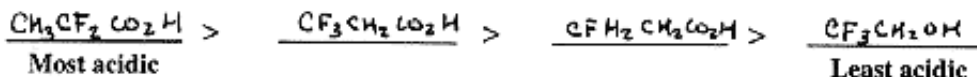
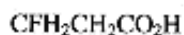


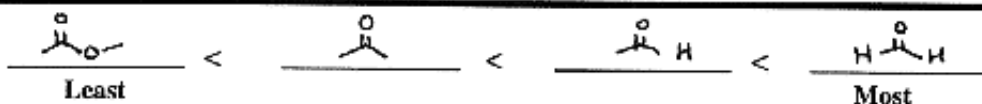
Question 1 (16 points)

Name Key

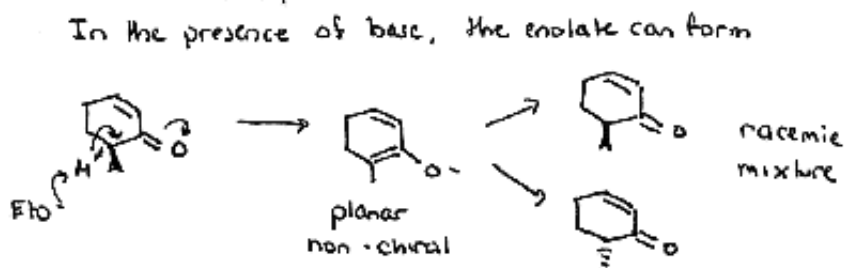
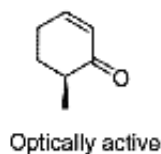
- a. (4 pts) Rank the following compounds in order of decreasing acidity, increasing pK_a . (NO PARTIAL CREDIT)



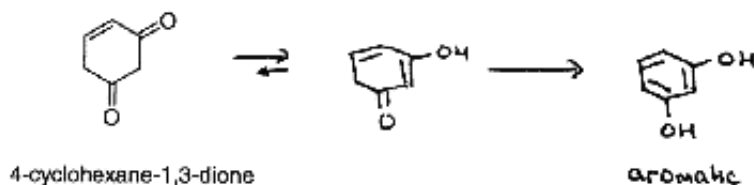
- b. (4 pts) Rank the following molecules in order of increasing electrophilicity at carbonyl carbon (C=O).



- c. (4 pts) The enantiomerically pure cyclic ketone shown below loses its optical activity upon standing in a solution of NaOEt in EtOH. Explain.



- d. (4 pts) Explain why 4-cyclohexane-1,3-dione does not exist as a stable compound.

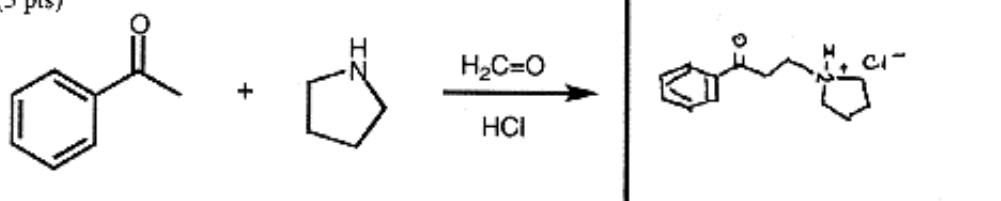


Question 2 (13 points)

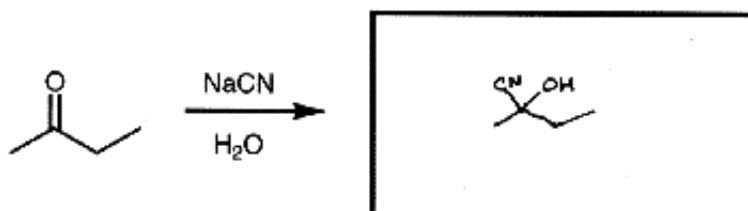
Name key

Give the complete structure of the major organic product(s) for the following reactions. Put your answer in the box provided. Be sure to indicate stereochemistry where appropriate. Write N. R., if no reaction occurs.

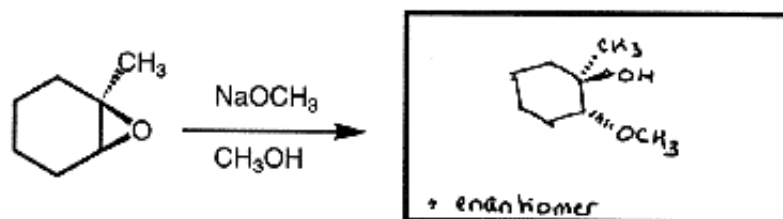
a. (3 pts)



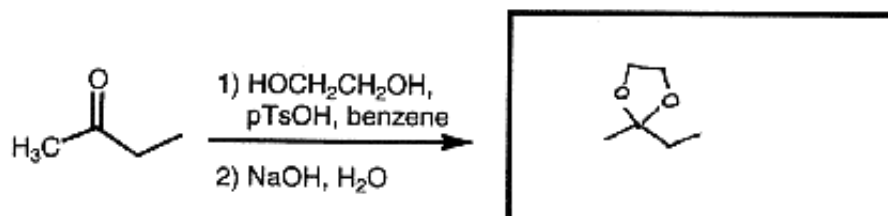
b. (3 pts)



c. (4 pts)



d. (3 pts)

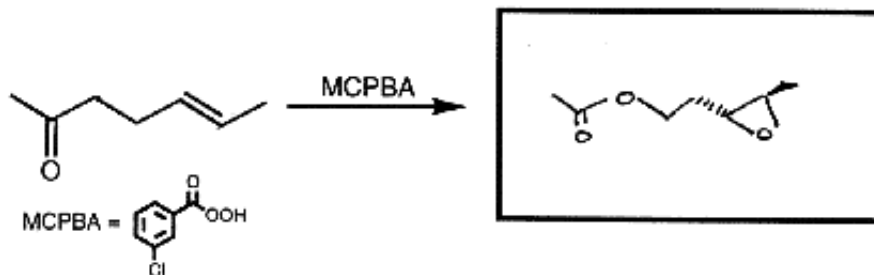


Question 3 (19 points)

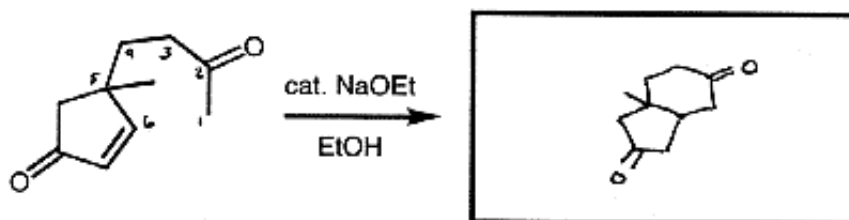
Name Key

Give the complete structure of the major organic product(s) for the following reactions. Put your answer in the box provided. Be sure to indicate stereochemistry where appropriate. Write N. R., if no reaction occurs.

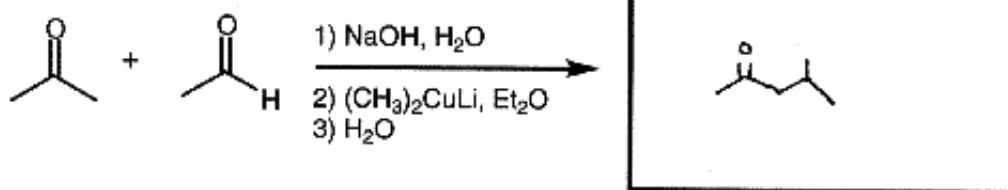
a. (5 pts)



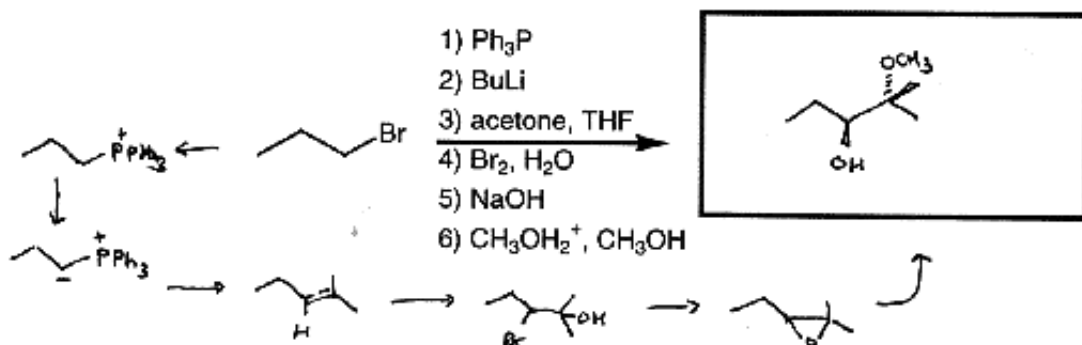
b. (3 pts)



c. (4 pts)



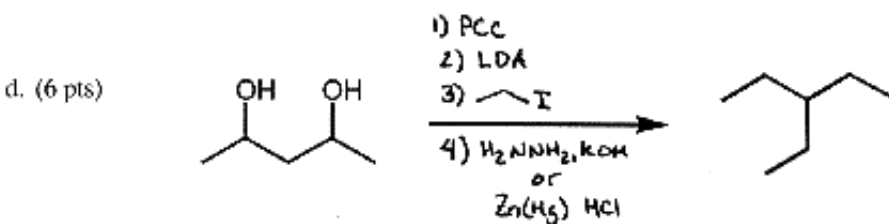
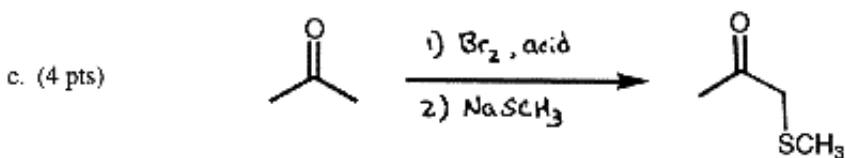
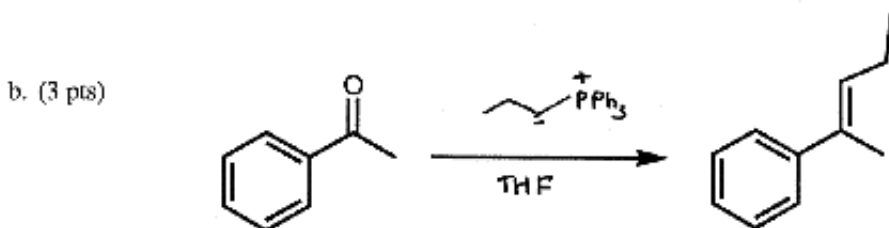
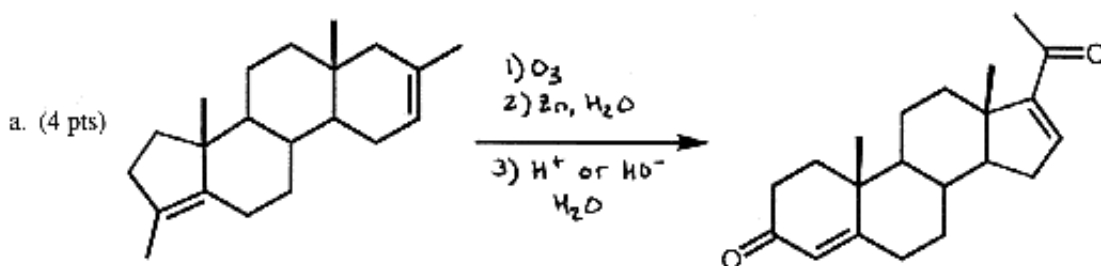
d. (7 pts)



Question 4 (17 points)

Name key

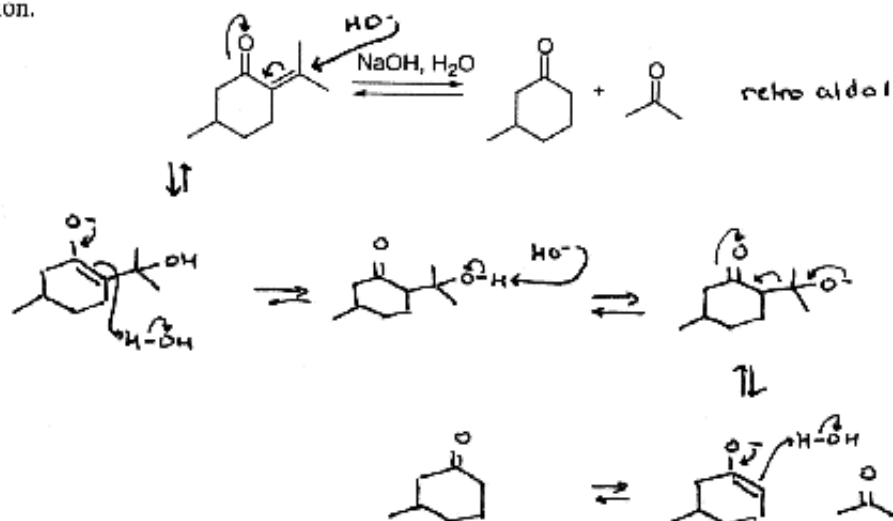
Provide the missing reagents for the following transformation. The reagents should be listed with numbers in order of use if more than one synthetic step is necessary.



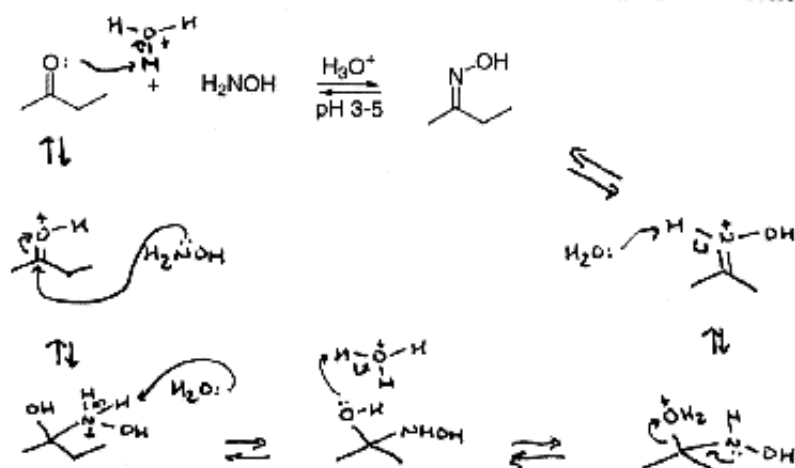
Question 5 (20 points)

Name key

a. (10 pts) Using the correct curved arrow formalism, draw the best mechanism for the following reaction.



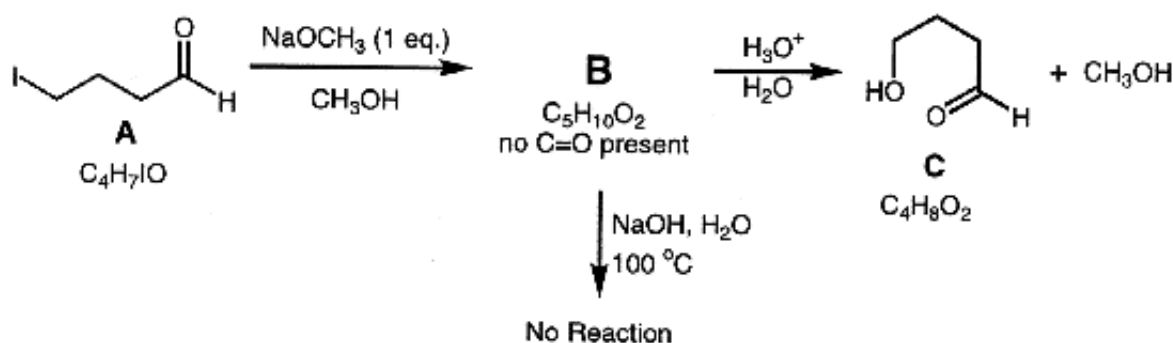
b. (10 pts) Using the correct curved arrow formalism, draw the best mechanism for the following reaction.



Question 6 (15 points)

Name key

Treatment of iodoaldehyde **A** with one equivalent of NaOCH_3 in CH_3OH affords a new substance **B**. Compound **B** does **not** contain a carbonyl group and is stable to NaOH in H_2O , even at 100°C . However, when compound **B** is exposed to aqueous HCl (H_3O^+ , H_2O), it is rapidly hydrolyzed to yield hydroxyaldehyde **C** plus CH_3OH .



- a. (4pts) Draw the structure of **B**.



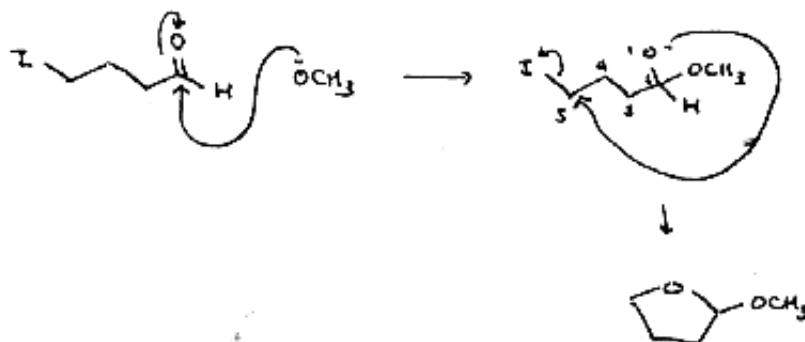
- b. (3 pts) What type of carbonyl derivative is **B**?

acetal

- c. (4 pts) Explain why is **B** stable to base but not to acid. **Limit your answer to one sentence.**

there is no good leaving group or acidic proton available on **B**.

- d. (4 pts) Using the correct arrow formalism, draw the best mechanism for the conversion of **A** to **B**.



Extra Credit (15 points)

Name key

Warfarin is a potent blood anticoagulant in mammals and is used as a rat poison. Outline a synthesis of warfarin from benzaldehyde, acetone and 4-hydroxycoumarin. Indicate the mechanism for each step of your synthesis.

