

Exam #2

Chemistry 220B (01) Kaszynski

February 28, 2006

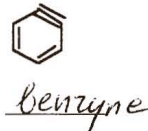
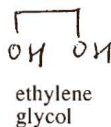
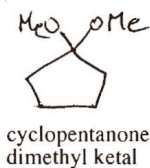
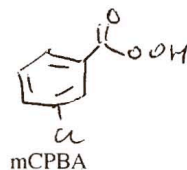
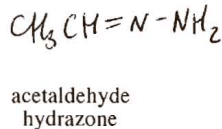
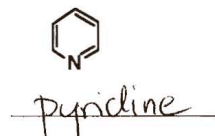
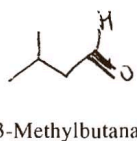
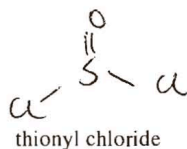
Student Name: Key (please print)

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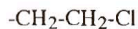
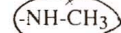
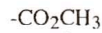
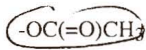
You have 50 minutes to complete this exam. Exams are due promptly at 10:50. Partial credit will be given for partially correct answers in most cases, so be sure to show your work.

### I. General Knowledge & Exam 1 review (46 pts)

1. (10 pts) Give the structures of the molecules written below and provide the names of any structures shown.



2. (10 pts) *Deja vu*. Circle the  $\pi$  electron donating groups and underline the  $\pi$  electron withdrawing groups listed below.



3. (6 pts) True or False. **Read the questions carefully.** (Circle T or F)

i. Enamine formation is reversible.

T F

ii. Secondary alcohols are obtained by reduction of esters with LiAlH<sub>4</sub>.

T F

iii. The LUMO of acetaldehyde is the  $\pi_{\text{C=O}}^*$  MO

T F

problem

points

name: \_\_\_\_\_

I. General knowledge (page 1) \_\_\_\_\_ (26 pts)

(page 2) \_\_\_\_\_ (20 pts)

II. Reactions \_\_\_\_\_ (29 pts)

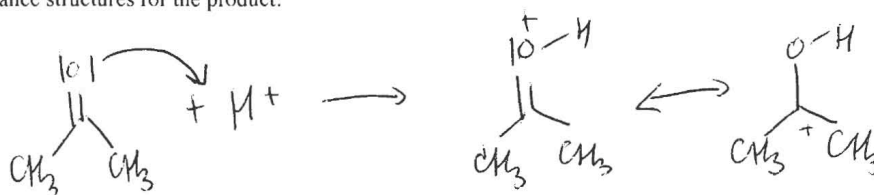
III. Mechanisms \_\_\_\_\_ (20 pts)

IV. Synthesis \_\_\_\_\_ (10 pts)

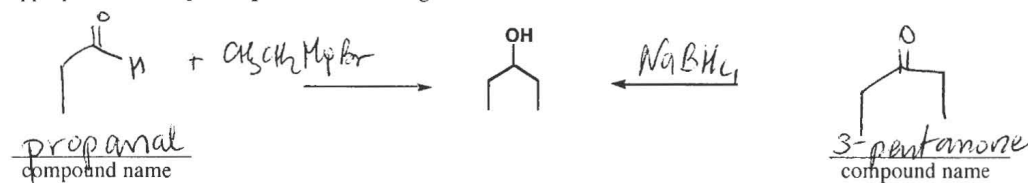
TOTAL \_\_\_\_\_ (105 pts) (5 pts extra credit)

4. (6 pts) A molecule of acetone undergoes a protonation reaction.

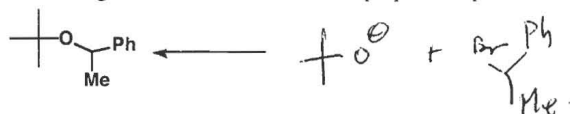
- a) Write the complete Lewis structure for acetone and its reaction with proton  
 b) Using arrows, show the flow of electrons, and draw the product (protonated acetone).  
 c) Show resonance structures for the product.



5. (6) Alcohols are often obtained from carbonyl compounds. Provide **two** methods to prepare 3-pentanol from appropriate **carbonyl compounds**. Show reagents and conditions and write IUPC names.

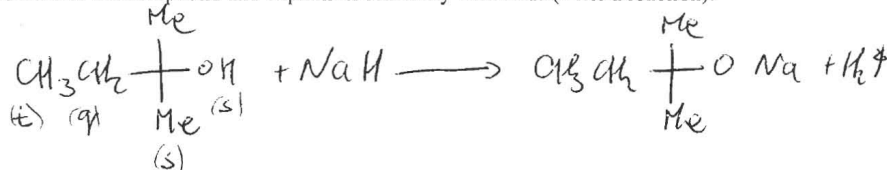


6. (3) Write the organic reactants best suited to prepare the product below and provide the needed reagent(s).

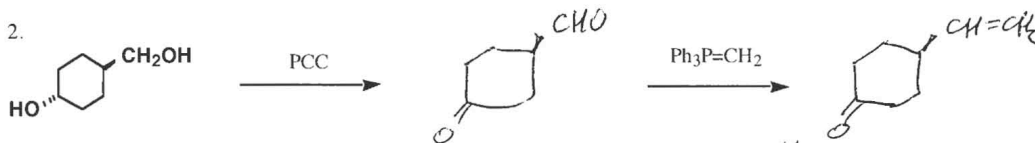
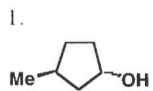


7. (5 pts) A compound of the molecular formula  $C_5H_{12}O$  reacts vigorously with NaH and does not undergo oxidation reactions with  $Cr^{+6}$  reagents. It shows a strong and broad absorption band at  $3400\text{ cm}^{-1}$  in the IR spectrum.  $^1H$  NMR spectroscopy revealed four groups of signals: 0.90 (triplet, 3H), 1.20 (singlet, 6H), 1.50 (quartet, 2H), 2.30 (singlet, 1H) ppm.

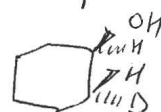
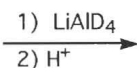
Propose the structure of the compound and explain its reactivity with NaH (write a reaction).



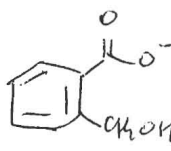
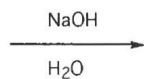
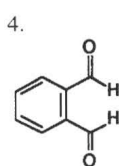
**III. Reactions** (29 pts total: 3 pts each reaction + 1 pt for name) Draw structures (including stereochemistry) of the expected organic products formed under the following reaction conditions and provide the names of the reactions where requested.



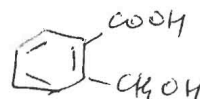
reaction name: Wittig



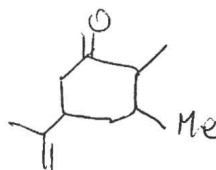
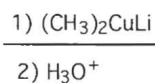
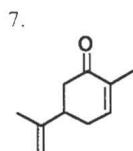
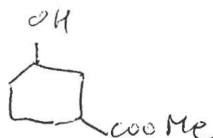
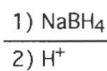
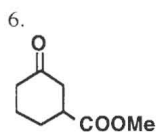
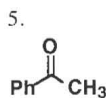
show stereochemistry!



or  
(after  
H<sub>2</sub>O)



reaction name: Cannizzaro

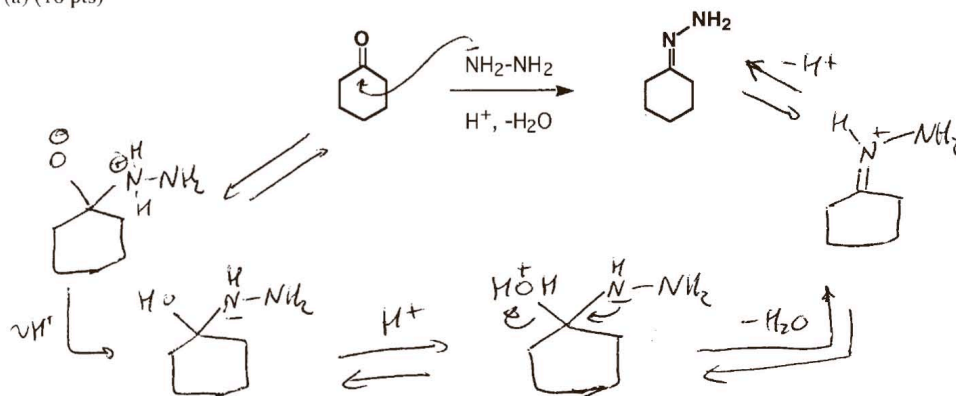


#### IV. Mechanism (20 pts)

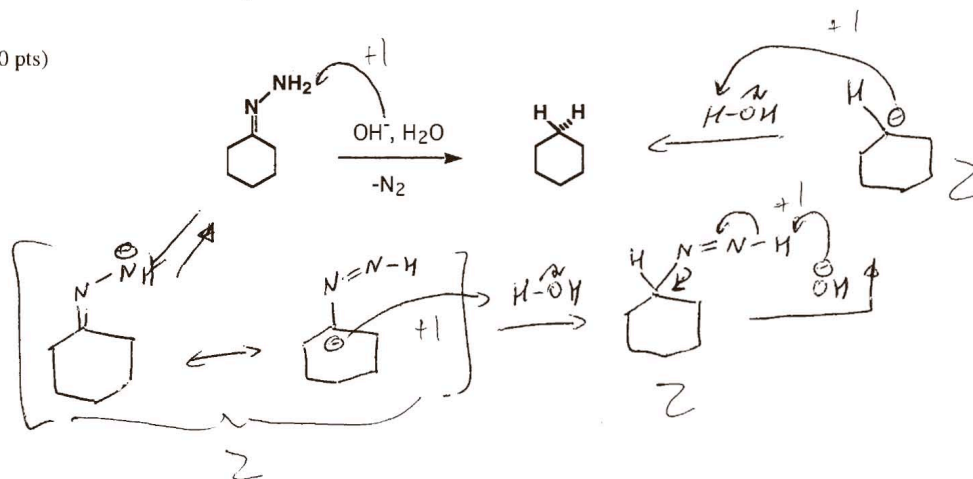
The Wolff-Kishner reaction proceeds in two steps that can be performed separately and the intermediate hydrazone isolated. Here we will first prepare cyclohexanone hydrazone under **acid-catalyzed** conditions and subsequently we will submit it to **strongly basic** conditions.

Provide detailed mechanisms for the transformations given below, showing every step in the process clearly. Use electron pushing arrows.

(a) (10 pts)

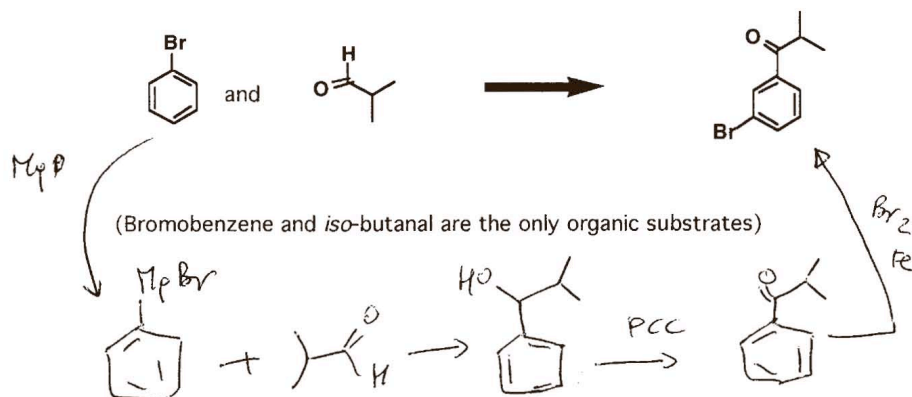


(b) (10 pts)



V. Synthesis (10 pts) Provide a reaction sequence to accomplish *one of the two* following conversions (left to right) using specified organic compounds and any inorganic reagent needed to convert the carbons of the starting material into the product structure. Show reactants, products, and necessary reagents for each step in the sequence, but do not show mechanisms here. Partially correct answers will receive partial credit. Mark clearly the problem that you want us to grade.

(1)



(2)

