

Easily Legible Printed Name: _____

CHEM 3331, Fall 2017
Professor Walba
Second Hour Exam
October 24, 2017

scores:

- 1)
 - 2)
 - 3)
 - 4)
 - 5)
- _____

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

Signature: _____

Recitation TA Name: _____

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 Ziploc bag. Please put all your answers on the test in the appropriate place. Use the backs of the pages for scratch (there are two additional blank scratch sheets after the last page of the exam). **DO NOT PUT ANSWERS ON THE SCRATCH SHEETS.**

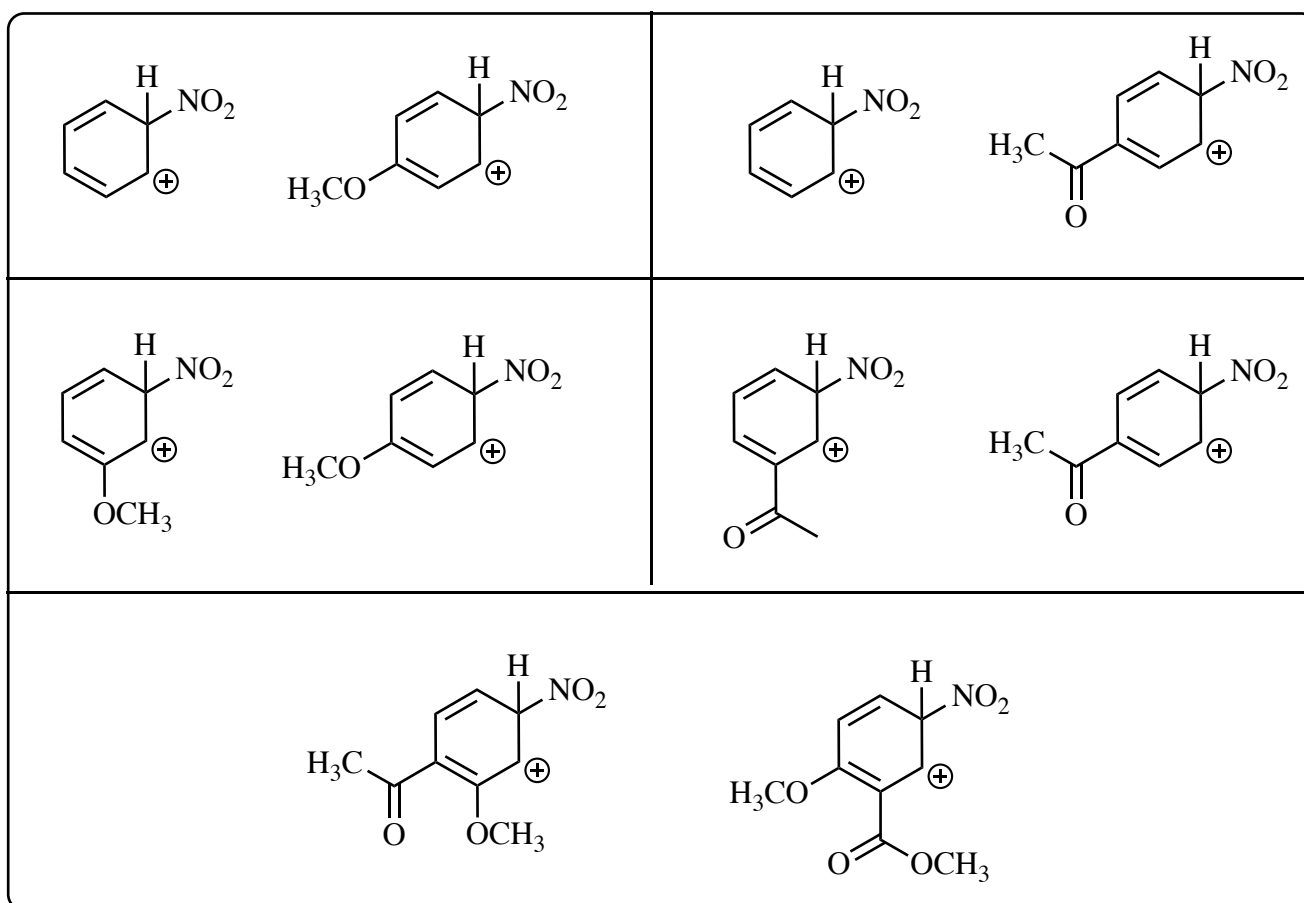
PLEASE read the questions very carefully!

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			

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1 (20 pts) One of the main over-arching themes of our course involves a qualitative understanding of the relative stability of pairs of molecules or reactive intermediates, which leads to predictions regarding estimation of relative rates of reactions, or relative equilibrium concentrations of related molecules. The following questions involve specific examples of this kind of "organic" thinking.

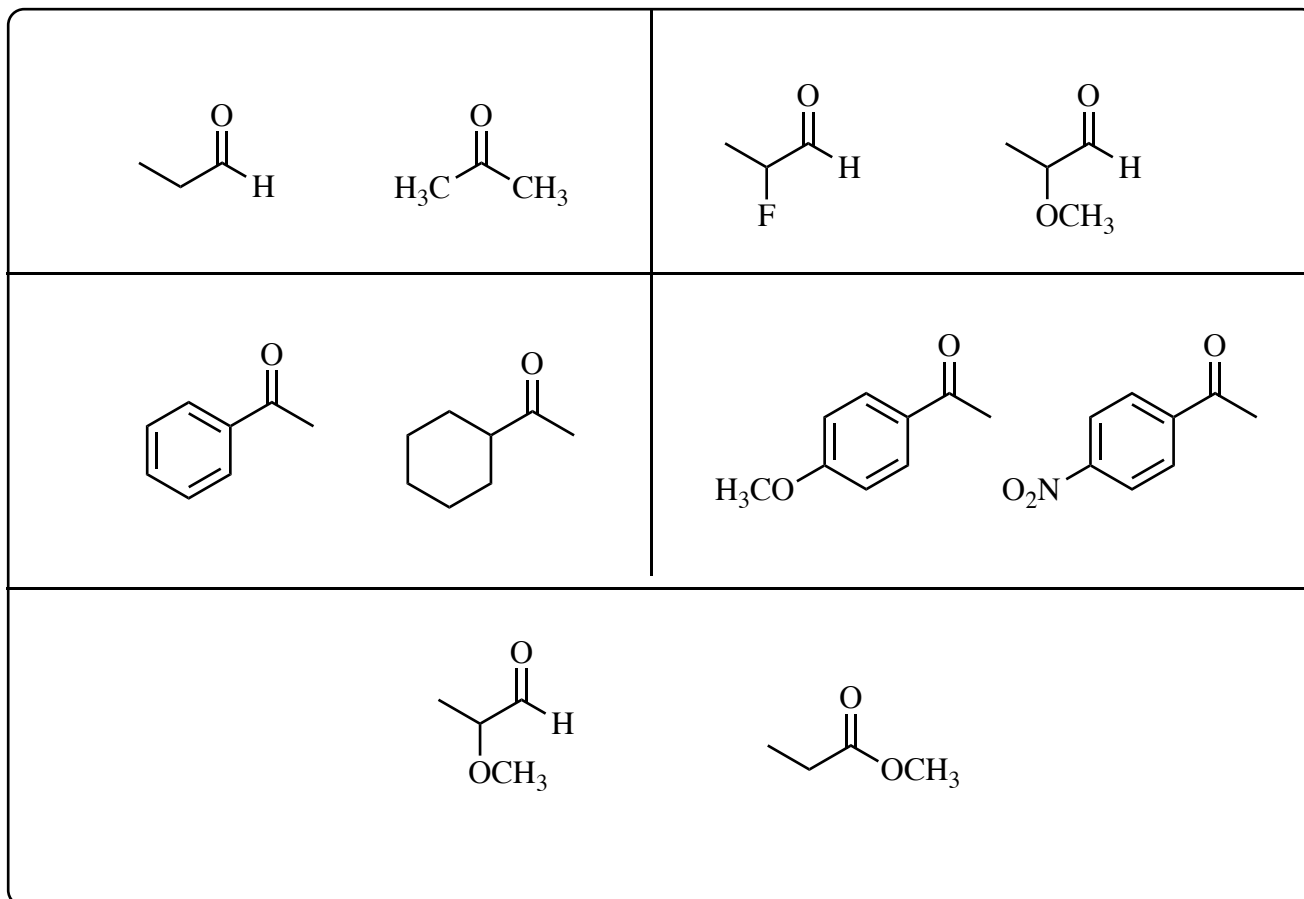
a) For each of the following pairs of cations, circle the MORE STABLE cation.



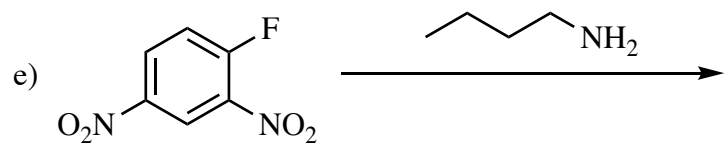
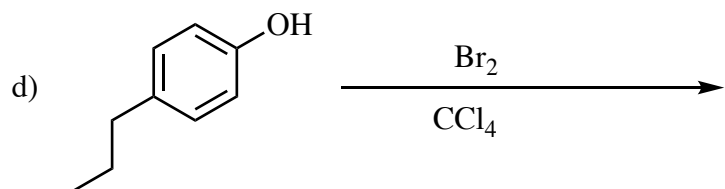
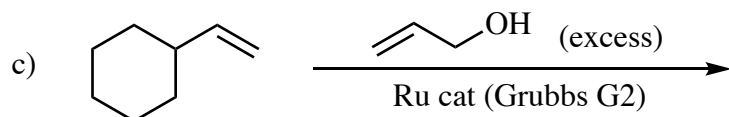
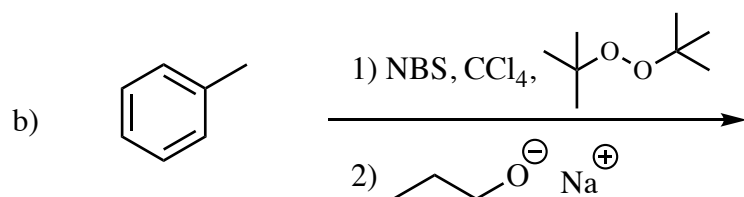
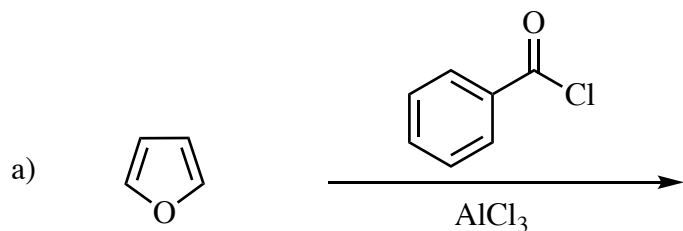
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1. - Continued

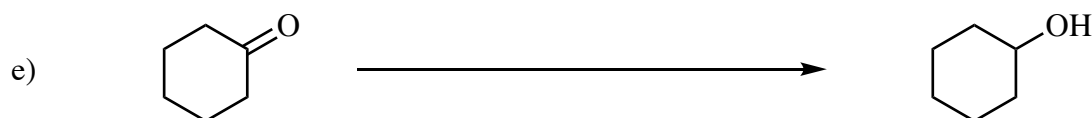
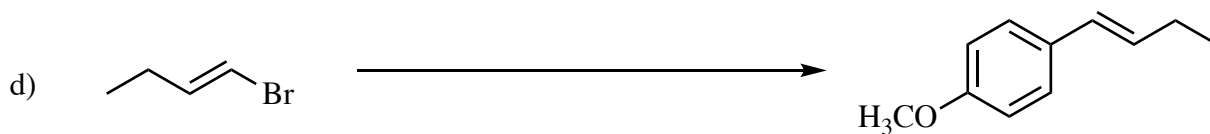
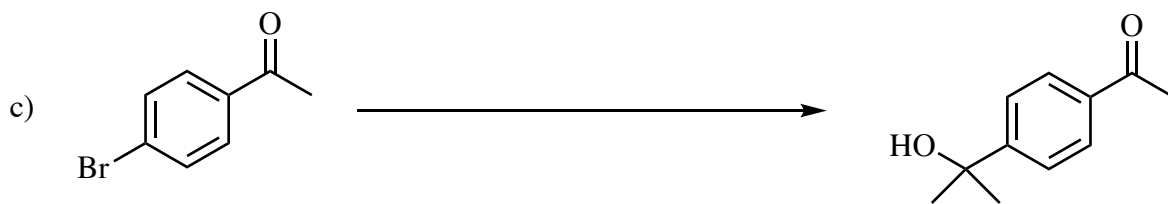
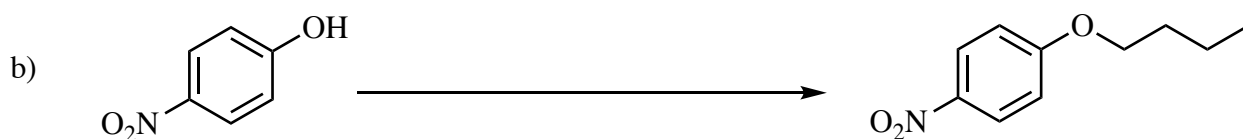
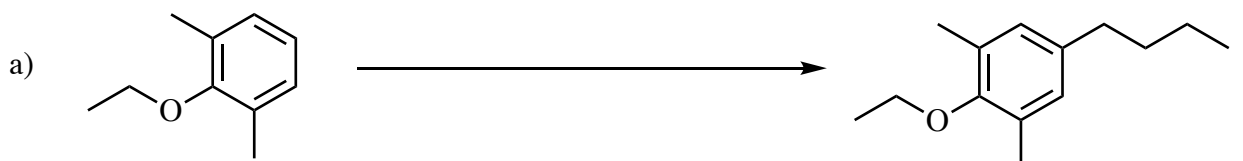
b) For each of the following pairs of carbonyl compounds, circle the compound with the more stable carbonyl group (this would be the carbonyl group that would react more slowly)



2) (20 pts) Give the **single major product** for each of the following reactions, carefully showing stereochemistry using wedges and dashes if appropriate. If a racemate is formed, show only one enantiomer and label it "rac." Assume chiral starting materials are single pure enantiomers unless they are labeled "rac."

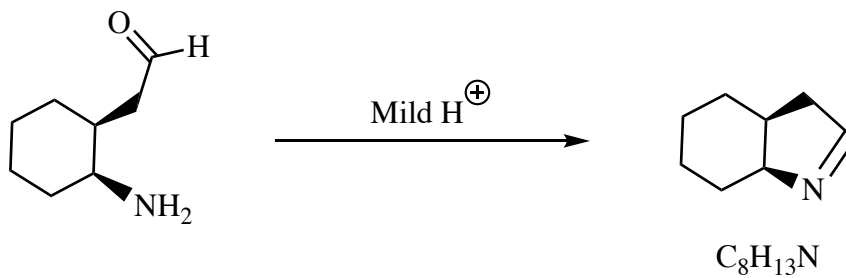


3) (20 pts) Propose reagents for accomplishing each of the following transformations. For reactions involving sequential addition of reagents, label the two parts of the reaction using letters. **Your synthesis may require multiple reactions**, with isolation of intermediate products, to make the target. Use numbers to indicate individual steps in a multi-step synthesis. Make your synthesis efficient (i.e. the target product should be the major product). Assume chiral starting materials and products are single pure enantiomers unless they are labeled "rac." Assume you have access to commercial reagents, including transition metal catalysts, and any boronic acid you need.



4) (20 pts) Propose an arrow-pushing mechanism for both of the following reactions.

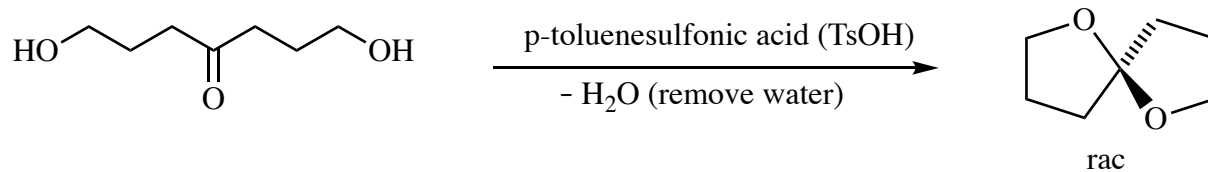
a)



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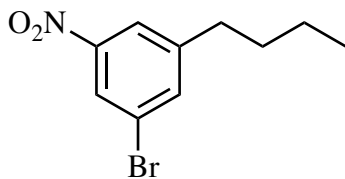
4) – continued

b)



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5) (20 pts) Propose a synthesis of the following 2 targets starting with benzene and any other organic starting materials with **five carbons or less**. You may use any necessary inorganic reagents. More than one step will be required. Each reaction in the sequence leading to an isolated and purified product should be shown. Please use letters over/under one arrow to indicate sequential addition of reagents in a single reaction. **Do not put multiple reactions over/under one arrow!**



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5 – continued

b)

