CHEM 3331-100 Spring 2008

Final Exam

Professor R. Hoenigman

High = 264

Low = 59

Average = 187

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 use a 3" x 5" notecard.

**** 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	Ashley
121	Tuesday	8 am	Noel
131	Tuesday	12 pm	Jin
132	Tuesday	12 pm	Ashley
161	Thursday	8 am	Morin
171	Thursday	12 pm	Jin

SCORE:

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

Page 4 _____/20 **Page 8 _____/16**

TOTAL _____/250

1. (6 pts) What is the IUPAC name of $(CH_3)_2CHOCH_2CH_2CH_2CH_3$?

A. butyl isopropyl ether

B. isobutyl propyl ether

C. *sec*-butyl isopropyl ether

D. butyl propyl ether

2. (6 pts) The reaction of excess Grignard reagent with an ester of formic acid gives

A. a primary alcohol.

B. a secondary alcohol.

C. a tertiary alcohol.

D. methanol.

3. (6 pts) Rank the following compounds in order of ***decreasing*** reactivity to aromatic electrophilic bromination.

I. benzene II. toluene III. benzoic acid IV. phenol

A. IV > II > I > III

B. IV > III > II > I

C. II > I > IV > III

D. II > III > IV > I

4. (6 pts) What is an acceptable IUPAC name of the following compound?

$CH_3CH_2CH_2CH_2NHCH_3$

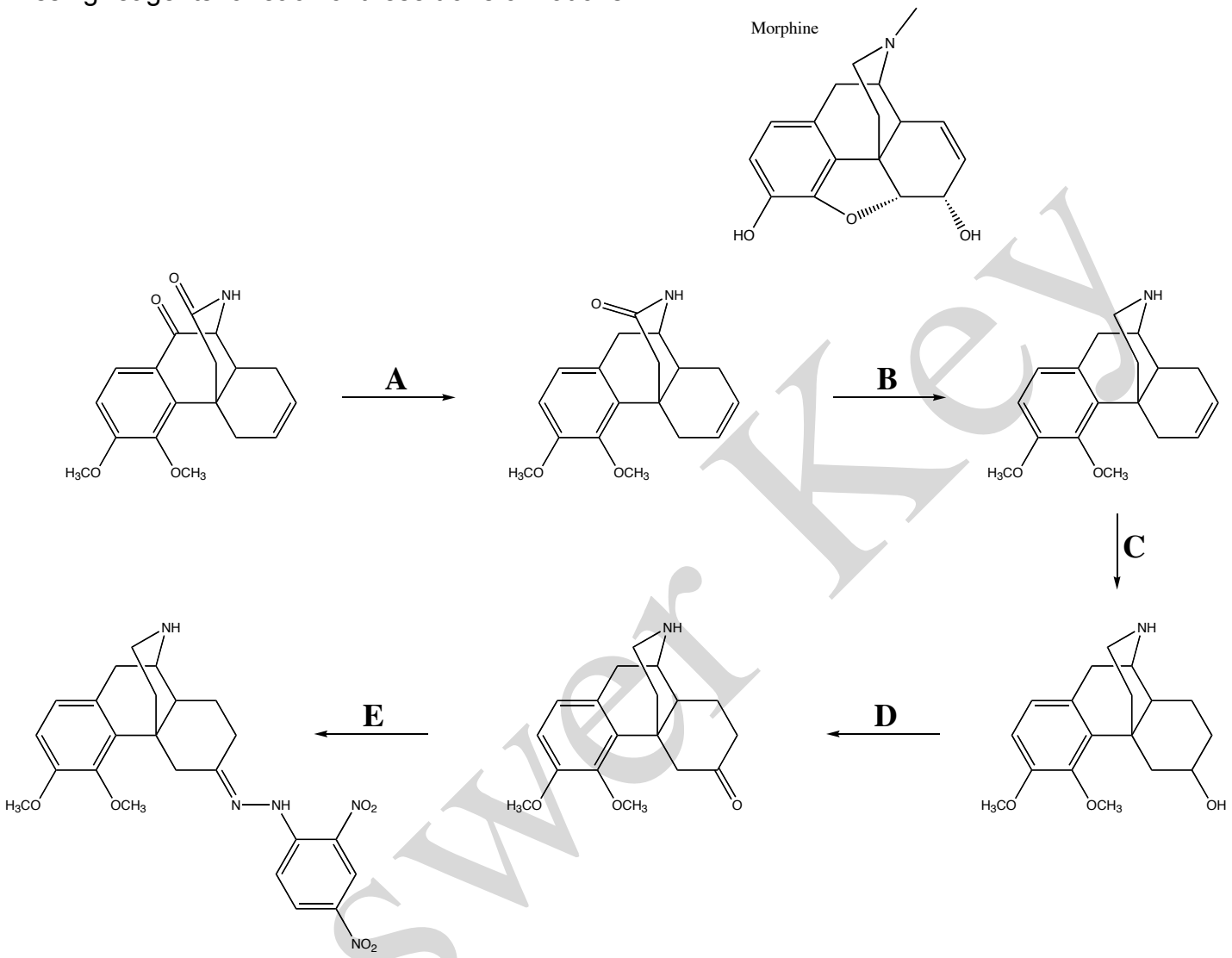
A. *N*-methylbutylamine

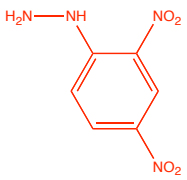
B. 1-methyl-1-butylamine

C. *N*-methylaminobutane

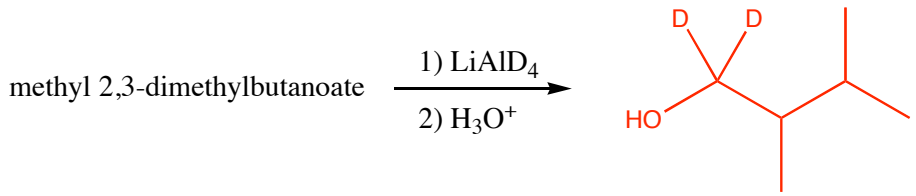
D. 2-pentylamine

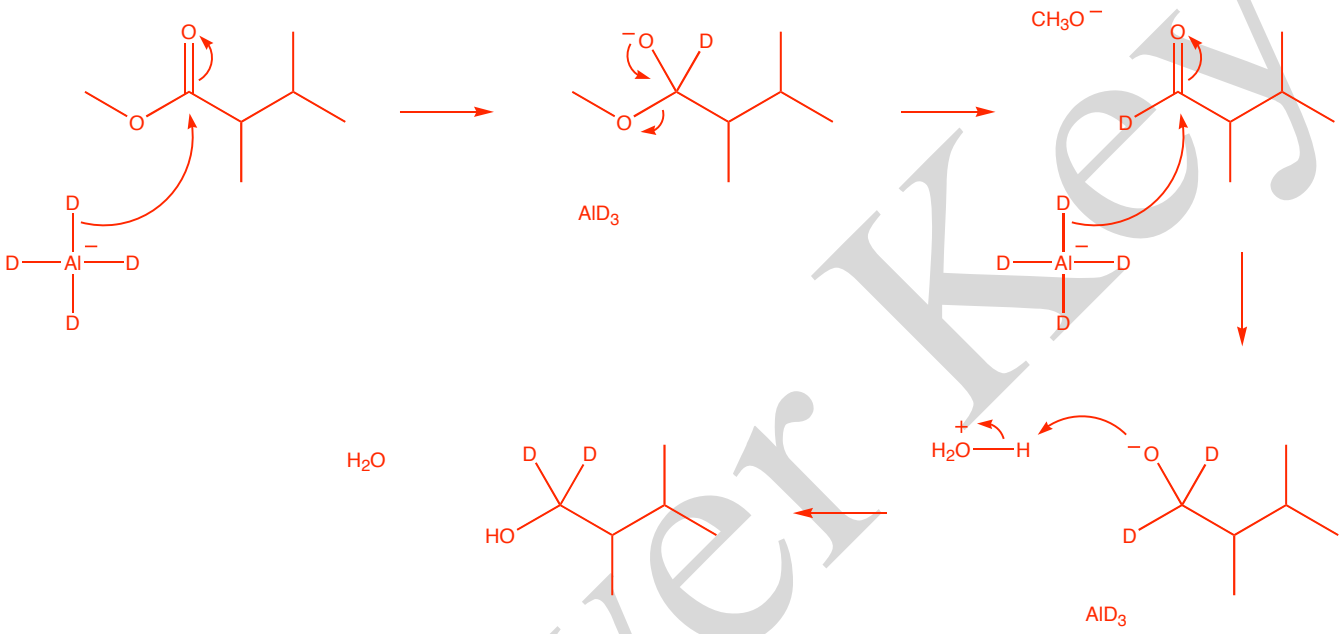
5. (30 pts) The schematic outline below consists of intermediate steps in the synthesis of morphine. All of these reactions we have studied this semester. In the boxes below, fill in the missing reagents for each of these transformations.



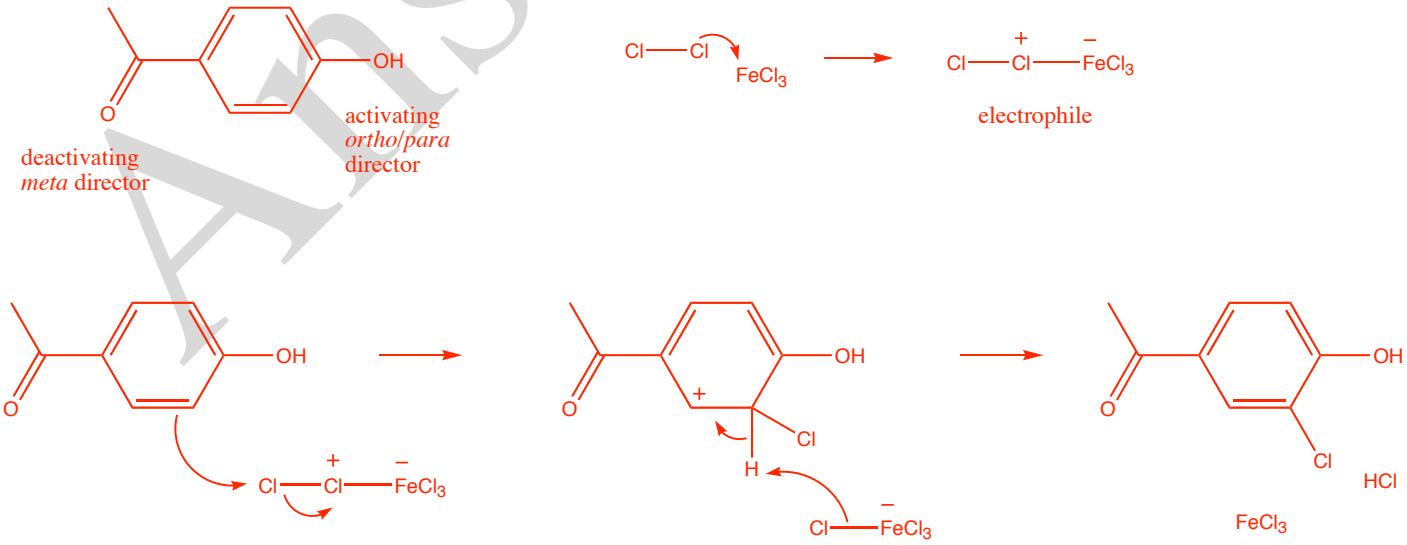
A (Wolf Kishner or Clemmensen Reduction) N_2H_4 and KOH or Zn(Hg) and HCl	B (Reduce amide) 1) LAH 2) H_3O^+	C (alkene → alcohol) $H_2SO_4(aq)$
D (oxidize alcohol) PCC , etc	E (ketone → imine) H_3O^+ and 	

6. (15 pts) Fill in the product of the following reaction and, using arrows to show the flow of electrons, propose a mechanism for the transformation.

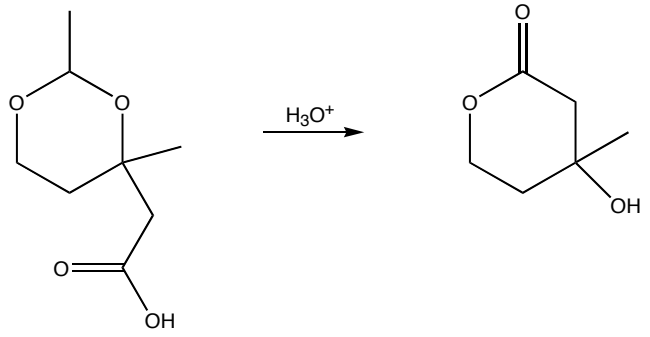


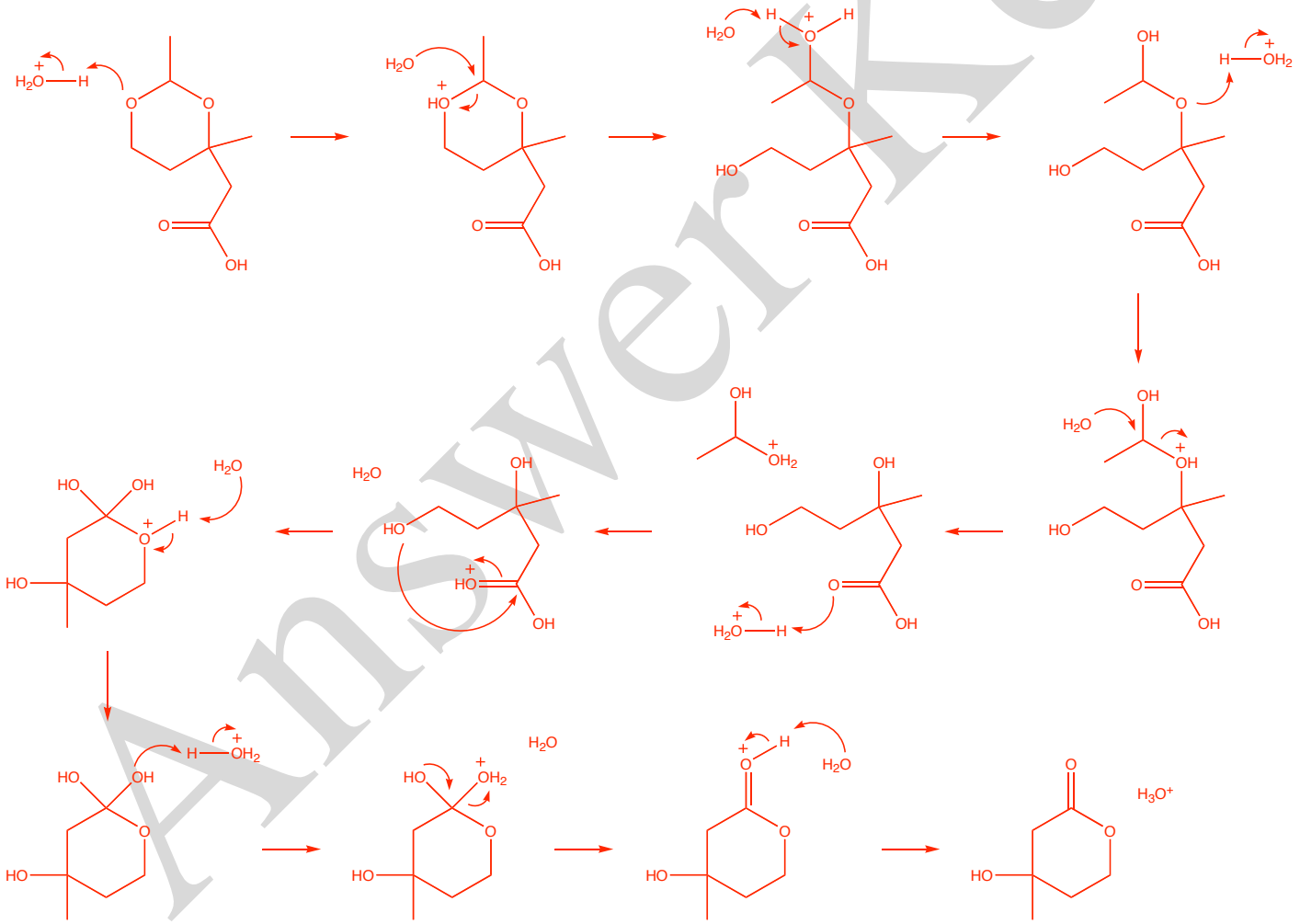


7. (15 pts) Using arrows to show the flow of electrons, propose a mechanism for the chlorination of *para*-hydroxyacetophenone.



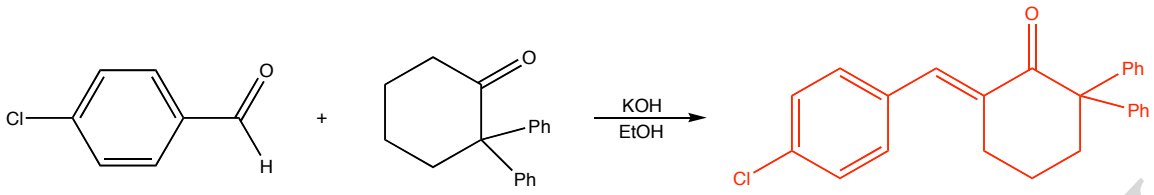
8. (20 pts) Using arrows to show the flow of electrons, propose a mechanism for the following transformation.
Book Problem 19.29



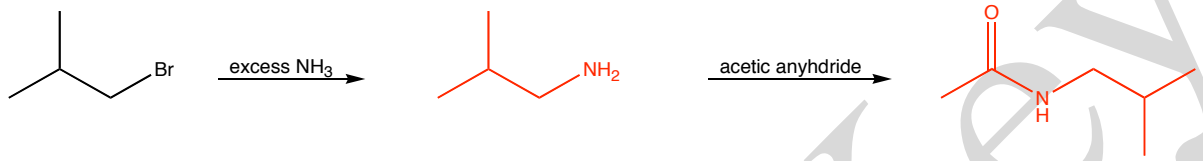


9. (70 pts) Draw the major organic product(s) of the following reactions. Write NR if no reaction occurs. Be sure to show stereochemistry if necessary.

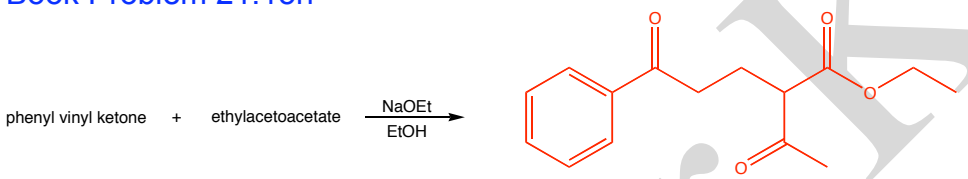
A. Book Problem 18.27d



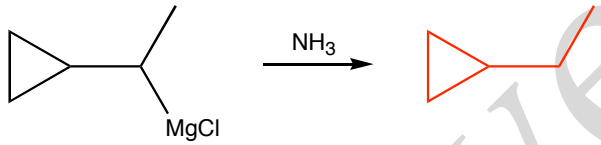
B.



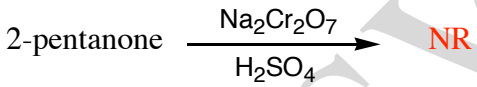
C. Book Problem 21.15h



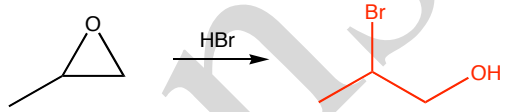
D.



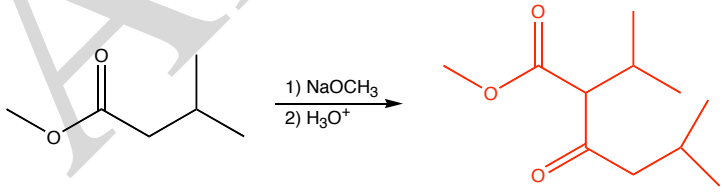
E.



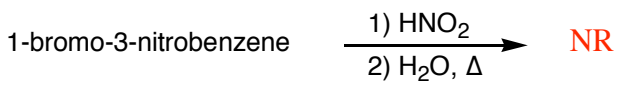
F.



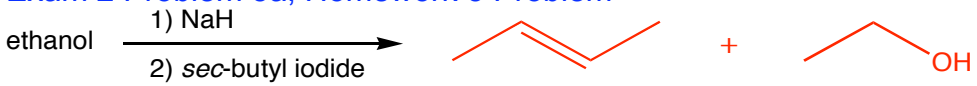
G.



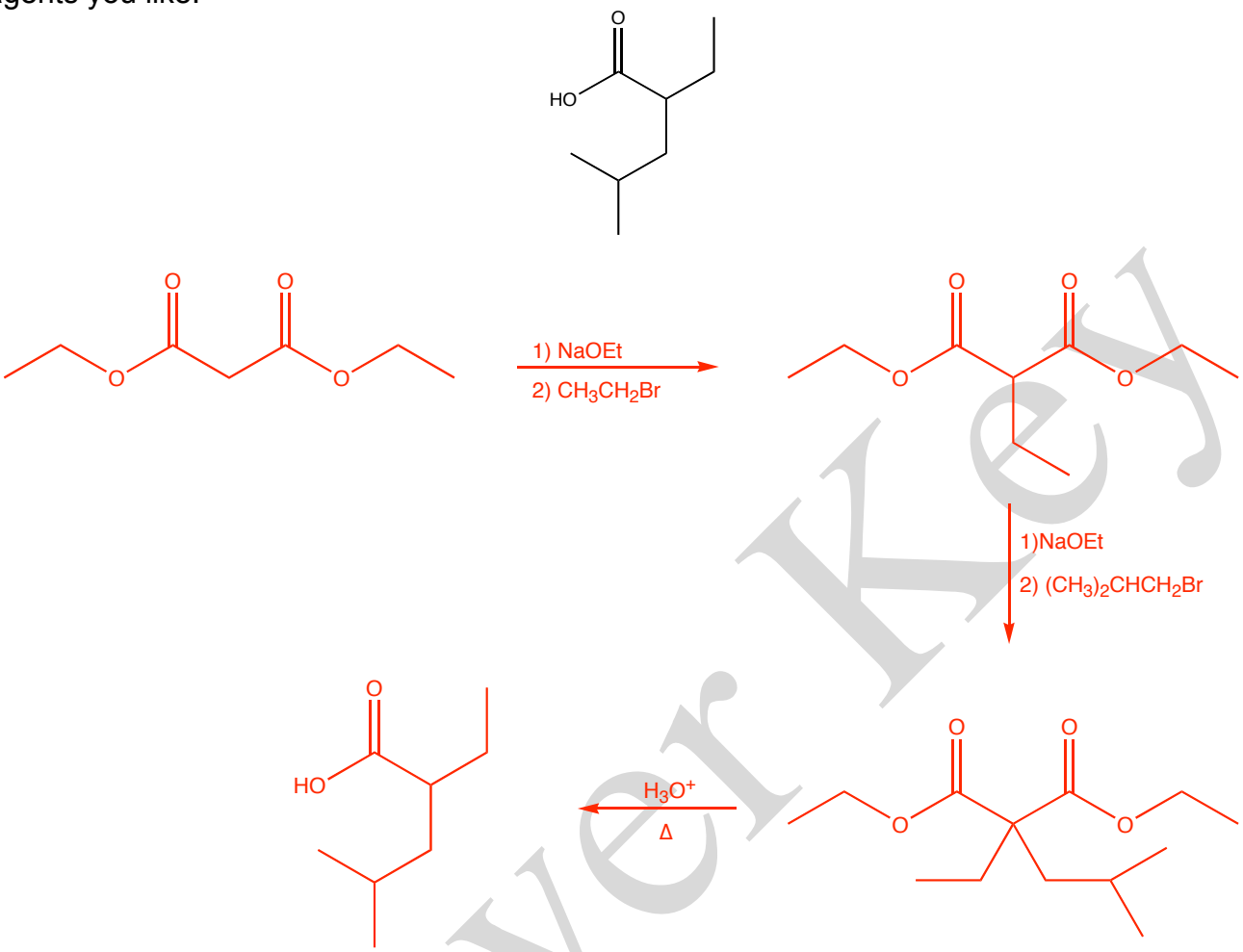
H.



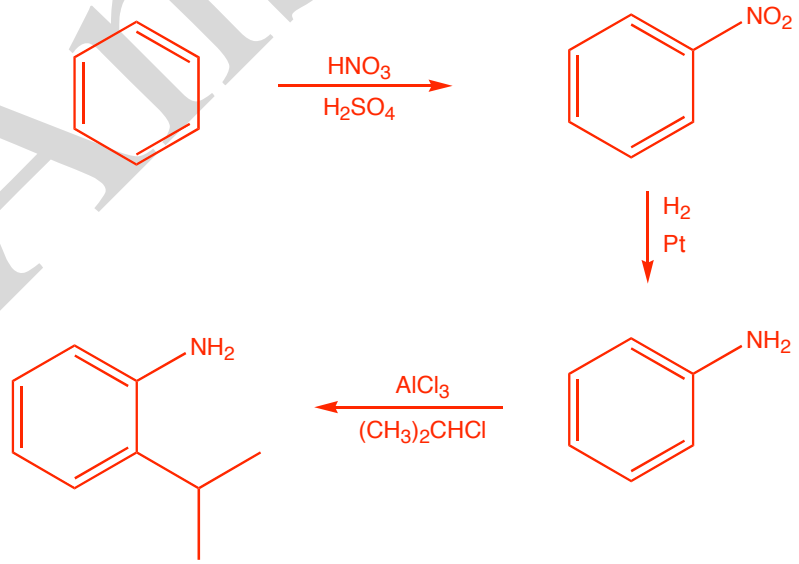
I. Exam 2 Problem 5a, Homework 5 Problem



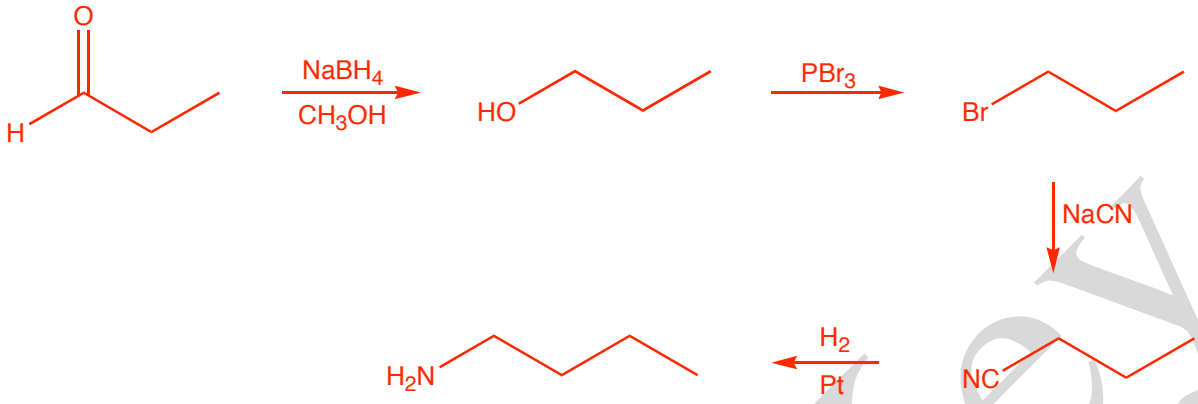
10. (15 pts) Use the malonic ester synthesis to make the compound below. You may use any reagents you like.



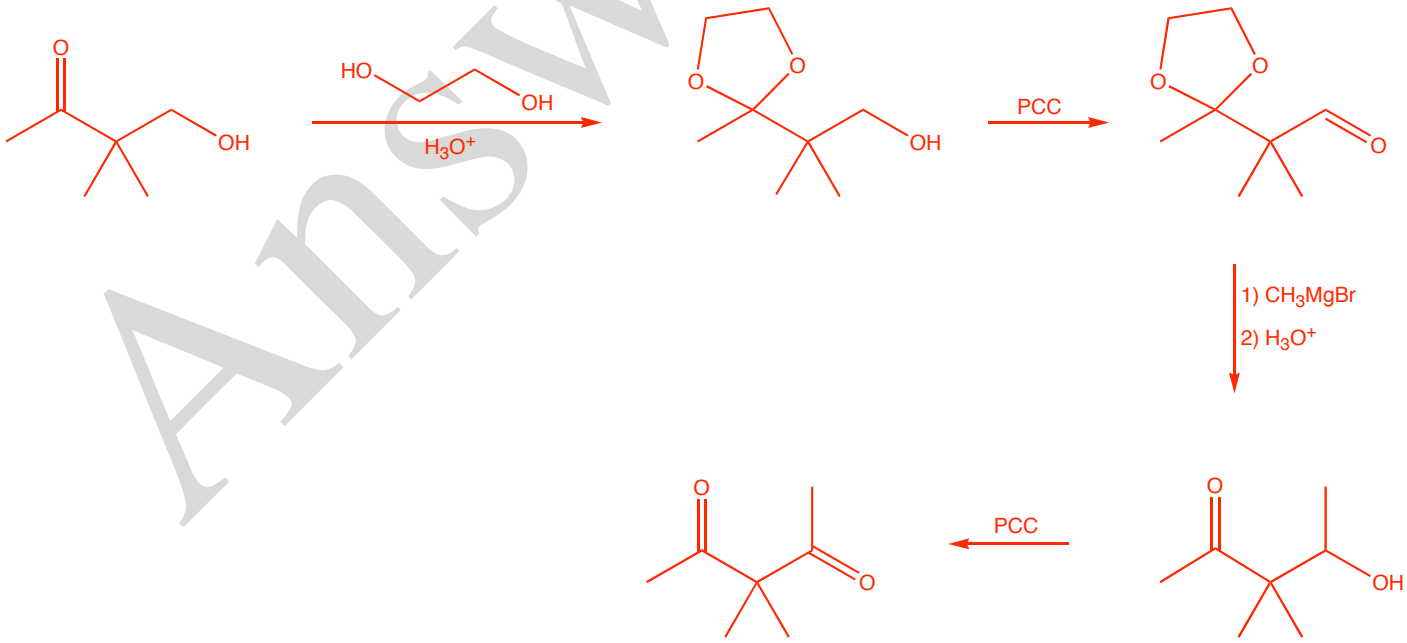
11. (15 pts) Propose an efficient synthesis of *ortho*-isopropylaniline starting from benzene. You may use any reagents you like.
Book Problem 22.12a



12. (15 pts) Propose an efficient synthesis of butylamine starting from propanal. You may use any reagents you like.



13. (15 pts) Propose an efficient synthesis of 3,3-dimethyl-2,4-pentanedione starting from 4-hydroxy-3,3-dimethyl-2-butanone. You may use any reagents you like.
Homework 7 Problem



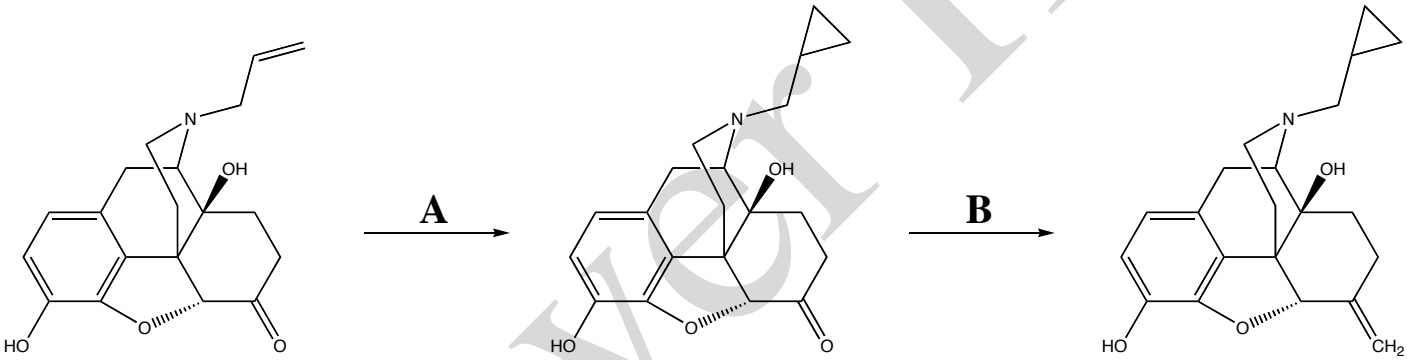
14. (16 pts) The compounds below are opioid antagonists that block the receptor that is activated by morphine.

A. Compare and contrast the structures below with that of morphine (see page 2). Give a brief reason why these compounds are able to prevent the body from responding to morphine.

As a general rule, "shape determines function". Since all three opioids have a similar carbon backbone to morphine, they will most likely fit into the same receptor in the body.

These compounds differ in either the amine group (naloxone has an allyl amine and the other two antagonists have a cyclopropylmethyl group), or in the carbonyl group (nalmefene has a methylene group in place of the ketone in the other two compounds).

B. In the boxes below, give the appropriate reagent(s) for each transformation.



naloxone naltrexone nalmefene

A	B
Zn CH_2I_2	$CH_2=PPh_3$

Extra Credit (15 pts): On Exam 3, there was a molecule called Edward Scissorhands. In the space below, draw a parody of organic nomenclature.