CHEM 310 Exam 3

Dr. Hanna

April 13, 2007

Honor Pledge:

In Part V of the Winthrop University Student Conduct Code, it is stated that "A fundamental tenet of all institutions of higher learning is academic honesty. … Misrepresentation of someone else's work as one's own is a most serious offense in any academic setting. … Academic misconduct includes but is not limited to providing or receiving assistance in a manner not authorized by the professor in the creation of work to be submitted for academic evaluation including papers, projects, and examinations …"

By my signature below, I pledge that I did not commit academic misconduct (cheat) on this examination.

_____ _____

Printed Name Signature

Part 1 _____/20

Part 2 _____/30

Part 3 _____/20

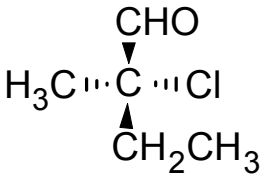
Part 4 _____/10

Part 5 _____/20

Total _____/100

Part 1: Nomenclature (20 pts)

Write IUPAC names for the following compounds (indicate stereochemistry where required):

1a. 

1b. $CH_3-CH_2-O-CH(CH_3)_2$

Draw structures corresponding to the following IUPAC names:

1c. *trans*-1-Bromo-2-ethylcyclopentane

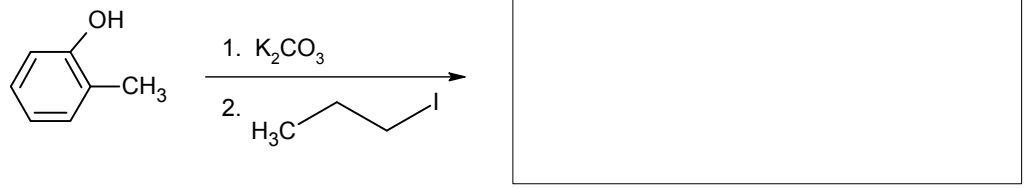
1d. 3-Methyl-2-buten-1-ol

1e. 3,3-Dimethylheptan-2,4-dione

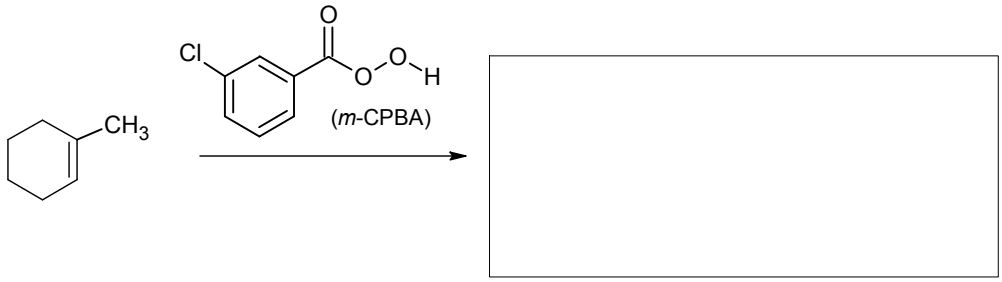
Part 2: Provide the Starting Material, Reagent, or Product (30 pts):

Provide the missing piece (starting material, reagent(s), or product(s)) in the box provided.

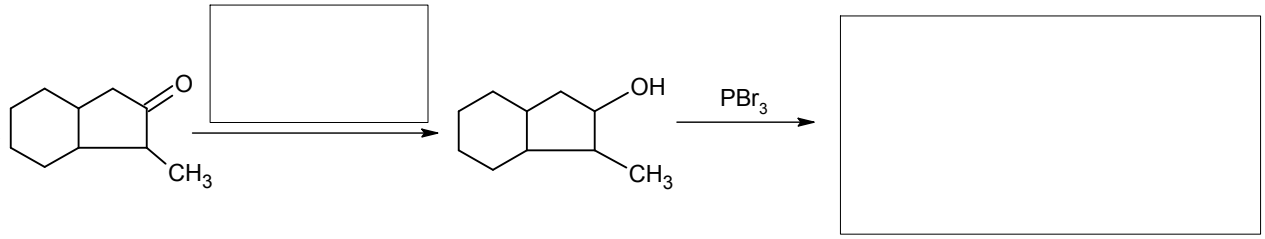
2a.



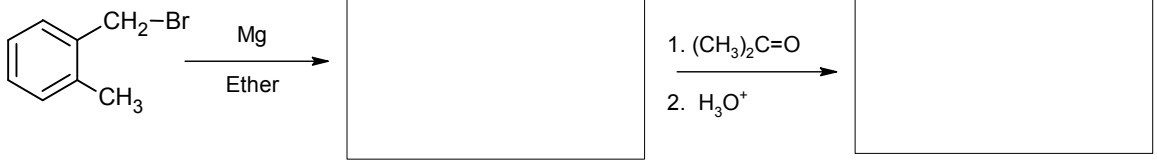
2b.

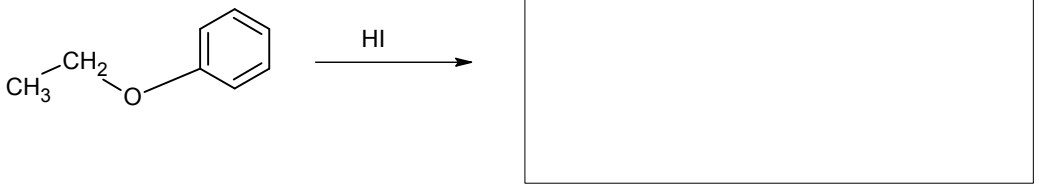


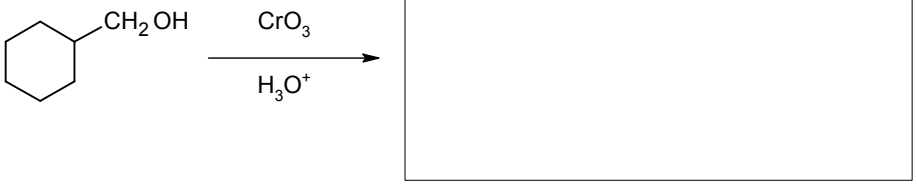
2c.

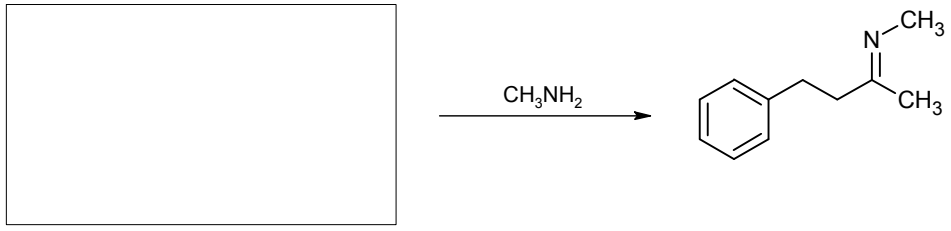


2d.

2e. 
CH2–Br
CH3
Mg
Ether
1. (CH3)2C=O
2. H3O+

2f. 
CH3
CH2
O
HI

2g. 
CH2 OH
CrO3
H3O+

2h. 
CH3NH2
N
CH3
CH3

Part 3: Mechanisms (20 pts)

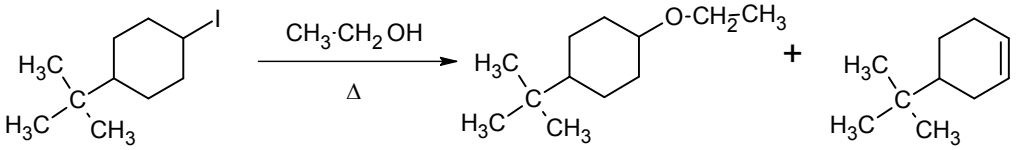
Draw the chemical equations (with structures) described below and indicate whether the mechanism of the reaction is S_N2, S_N1, E2 or E1.

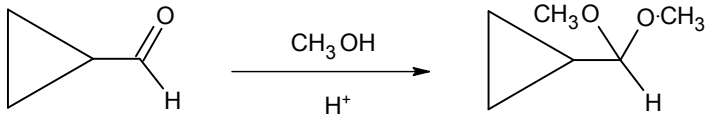
3a. 1-Bromo-4-ethyl-1-methylcyclohexane reacts with sodium methoxide ($Na^+ {}^-OCH_3$) to give 4-ethyl-1-methylcyclohexene

3b. (S)-2-Iodobutane reacts with sodium hydroxide to give (R)-butan-2-ol.

3c. (R)-2-Methylpentan-3-ol reacts with dry $HCl_{(g)}$ to give racemic 3-chloro-2-methylpentane

Provide complete arrow-pushing mechanisms for the following transformations:

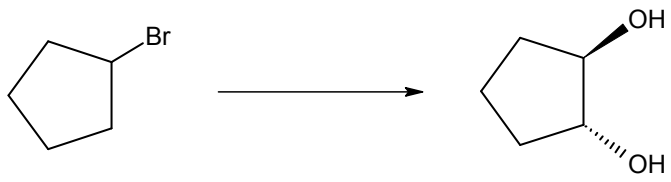
3d. 

3e. 

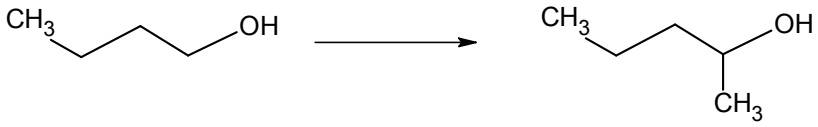
Part 4: Synthesis (10 pts)

Provide a synthesis of each of the following compounds <u>starting from the indicated compound</u> and any other reagents you need:

4a.



4b.

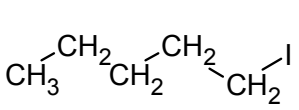


Part 5: General Questions (20 pts)

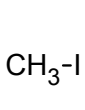
Provide answers to the following questions. Where applicable, draw structures to support your answers.

5a. The pK_a of cyclohexanol is approximately 16, while the pK_a of phenol is approximately 10. Indicate which compound is the stronger acid, and explain the reason for the difference in acidity.

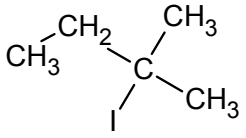
5b. Rank the following compounds in order of S_N2 reactivity (1 = fastest, 4 = slowest). Explain your answer.



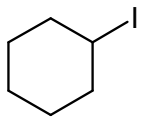
A



B

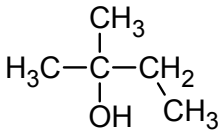


C

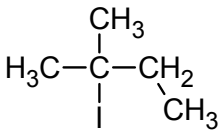


D

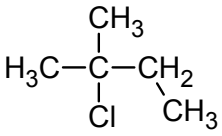
5c. Rank the following compounds in order of S_N1 reactivity. (1 = fastest, 4 = slowest). Explain your answer.



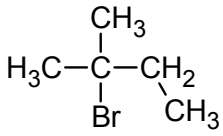
A



B



C



D

5d. Explain why a Grignard reagent cannot be prepared in the presence of water or alcohols.