

Chem 51C Midterm Exam  
100 points; 50 minutes  
April 25, 2014

Problem	Possible Points	Score
<b>1</b>	24	_____
<b>2</b>	8	_____
<b>3</b>	16	_____
<b>4</b>	24	_____
<b>5</b>	30	_____
<b>Total</b>	<b>102</b>	_____

**Academic Honesty Policy.** Academic honesty is strictly enforced on quizzes, exams, and other aspects of this course. Academic dishonesty will result in a failing grade in the class and a letter in the student's file. Activities constituting academic dishonesty include:

*Cheating*

- Copying from others during an examination.
- Communicating exam answers with other students during an examination.
- Offering another person's work as one's own.
- Taking an examination for another student or having someone take an examination for oneself.
- Tampering with an examination after it has been corrected, then returning it for more credit.
- Using unauthorized materials, prepared answers, written notes, or concealed information during an examination.

*Dishonest Conduct*

- Stealing or attempting to steal an examination or answer key from the instructor.
- Allowing another student to copy off of one's own work during a test.

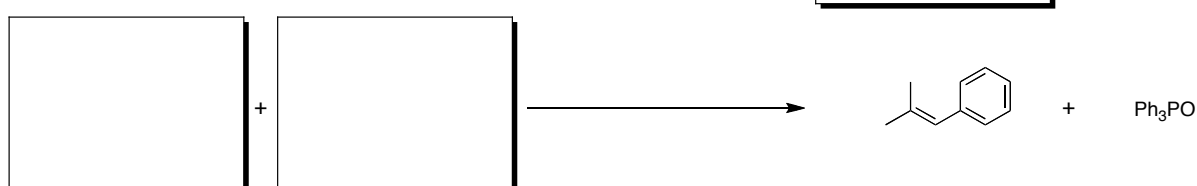
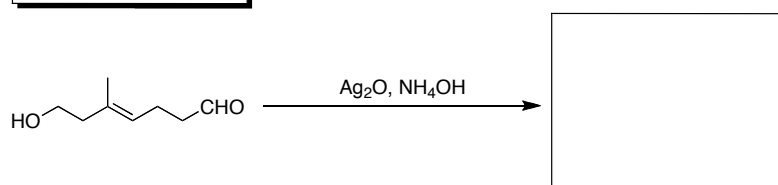
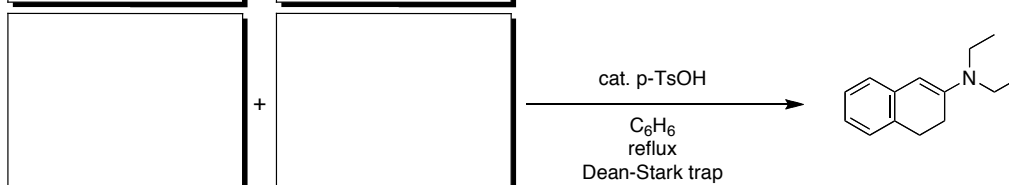
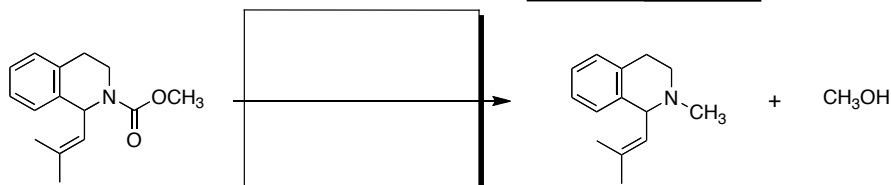
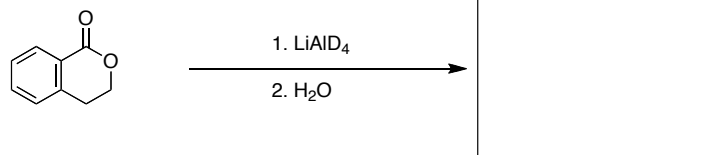
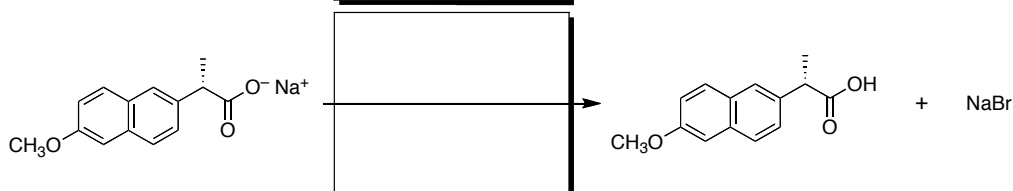
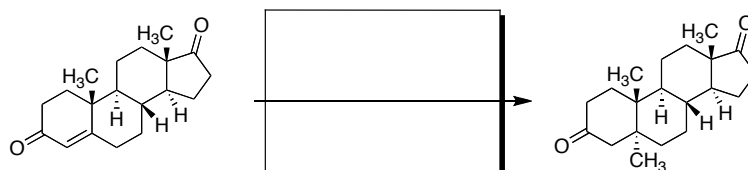
*Collusion*

- Any student who knowingly or intentionally helps another student perform any of the above acts is subject to discipline for academic dishonesty.

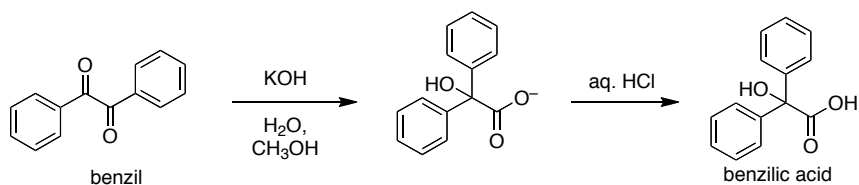
I understand and will abide by this academic honesty policy: \_\_\_\_\_ (signature)

Seat: \_\_\_\_\_

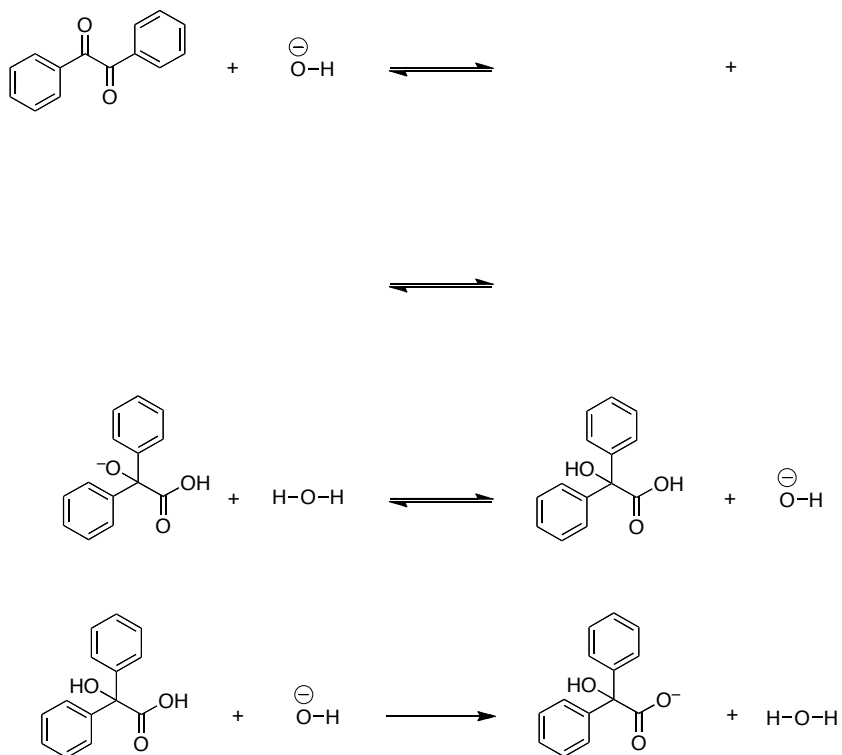
1. Write the missing reactants, reagents, and products in the boxes. Note: All of these examples are taken directly from class. (3 points each, 24 points)



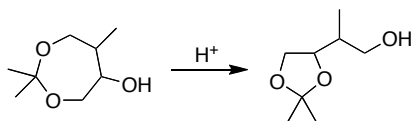
2. Benzil undergoes rearrangement to benzilic acid upon treatment with hydroxide followed by workup with aqueous acid. (8 points)



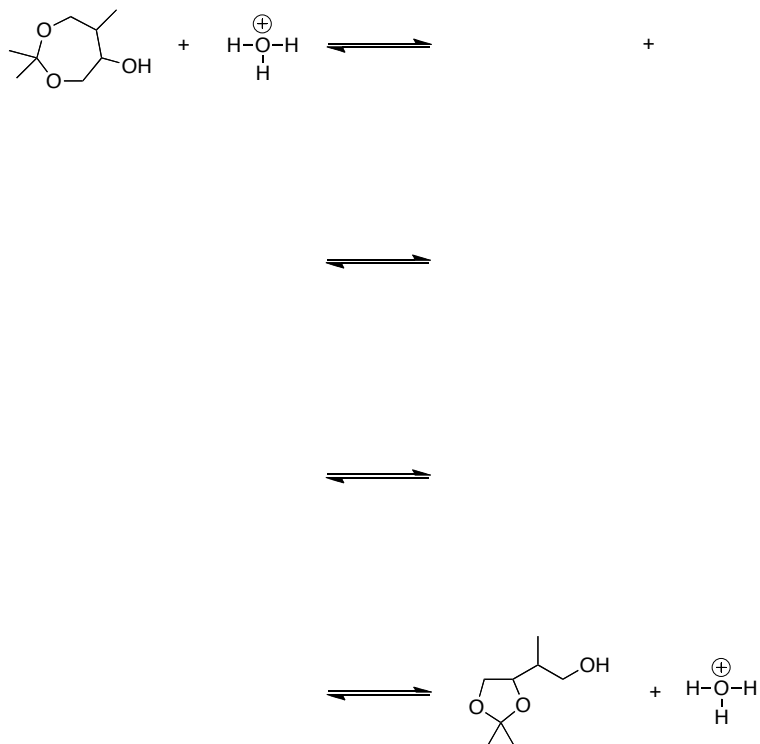
Using the template below, write a curved-arrow mechanism for **first two steps** of the reaction mechanism. Make sure to show each step of the reaction and all reactants, intermediates, products, charges, and all important lone pairs of electrons.



3. The following is from the assigned homework in Smith, problem 21.88. (16 pts)



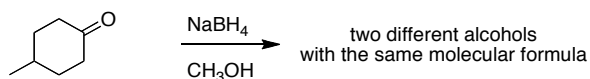
Using the template below, write a curved-arrow mechanism for the following reaction. Make sure to show each step of the reaction and all reactants, intermediates, products, charges, and all important lone pairs of electrons.



4. Provide concise explanations of the following. For most, a few words and a chemical equation or structures may suffice. Note that clarity counts and muddled answers containing irrelevancies will receive little or no credit.

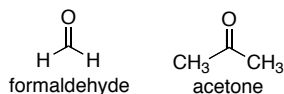
**Select four of the following five.** (6 points each, 24 points total). **Cross out** the one that you do not wish to answer or only the first four problems will be graded.

a. Reduction of 4-methylcyclohexanone with sodium borohydride gives two different alcohols with the same molecular formula.

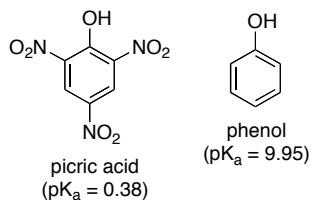


b. Reaction of benzaldehyde ( $\text{PhCHO}$ ) with ethylidinetriphenylphosphorane ( $\text{Ph}_3\text{P}=\text{CHCH}_3$ ) gives two different alkenes with the same molecular formula.

c. When formaldehyde is dissolved in water, the band in the infrared spectrum at approximately  $1700\text{ cm}^{-1}$  disappears, but when acetone is dissolved in water, the band in the infrared spectrum at approximately  $1700\text{ cm}^{-1}$  remains.



d. Picric acid is a much stronger acid than phenol.

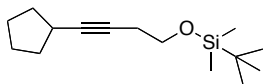


e. Water must be rigorously excluded from reactions involving Grignard reagents ( $\text{RMgX}$ ).

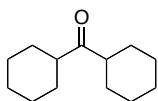
5. Design good syntheses of the following compound starting only with compounds containing **seven carbon atoms or fewer** as the only organic starting materials. You may use any other inorganic reagents you choose and organic reagents that don't get incorporated into the final product, such as TBDMSCl,  $\text{Ph}_3\text{P}$ , LDA, PCC, DCC, *p*-TsOH, TsCl, etc.

**Select five of the following six.** (6 points each, 30 points total). **Cross out** the one that you do not wish to answer or only the first four problems will be graded.

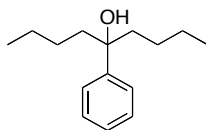
a.



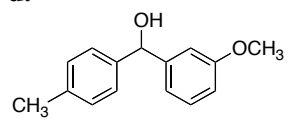
b.



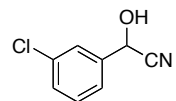
c.



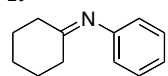
**d.**



**e.**



**f.**



PLEASE REVIEW THE ACADEMIC HONESTY STATEMENT ON PAGE 1 AND SIGN IT IF YOU ARE ABLE