

CHEM 3371, Spring 2014
Professor Walba
Third Hour Exam
April 15, 2014

scores:

- 1)
 - 2)
 - 3)
 - 4)
 - 5)
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CU Honor Code Pledge: On my honor, as a University of Colorado at Boulder Student, I have neither given nor received unauthorized assistance.

Name (printed): _____

Signature: _____

Recitation TA Name: _____ Thomas Carey

Recitation day and time: _____

This is a closed-book exam. The use of notes, calculators, scratch paper, or cell phones will not be allowed during the exam. You may use models brought in a clear ziplock bag. Please put all your answers on the test. Use the backs of the pages for scratch.

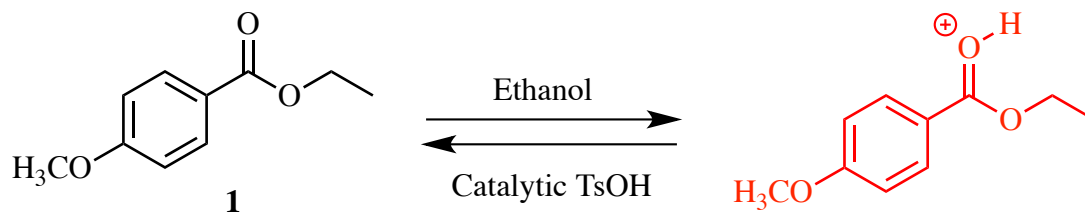
PLEASE read the questions very carefully!

1A								8A
1 H								2 He
	2A		3A	4A	5A	6A	7A	
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	

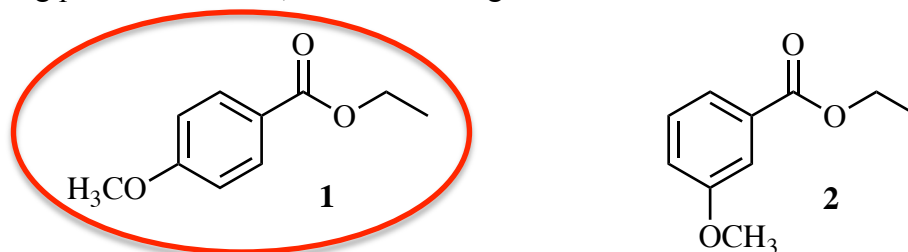
1 (20 pts) a) For the following pair of molecules, circle the stronger Bronsted acid.



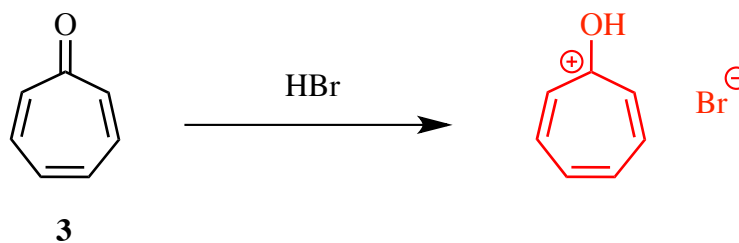
b) Ester **1** is protonated by toluenesulfonic acid (TsOH) in ethanol. Draw the structure of the protonated product.



c) For the following pair of molecules, circle the stronger Bronsted base.



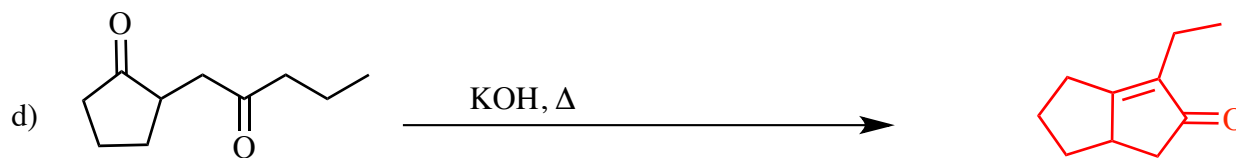
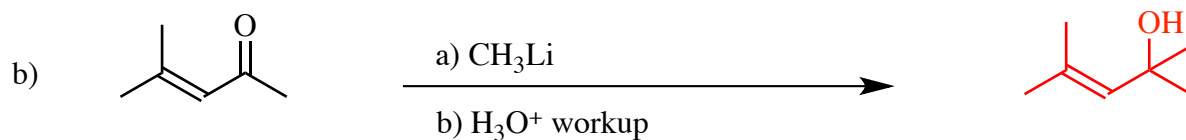
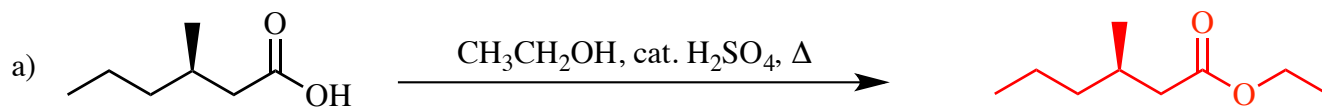
d) When tropone (**3**) reacts with HBr, one would expect addition of HBr across one of the double bonds. However, the product formed is not soluble in organic solvents, but is soluble in water, suggesting it's some kind of salt. Furthermore, the Br atom is NOT covalently connected to the molecule, but is present as a Br⁻ anion. Draw the structure of protonated tropone (**3-H⁺**), and **briefly** explain why **3-H⁺** is especially stable.



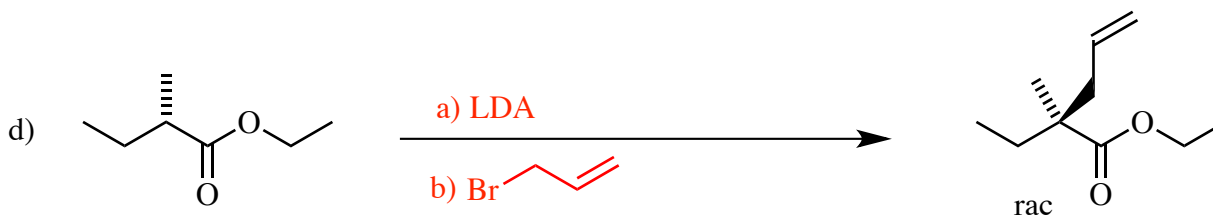
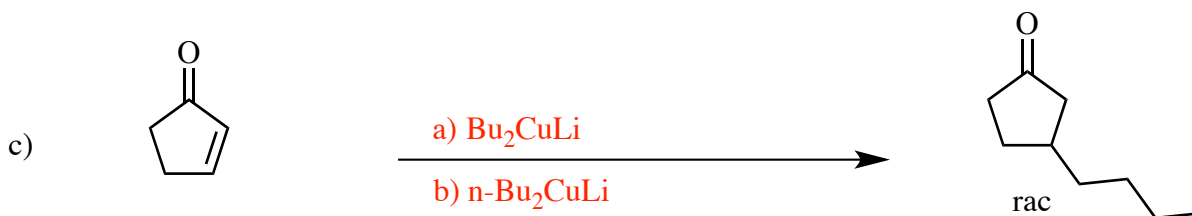
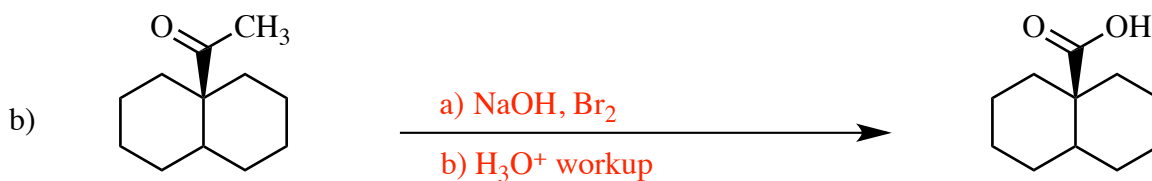
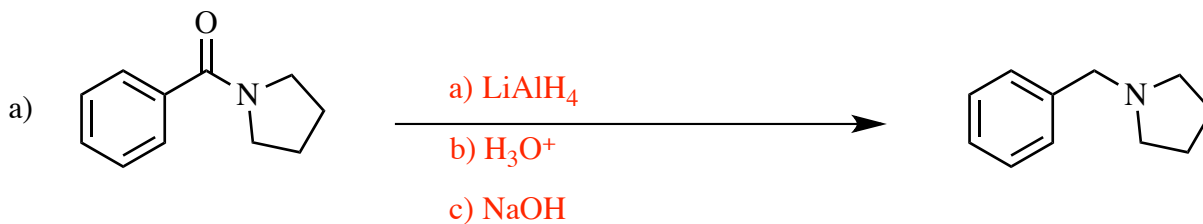
The tropylium cation shown on the right is aromatic. If the bromide ion made a covalent bond to one of the carbons of the six membered ring, the aromaticity would be lost.

Printed Name: _____

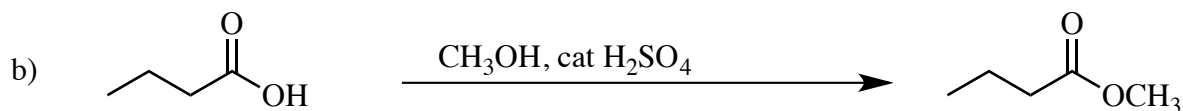
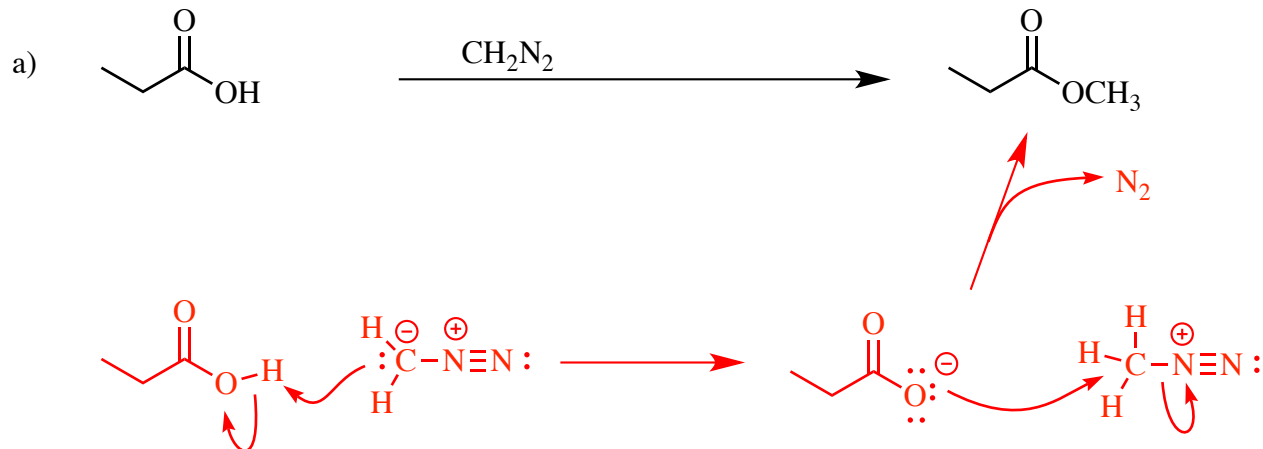
2) (20 pts) Give the single major product of each of the following reactions, carefully showing stereochemistry if appropriate. If a racemate is formed, show only one enantiomer, and label it "rac."



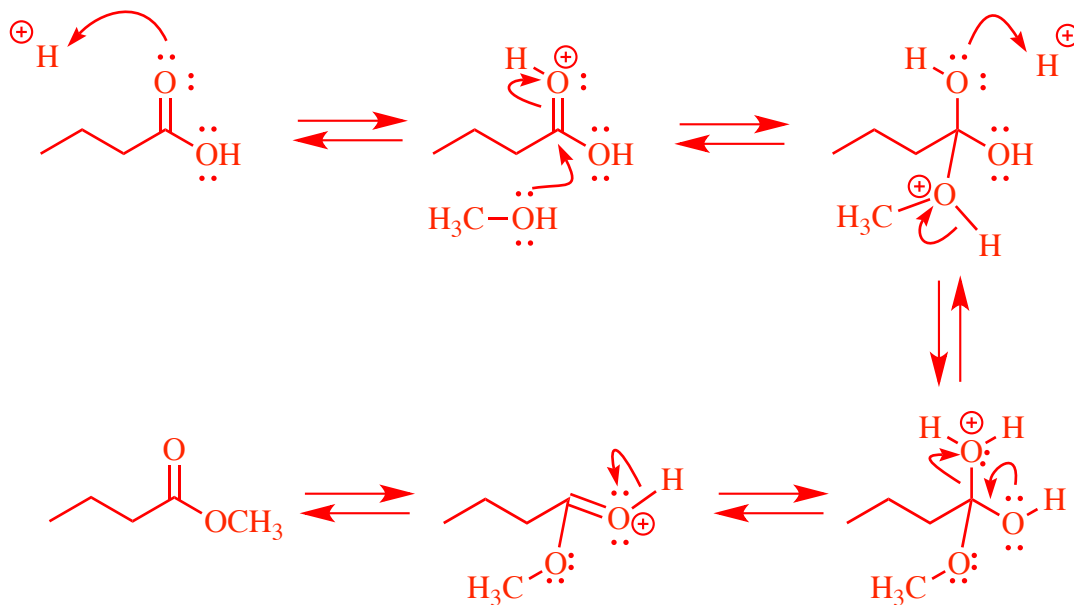
3) (20 pts) Propose reagents for accomplishing each of the following transformations. Make your reactions efficient (i.e. the target product should be the major product). More than one step may be required. Assume chiral starting materials or products are single pure enantiomers unless they are labeled “rac.”



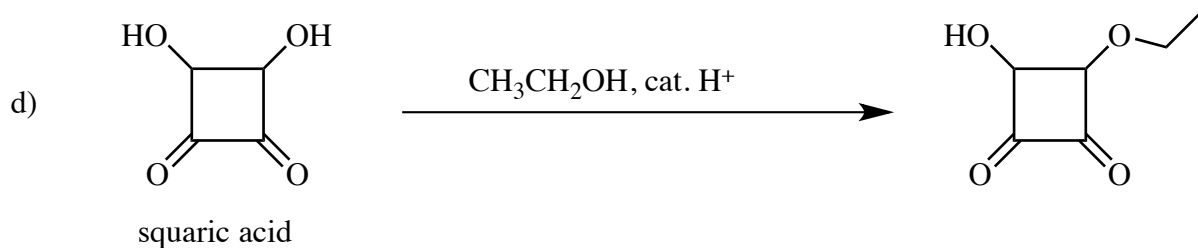
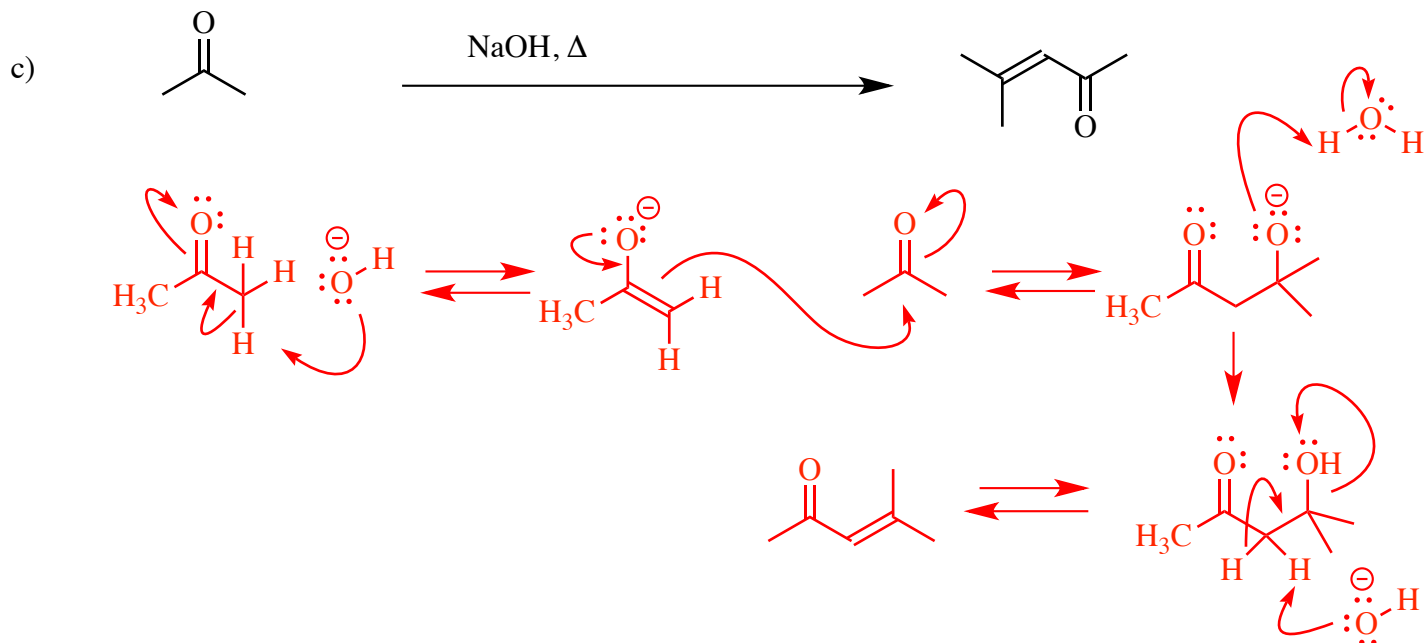
4) (20 pts) Propose an arrow-pushing mechanism for each of the following reactions. (continued on next page)



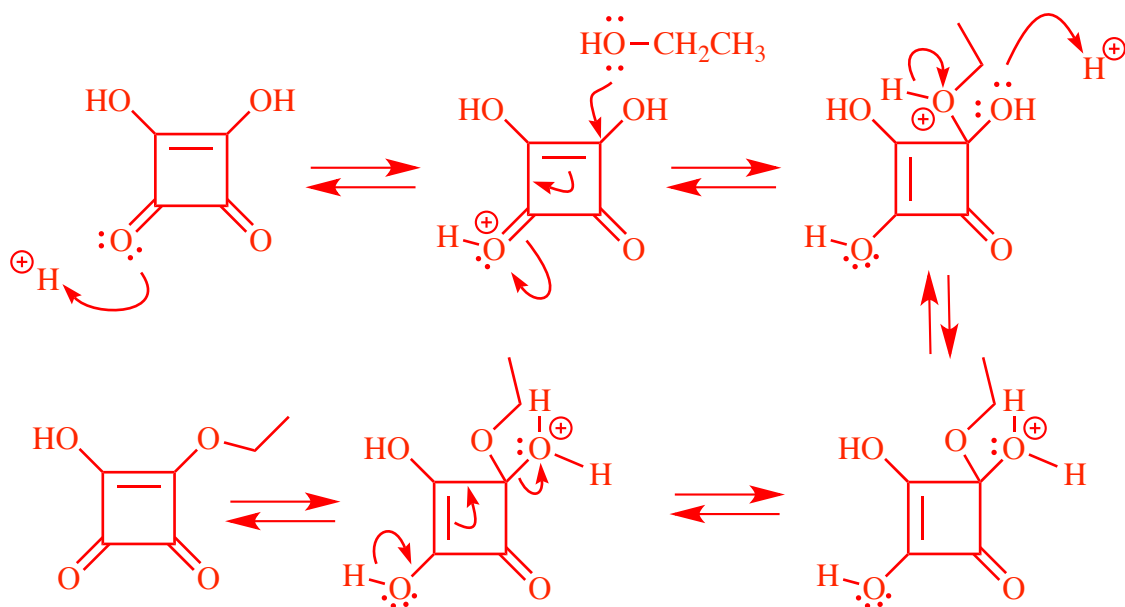
Note: in your mechanism for problem 4b you can use H^+ to represent the catalytic H_2SO_4 .



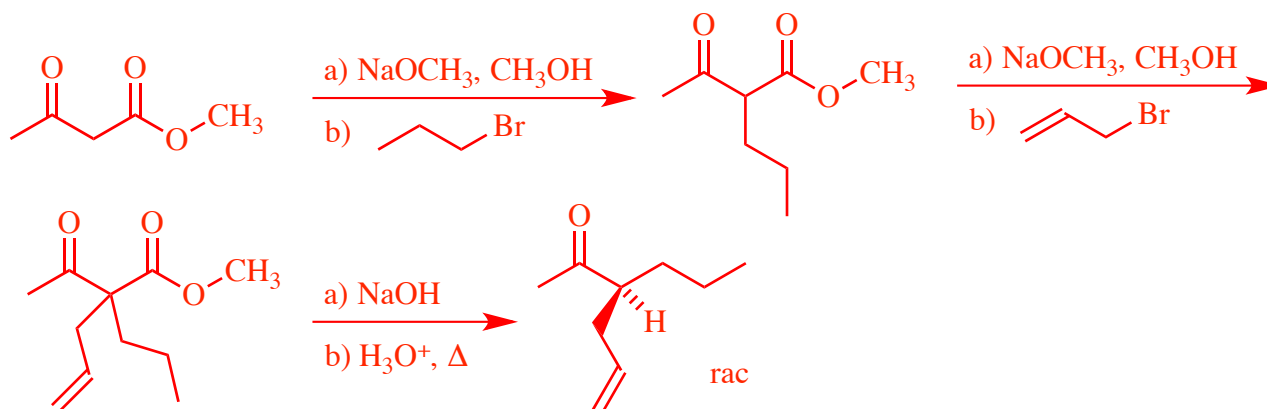
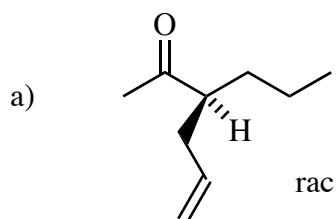
4) – Continued –



Hint: For the mechanism in problem 4d, the first step is protonation of one of the carbonyl groups.



5) (20 pts) Propose a synthesis for each of the following targets. Allowed starting materials include benzene, Ph_3P , and/or any other organic molecules containing **five (5) carbons or less**. You may use any necessary inorganic reagents. Try to make your syntheses efficient (i.e. the target should be produced in the highest possible yield). More than one step will be required. Please show all the intermediate **products** in your synthesis (not reactive intermediates involved in the mechanisms, but actual isolated molecules on the path from starting material to product). Please put reagents for reactions involving sequential addition of reagents, over an arrow using letters (a, b, c...) to designate the sequence of addition. Please do **not** put multiple reactions over one arrow. (Continued on next page)



5) – Continued –

