Massachusetts Institute of Technology
Dr. Kimberly L. Berkowski

5.13, Fall 2006
Organic Chemistry II

PRACTICE EXAM #4

Hour exam #4 will be held on Wednesday, December 6, from 12:05-12:55.

Location:
If your last name begins with A-K, report to 2-190.
If your last name begins with L-Z, report to 54-100.
A 10 point deduction for reporting to the wrong room.

Books, notes, and calculators **will not** be allowed during the exam.

Molecular model kits **will** be allowed during the exam. You will be given a periodic table and blank pages.

Material Covered on Exam #4:
- Everything presented in lecture related to Enols & Enolates and Carbocations
- Recitation and Drill Problems
- Problem Sets 7 & 8
- McMurry Chapters 22 & 23
- All 5.12 material.

The answer key will be posted on Monday

(1) (1 point each, 7 points total) Please provide the pK_a value for the indicated "H".

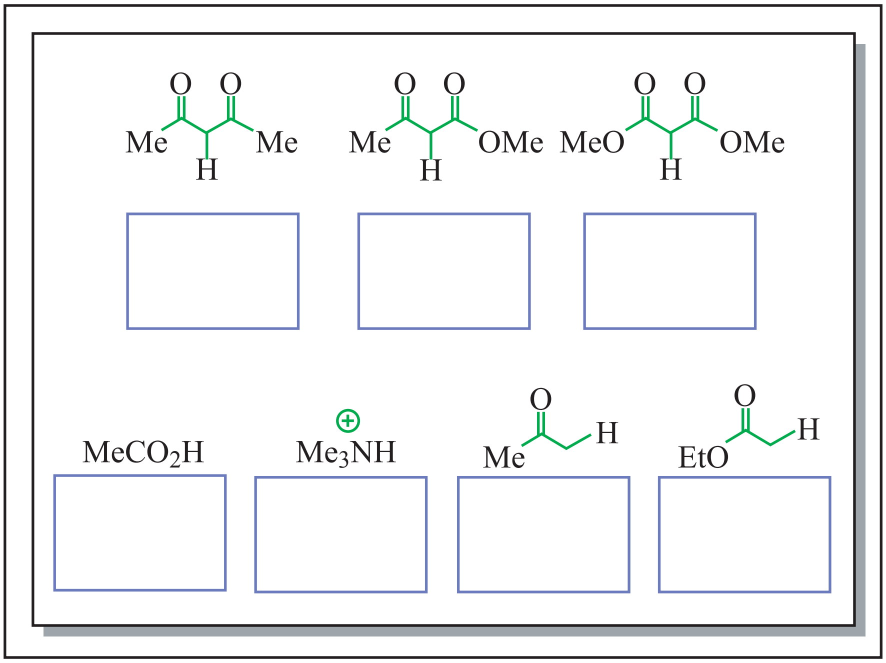


Figure by MIT OCW.

(2) (2 points for each box; 20 points total) Please provide the indicated information. If you use a base or an acid, please specify whether a "catalytic amount", "1 equivalent", etc. is required.

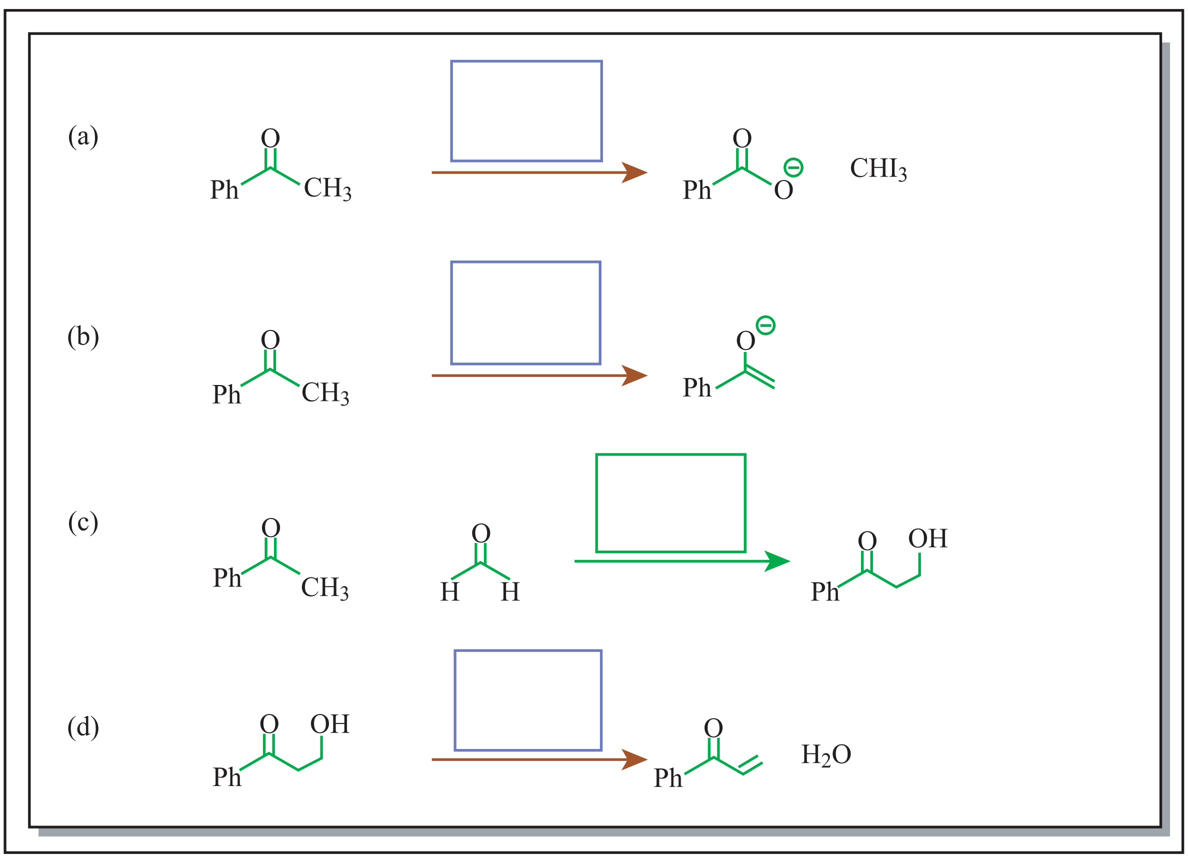


Figure by MIT OCW.

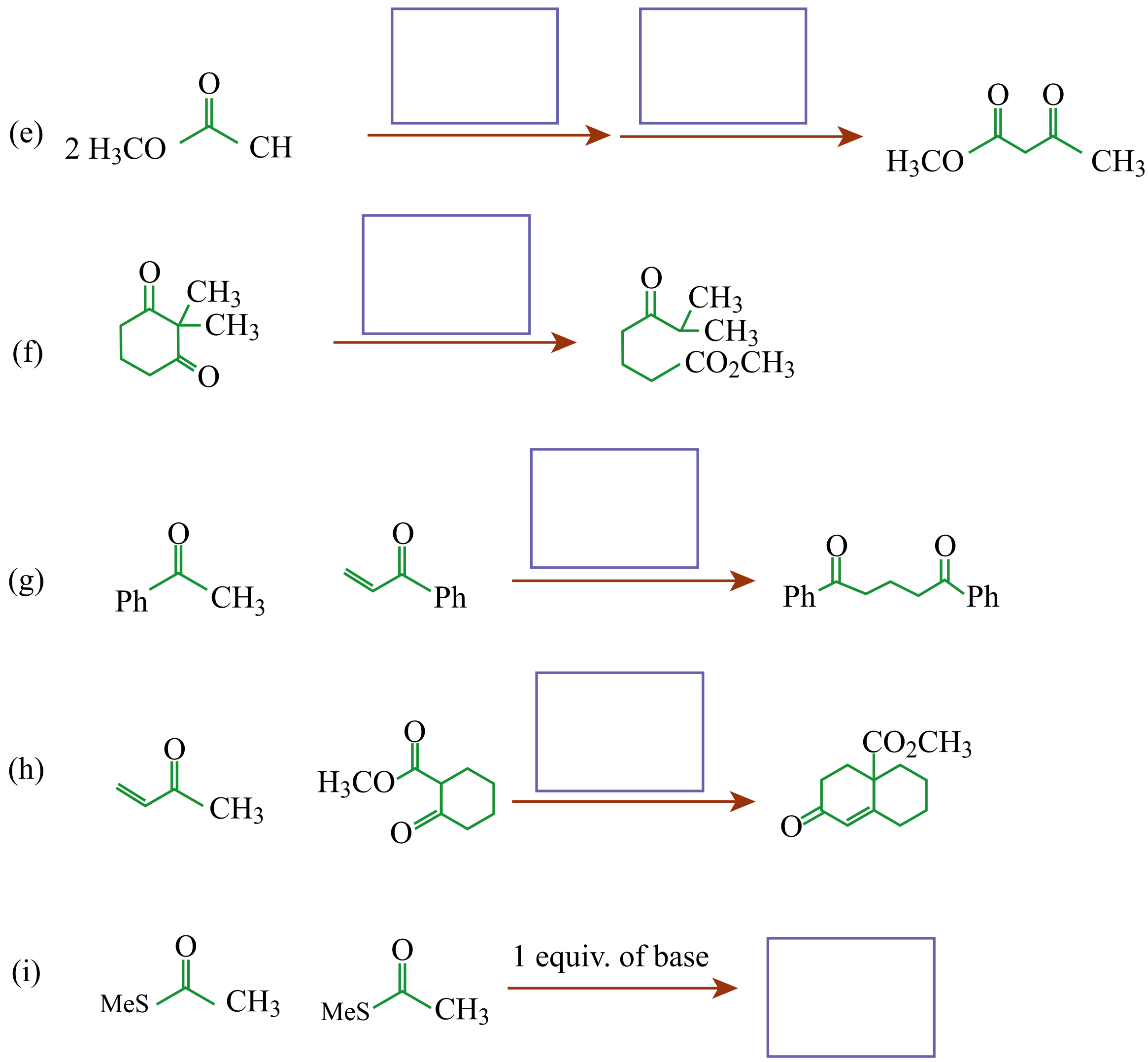


Figure by MIT OCW.

(3) (12 points) Please provide an efficient synthesis of the indicated target compound. All of the carbons of the target compound must come from ethyl acetate and 1, 5-dibromopentane.

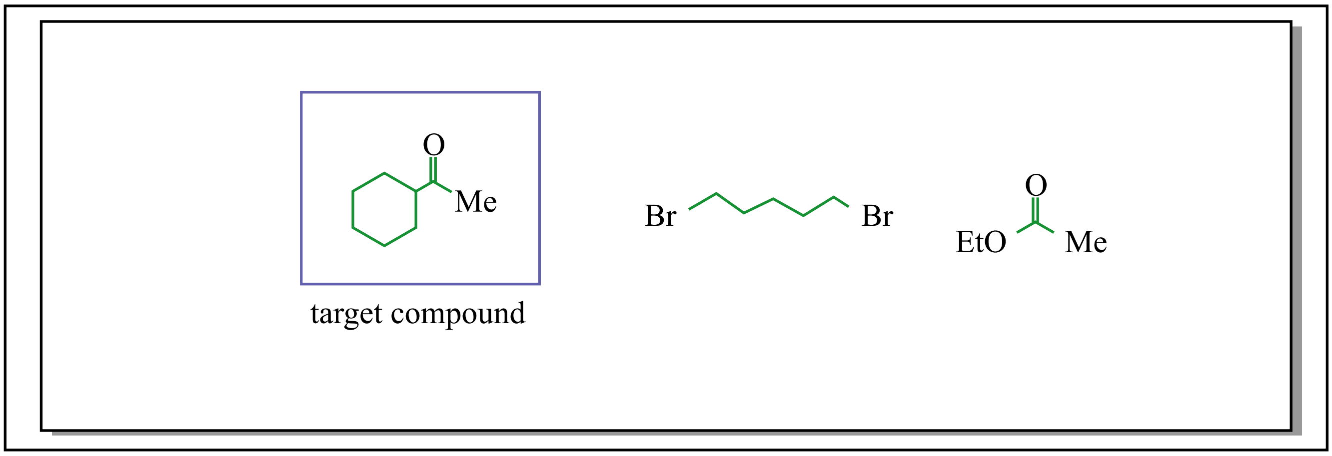
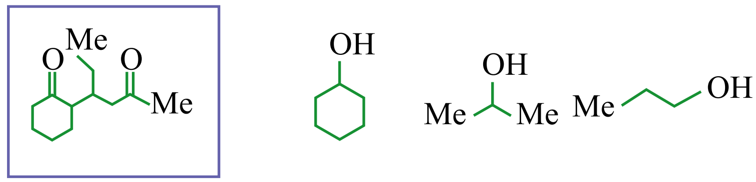


Figure by MIT OCW.

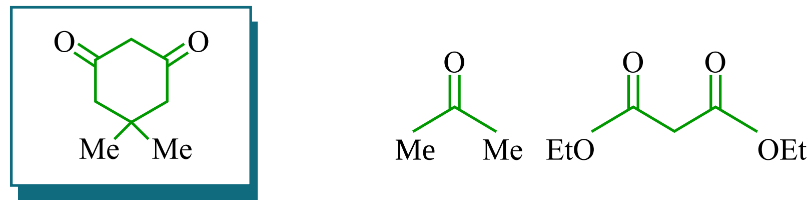
(4) (12 points) Please provide an efficient synthesis of the indicated target compound. All of the carbons of the target compound must come from the three illustrated alcohols.



target compound

Figure by MIT OCW.

(5) (12 points) Please provide an efficient synthesis of the indicated target compound. All of the carbons of the target compound must come from acetone and diethyl malonate.



target compound

Figure by MIT OCW.

(6) (12 points) Provide a mechanism for the conversion of **A** to **B** and **B** to **C**. Please show all arrow pushing.

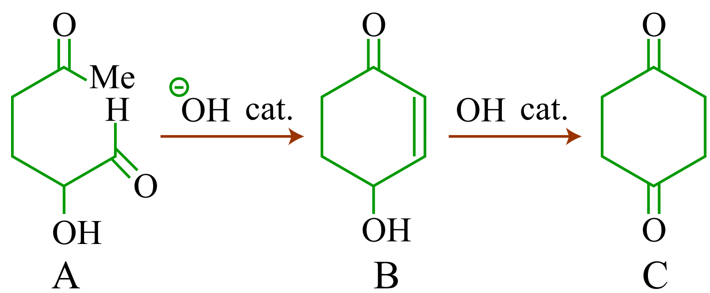


Figure by MIT OCW.

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

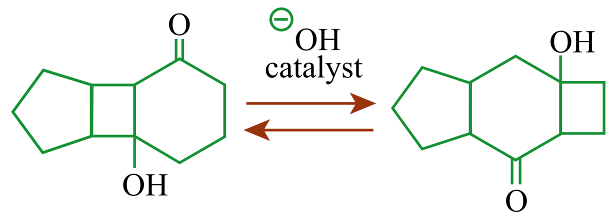


Figure by MIT OCW.

(8) (13 points) Provide the best mechanism for the illustrated reaction. Please show all arrow pushing. ***Hint:*** RS^{θ} can serve as a nucleophile and add to the β carbon of Michael acceptors.

Figure by MIT OCW.

(9) BONUS question (10 points) The process shown below is an example of a "Mannich reaction". Nature uses this reaction to synthesize alkaloids (natural product that contain a basic nitrogen). Suggest the best mechanism for this process. Please show all arrow-pushing.

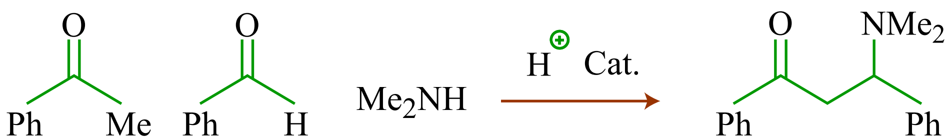


Figure by MIT OCW.