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Massachusetts Institute of Technology

5.13: Organic Chemistry II *May 10, 2002*

Test 4

Question 1 _____/26 points

Question 2 _____/08 points

Question 3 _____/14 points

Question 4 _____/12 points

Question 5 _____/12 points

Question 6 _____/16 points

Question 7 _____/12 points

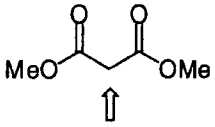
TOTAL _____/100 points

Name SOLUTIONS

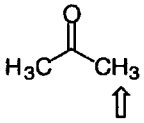
T.A. _____

There are eight pages (2-9) of questions in this exam.

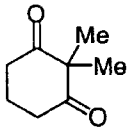
(1) (2 points each, 26 points total) Please provide the requested answer/data/reagents. If no reaction is expected, write "NR".

(a) pK_a of: 

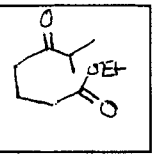
13

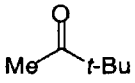
(b) pK_a of: 

20

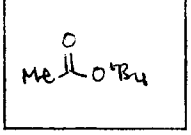
(c) 

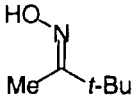
$\xrightarrow[EtOH]{\text{cat. } EtO^{\ominus}}$



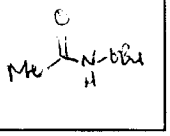
(d) 

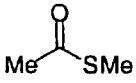
$\xrightarrow{MCPBA}$



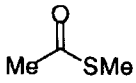
(e) 

$\xrightarrow[H_2O]{H_2SO_4}$

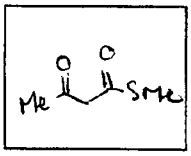


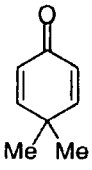
(f) 

+

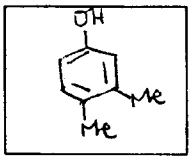


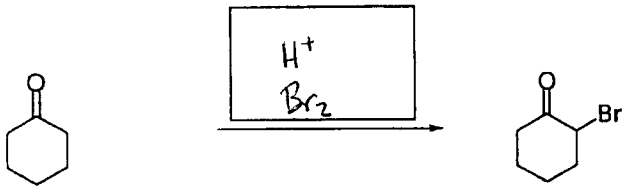
$\xrightarrow{\text{1 equiv of base}}$



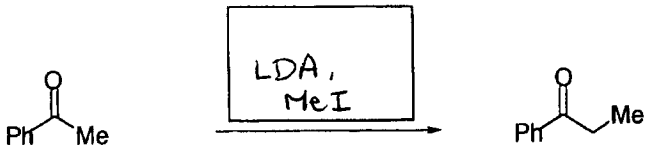
(g) 

$\xrightarrow{H^{\oplus}}$

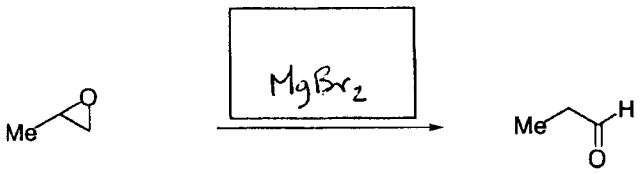


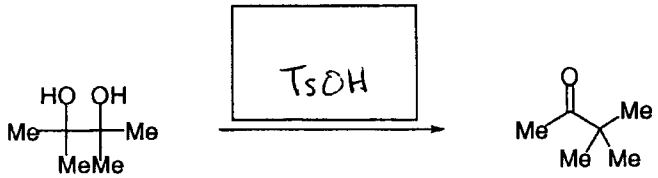
(h) 

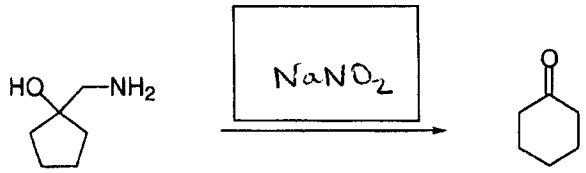
without over-bromination

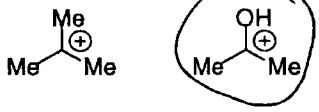
(i) 

without over-alkylation

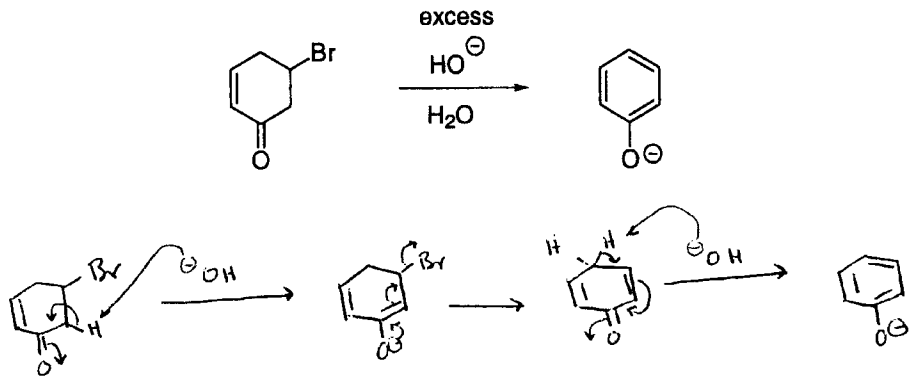
(j) 

(k) 

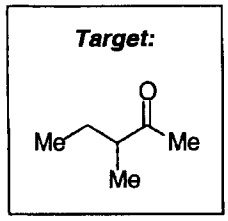
(l) 

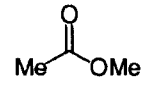
(m) Circle the cation that is more stable: 

(2) (8 points) Provide the best mechanism. Please show all arrow pushing.

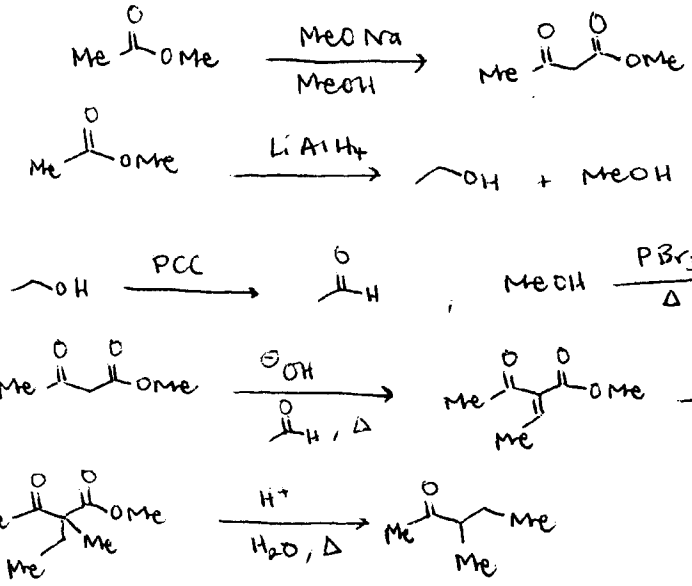


(3) (14 points) Synthesize the illustrated ketone. ALL carbons of the ketone must be derived from molecules of methyl acetate, which has three carbons. You may not use lithium diisopropylamide in your synthesis.

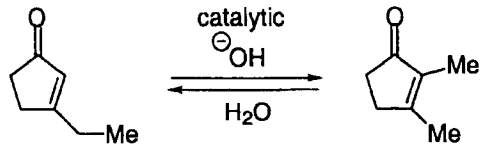


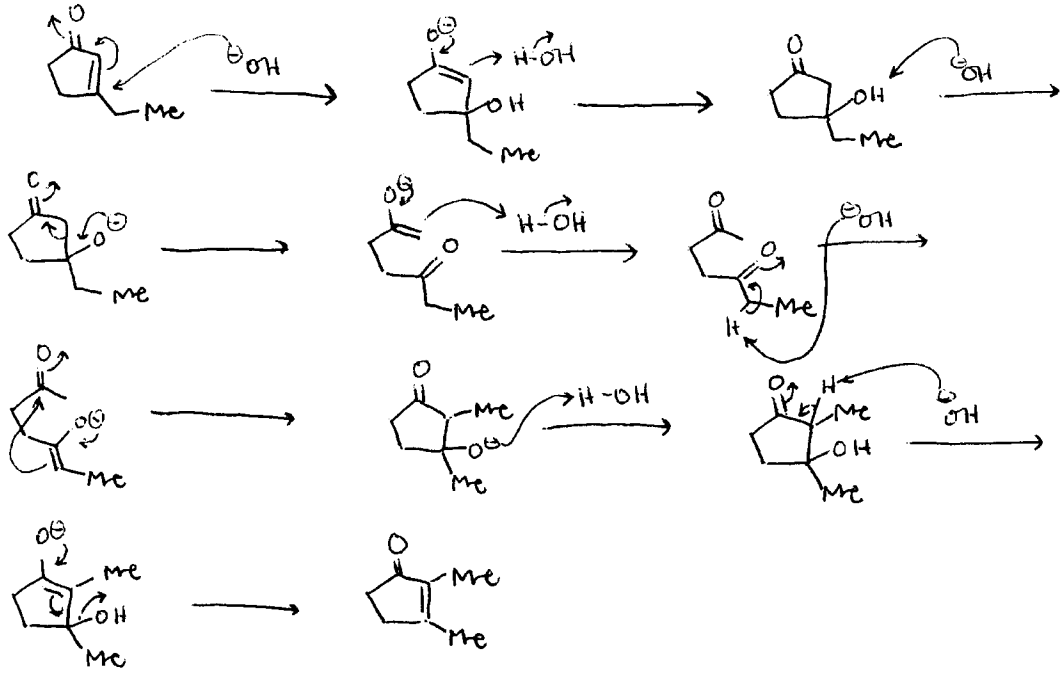


methyl acetate

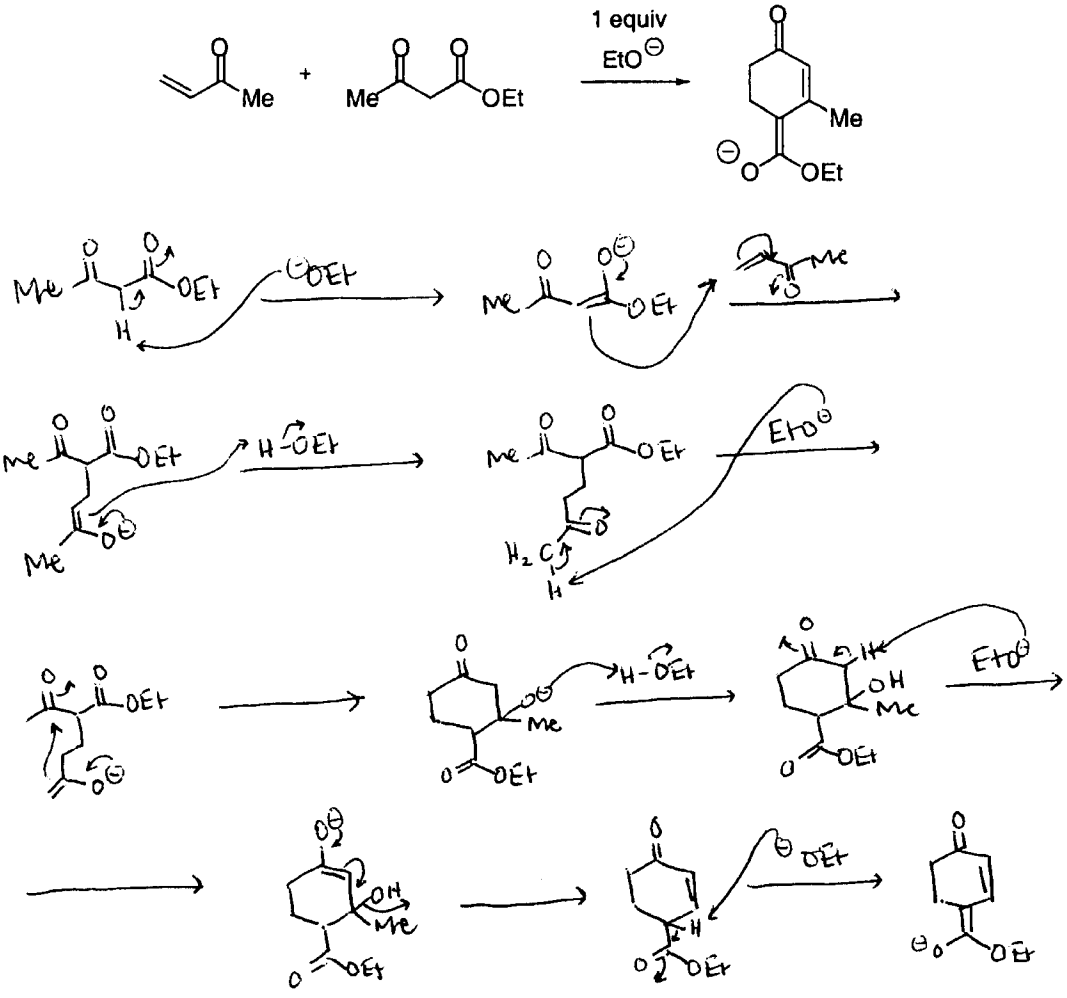


(4) (12 points) Provide the best mechanism for the illustrated transformation. Please show all arrow pushing.



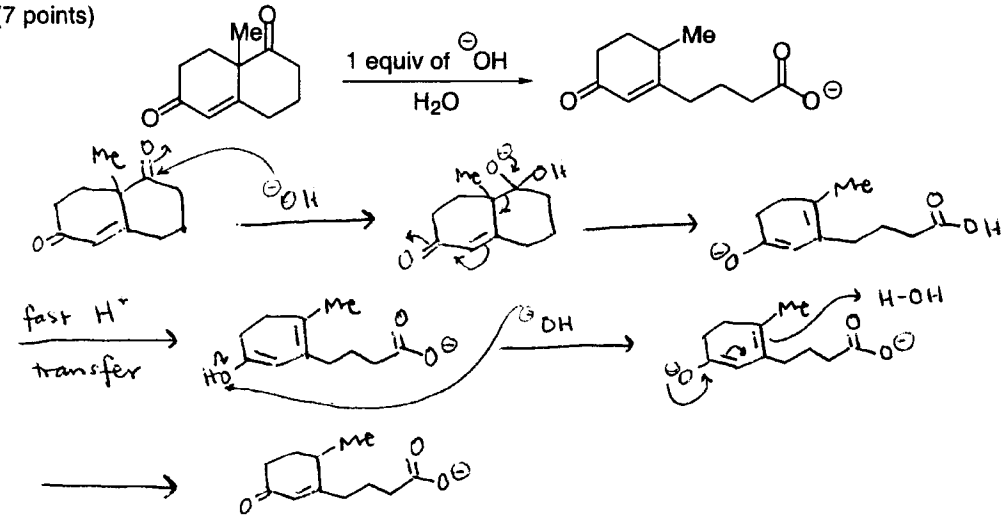


(5) (12 points) Provide the best mechanism. Please show all arrow pushing.

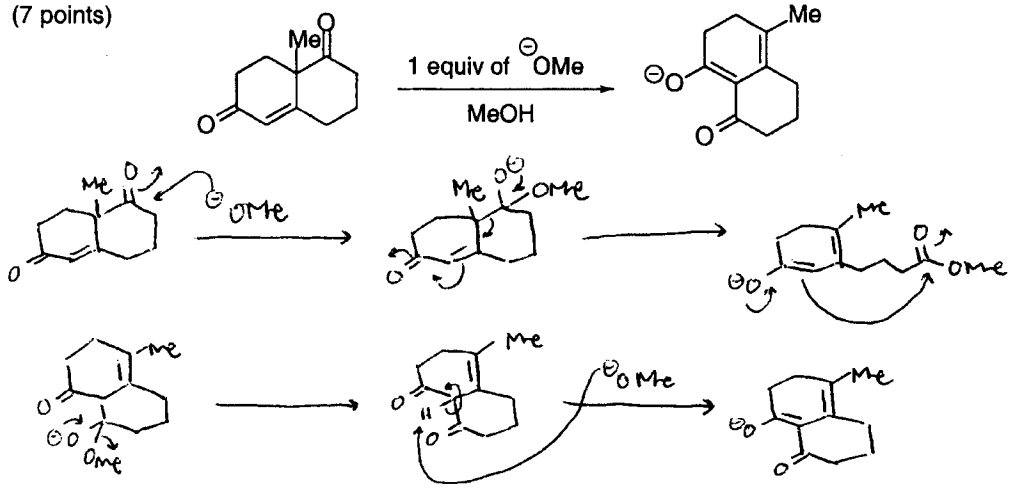


(6) (16 points total) Provide the best mechanism for each of the reactions illustrated below. Hint: The mechanism for part (a) only requires three or four steps. Please show all arrow pushing.

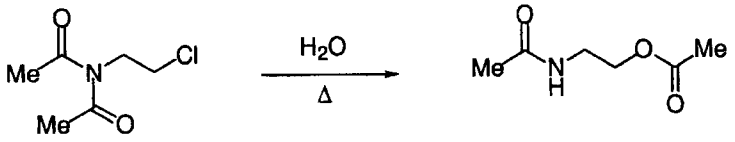
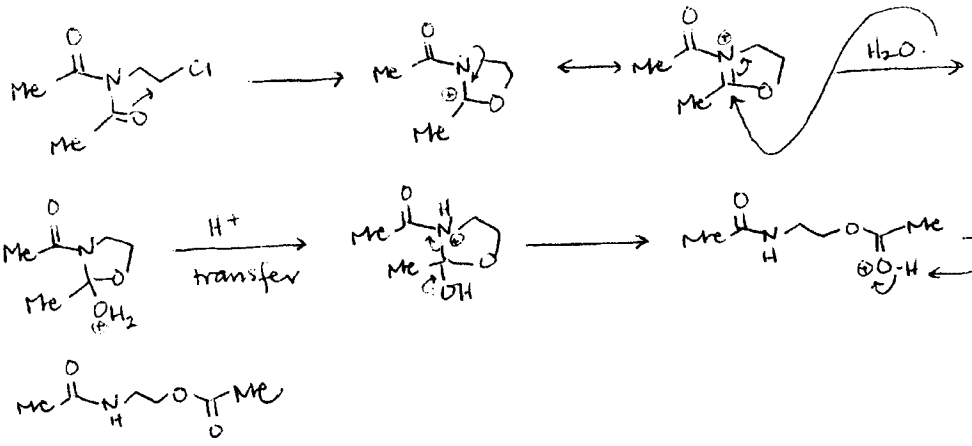
(a) (7 points)



(b) (7 points)



(c) (2 points) Succinctly explain why different pathways are observed under the different reaction conditions.

The difference lies in the ester being an electrophilic site while the carboxylate is not.

(7) (12 points) Provide the best mechanism for the illustrated transformation.
Please show all arrow pushing.