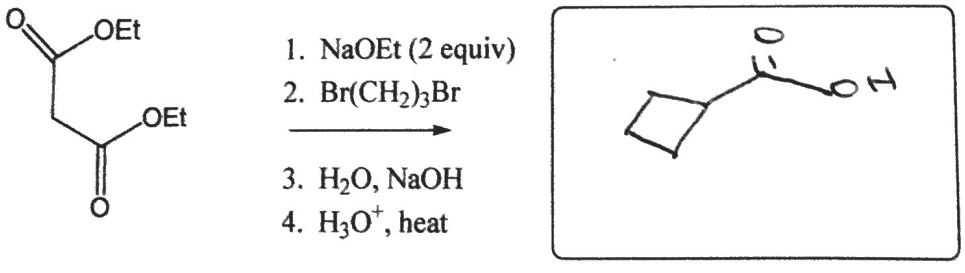


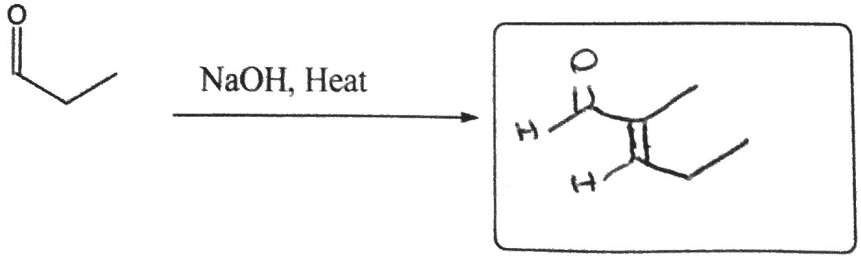




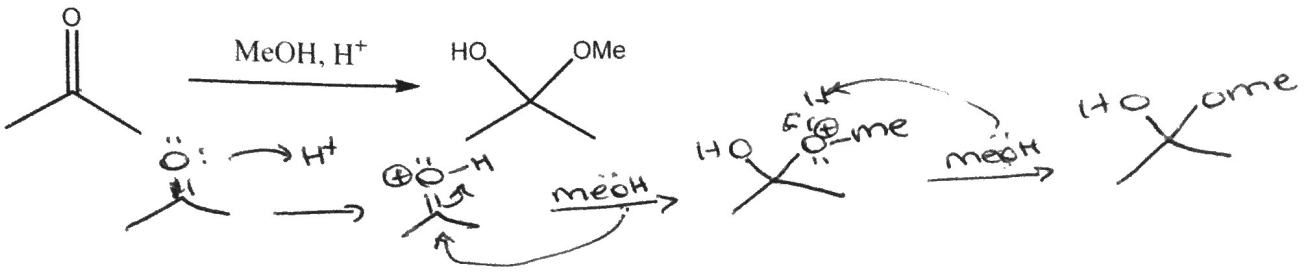




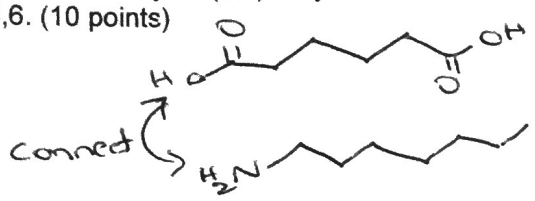




III. Using curved arrows, propose a mechanism for the below formation of a hemiacetal. (10 points)



IV. Describe how Nylon (6,6) is synthesized. What reagents are required? What is the chemical structure of Nylon 6,6. (10 points)



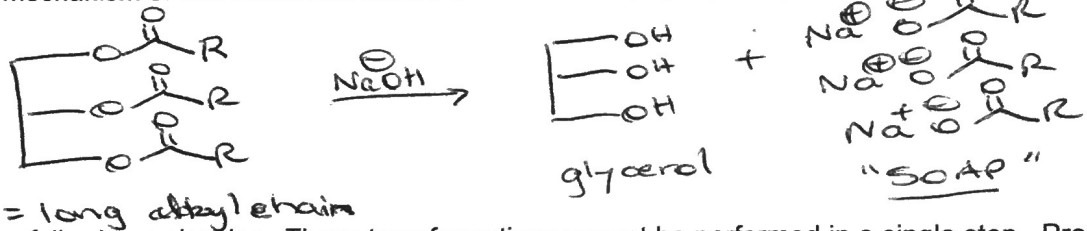
6 carbons in RCOOH

6 carbons in amine

It is a condensation reaction

$R\overset{O}{C}OH + RNH_2 \rightarrow R-\overset{O}{C}-\overset{H}{N}-H + H_2O$

V. Show the mechanism of how animal fat can be turned into soap. (10 points)



R = long alkyl chain

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, benzene or other starting materials of four carbons or less. (10 points)**