CH310N
Spring 2010

Anslyn

March 23, 2010

Exam 2

Please **PRINT** the first three letters of your last name in the boxes below.

K	E	Y

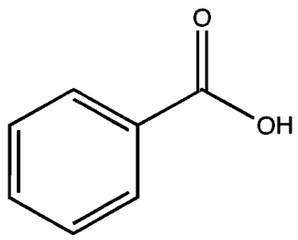
PRINT Full Name _____ **UT-EID**_____

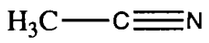
1) _____ (8 pts)
2) _____ (5 pts)
3) _____ (5 pts)
4) _____ (22 pts)
5) _____ (4 pts)
6) _____ (8 pts)
7) _____ (7 pts)
8) _____ (6 pts)
9) _____ (8 pts)
10) _____ (8 pts)
11) _____ (7 pts)
12) _____ (12 pts)
Bonus) _____ (2 pts)

Total Score _____ (100 pts)

1.

a) Give the common names for the following molecules. (From notes, 2 points)

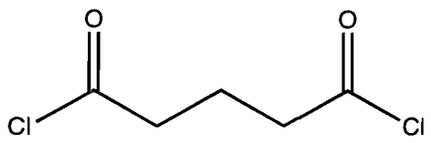




Benzoic Acid

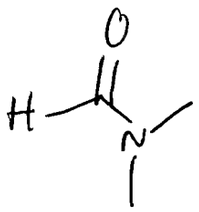
Acetonitrile

b) Give the IUPAC name for the following molecule. (From homework, problem 18.13h, 2 points)

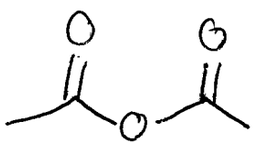


Pentanedioyl Chloride

c) Draw the chemical structures for the following common names. (From notes, 2 points)



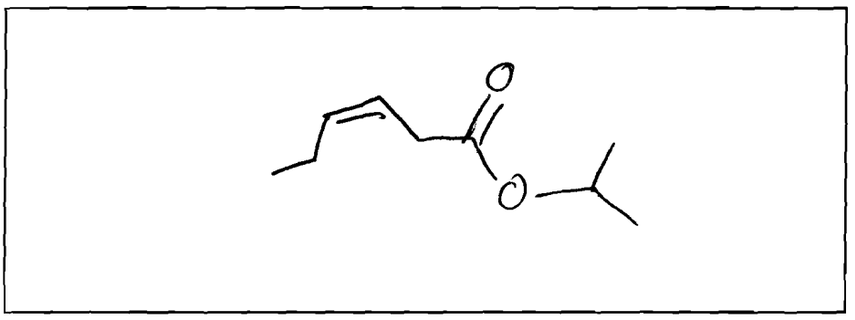
DMF (N, N-Dimethyl formamide)



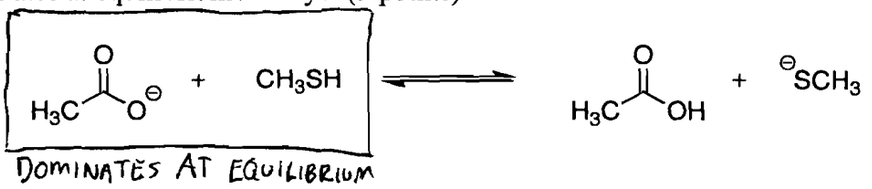
Acetic Anhydride

d) Draw the chemical structure for the following IUPAC name. (2 points)

Z-isopropyl hex-3-enoate



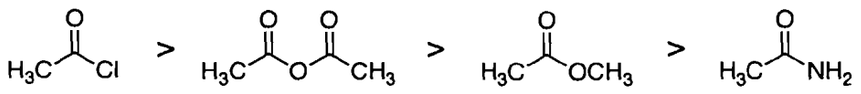
2. The following question is in regards to the equilibrium established by dissolving sodium acetate in methanethiol (CH_3SH, pKa=10.4), as shown below. Which side of this reaction dominates at equilibrium? Why? (5 points)



DOMINATES AT EQUILIBRIUM

Carboxylic acids have lower pKa values than thiols, so they are the stronger acids. The side of the equilibrium that has the weaker acid is favored, so the left dominates.

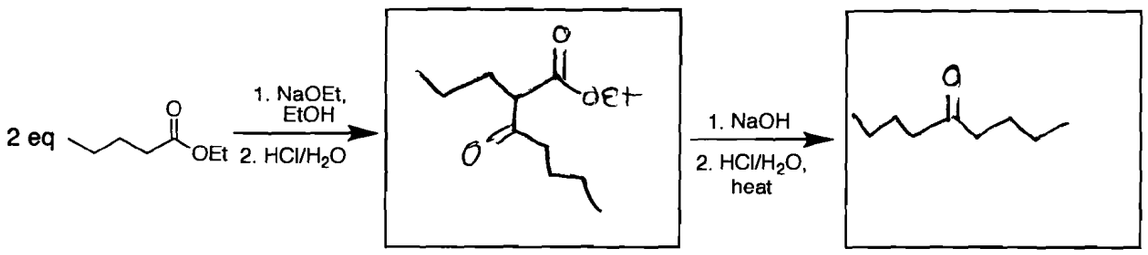
3. In class, we talked at length about the hydrolysis of carboxylic acid derivatives, where reaction with water gives the parent carboxylic acid. Please explain the observed reactivity trend of the carboxylic acid derivatives toward hydrolysis. (5 points)



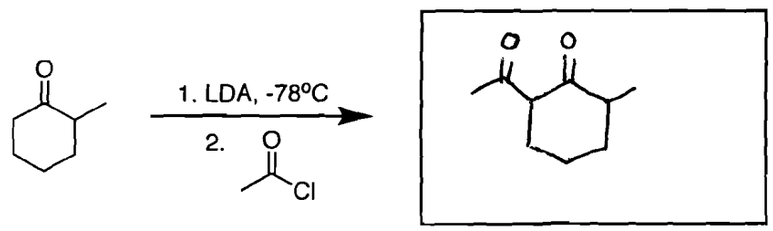
One way to explain the reactivity trend is in terms of resonance. As we go from more reactive to less reactive (left to right), the resonance structures we can draw become more reasonable. A double bond between carbon and chlorine is not very feasable, while the double bond between carbon and nitrogen is preferred. The better resonance structures that can be drawn mean that the carbonyl is less electrophilic and reacts slower with nucleophiles such as water.

4. Fill in the box with the appropriate reactant, reagent, or product. Some boxes require more than one step. (22 points)

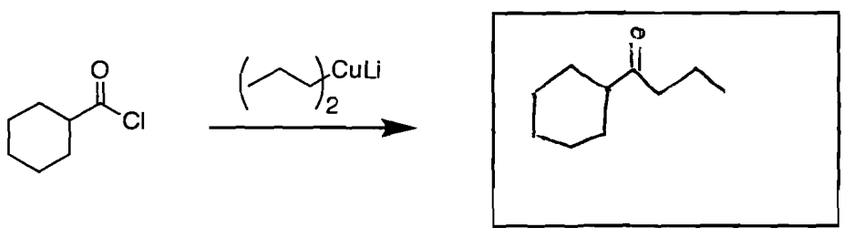
A) From homework, problem 19.33



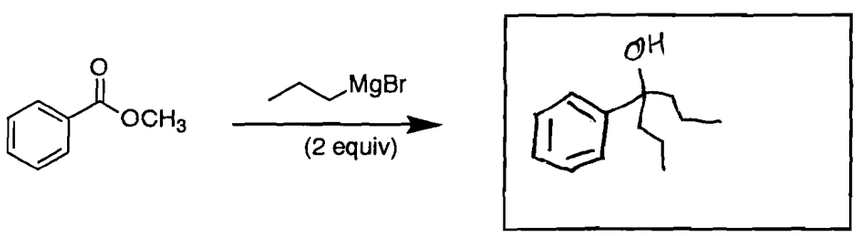
B)



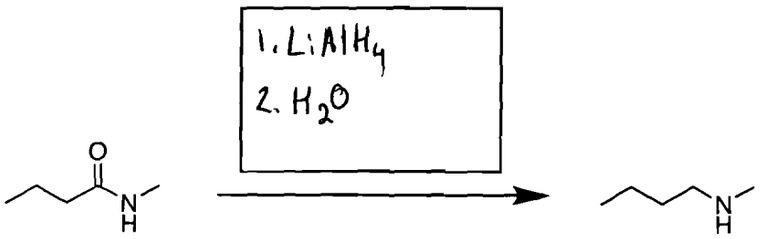
C)



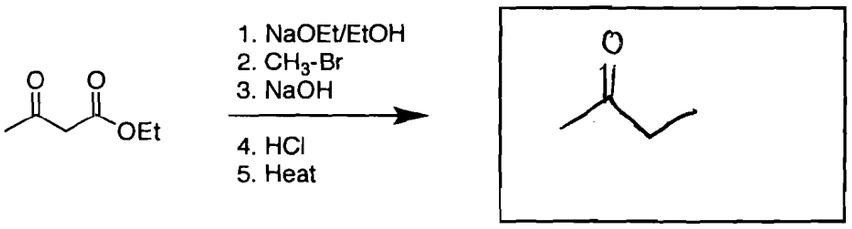
D)



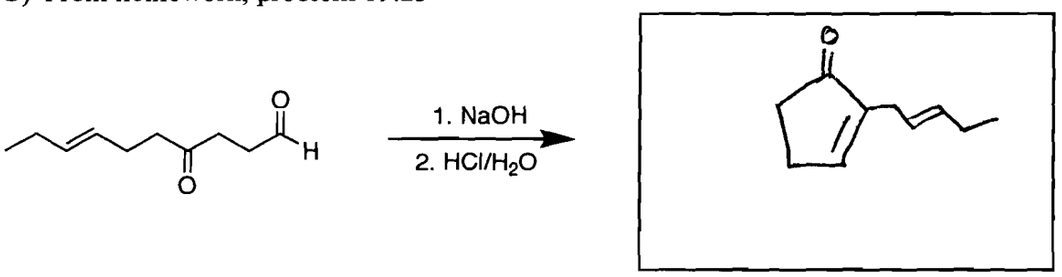
E)



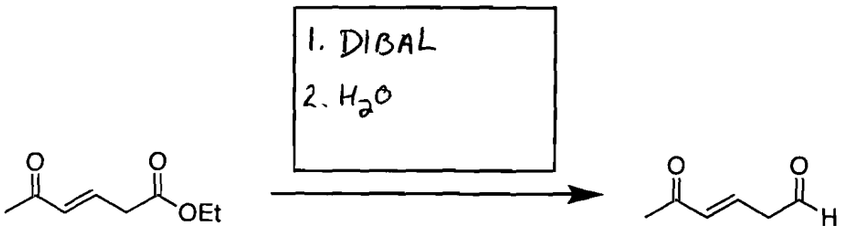
F)



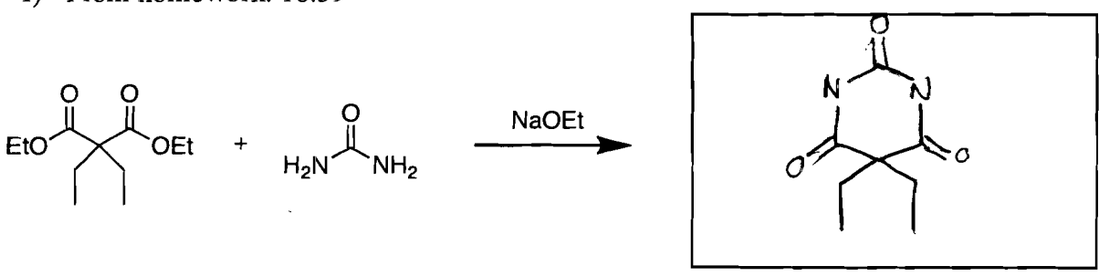
G) From homework, problem 19.23



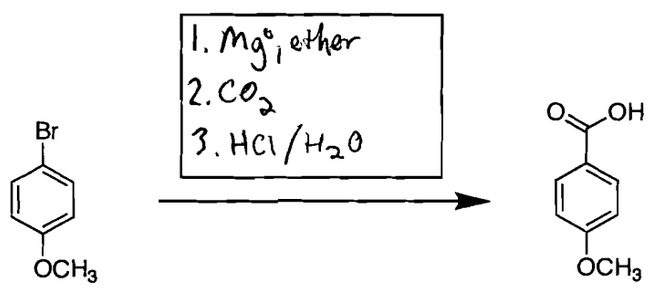
H) From homework, problem 18.25D



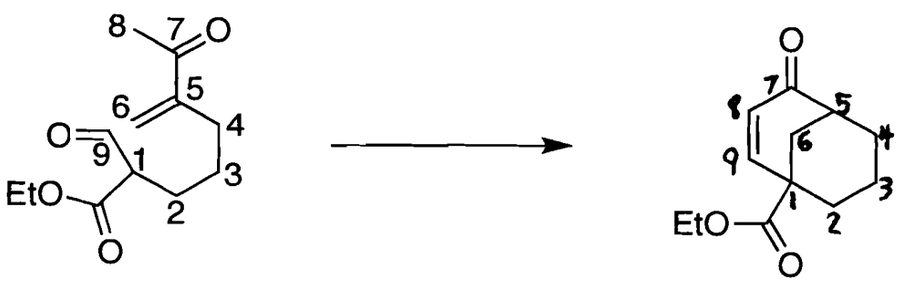
I) From homework. 18.39



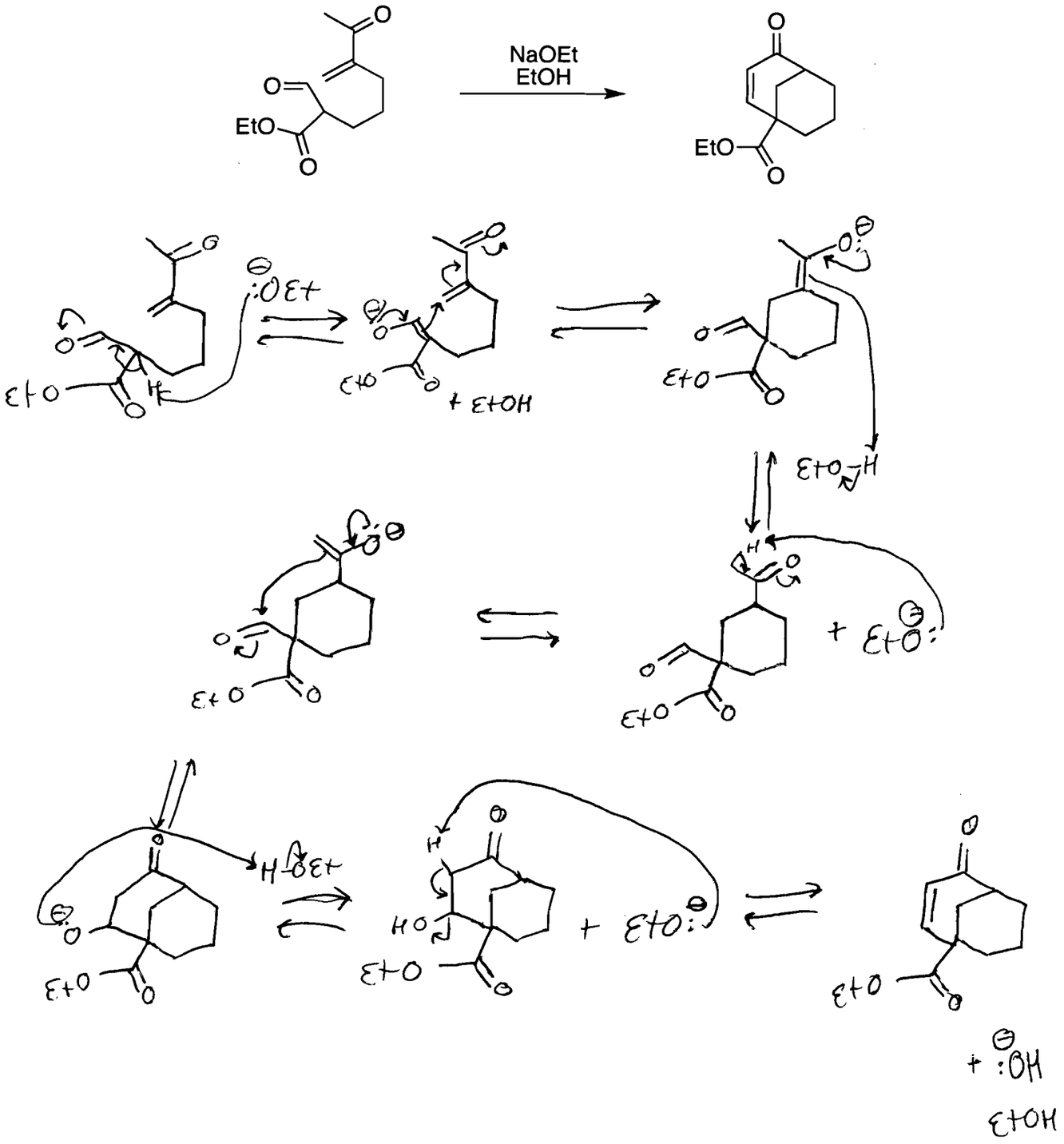
J) From homework, problem 17.18D



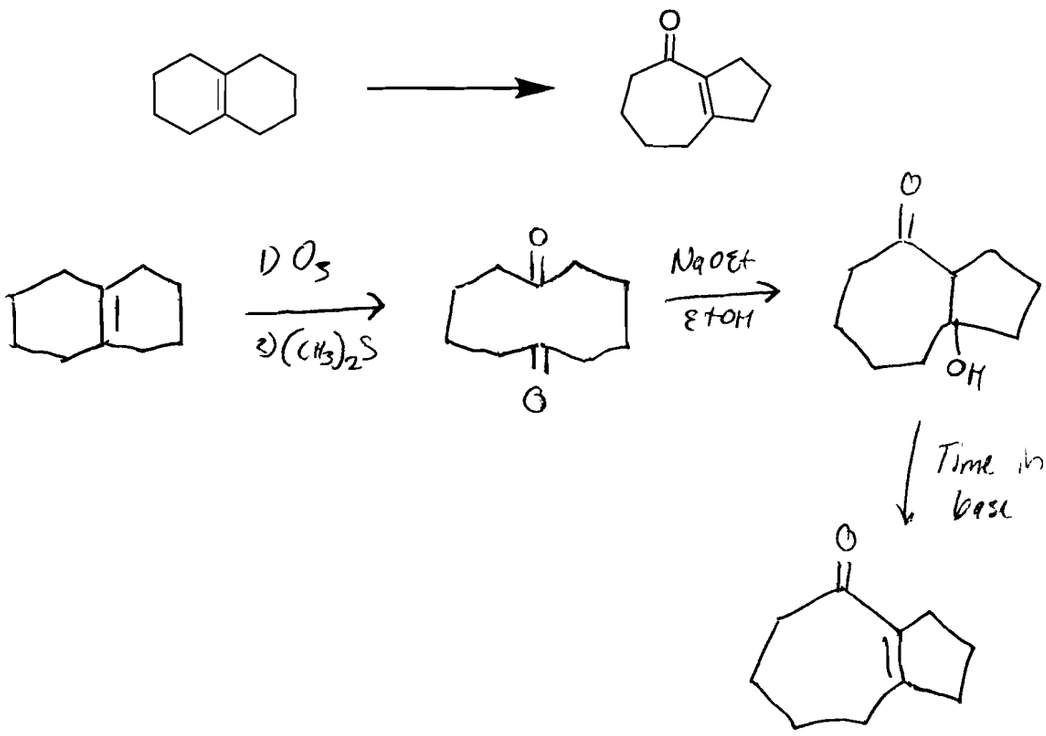
5. In the presence of a base such as NaOEt, the following reaction proceeds to form the bicyclic product that is shown below. Some of the carbon atoms have been labeled from 1-9 in the starting material. Number the atoms in the product that correspond to those numbered in the starting material. (4 points)



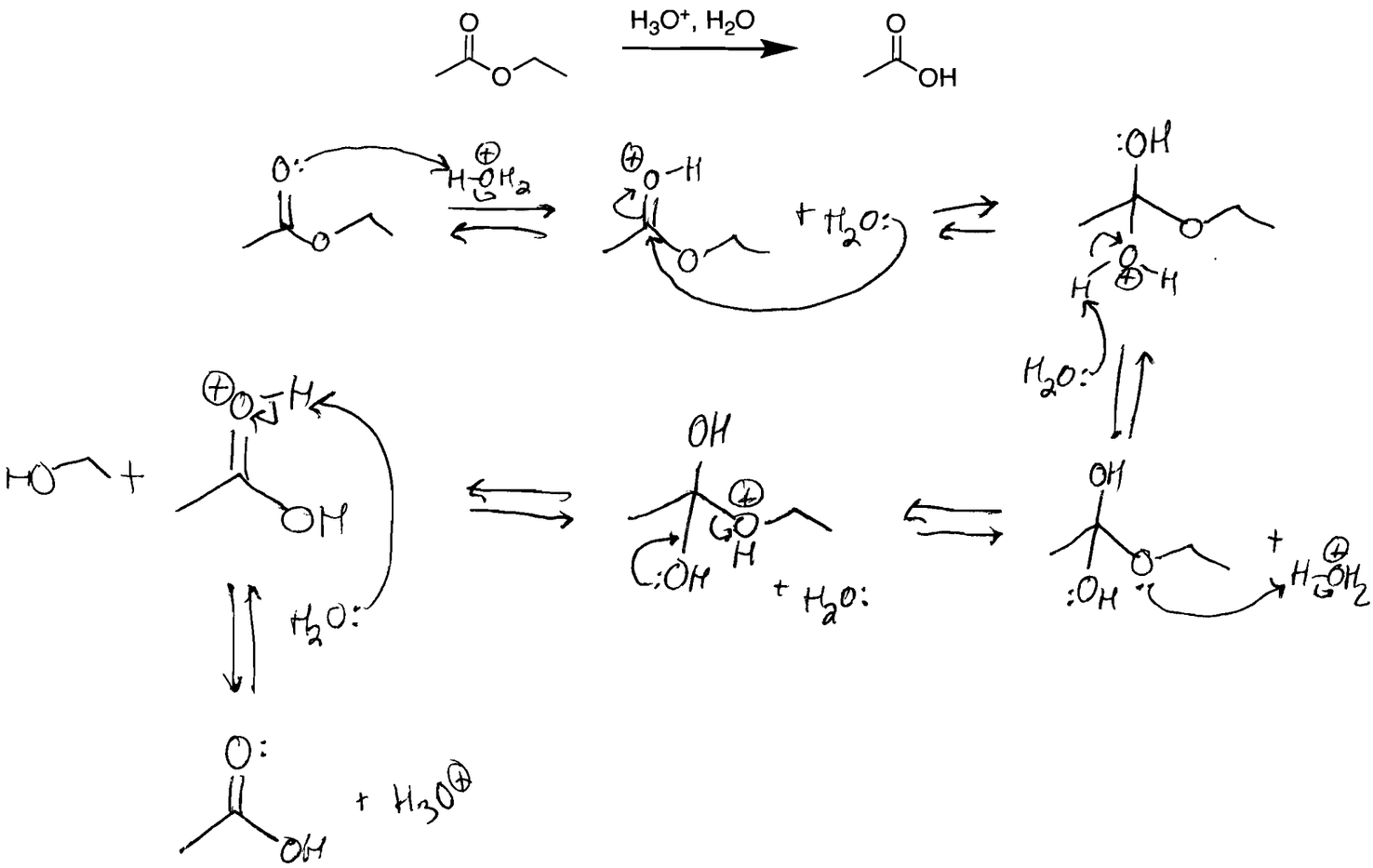
6. Next, draw the mechanism for the reaction in problem 5 (which has been re-drawn below), including all participating lone pairs, applicable formal charges, and required arrow pushing to indicate flow of electrons. (8 points)



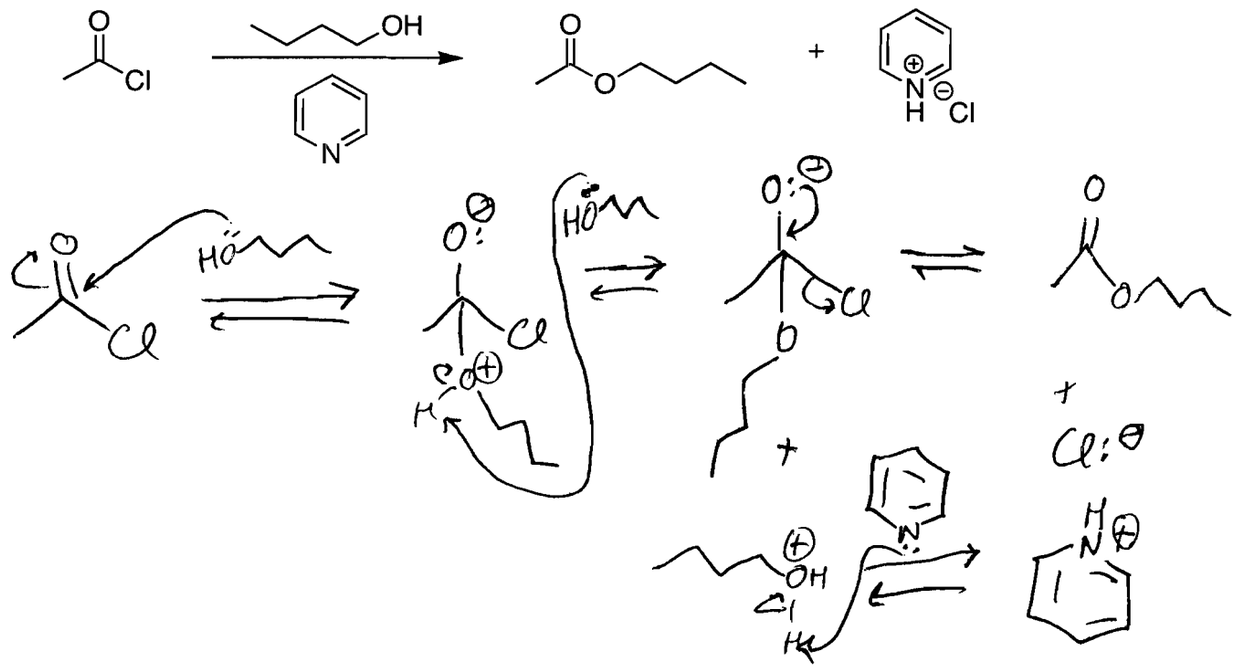
7. (From homework, problem 19.26) Show how you might bring about the following conversion. (7 points)



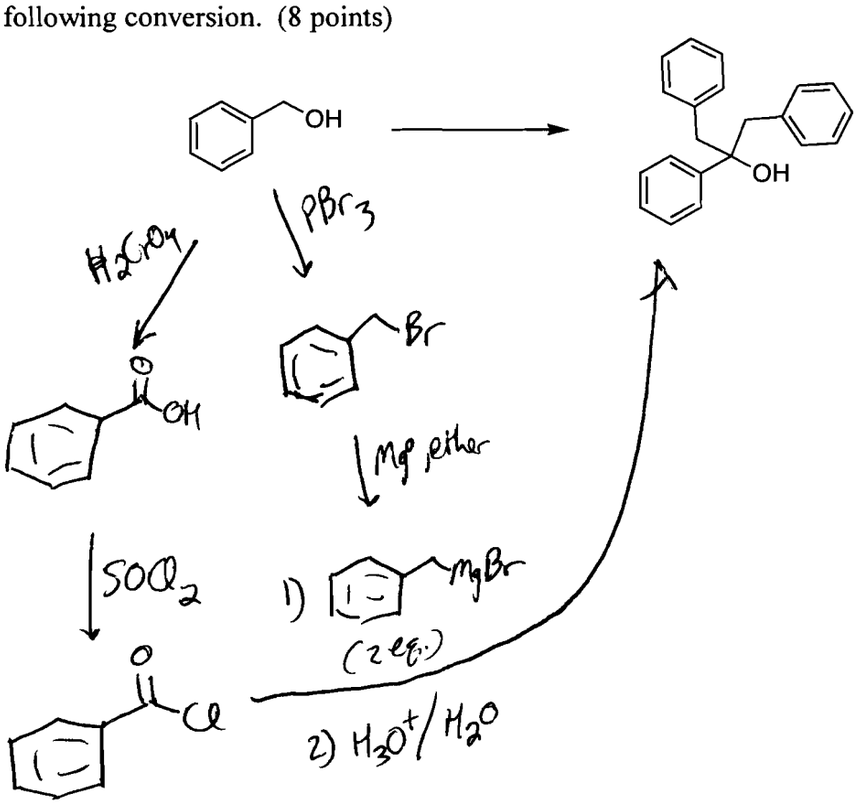
8. An ester can be hydrolyzed to the parent carboxylic acid under acidic conditions. Draw this mechanism, making sure to show all participating lone pairs, applicable formal charges, and required arrow pushing to indicate flow of electrons. (6 points)



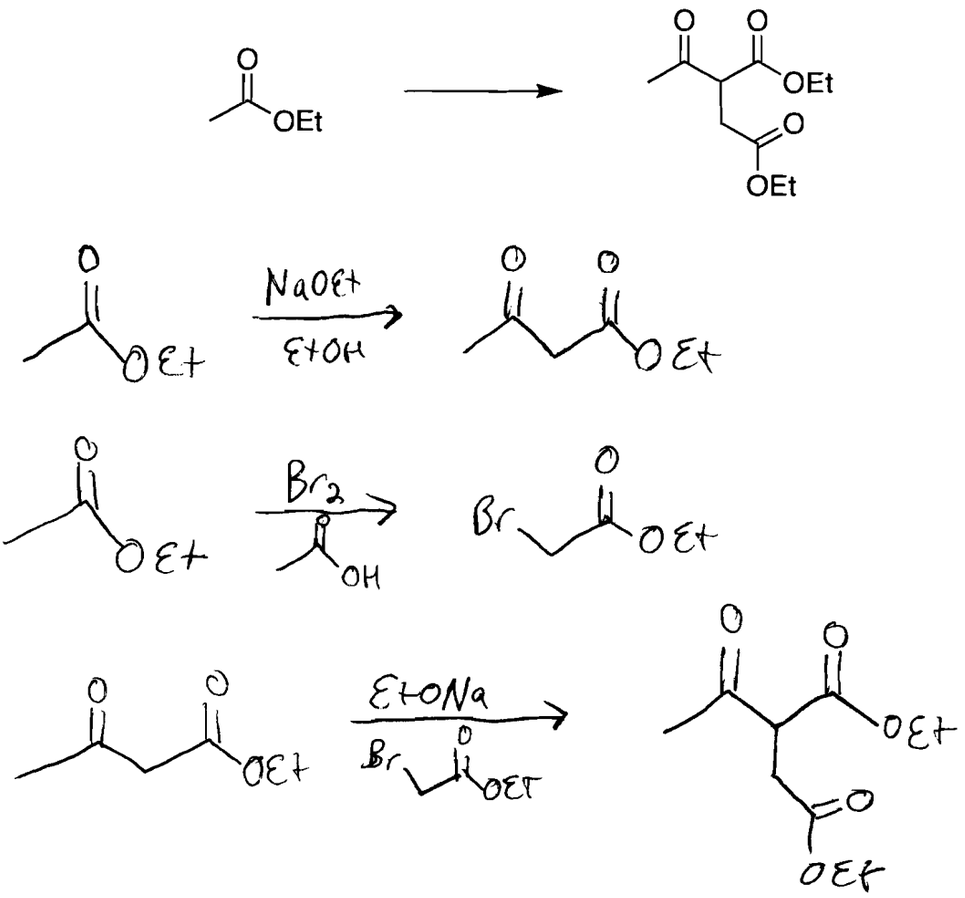
9. Treatment of an acid chloride with an alcohol in the presence of pyridine forms an ester, as shown below. Draw the mechanism for this reaction, including all participating lone pairs, applicable formal charges, and required arrow pushing to indicate flow of electrons. Be sure to account for the formation of the side product. (8 points)



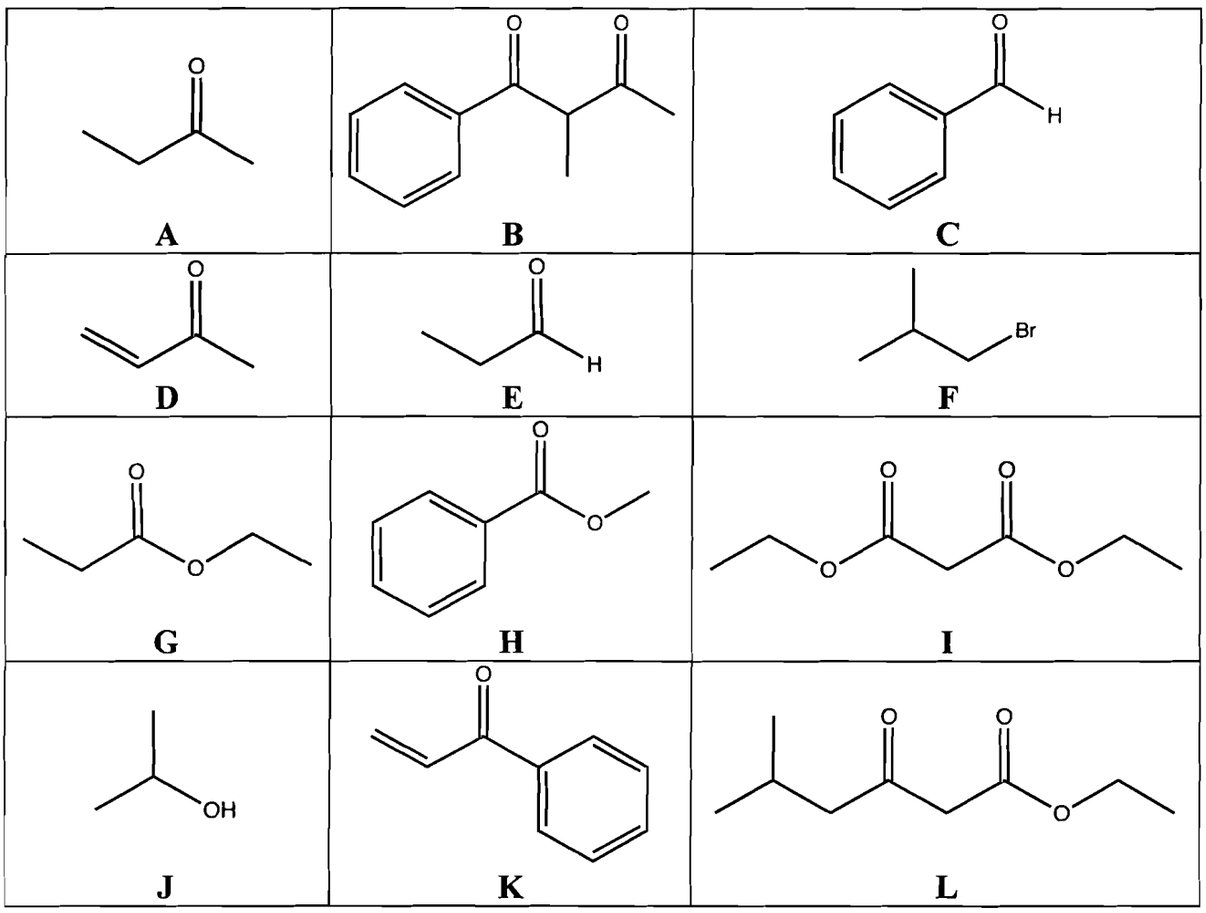
10. Using only benzyl alcohol as a source of carbon atoms, show how you might bring about the following conversion. (8 points)



11. Using only ethyl acetate as a source of carbon atoms, show how you might bring about the following conversion. (7 points)



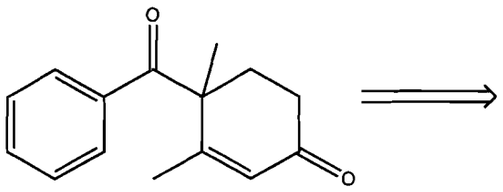
12. Using a retrosynthetic approach, give the letters (A-L) and the name of the reaction (a list of reactions names is provided) needed to make each of the products listed. Each letter can be used once, more than once, or not at all. There is an extra copy of the box of options on the last page of the test for you to tear off and use. (12 points)



List of Possible Reaction Names:

Aldol Reaction
Claisen Condensation
Acetoacetic Ester "Like" Synthesis
Malonic Ester Synthesis
Michael Addition Malonic Ester Synthesis
Michael Addition Acetoacetic Ester "Like" Synthesis
Robinson Annulation
Enamine Alkylation

I)

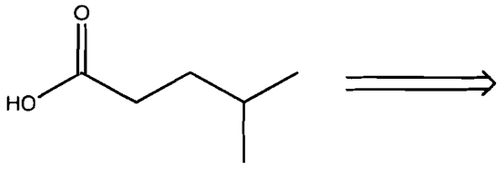


Starting Material Letters:

B & D

Reaction Name: Robinson Annulation

II)

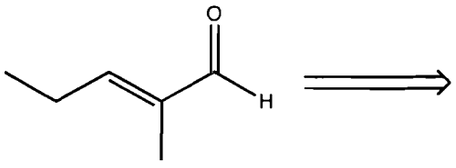


Starting Material Letters:

I & F

Reaction Name: Malonic Ester Synthesis

III)

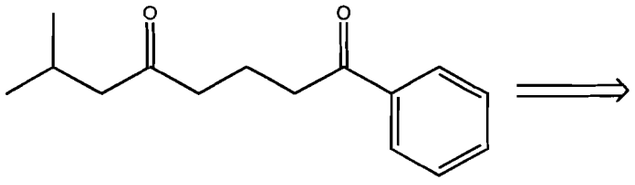


Starting Material Letters:

E (x2)

Reaction Name: Aldol Reaction

IV)

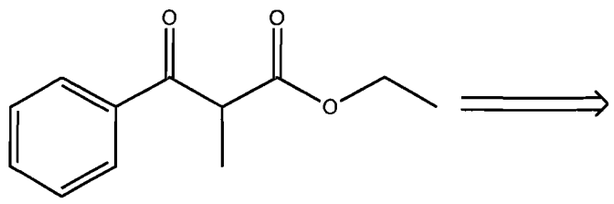


Starting Material Letters:

L & K

Reaction Name: Michael Addition Acetoacetic Ester "Like" Synthesis

V)



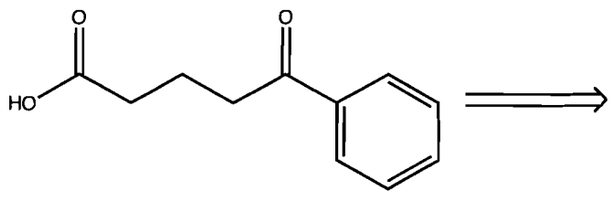
Starting Material Letters:

H & G

Reaction Name:

Claisen condensation

VI)



Starting Material Letters:

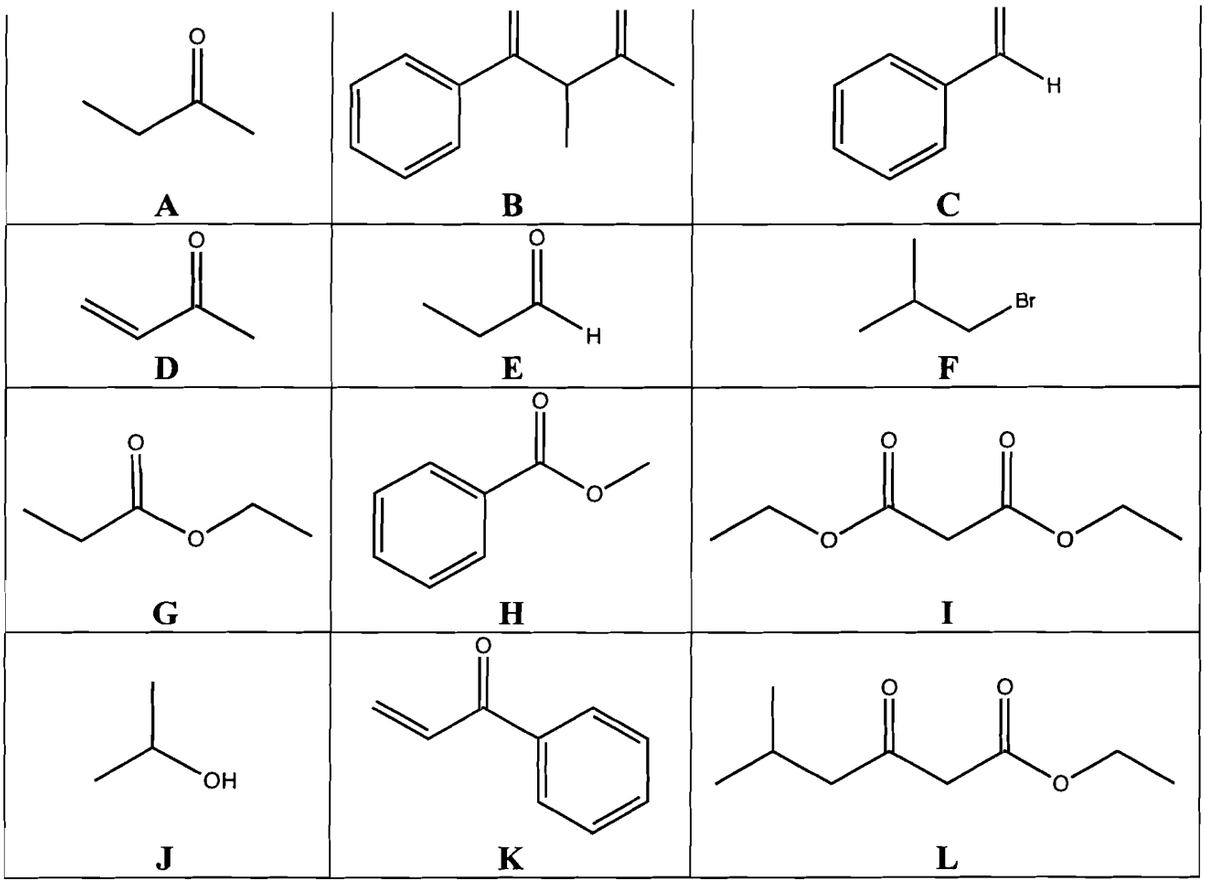
I & K

Reaction Name:

Michael Addition Malonic Ester Synthesis

BONUS QUESTION: What is the name of the greatest rock band in history, aptly titled so by their biggest fan Dr. Anslyn? (2 points)

Yes



List of Possible Reaction Names:

Aldol Reaction
Claisen Condensation
Acetoacetic Ester "Like" Synthesis
Malonic Ester Synthesis
Michael Addition Malonic Ester Synthesis
Michael Addition Acetoacetic Ester "Like" Synthesis
Robinson Annulation
Enamine Alkylation