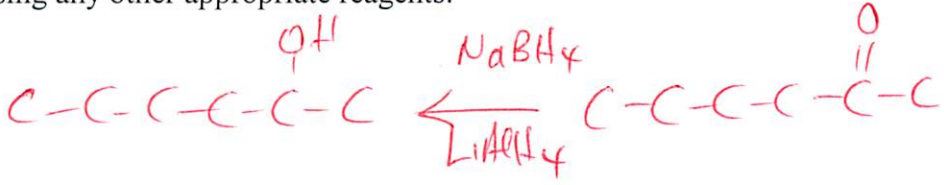
Chemistry 211
March 17, 2004

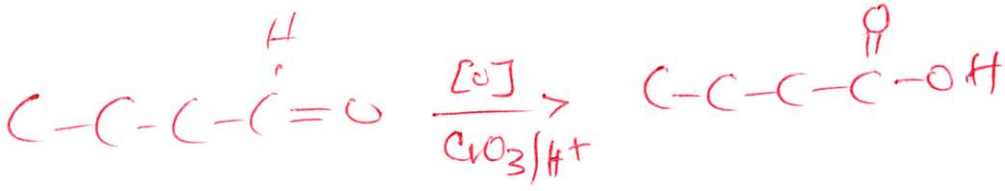
Name Key

15 1. Starting with an aldehyde or ketone show the reaction needed to produce the following compounds, using any other appropriate reagents:

2-hexanol

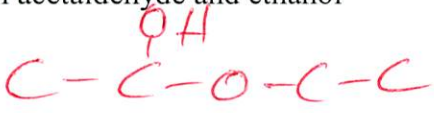


butanoic acid

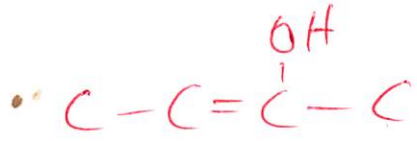


Show the structure for each of the following compounds:

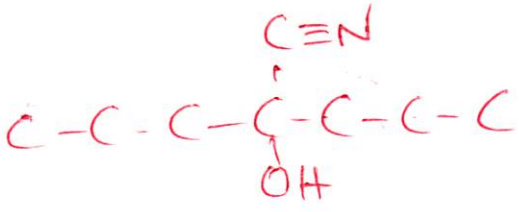
hemiacetal between acetaldehyde and ethanol



2-butene-2-ol (an enol)



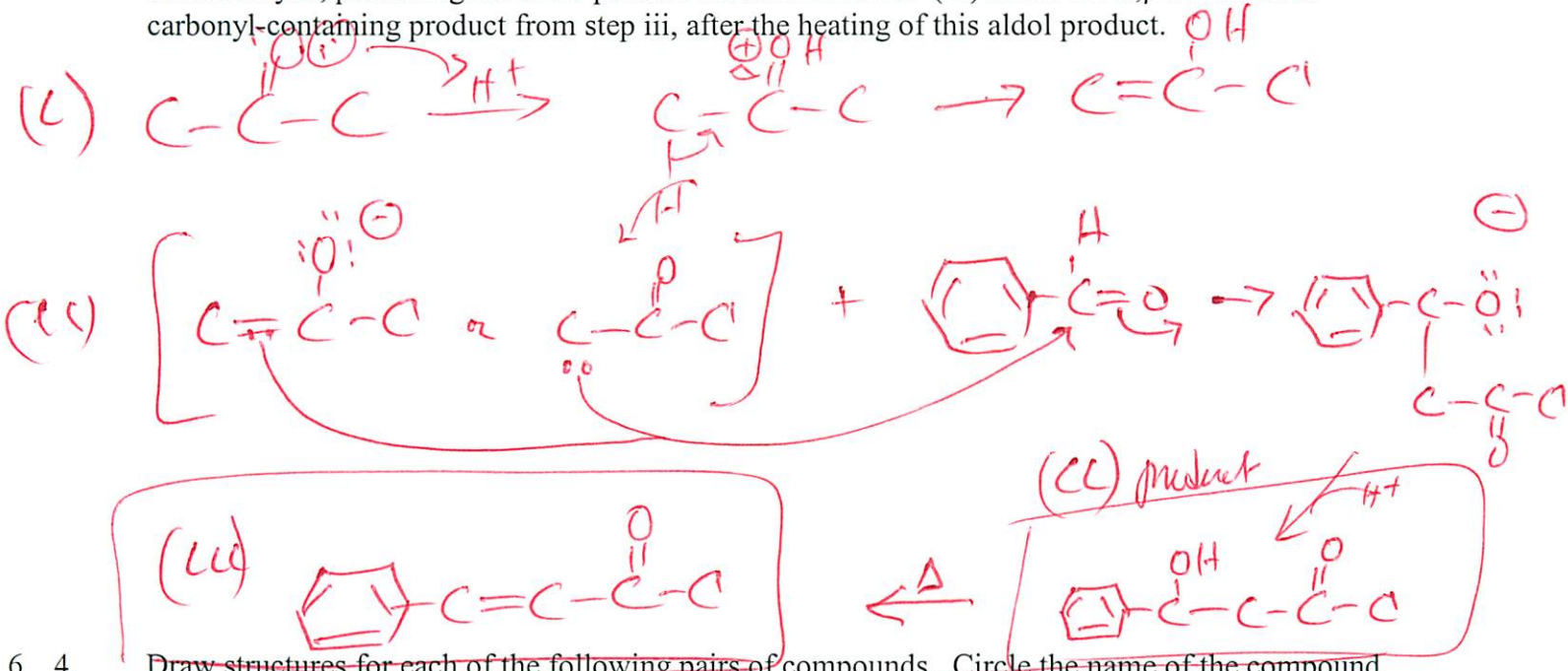
4-cyano-4-heptanol (a nitrile)



9 2. Give names (IUPAC or common) of the alcohol, aldehyde and acid having the number carbons shown. If more than one compound is possible, list only one.

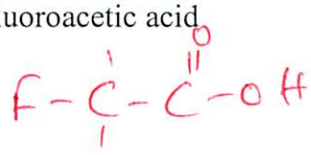
	Alcohol	Aldehyde	Acid
3-carbon	Propyl alcohol 1-propanol	propanal propionaldehyde	propanoic propionic
4-carbon	1-butanol	butanal butyraldehyde	butanoic butyric
5-carbon	2-pentanol	pentanal	pentanoic

12 3. (i) Starting with acetone, show the reaction mechanism (with arrows) required to produce an enol in acidic conditions. (ii) Using the enolate ion of acetone, show the reaction mechanism (with arrows) for an aldol condensation (product contains an alcohol and keto groups) using benzaldehyde, producing the same product we did in the lab. (iii) Show the α,β-unsaturated carbonyl-containing product from step iii, after the heating of this aldol product.

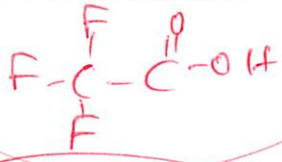


6 4. ~~Draw structures for each of the following pairs of compounds. Circle the name of the compound~~ in each pair which would be the most acidic (lower pK_a).

A. Fluoroacetic acid

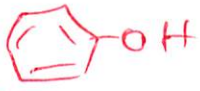


Trifluoroacetic acid

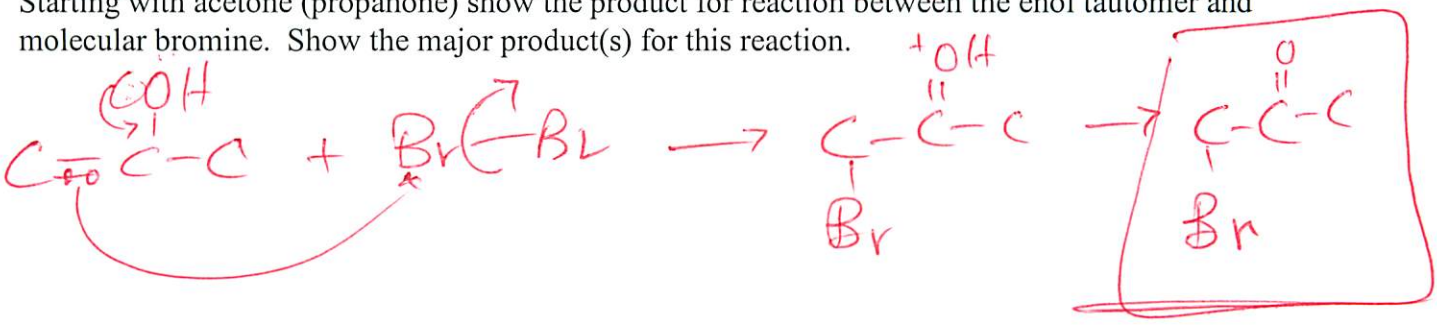


B. Ethanol

Phenol

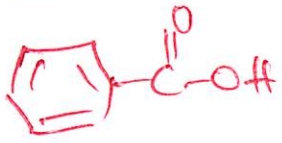


6 5. Starting with acetone (propanone) show the product for reaction between the enol tautomer and molecular bromine. Show the major product(s) for this reaction.



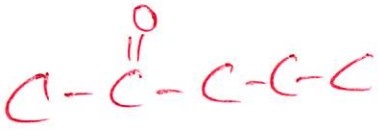
12 6. Show structures for the following compounds

benzoic acid

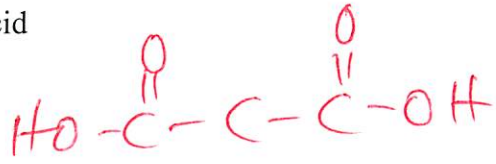


sodium butyrate

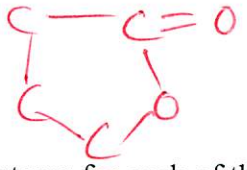
methyl propyl ketone



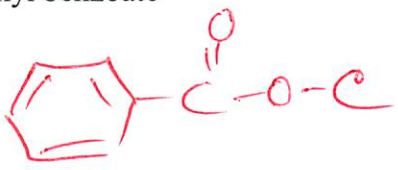
malonic acid



4-carbon lactone (cyclic ester)



Methyl benzoate

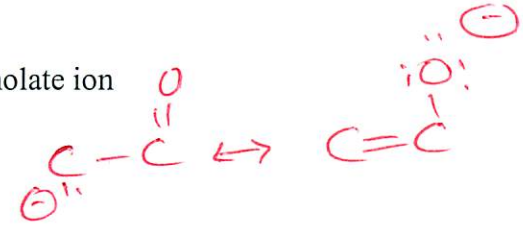


8 7. Show structures for each of the following functional groups or reaction products.

Alcohol

Ether

enolate ion



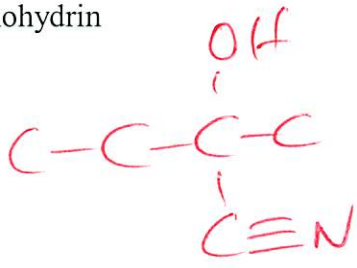
Aldehyde

Ketone

ester

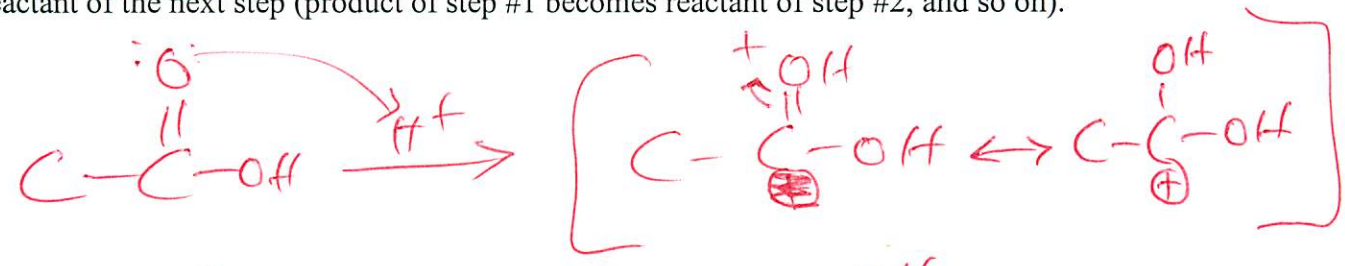
nitrile

cyanohydrin

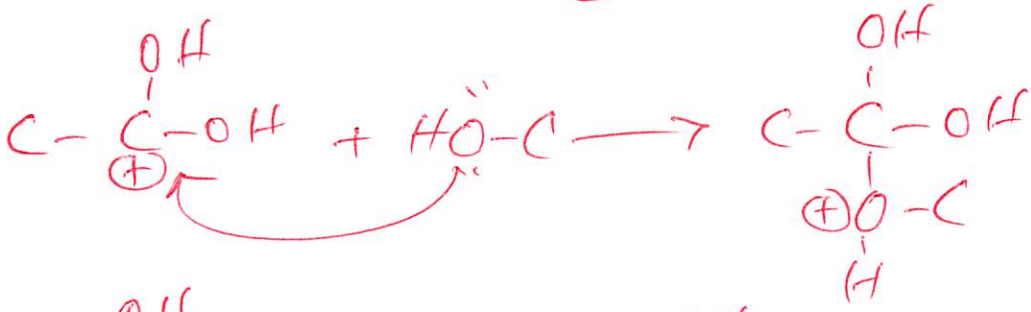


12 8. In lecture, we discussed the 6-step process to make an ester from a carboxylic acid and an alcohol. This reaction process produces a tetrahedral intermediate which is common to virtually all reactions involving carboxylic acids. Show this 6-step process, starting with acetic acid and methanol to produce methyl acetate. For each step below, show the product of the previous step as the reactant of the next step (product of step #1 becomes reactant of step #2, and so on).

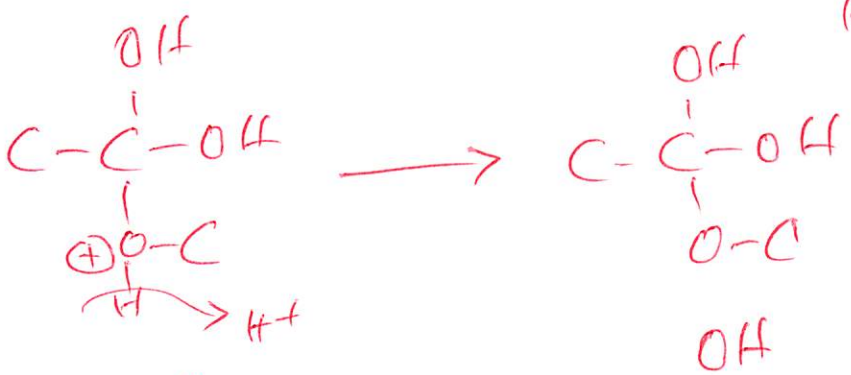
1.



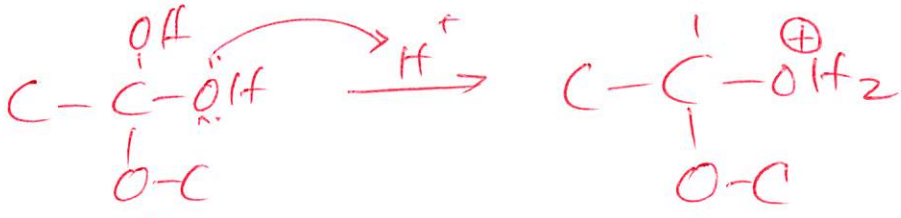
2.



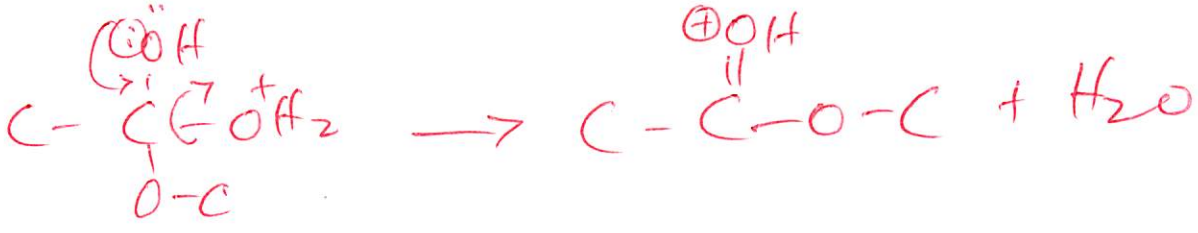
3.



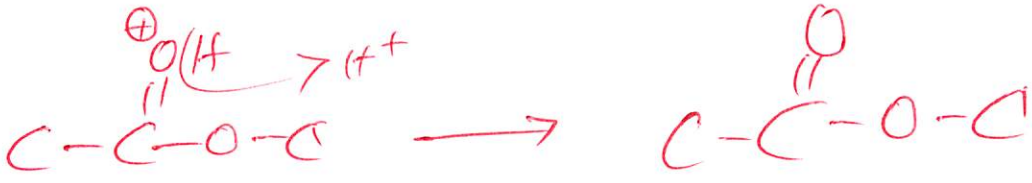
4.



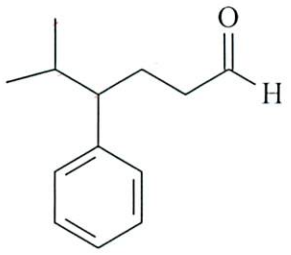
5.



6.

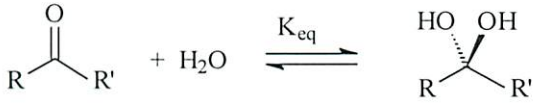


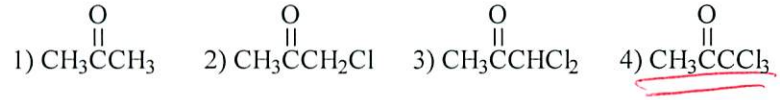
1. Identify the correct IUPAC name of the compound below?



1) 4-benzyl-5-methylhexanal
2) 5-isopropyl-5-phenylbutanal
3) 2-methyl-3-phenylhexanal
4) 5-methyl-4-phenylhexanal

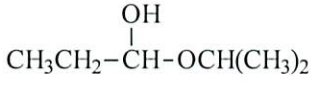
2. Which of the following has the largest K_{eq} for the formation of the hydrate (as shown below)?





1) 1 2) 2 3) 3 4) 4

3. The compound shown to the right is the hemiacetal formed between:



1) propanal and 2-propanol
2) 2-methylpropanal and ethanol
3) acetone and 1-propanol
4) ethanal and 2-methyl-1-propanol

4. Which of the following have an enol form?

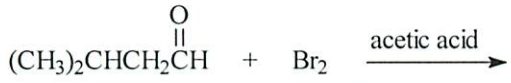
A. benzaldehyde, C_6H_5CHO
B. 2,2-dimethylpropanal, $(CH_3)_3CCHO$
C. 2,2-dichloropropanal, CH_3CCl_2CHO

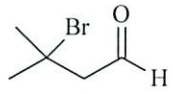
1) none have enol forms 2) only A
3) only B 4) A and C

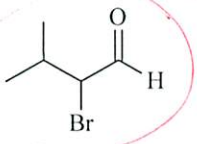
5. How many alpha hydrogens are there on 2,4-dimethyl-3-pentanone?

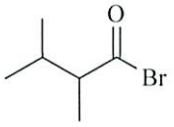
1) only one 2) two 3) three 4) four

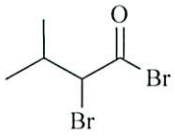
6. What is the product of the reaction below?



1) 

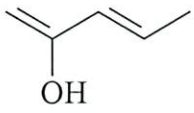
2) 

3) 

4) 

1) 1 2) 2 3) 3 4) 4

7. Identify the keto form of the following enol.

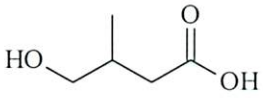


1) 1-penten-3-one
2) (*E*)-3-penten-2-one
3) 2-pentanone
4) (*E*)-3-pentenal

8. What is the relationship between keto and enol tautomers?

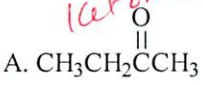
1) resonance forms
2) stereoisomers
3) constitutional isomers
4) different conformations of the same compound

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

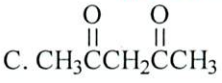


1) 4-hydroxy-3-methylbutanoic acid
2) 3-hydroxy-2-methylbutanoic acid
3) 1-hydroxy-2-methylbutanoic acid
4) 3-(hydroxymethyl)butanoic acid

10. Rank the following compounds in decreasing order of acidity.

A. 

B. 

C. 

1) B>A>C 2) B>C>A 3) C>B>A 4) C>A>B