

CHEM 3311-100 Fall 2007

Exam 3

Professor R. Hoenigman

Average = 64

High = 99

Low = 14

I pledge to uphold the CU Honor Code:

Signature _____

Name (printed) _____

Last four digits of your student ID number _____

Recitation TA _____

Recitation number, day, and time _____

You have 1.5 hours to complete this exam.

No model kits or calculators allowed.

Periodic table and scratch paper are attached.

**DO NOT TURN THIS PAGE UNTIL
INSTRUCTED TO DO SO.**

Recitation Sections:

#	Day	Time	TA
111	Monday	8 am	Noel
151	Monday	2 pm	Noel
191	Monday	5 pm	Noel
113	Tuesday	8 am	Noel
193	Tuesday	5 pm	Noel
112	Wednesday	8 am	Doug
152	Wednesday	11 am	Jon
192	Wednesday	5 pm	Doug
153	Thursday	8 am	Noel

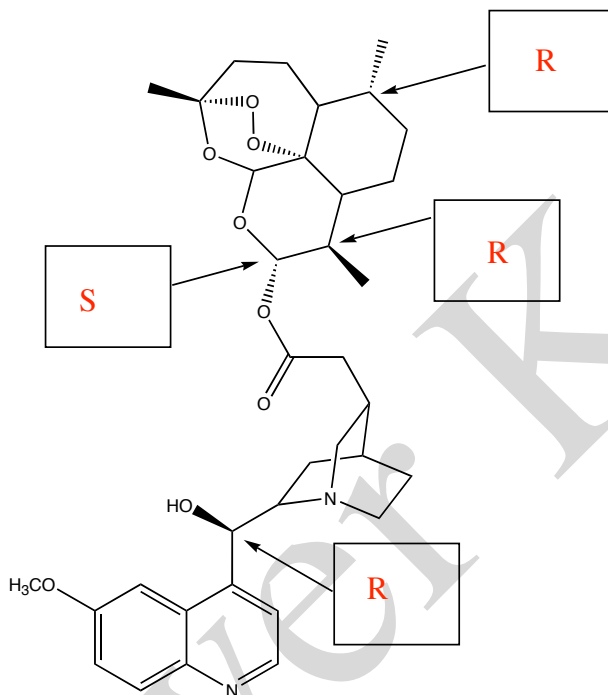
Page 1 _____/20 Page 4 _____/24

Page 2 _____/10 Page 5 _____/26

Page 3 _____/20

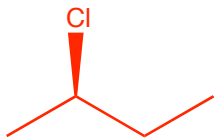
TOTAL _____/100

1. (8 pts) One area of pharmaceutical research is the development of hybrid drugs. A hybrid drug is a combination of two drugs into a single compound. Hybrid drugs sometimes have the benefit of being more active than either component drug, and also help treat drug resistant strains of disease. Shown below is a hybrid of quinine and artemisinin, two drugs used to treat malaria. In the boxes below give the stereochemical designator for each indicated chirality center.

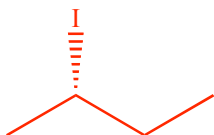


2. (12 pts) A) In the boxes below draw the indicated compound. B) Based on what we know about nucleophiles and leaving groups, we suspect that the reaction of (*R*)-2-chlorobutane with sodium iodide in acetone would not be useful as a synthesis of (*S*)-2-iodobutane. Explain. [Book Problem 8.46](#)

(*R*)-2-chlorobutane



(*S*)-2-iodobutane



Although the iodide ion is a better nucleophile than the chloride ion, iodide is also a better leaving group than chloride. The initial S_N2 reaction will form (*S*)-2-iodobutane. However, this compound is more reactive than (*R*)-2-chlorobutane, and will react with iodide to produce (*R*)-2-iodobutane. Ultimately, a racemic mixture will form in this reaction, not pure (*S*)-2-iodobutane.

3. (10 pts) Circle the relationship between the following pairs of compounds.

A. [Book Problem 7.33b](#)



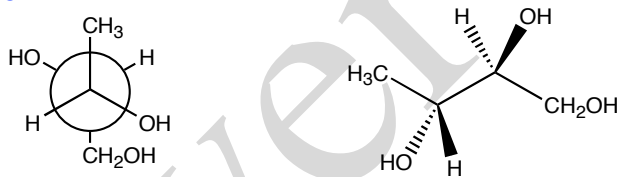
Identical constitutional isomers **enantiomers** diastereomers

B. [Book Problem 7.33h](#)



Identical constitutional isomers enantiomers diastereomers

C. [Book Problem 7.33L](#)



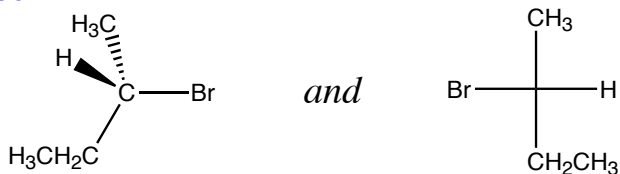
Identical constitutional isomers **enantiomers** diastereomers

D.



Identical constitutional isomers enantiomers **diastereomers**

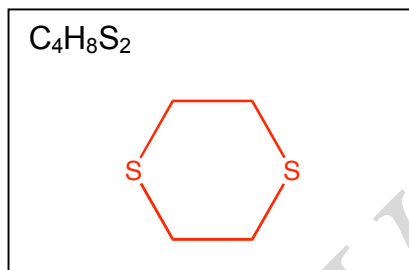
E. [Book Problem 7.33d](#)



Identical constitutional isomers **enantiomers** diastereomers

4. (10 pts) In the box below, draw the major organic product of the following reaction. Using arrows to show the flow of electrons, propose a mechanism for its formation. To the left, circle the term that best describes this mechanism.

Book Problem 8.31b



$\text{S}_{\text{N}}2$

E2

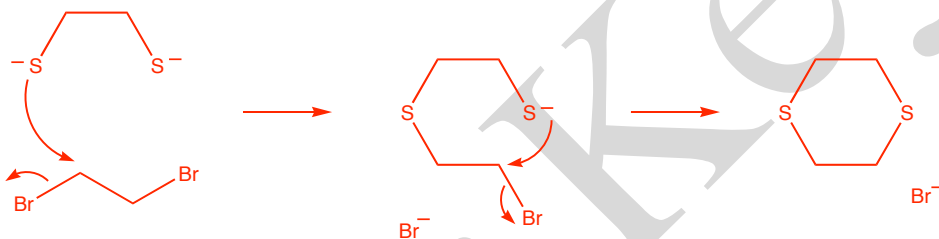
$\text{S}_{\text{N}}1$

E1

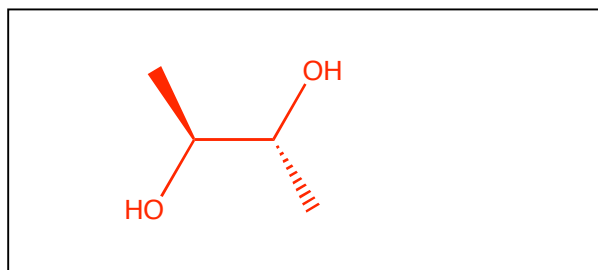
Electrophilic addition

Radical

None of these



5. (10 pts) In the box below, draw the major organic product(s) of the following reaction. Using arrows to show the flow of electrons, propose a mechanism for its formation. To the left, circle the term that best describes this mechanism.



$\text{S}_{\text{N}}2$

E2

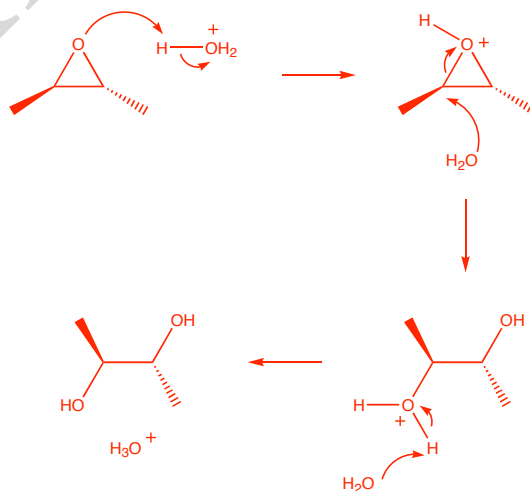
$\text{S}_{\text{N}}1$

E1

Electrophilic addition

Radical

None of these

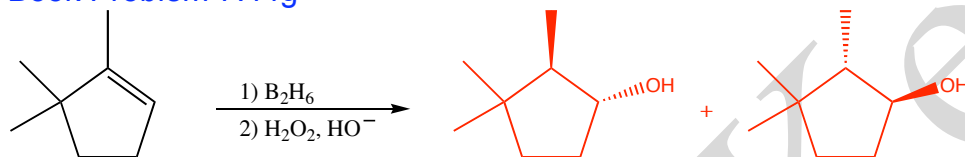


6. (24 pts) Give the major organic product(s) of each of the following reactions. If necessary, clearly show the stereochemistry of the products. **If no reaction occurs, write NR. Write "meso" under any meso compounds.** Note: some problems have more than one step.

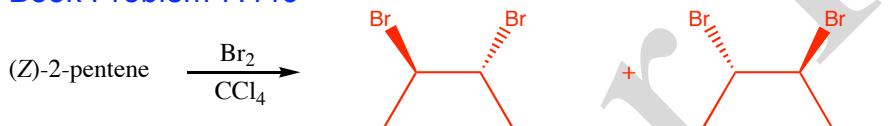
A. Book Problem 7.43b



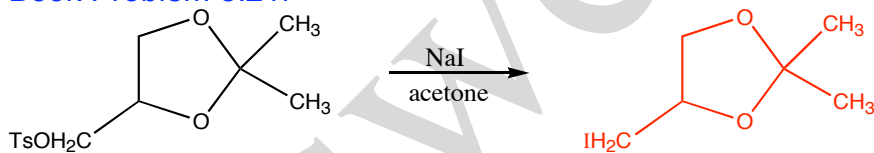
B. Book Problem 7.44g



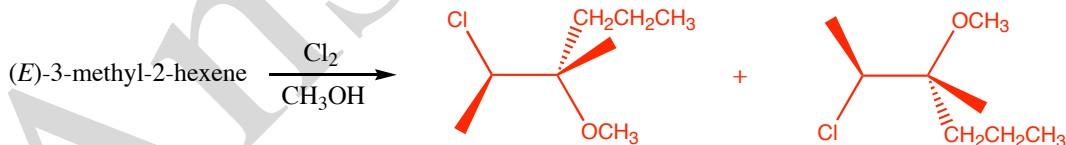
C. Book Problem 7.44c



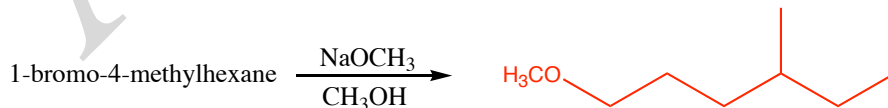
D. Book Problem 8.21f



E.



F.

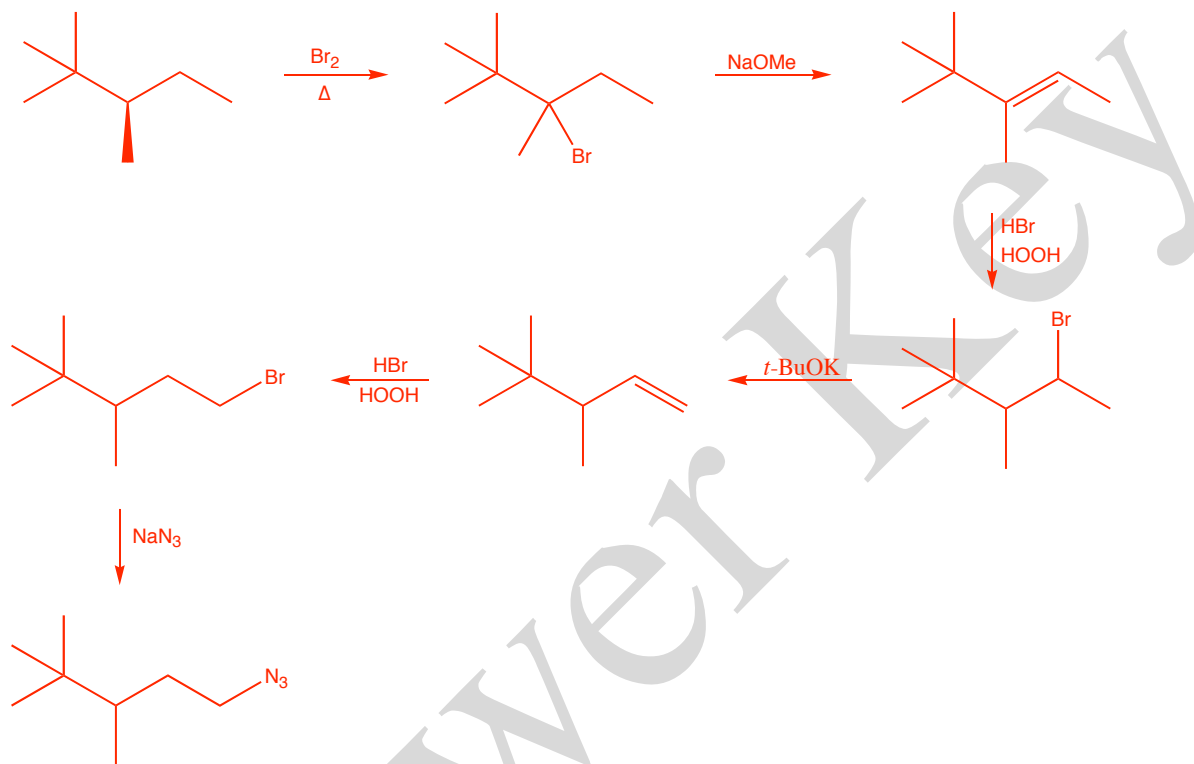


G. Book Problem 8.53



7. (26 pts) Propose an efficient synthesis for each of the following transformations. You may use any reagents you like. Be sure to show any intermediates. (Do not draw a mechanism.)

A. (\pm)-1-azido-3,4,4-trimethylpentane starting from (*R*)-2,2,3-trimethylpentane
(azido = N_3)



B. $NCCH_2CH_2CN$ starting from ethyl alcohol
Book Problem 8.33d

