

Massachusetts Institute of Technology

5.13: Organic Chemistry II

Dr. Sarah A. Tabacco

Hour Exam #4
December 5, 2003

Printed Name _____ Signature _____

MIT ID # _____ Recitation TA _____

General Instructions:

- **This is a closed book exam.** No books, notes, or calculators allowed. You are allowed to use molecular models.
- Make sure that your exam has **12 pages** (including cover, a blank page for extra work, and a periodic table).
- Write your name on each page.
- Write answers in the spaces provided. If you run out of room, use the blank page and **indicate this for your grader.**
- Show all of your work if you wish to receive partial credit.
- Read the instructions **carefully**, and budget your time.

• **GOOD LUCK!!**

1 _____ / 5 _____

2 _____ / 9 _____

3 _____ / 12 _____

4 _____ / 10 _____

5 _____ / 10 _____

6 _____ / 10 _____

7 _____ / 10 _____

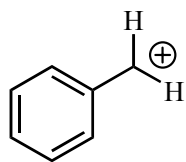
8 _____ / 10 _____

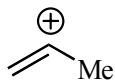
9 _____ / 12 _____

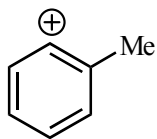
10 _____ / 12 _____

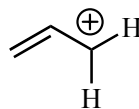
Total _____
(out of 100 points)

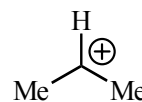
1. (5 points, all or nothing) Please rank the following species by carbocation stability.
(1 = most stable, 2 = least stable)





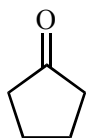


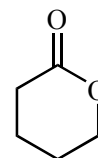




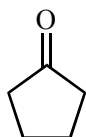
2. (3 points each, 9 points total) In the boxes, please provide the reagents for the illustrated transformations. More than one step may be required.

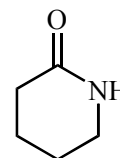
a)



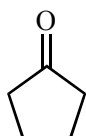


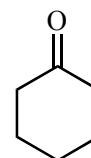
b)





c)

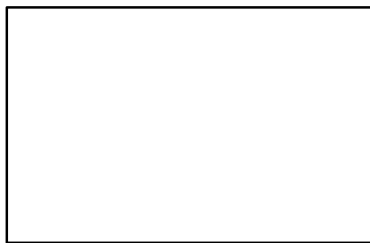
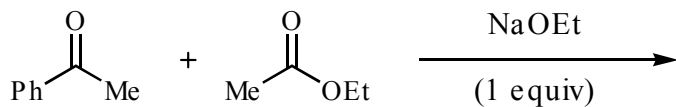




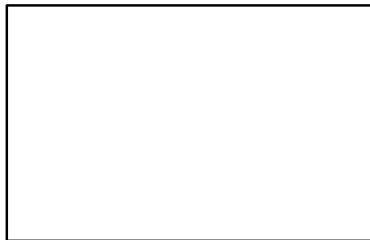
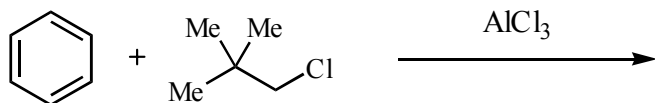
Name _____

3. (2 points each, 12 points total) Please provide the products of the following reactions. If no reaction is expected, write "NR".

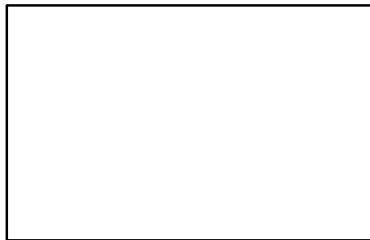
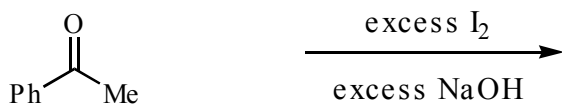
a)



b)



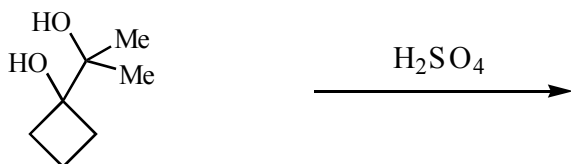
c)



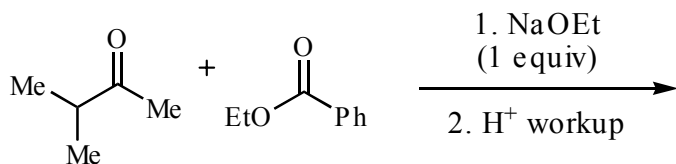
d)



e)



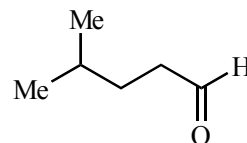
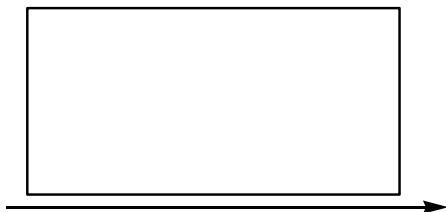
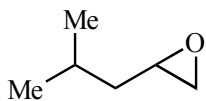
f)



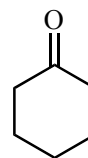
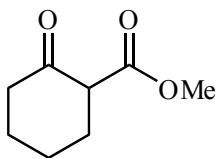
Name _____

4. (2 points each, 10 points total) Please provide the reagents for the following transformations. Be specific about quantities of reagents where relevant.

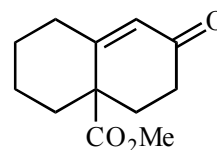
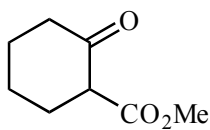
a)



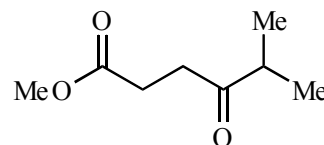
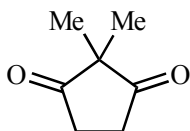
b)



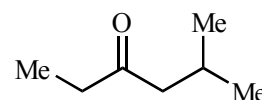
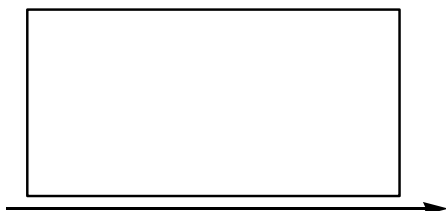
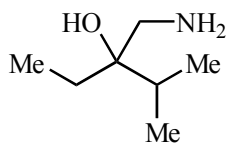
c)



d)

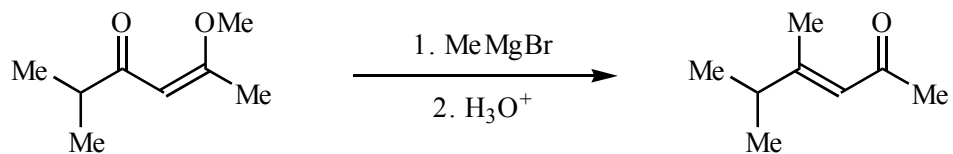


e)



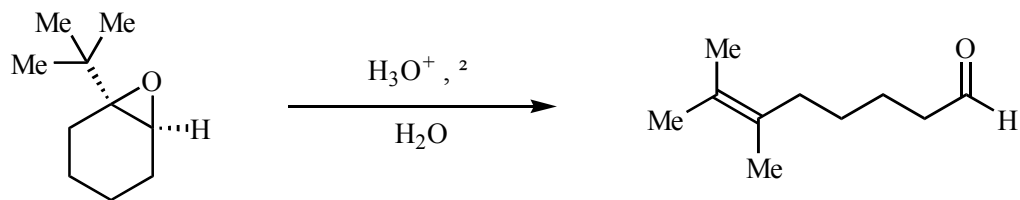
Name _____

5. (10 points) Please provide a detailed mechanism for the following transformation. Show all arrow pushing.



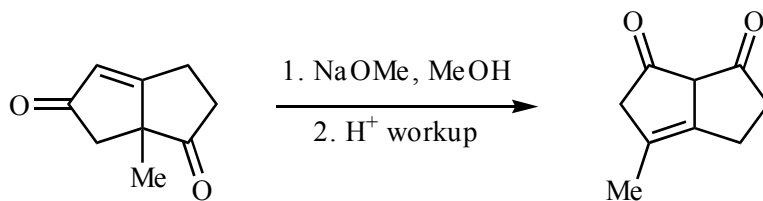
Name _____

6. (10 points) Please provide a detailed mechanism for the following transformation. Show all arrow pushing.



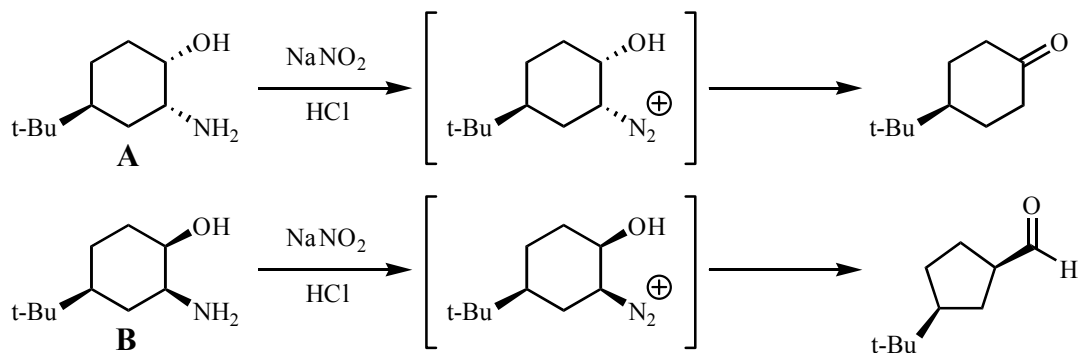
Name _____

7. (10 points) Please provide a detailed mechanism for the following transformation. Show all arrow pushing. Hint: This mechanism is from problem set 6.



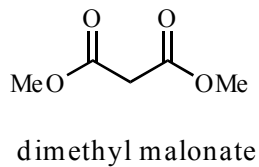
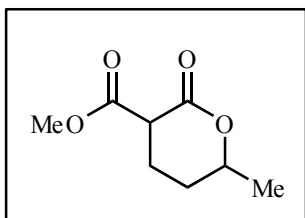
Name _____

8. (10 points) Diastereomers **A** and **B** provide different products upon diazotization. Please explain why only one product is formed selectively in each reaction. Your explanation should include a **3-dimensional** mechanism for the formation of each product from the corresponding diazonium salt.



Name _____

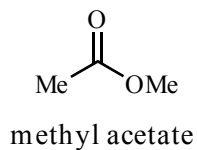
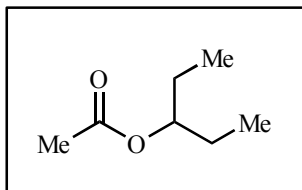
9. (12 points) Please provide a synthesis of the indicated compound. All of the carbon atoms should be derived from **dimethyl malonate** and **alcohols containing three or fewer carbons**. You will receive partial credit for a complete retrosynthesis.



R-OH
alcohols containing
three or fewer carbons

Name _____

10. (12 points) Please provide a synthesis of the indicated compound. All of the carbon atoms should be derived from **methyl acetate**. You will receive partial credit for a complete retrosynthesis.



Name _____