High = 236

Low = 54

Average = 173

CHEM 3331-100 Spring 2007

Final Exam

Professor R. Hoenigman

I pledge to uphold the CU Honor Code:

Signature_____

Name (printed)_____

Last four digits of your student ID number_____

Recitation TA_____

Recitation number, day, and time_____

You have 2 hours and 30 minutes to complete this exam.
No model kits or calculators allowed.
Periodic table and scratch paper are attached.

**** You may "purchase" a structure for a name for 3 points each ****

DO NOT TURN THIS PAGE UNTIL INSTRUCTED TO DO SO.

Recitation Sections:

#	Day	Time	TA
122	Monday	5 pm	Tom
121	Tuesday	8 am	Tom
131	Tuesday	12 pm	Tom
132	Tuesday	12 pm	Lee
161	Thursday	8 am	Tom
171	Thursday	12 pm	Lee

SCORE:

Page 1 _____/30 **Page 5 _____/45**

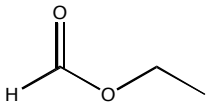
Page 2 _____/25 **Page 6 _____/40**

Page 3 _____/30 **Page 7 _____/25**

Page 4 _____/35 **Page 8 _____/30**

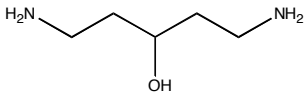
TOTAL_____/250

1. (3 pts) The compound below contributes to the flavor of rum. Give the IUPAC name for this compound.



ethyl formate *or* ethyl methanoate

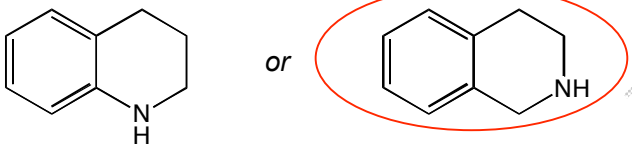
2. (3 pts) Give the IUPAC name for the derivative of cadaverine shown below.



1,5-diamino-3-pentanol

3. (15 pts) Circle the more basic compound in each of the following pairs. In the adjacent box provide an explanation for your choice.
(2 pts each circle, 3 pts each explanation)

A. Book Problem 22.6



The lone pair of electrons is more accessible since it is not in resonance with the aromatic ring.

(aryl amine *vs* alkyl amine)

B. Book Problem 22.7c

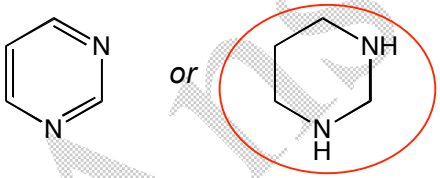
aniline

or

p-aminoacetophenone

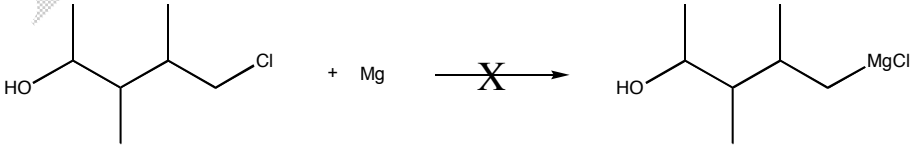
Less resonance for the lone pair of electrons.

C.



sp^3 nitrogens have less s-character, making the electrons more available for bonding.

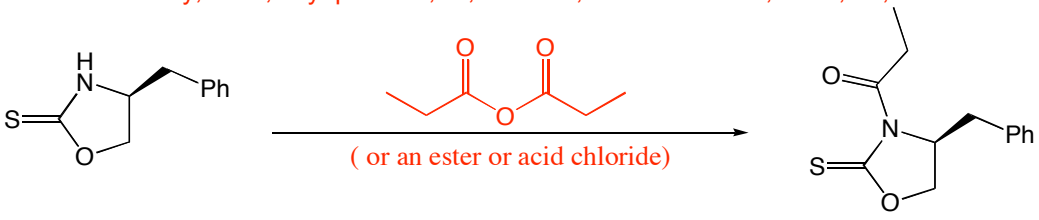
4. (9 pts) Explain why the reaction below will not generate the desired Gringard reagent.



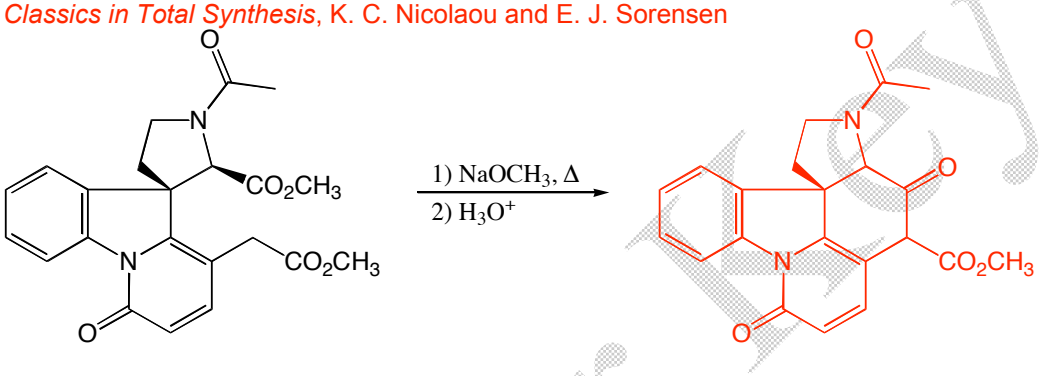
The magnesium will undergo an oxidation-reduction reaction with the hydroxyl group, rather than with the chlorine.

5. (25 pts) The partial syntheses below have been taken from the literature. All of these reactions we have studied this semester. Fill in the missing reagents or products for each of these reactions.
(5 points each)

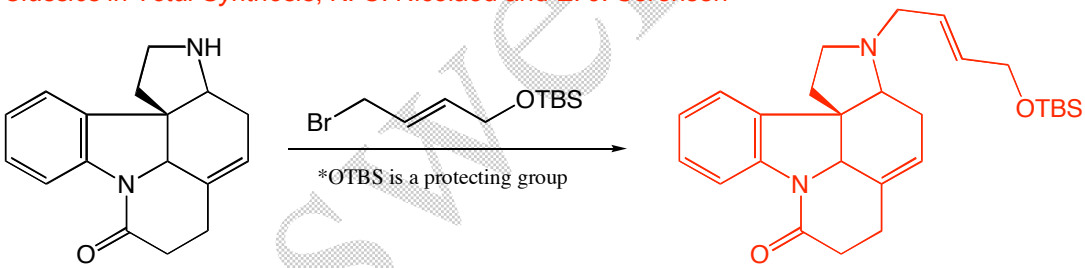
A. Chakraborty, T. K.; Jayaprakash, S.; Laxman, P. *Tetrahedron*, **2001**, *57*, 9461.



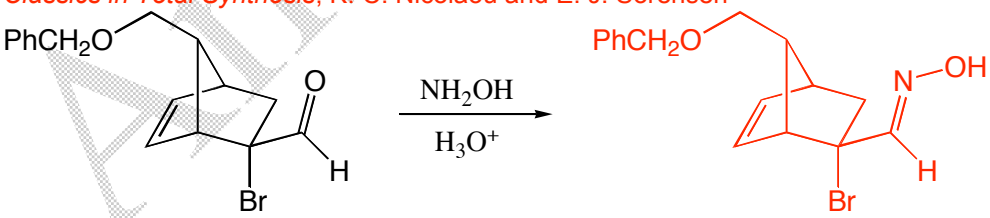
B. *Classics in Total Synthesis*, K. C. Nicolaou and E. J. Sorensen



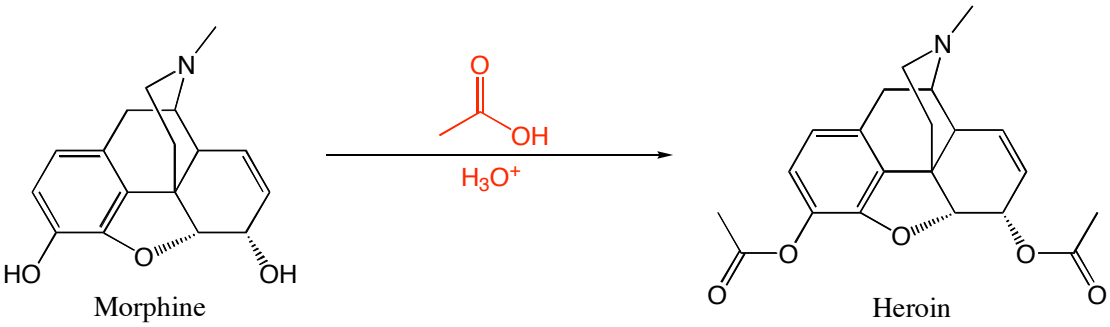
C. *Classics in Total Synthesis*, K. C. Nicolaou and E. J. Sorensen



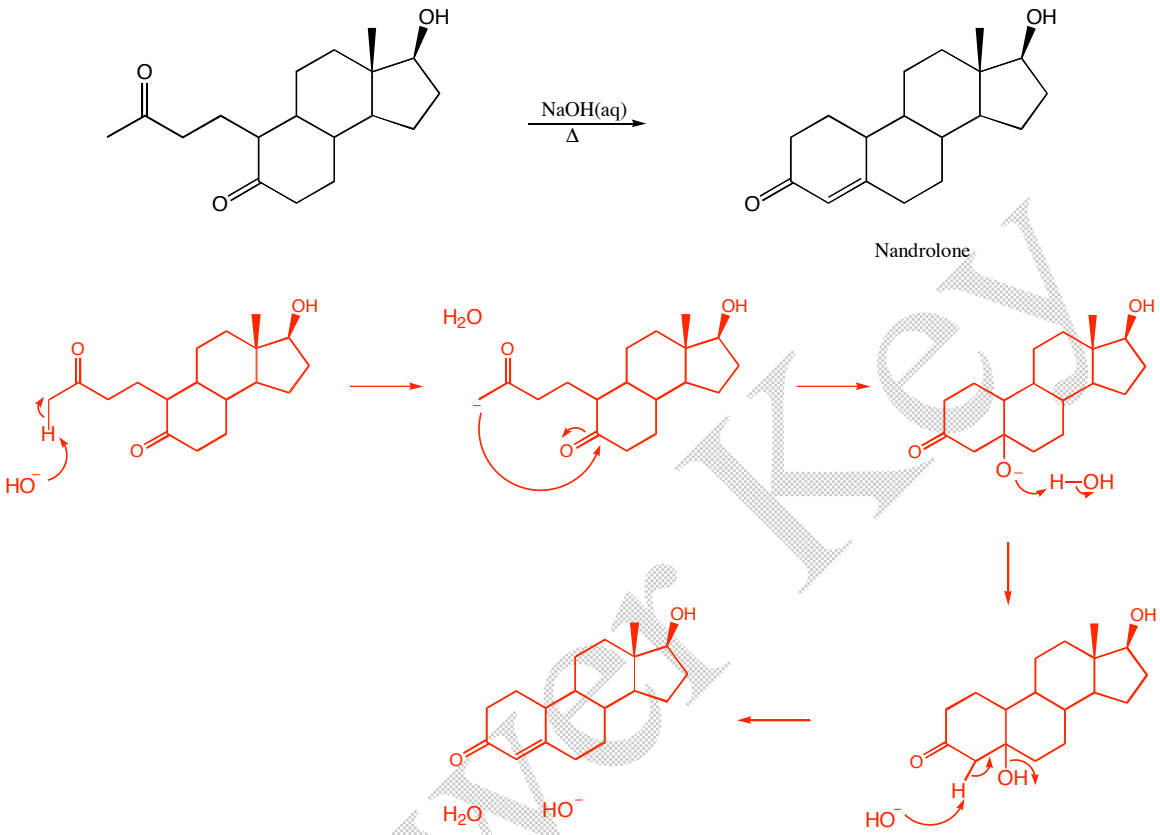
D. *Classics in Total Synthesis*, K. C. Nicolaou and E. J. Sorensen



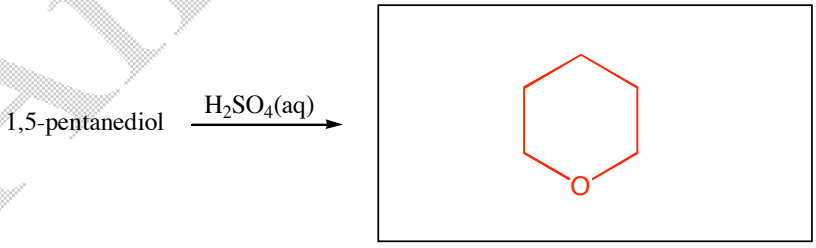
E.



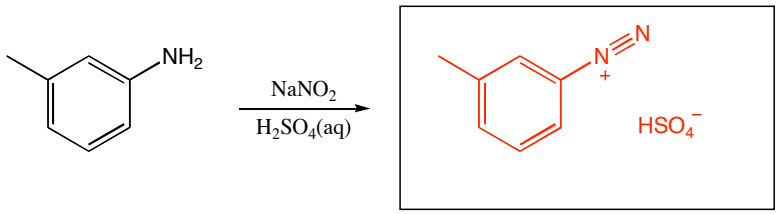
6. (15 pts) Nandrolone is an anabolic steroid that occurs naturally in humans in small amounts. However, some athletes inject nandrolone to improve their athletic performance, and tend to get banned from competition when discovered. Using arrows to show the flow of electrons, give a mechanism for the formation of nandrolone from the reaction below.

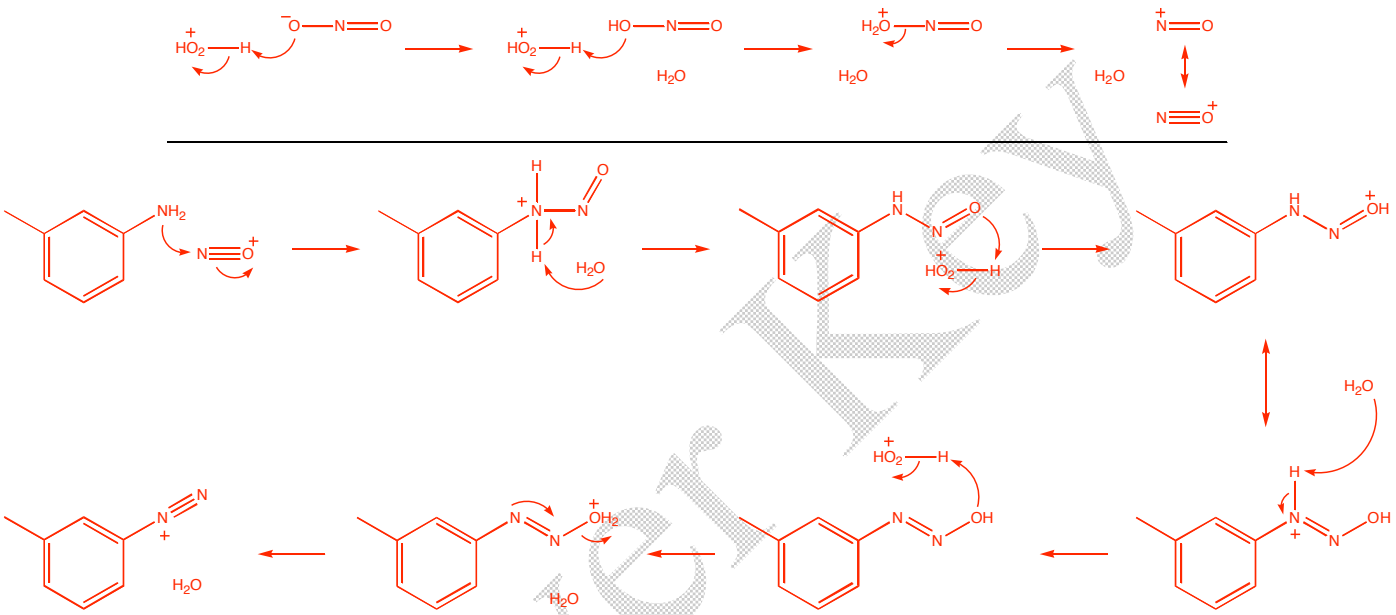


7. (15 pts) Fill in the major organic product of the following reaction and, using arrows to show the flow of electrons, propose a mechanism for its formation.
Book Problem 15.8

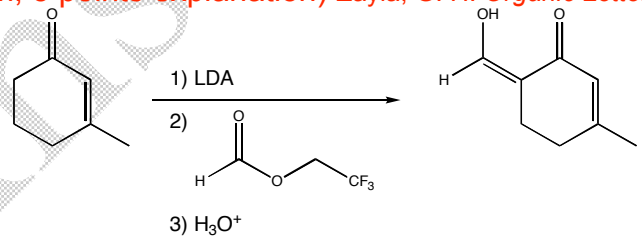


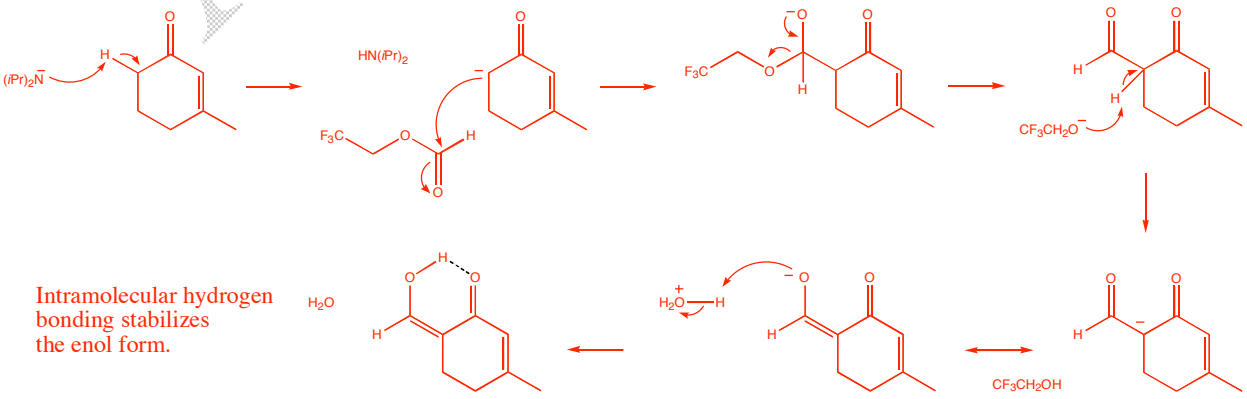
8. (15 pts) Give the major organic product of the following reaction and, using arrows to show the flow of electrons, propose a mechanism for its formation.





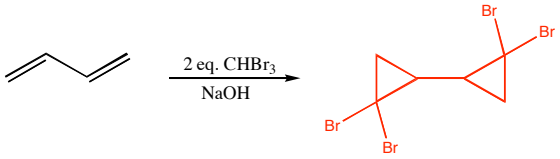
9. (20 pts) Explain why the product of the reaction below exists in the enol, rather than keto, form. Draw an arrow-pushing mechanism to account for this reaction.
(15 points mechanism, 5 points explanation) Zayia, G. H. *Organic Letters*, **1999**, *1*, 989.



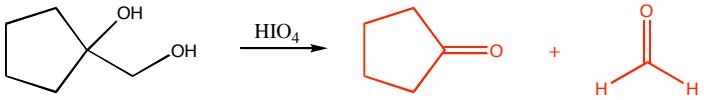


10. (45 pts) Draw the major organic product(s) of the following reactions. Write NR if no reaction occurs. Be sure to show stereochemistry if necessary.
(5 points each)

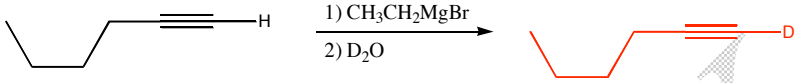
A.



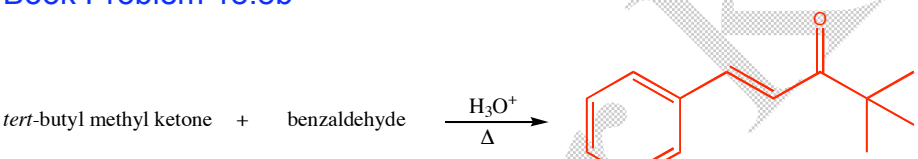
B. Book Problem 15.14c



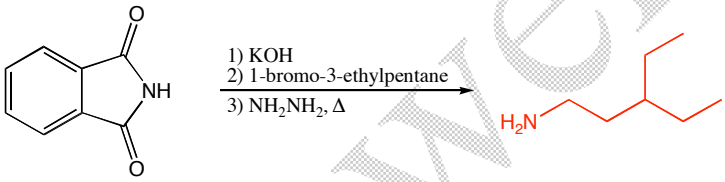
C. Book Problem 14.7



D. Book Problem 18.8b

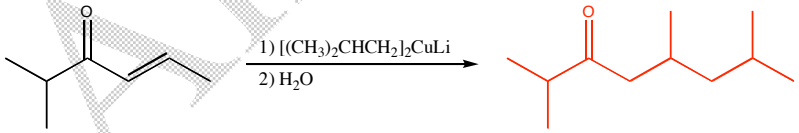


E.

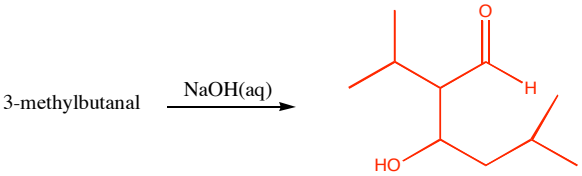


F. Book Problem 16.25h

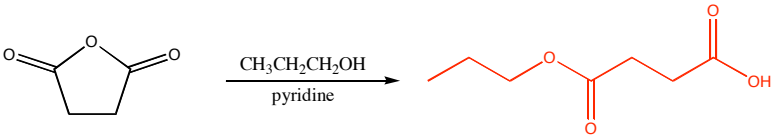
G.



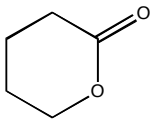
H. Book Problem 18.4c

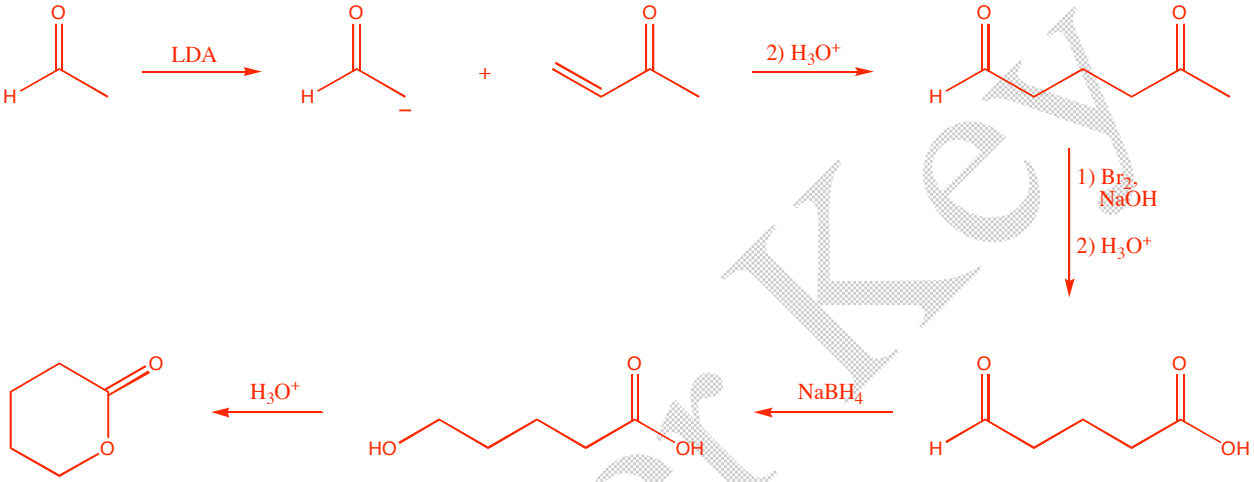


I. Book Problem 15.29k

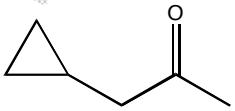


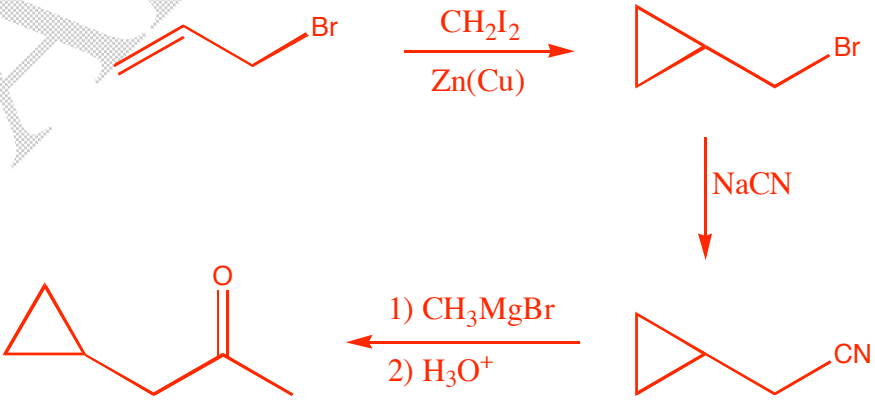
11. (20 pts) Propose an efficient synthesis for the lactone below using acetaldehyde (and 3-butenone) as your only source of carbons. You may use any inorganic reagents you like.



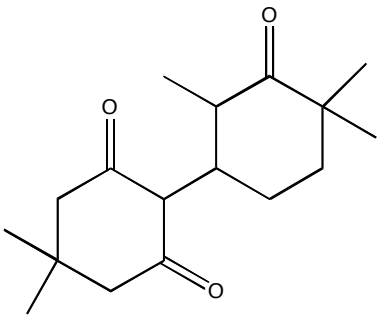


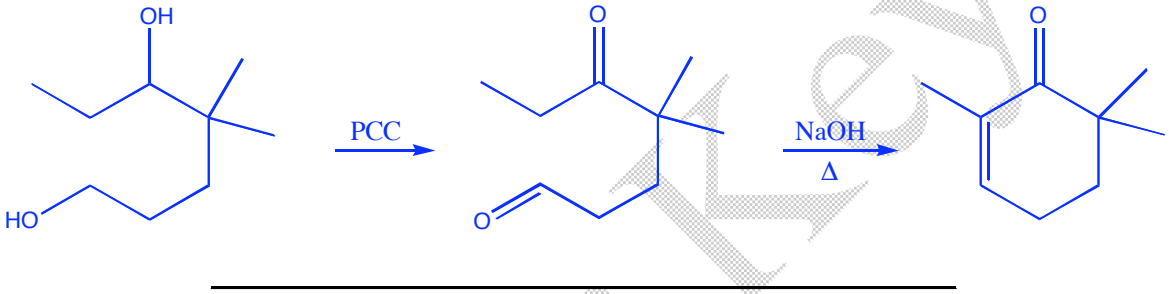
12. (20 pts) Propose an efficient synthesis for the ketone below. You must use allyl bromide, but may use any additional reagents containing two or fewer carbons.

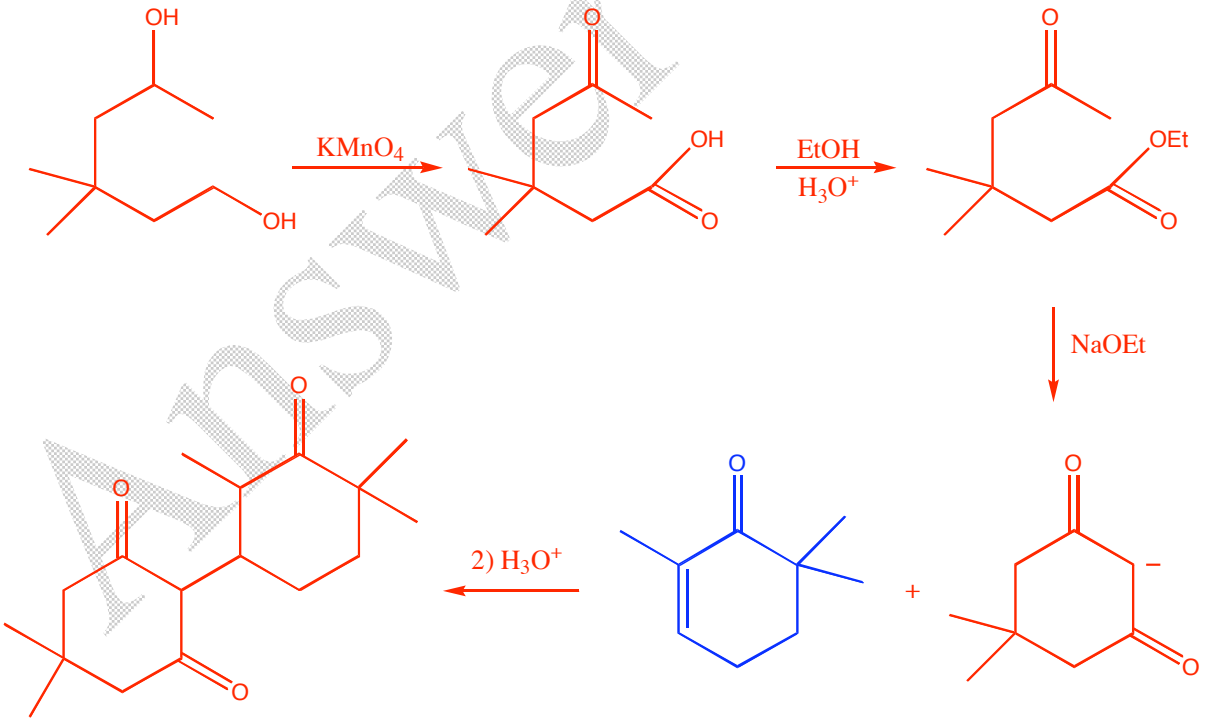




13. (25 pts) Propose an efficient synthesis for the compound below. All of your carbon atoms must originate from acyclic diols. You may use any inorganic reagents you like.

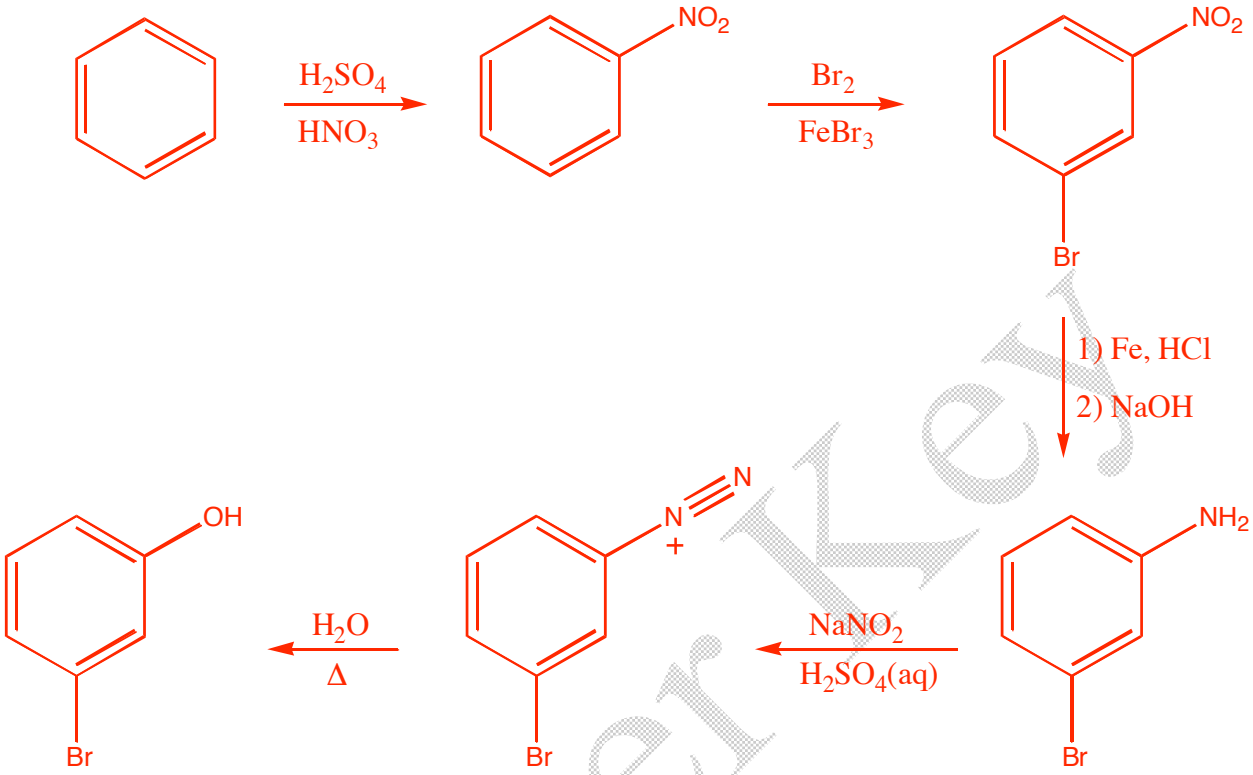






14. (20 pts) Propose an efficient synthesis for *meta*-bromophenol starting from benzene.

Book Problem 22.18



Extra Credit (10 pts): In an outline form, briefly explain how you would purify an amine or carboxylic acid. (*i.e.* Step 1…, Step 2…)

1) Wash with water to remove organic impurities
2) React amine with HCl to form salt (or use base with the carboxylic acid)
3) Wash with organic solvent to remove organic impurities
4) React with NaOH to form amine (or with HCl to form carboxylic acid)