

Easily Legible Printed Name: _____

CHEM 3311 (300), Fall 2014
Professor Walba
Second Hour Exam
October 21, 2014

scores:

- 1) 20
- 2) 20
- 3) 20
- 4) 20
- 5) 20

100

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

Signature: _____ *Key*

Recitation TA Name: _____

Recitation day and time: _____

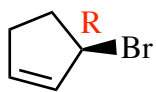
This is a closed-book exam. The use of notes, calculators, scratch paper, or cell phones will not be allowed during the exam. You may use models brought in a clear ziplock bag. Please put all you answers on the test in the appropriate place. Use the backs of the pages for scratch (there are two additional blank scratch sheets after the last page of the exam). DO NOT PUT ANSWERS ON THE SCRATCH SHEETS.

PLEASE read the questions very carefully!

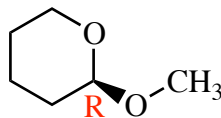
PLEASE legibly print your name on each page of the exam.

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 molecules **1** – **3** below, label the configuration at the tetrahedral stereocenters using the R/S descriptors.

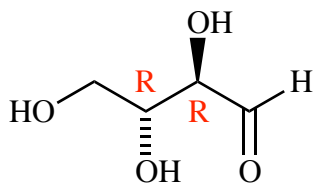


1

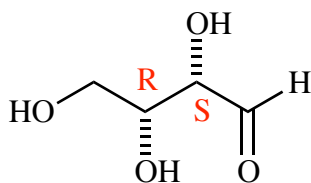


2

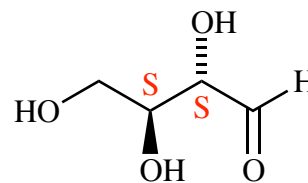
b) For the following compounds, carefully label the configuration of the tetrahedral stereocenters using the R/S descriptors. Be sure it's obvious which labels go with which stereocenters.



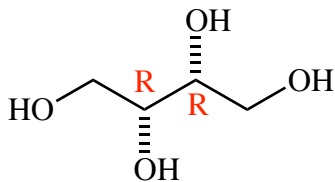
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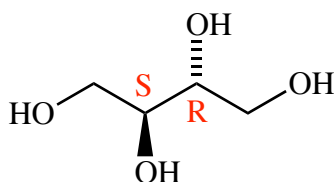
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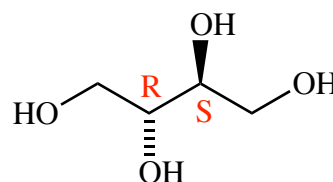
5



6



7



8

c) Circle the chiral structures.

d) Describe the relationship between the pairs of structures indicated (from part b above) as enantiomers, diastereomers, or homomers below.

3,4

Diastereomers

6,7

Diastereomers

4,5

Diastereomers

6,8

Diastereomers

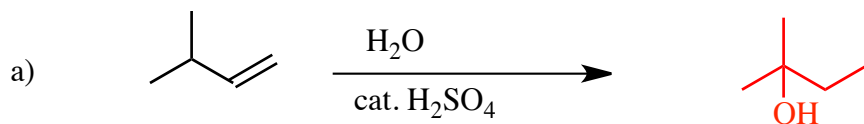
3,5

Enantiomers

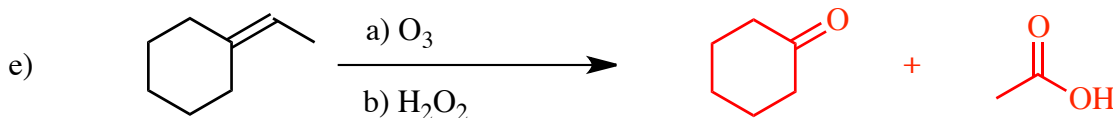
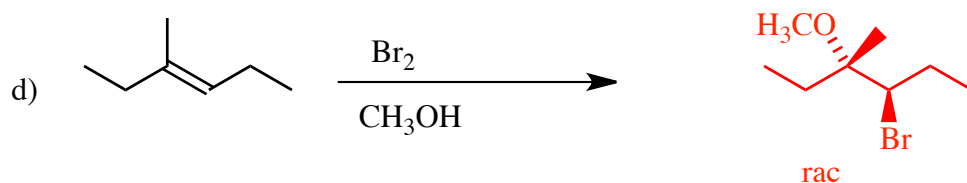
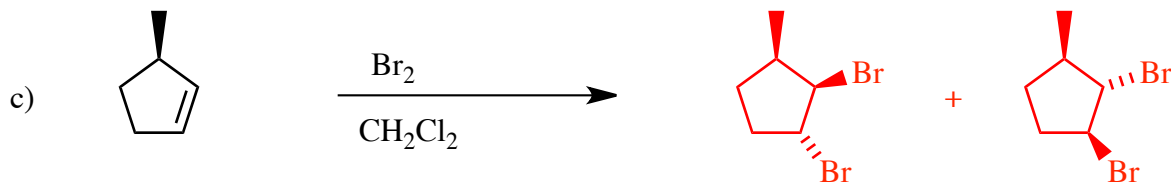
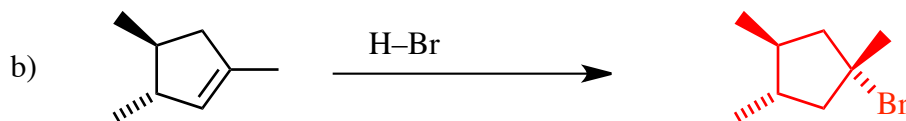
7,8

Homomers

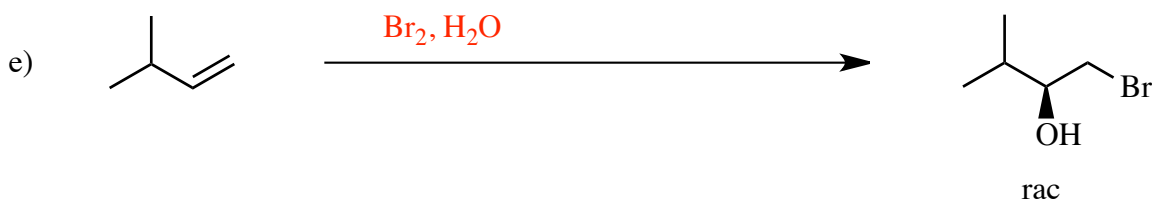
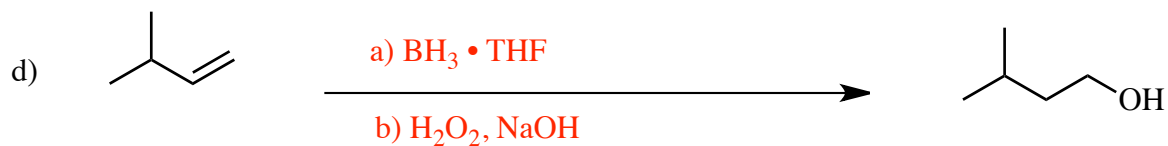
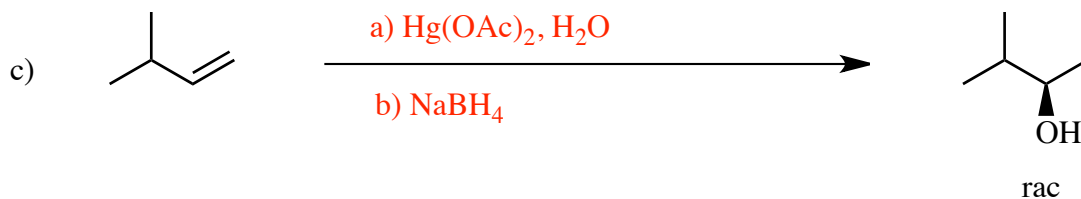
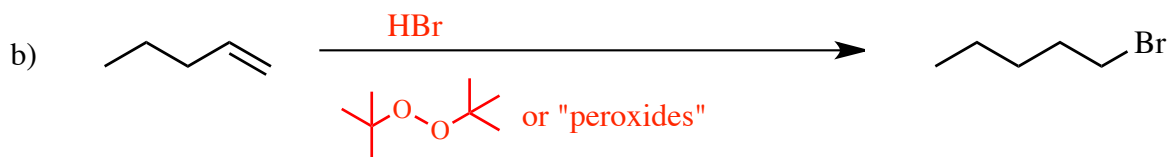
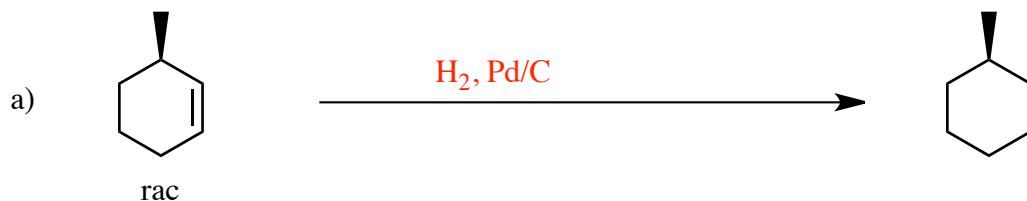
2) (20 pts)) Give the single major product (or two major products if two are formed) for each of the following reactions, carefully showing stereochemistry using wedges and dashes if appropriate. For racemates, show only one enantiomer and label it "rac." Assume chiral starting materials are single pure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



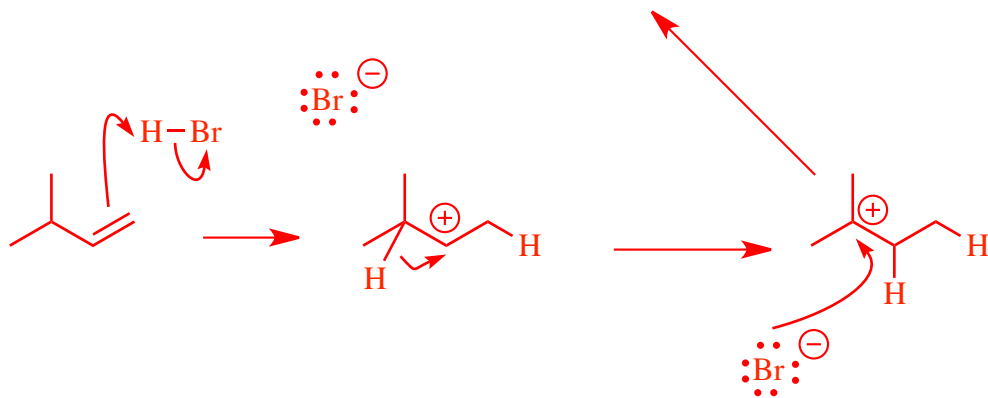
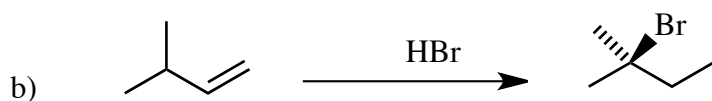
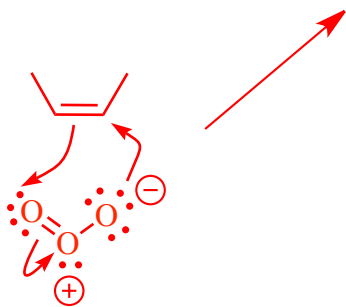
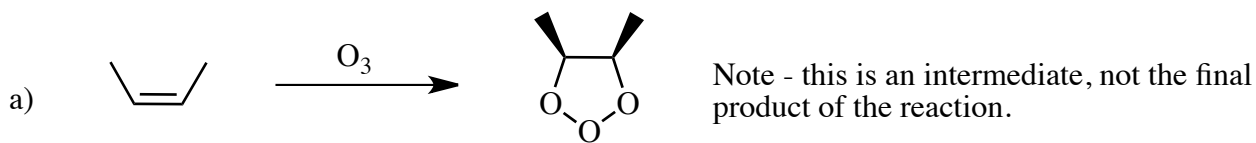
For the reaction above, please give the single major product



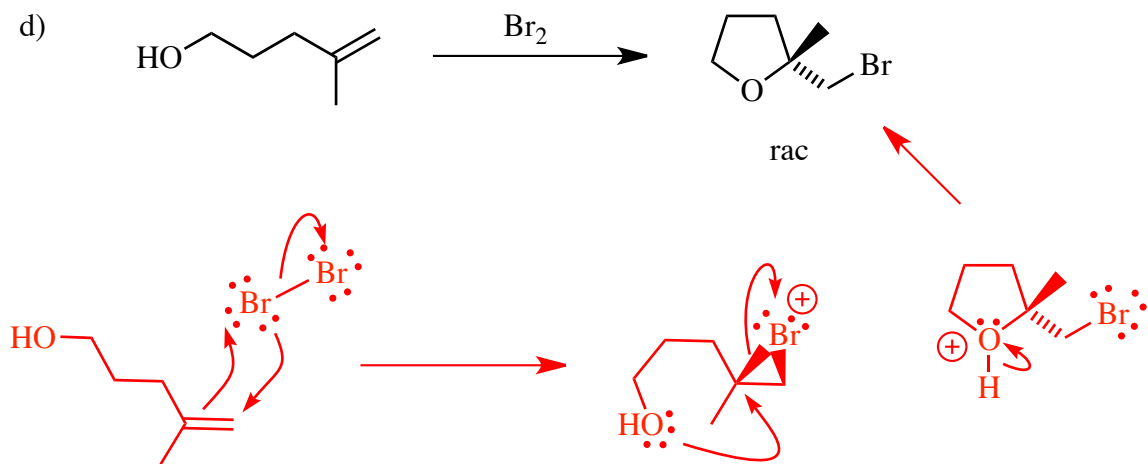
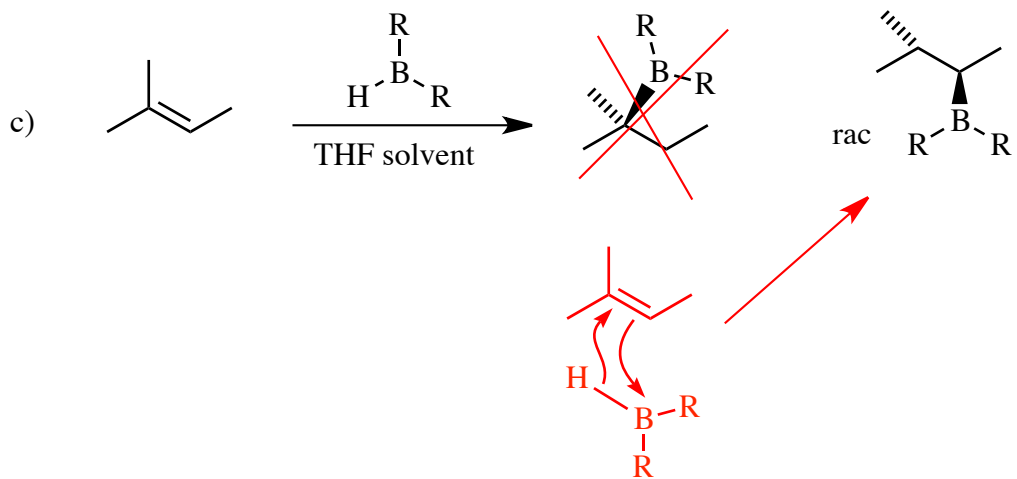
3) 20 pts) Propose reagents for accomplishing each of the following reactions. Make your reactions efficient (i.e. the target product should be the major product). Assume chiral starting materials and products are single pure enantiomers unless they are labeled "rac."



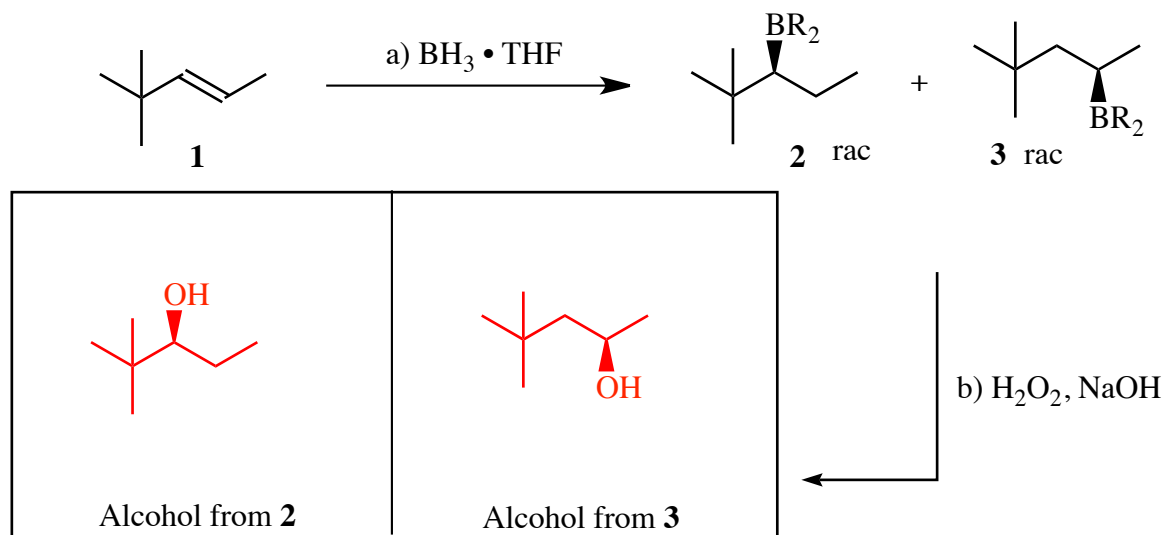
4) (20 pts) Propose arrow-pushing mechanisms for each of the following transformations. Show **all** intermediates in your mechanisms, but do not show transition states. Be sure structures are complete, including all lone pairs.



4 - Continued

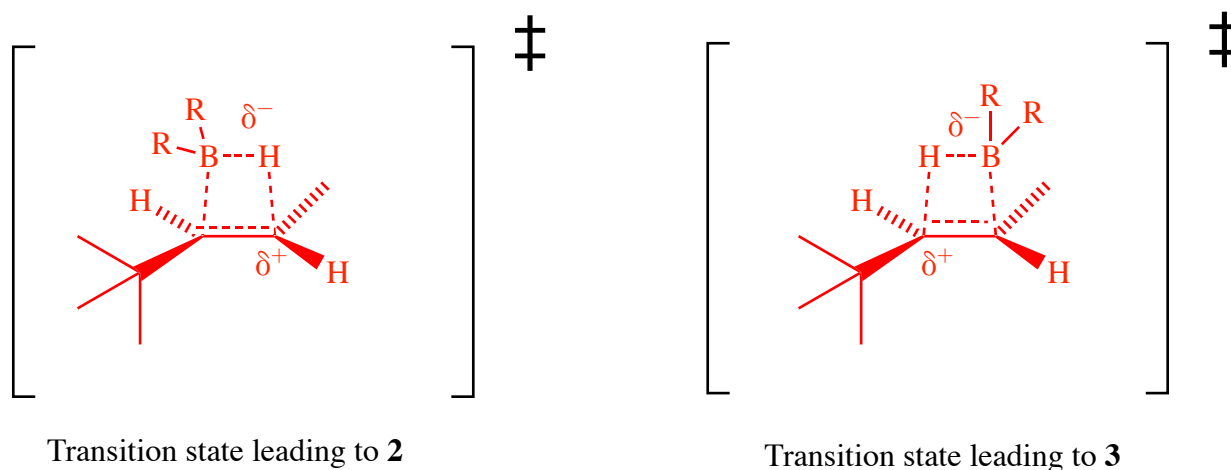


5) (20 pts) Alkene **1** reacts with borane in THF to give two alkylboranes **2**, and **3** (ignore the fact that each boron has three alkyl groups, and just focus on one of them, as indicated).



a) Draw the structures of the two alcohol products in the box above. Though the two alcohols are racemic, draw the specific products of oxidation of the borane enantiomers shown in structures **2** and **3**.

b) For this hydroboration reaction, carefully draw the transition states leading to the two borane products.



c) One of these borane products is formed in greater amount than the other. Predict which product is the major product (**2** or **3**).

d) Very briefly explain the reason for your answer in part c). Your answer should be written below.

Steric strain disfavors the transition state leading to isomer 2.

5 – Continued

e) Complete the reaction coordinate diagrams for both reactions given below. Carefully show the relative energies of the starting materials, and all of the barriers and wells on the hypersurfaces. Assume the products have the same energy, as indicated (this is not strictly true, but on the scale of this drawing, they are very close).

