A1

CHEM 3331, Professor Zhang, Spring 2017
Second hour exam, Mar 14, 2017

Printed Name:_____ Student ID:_____

Recitation TA Name:_____Recitation day and time:_____

Scores:

1)

2)

3)

4)

5)

Key

CU Honor Code Pledge: On my honor, as a University of Colorado at Boulder Student, I have neither given nor received unauthorized assistance.

This is a closed-book exam. The use of notes, models, calculators, scratch paper will not be allowed during the exam. Please put all your answers on the test. Use the backs of the pages for scratch.

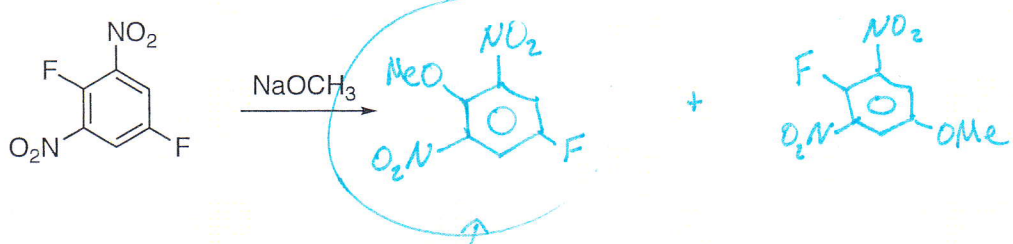
Partial Periodic Table

1A	2A	3A	4A	5A	6A	7A	8A
1 H							2 He
3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
						35 Br	
						53 I	

A2

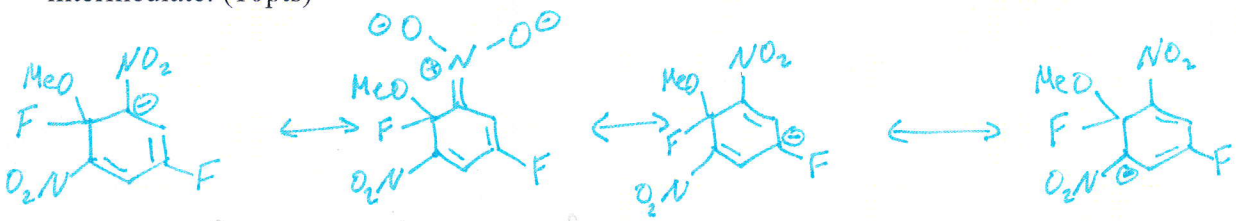
1) (26pts)

a) The following compound reacts with sodium methoxide (1.0 equivalent) to give two products. Give the structures of the two products. (6pts)



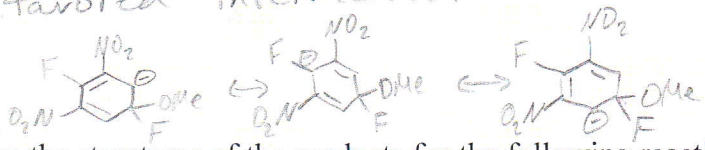
b) Circle the product that is more favored? (2pts)

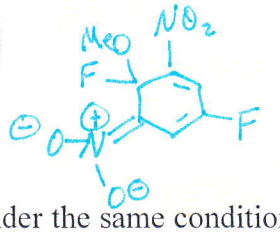
c) The reactions above involve formation of reactive intermediate anions. For the more favored product, draw all the important resonance contributors to the structure of the anion intermediate. (10pts)



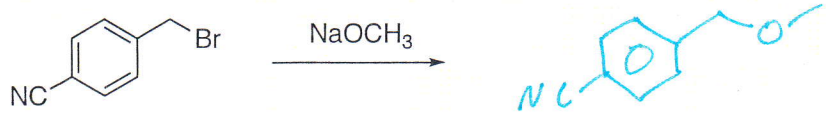
2 pts for each res. form

(Can earn up to 5 pts for showing correct res. forms of the less favored intermediat



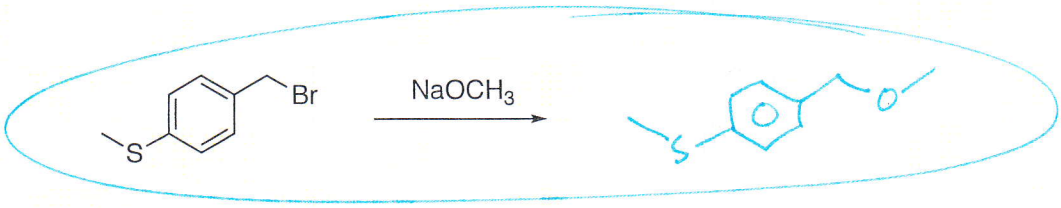


d) Give the structures of the products for the following reactions. Under the same conditions, circle the **faster** reaction? (8pts)

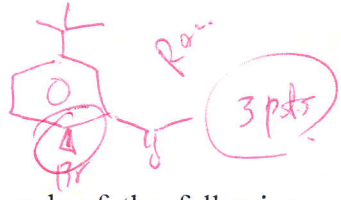


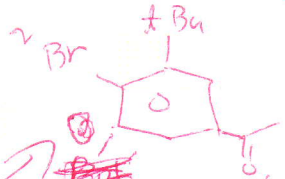
4 pts for products

4 pts for faster Rxn



A3

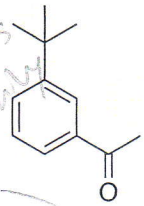




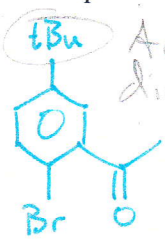
2) (16 pts) Give the single major product of each of the following reactions, carefully showing stereochemistry if appropriate. If a racemate is formed, show only one enantiomer, and label it "rac". All reactions have an appropriate aqueous work up.

2pts partial credit if answers are correct w/ only minor error (such as # of C's)

a)



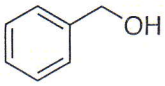
Br_2, $FeBr_3$ →



Activating group directs Br para preferred b.c. of sterics

5 pts

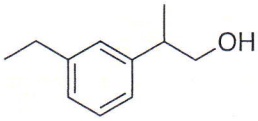
b)



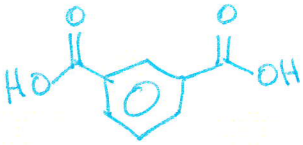
a) PBr3
b) Mg
c) 

6 pts

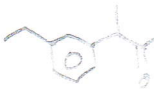
c)



Jones reagent
100 °C/ 1day →

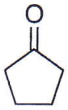


5 pts

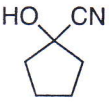
(2pts for )

3) (18 pts) Propose reagents for accomplishing the following transformations. NOTE: more than one step may be required! Try to make your synthesis efficient (i.e. the desired product should be the major product, and generally a shorter synthesis is better than a longer one). You must use the starting material given; you may use any other reagents you need.

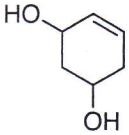
a)



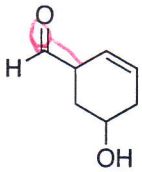
HCN, NaCN (cat/5%) →
3' 3'



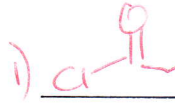
b)

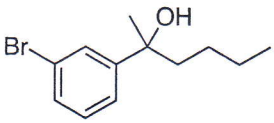


MnO_2 →
6'



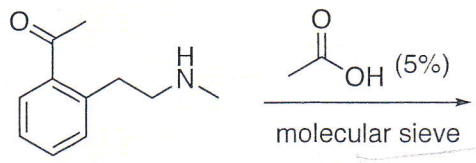
c)

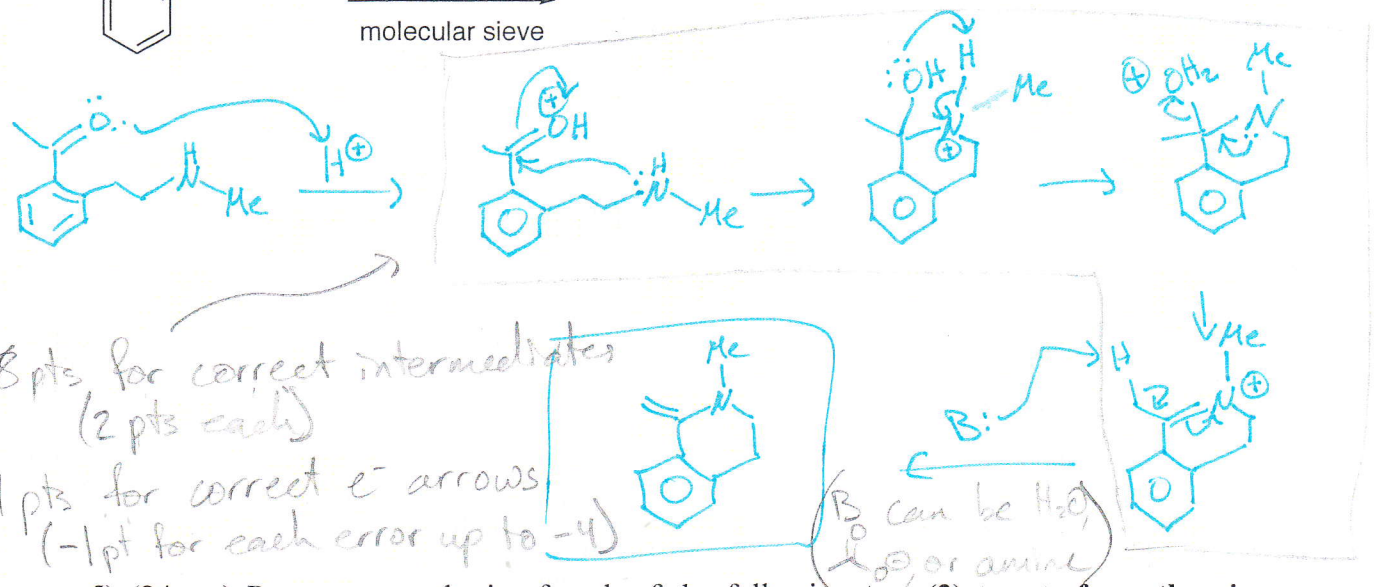
1)  , $AlCl_3$ 2
2) Br_2 $FeBr_3$ 2
3) MeMgBr
H^+ workup 2 →



A4

4) (16 pts) Provide the product and mechanism for the following reaction. Show every intermediate with the proper charges and all the arrows required for each step of the reaction. (4 pts for product, 12 pts for mechanism).





8 pts for correct intermediates (2 pts each)

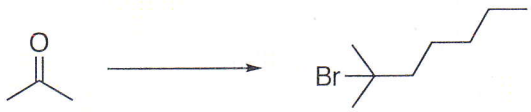
4 pts for correct e⁻ arrows (−1 pt for each error up to −4)

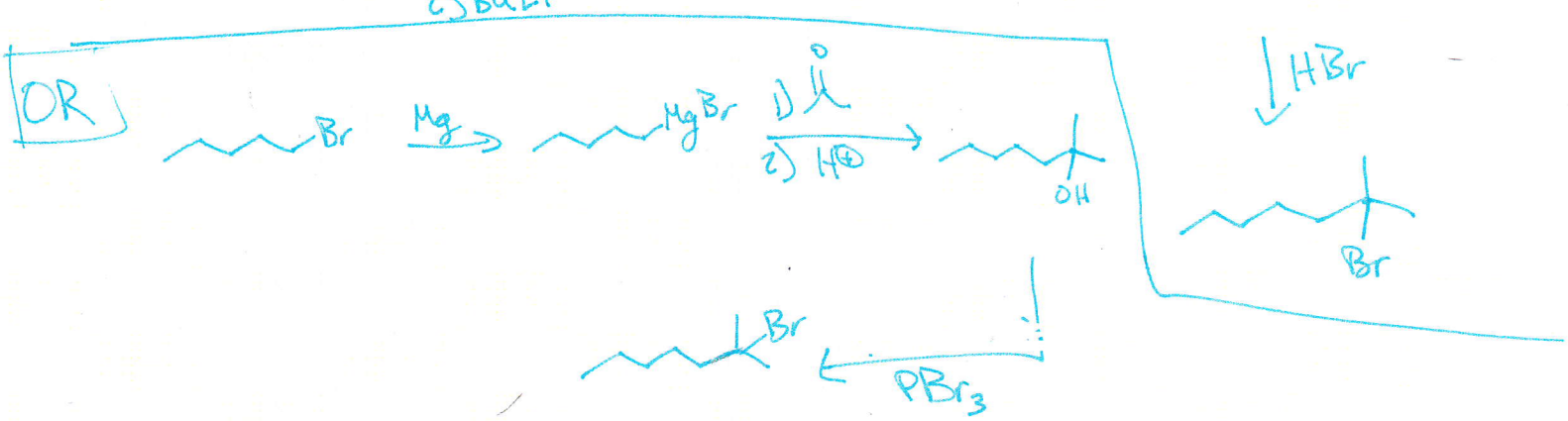
(B can be H_2O, $^{\ominus}OC(=O)R$ or amine)

5) (24 pts) Propose a synthesis of each of the following **two (2)** targets **from the given starting material**. Other allowed starting materials include triphenylphosphine and/or any other organic molecules containing **five (5)** carbons or less. You may use any necessary inorganic reagents. Try to make your synthesis efficient (i.e. the desired product should be the major product, and generally a shorter synthesis is better than a longer one). More than one step may be required.

Other syntheses may work. Minus pts by TA discretion.

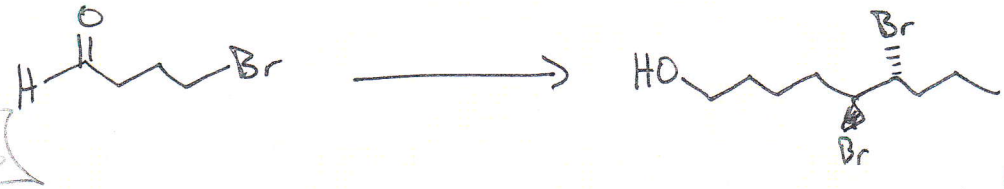
10pts a)





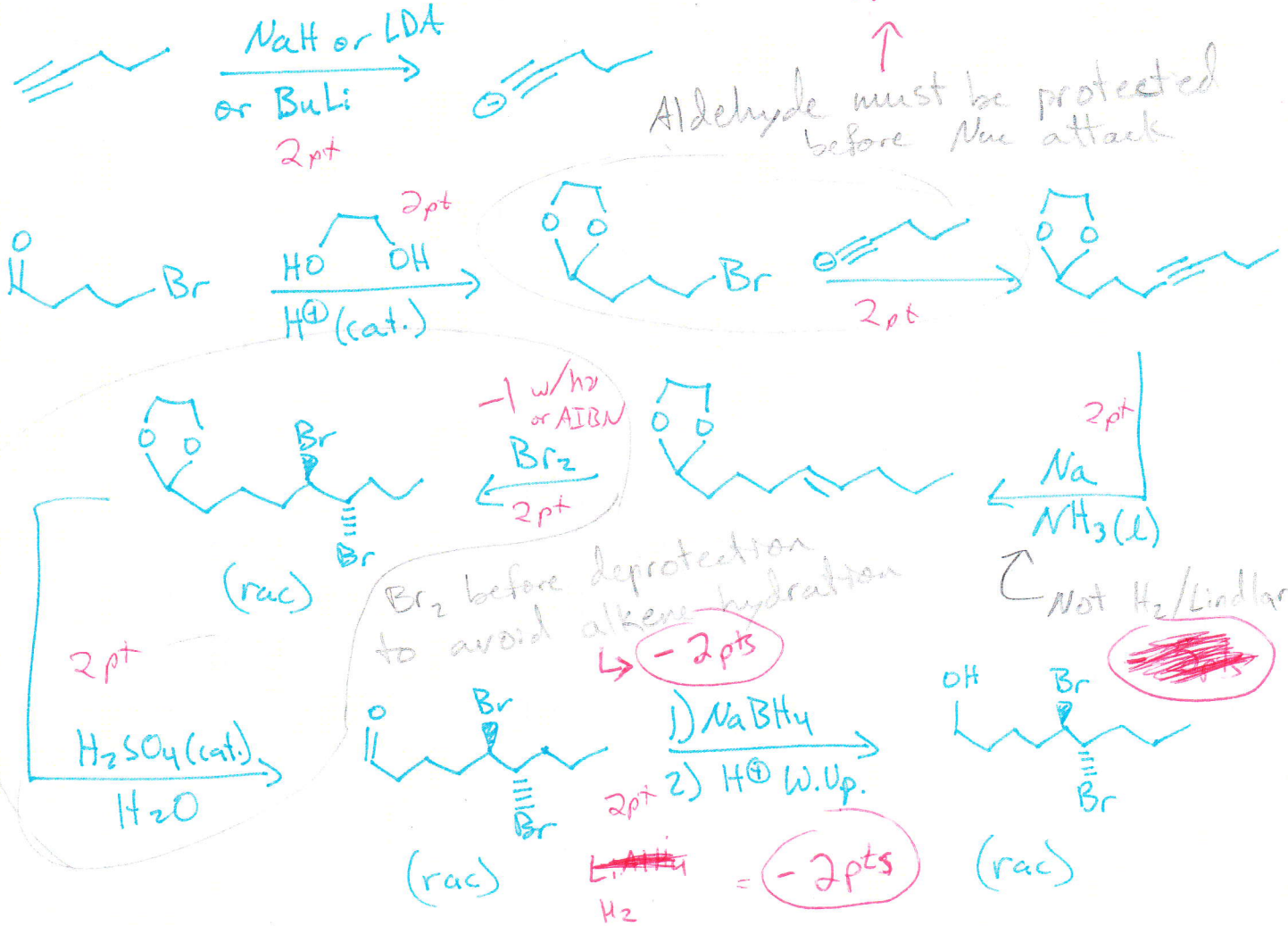
b) A5

14 pts



no PG -5 pts

Aldehyde must be protected before Nuc attack



There may be other routes that also work
(In all cases, if a protecting group is needed, but not used, no more than half credit on this question)

Minus points for incorrect conditions and "magic" by TA discretion.

-2 pts no control of alkene