First Three Letters of Last Name:

TA Name:

Hour Exam #3

5.13 Fall 2006

KEY

Organic Chemistry II

November 15, 2006

Jame	
ignature	
D#	

- 1. Make sure your exam has 9 numbered pages plus a periodic table.
- 2. Write your initials on each page.
- 3. Look over the entire exam before you begin to familiarize yourself with its length. Do what you know first, then attempt the harder problems.
- 4. Show all of your work. Partial credit receives points!

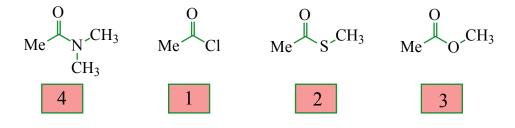
Page	Possible Points	Total
1	8	
2	18	
3	21	
4	12	
5	10	
Sum 1	69	

Page	Possible Points	Total
6	10	
7	9	
8	12	
9 (XC)	5	
Sum 2	36	
TOTAL	100	

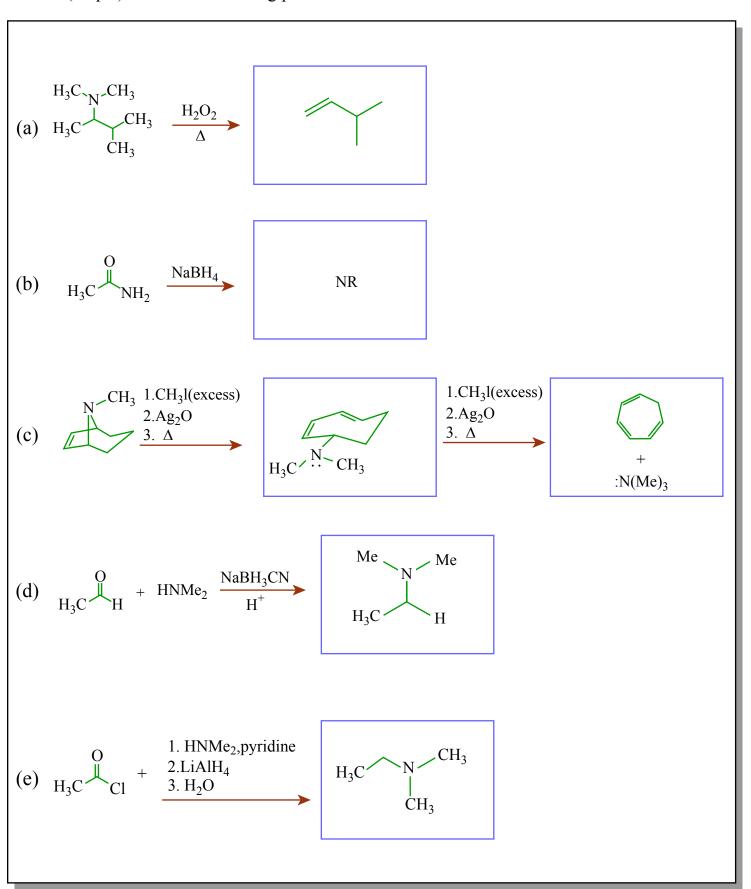
1. (4 pts) When N,N-dimethylaminopyridine reacts with one equivalent of acid, the sp2 nitrogen becomes protonated. Why don't you see protonation at the sp3 nitrogen when you know that the more p character an orbital has, the more stable it is with a positive charge?

The Sp3 Nitrogen is actually Sp2. The lone pair on nitrogen is in a P orbital &can delocalize into the pyridine ring. The lone pair of electrons on the Nitrogen atom in the ring are orthogonal to the ring & cannot delocalize .Those electrons are more available for bonding and more basic.

2. (4 pts) Rank the following molecules in order of electrophilicty(1= most electrophilic)



3. (18 pts) Provide the missing products for each reaction. Indicate no reaction with N.R.



4. (21 pts) Provide the missing reagents for each reaction. Several steps may be needed for some transformations.

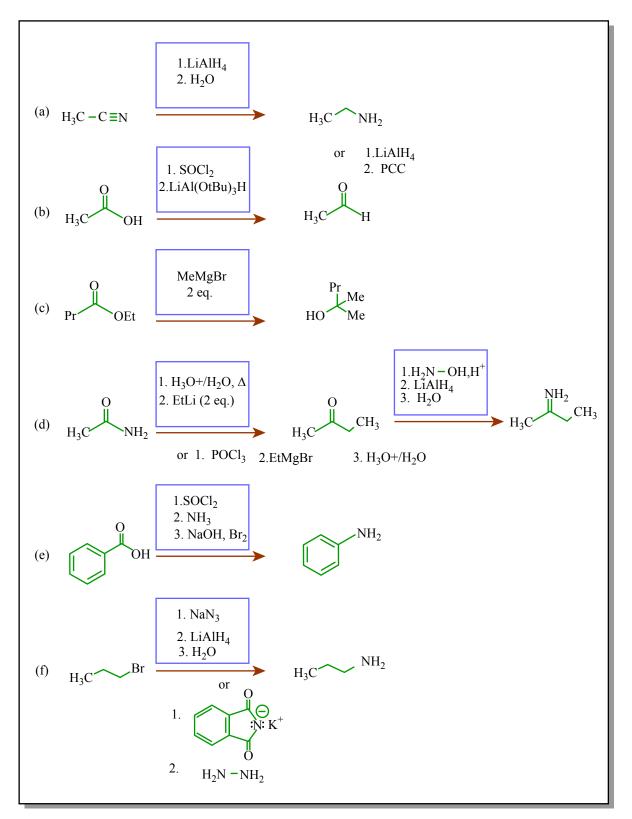


Figure by MIT OCW.

5. (1 2 pts) Consider the labeling experiment outlined below. What level of ¹⁸O incorporation do you expect in the recovered anhydride (high or low)? Your answer should include a mechanism of hydrolysis and a detailed explanation.

Figure by MIT OCW.

6. (10 pts) Provide a mechanism for the following transformation.

Figure by MIT OCW.

7. (10 pts) Under basic hydrolysis conditions, a nitrile goes through a primary amide intermediate before becoming a carboxylate. Show the mechanism for this reaction and explain why it is NOT a facile method for converting nitriles into carboxylates.

8. (9 pts) Provide a synthesis for the following compound.

$$\begin{array}{c} OH \\ \\ \longrightarrow \\ CI \\ \end{array}$$

$$\begin{array}{c} HNO_3 \\ \\ H_2SO_4 \\ \end{array}$$

$$\begin{array}{c} NO_2 \\ \\ \longrightarrow \\ CI \\ \end{array}$$

$$\begin{array}{c} CI_2 \\ \\ \longrightarrow \\ CI \\ \end{array}$$

$$\begin{array}{c} NO_2 \\ \\ \longrightarrow \\ CI \\ \end{array}$$

$$\begin{array}{c} IH_2, Pd \\ \\ \longrightarrow \\ NH_2 \\ \end{array}$$

$$\begin{array}{c} OH \\ \\ \longrightarrow \\ NH_2 \\ \end{array}$$

$$\begin{array}{c} OH \\ \\ \longrightarrow \\ NH_2 \\ \end{array}$$

$$\begin{array}{c} OH \\ \\ \longrightarrow \\ NH_2 \\ \end{array}$$

$$\begin{array}{c} OH \\ \\ \longrightarrow \\ NH_2 \\ \end{array}$$

$$\begin{array}{c} OH \\ \\ \longrightarrow \\ NH_2 \\ \end{array}$$

Figure by MIT OCW.

9. (12 pts) Provide a selective synthesis for **ONE** of the following compounds. Circle the molecule that you want graded. All of the carbon atoms of the product should come from either ethanol or compounds that contain just one carbon atom.

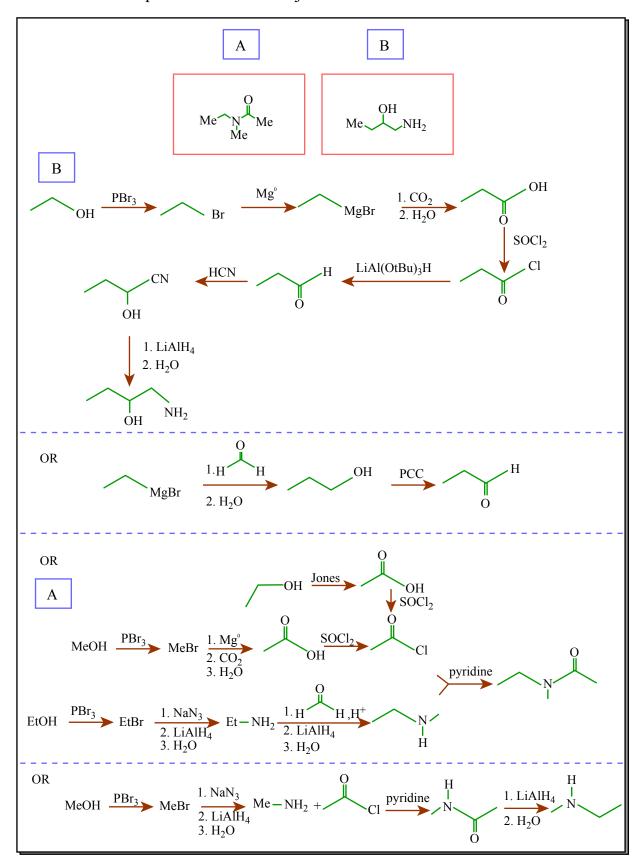


Figure by MIT OCW.

EXTRA CREDIT

(5 pts) Synthesize methamphetamine (crystal meth) from benzene and any other reagents. All the carbon atoms in the product should come from reagents that only contain one carbon atom.

Figure by MIT OCW.