

Name Key

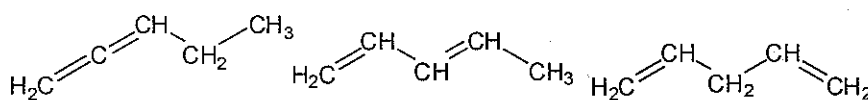
(Last) (First)

BOO# _____

This exam is divided up into two parts, multiple choice and short answer questions. All work must be shown in order to receive full credit. Please turn off all electronic communication devices.

Multiple choice questions: Choose the correct answer and record it on the scantron provided (2 points each).

1. Which of the following are conjugated dienes?



- ~~(a) only 1~~
 (b) only 2
 (c) only 1 and 2
 ~~(d) 1, 2 and 3~~

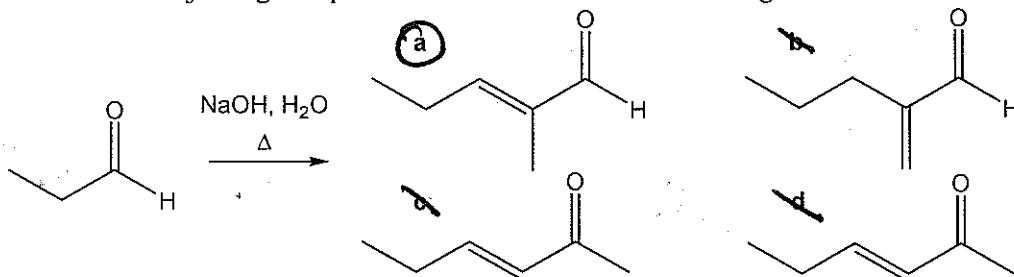
2. Which of the following is the correct order of decreasing leaving group ability in nucleophilic acyl substitutions (better leaving group > worse leaving group)?

- (a) $\text{Cl}^- > \text{CH}_3\text{COO}^- > \text{CH}_3\text{O}^-$
 (b) $\text{CH}_3\text{COO}^- > \text{CH}_3\text{O}^- > \text{Cl}^-$
~~(c) $\text{Cl}^- > \text{CH}_3\text{O}^- > \text{CH}_3\text{COO}^-$~~
~~(d) $\text{CH}_3\text{O}^- > \text{Cl}^- > \text{CH}_3\text{COO}^-$~~

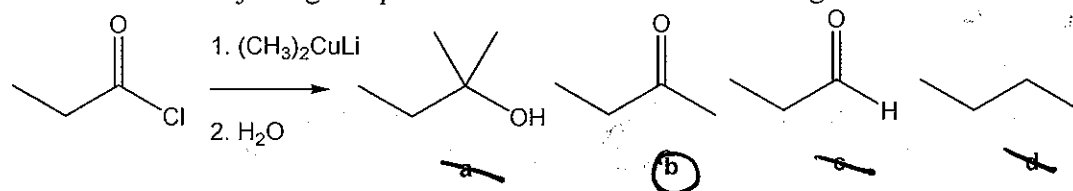
3. Which of the following is the correct order of decreasing reactivity in hydrolysis reactions (more reactive > less reactive)?

- ~~(a) anhydrides > amides > acid chlorides~~
 (b) amides > acid chlorides > anhydrides
~~(c) anhydrides > acid chlorides > amides~~
 (d) acid chlorides > anhydrides > amides

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

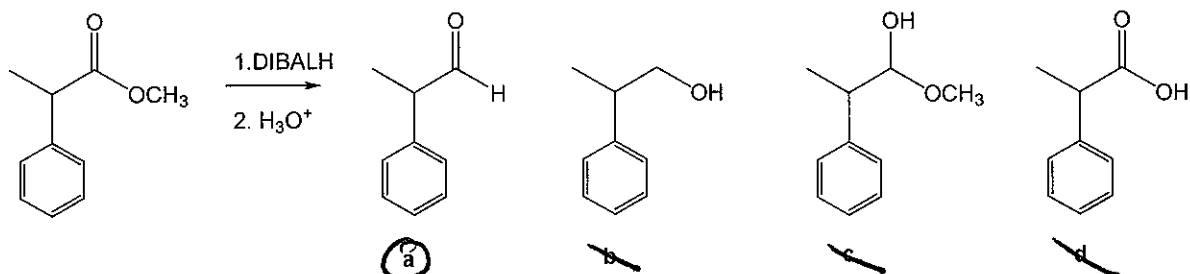


5. What is the major organic product obtained from the following reaction?



6. Which of the following is the most soluble in water?
~~(a) hexane~~ ~~(b) 1-pentanol~~ ~~(c) pentanal~~ **(d) butanoic acid**

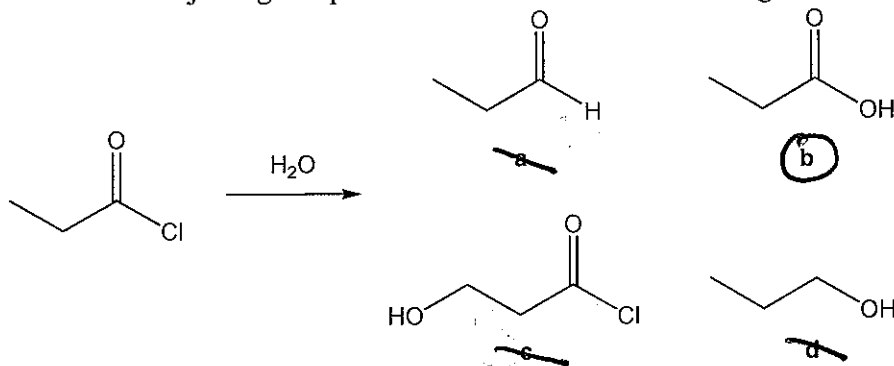
7. What is the major organic product obtained from the following reaction?



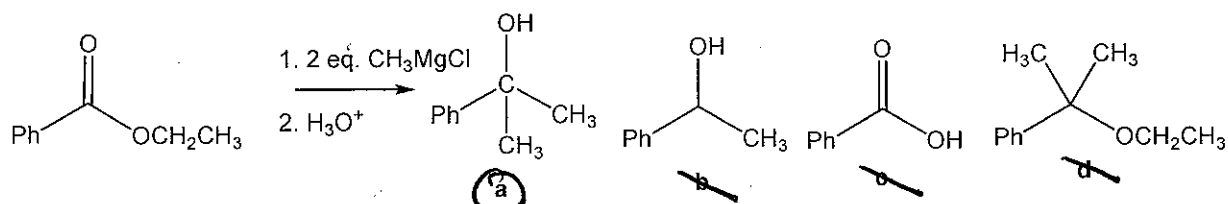
8. Which of the following is the correct order of decreasing acid strength (more acidic > less acidic)?

- (a) FCH₂COOH > ClCH₂COOH > BrCH₂COOH**
~~(b) CH₃COOH > ClCH₂COOH > Cl₂CHCOOH~~
~~(c) CH₃COOH > FCH₂COOH > CH₃CH₂OH~~
~~(d) CH₃CH₂OH > FCH₂COOH > ClCH₂COOH~~

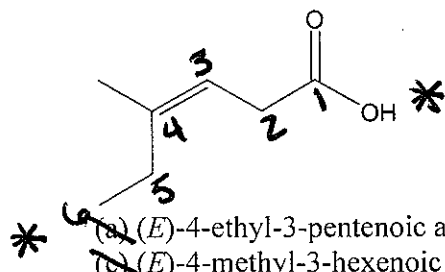
9. What is the major organic product obtained from the following reaction?



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



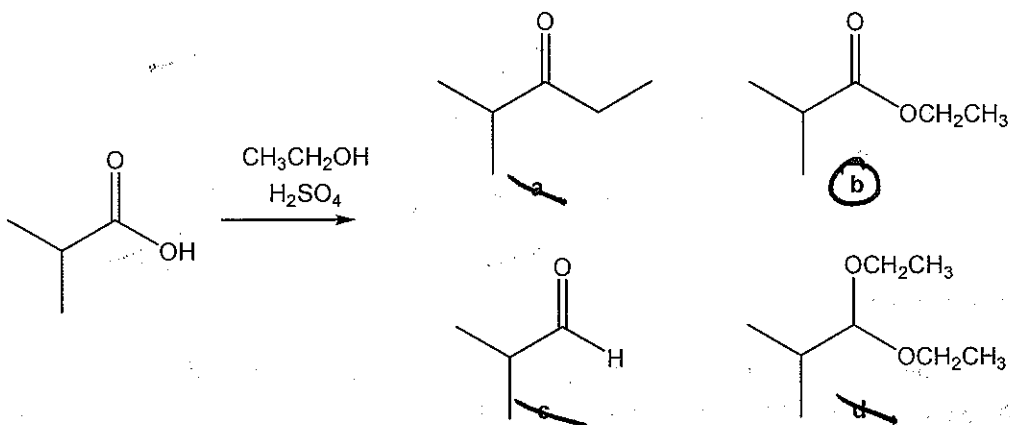
11. What is the IUPAC name of the following compound?



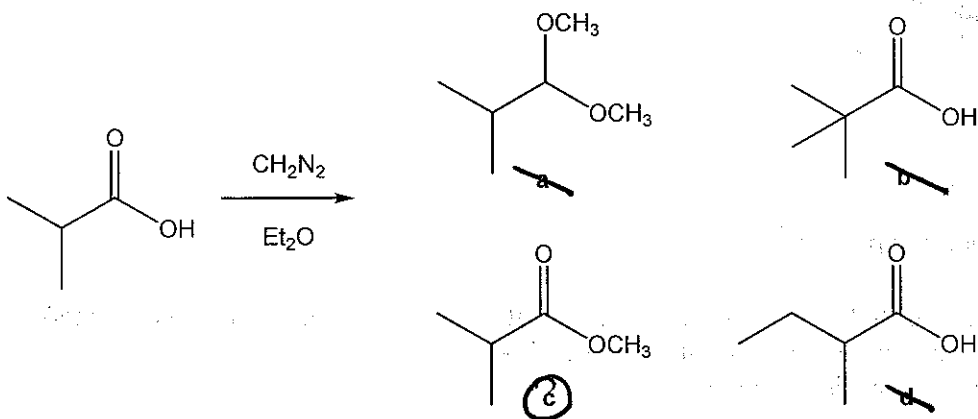
- ~~(a) (E)-4-ethyl-3-pentenoic acid~~
~~(c) (E)-4-methyl-3-hexenoic acid~~

- ~~(b) (Z)-4-ethyl-3-pentenoic acid~~
(d) (Z)-4-methyl-3-hexenoic acid

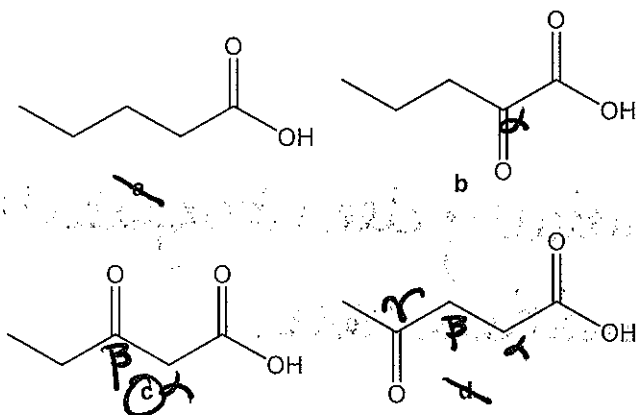
12. What is the major organic product obtained from the following reaction?



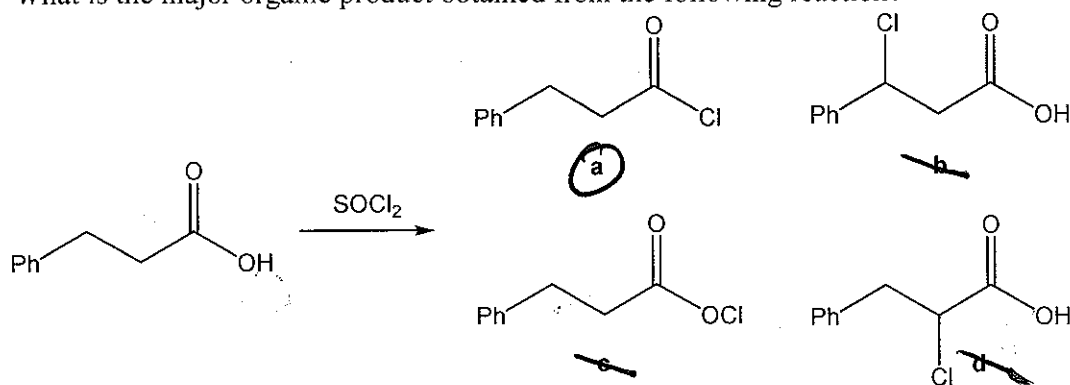
13. What is the major organic product obtained from the following reaction?



14. Which of the following carboxylic acids undergoes the most rapid thermal decarboxylation reaction?

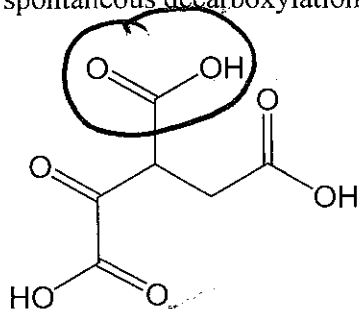


15. What is the major organic product obtained from the following reaction?



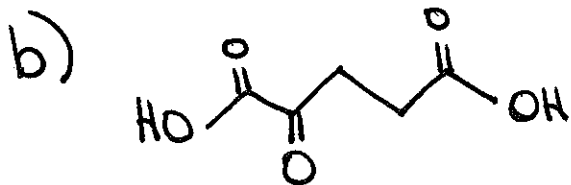
Short answer questions.

1. Oxalosuccinic acid contains three -COOH groups. One of these groups undergoes spontaneous decarboxylation during the oxidation of food in the tricarboxylic acid cycle.



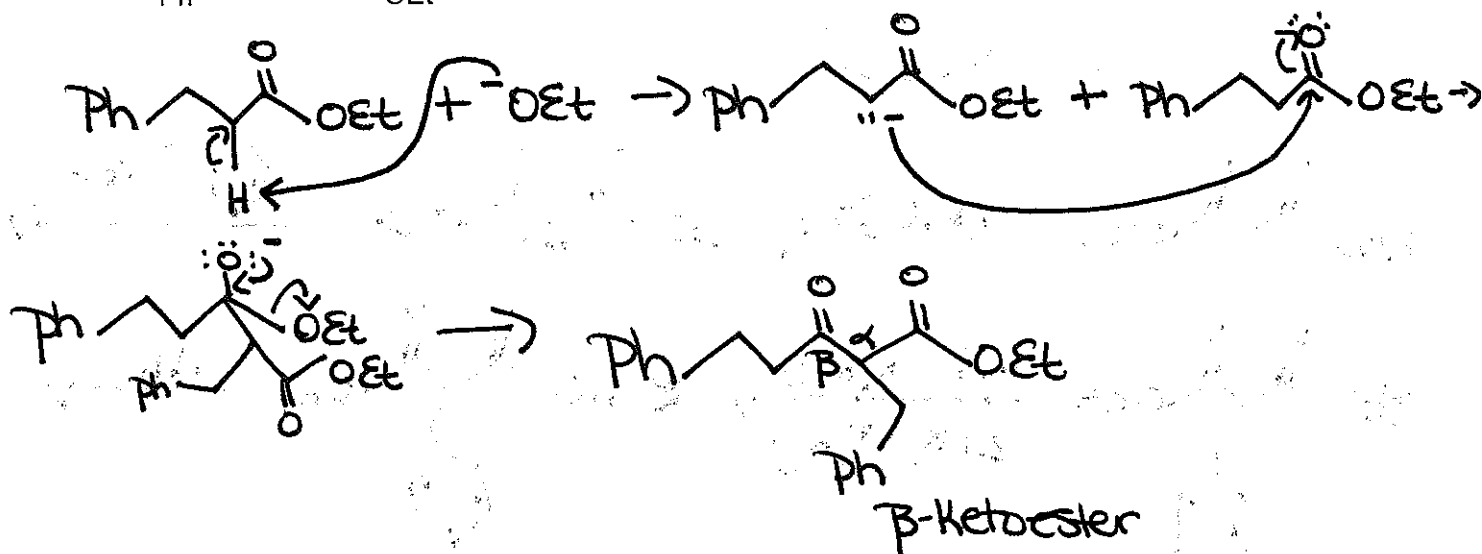
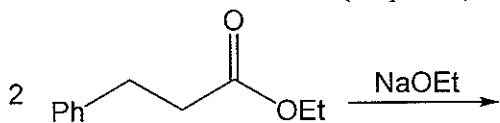
Oxalosuccinic acid

- Circle the -COOH group in the molecule that undergoes decarboxylation (4 points).
- Draw the structure of the product formed (4 points).
- Give reason for this selective decarboxylation (4 points).

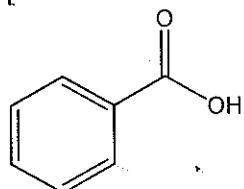


c) β -Ketoacids preferentially decarboxylate due to cyclic 6 membered transition state

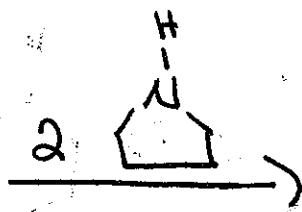
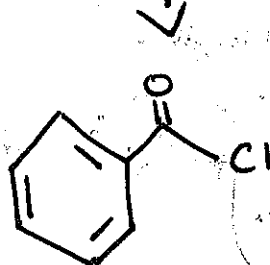
2. Write the structure of the product formed from the following Claisen condensation. Draw the mechanism of this reaction (10 points).



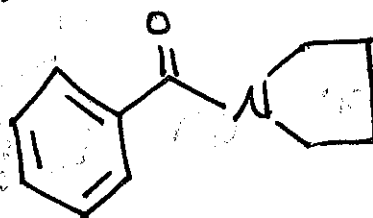
3. How will you carry out the following synthetic transformation. Use any organic/inorganic reagents and solvents as necessary (12 points).
[NOTE: No need to write the reaction mechanism].



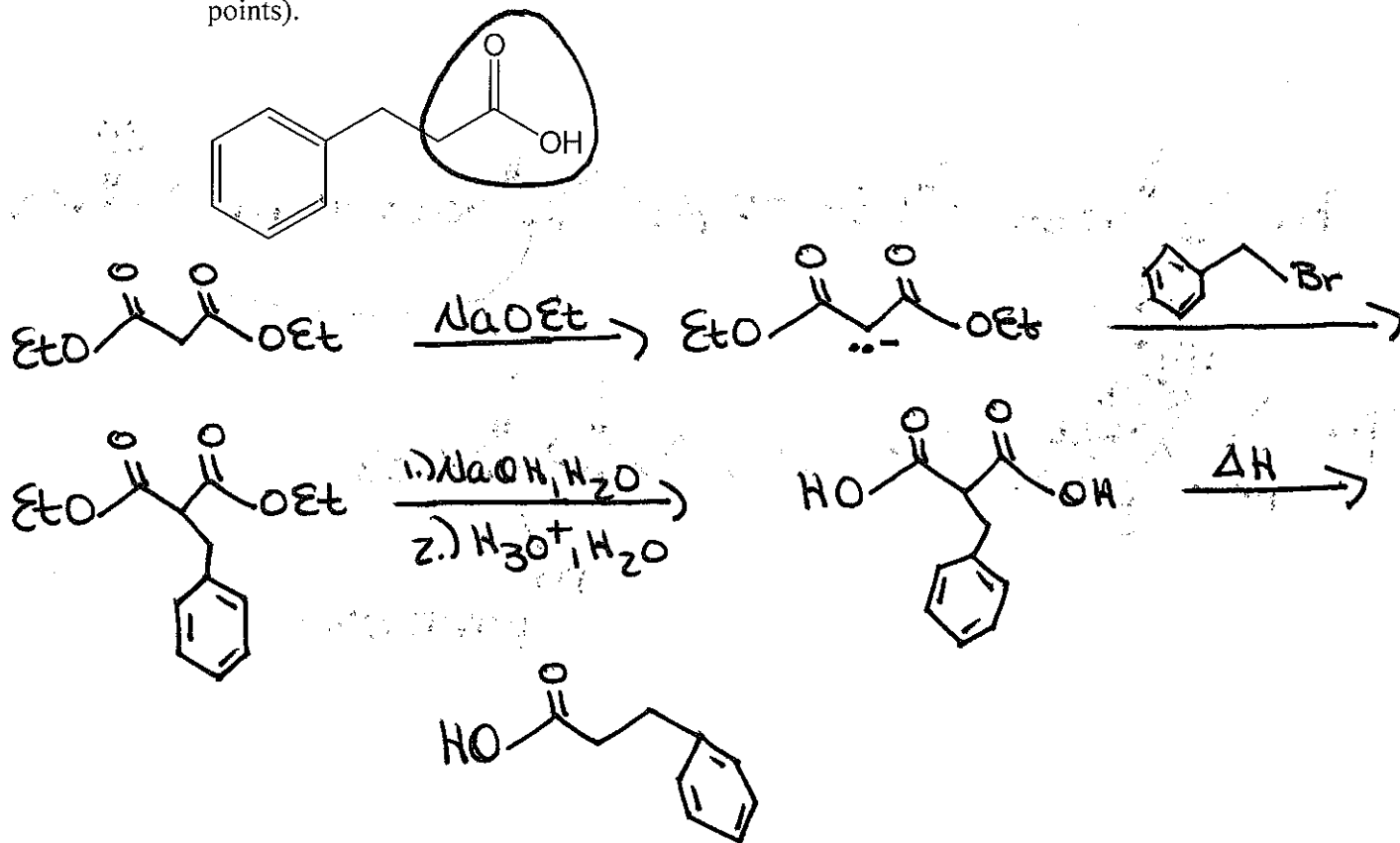
Pyridine / SOCl2



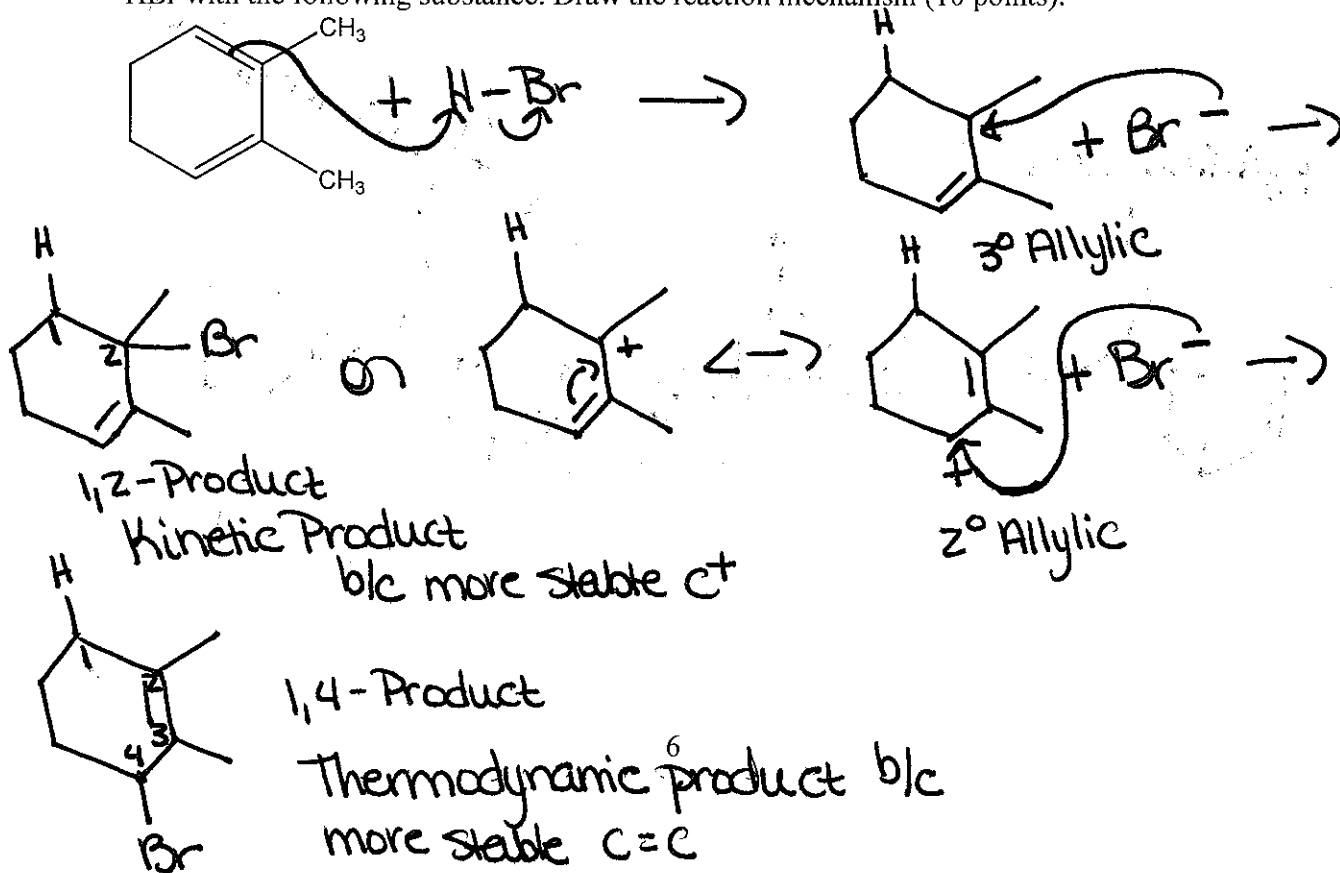
2.) H3O^+ / 1.) KAlH4 ether



4. Show how Malonic ester synthesis can be used to prepare the following carboxylic acid (12 points).



5. Give the structures of both 1,2 and 1,4 adducts resulting from the reaction of 1 equivalent of HBr with the following substance. Draw the reaction mechanism (10 points).



6. Give the major organic product for the following reactions (14 points).

