

CHEM 3311-200

Exam 2

Fall 2008

By printing my name below, I pledge that
"On my honor, as a University of Colorado at Boulder student, I have neither given nor
received unauthorized assistance on this work."

Name Answer Key
Student CU ID # _____

NOTE: Exams will be returned by your TA in recitation!

Recitation TA's Name _____ (Bailey, Meylemans)

Recitation Day & Time _____

Grading Information

Page #	Points Possible	Your Score
2 (Questions 1 & 2)	20	_____
3 (Question 3)	12	_____
4 (Questions 4 & 5)	24	_____
5 (Question 6)	22	_____
6 (Questions 7 & 8)	22	_____
		_____ TOTAL (out of 100)

General Instructions

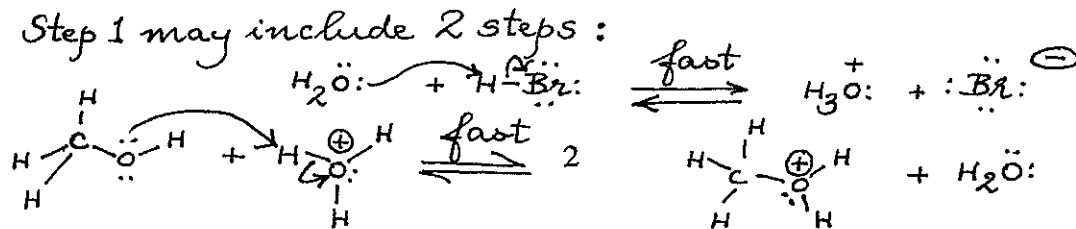
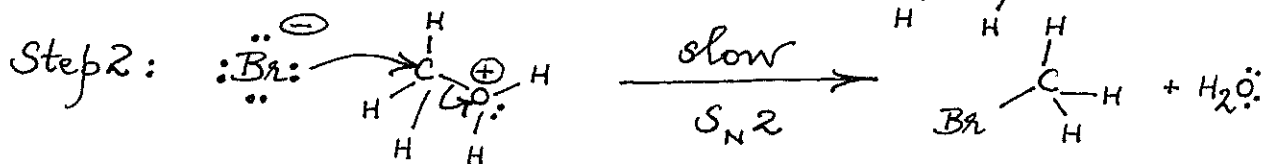
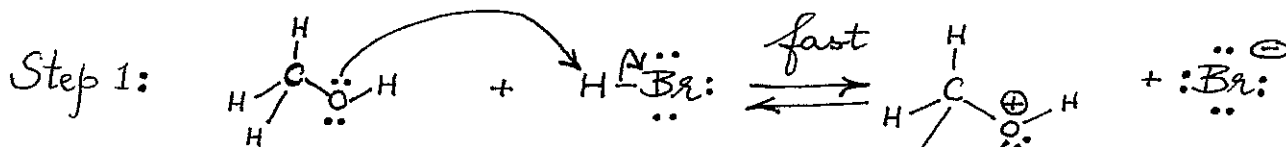
- (1) This is a **CLOSED BOOK** exam! No notes and molecular models are allowed.
- (2) You have 2 hours to complete the exam.
- (3) Write your name at the top of each page, starting with page 2.
- (4) Use the back of exam pages for scratch paper.
- (5) **Cell phones must be turned off; cell phones, headsets, and Bluetooth devices must be placed in a backpack or on the floor, and may not be accessed during the exam.** Students violating this policy will be asked to leave and will receive a zero for the exam.
- (6) If caught cheating, you will receive at best an F for this exam. The instructor reserves the right to proceed further, in compliance with university policies.

Name: Answer Key

1. (10 points) Write bond-line structural formulas for ALL the constitutionally isomeric alcohols of molecular formula $C_4H_{10}O$. Assign an IUPAC name to each isomer using either the substitutive or functional class system of nomenclature. Please enter the information in the spaces provided. The number of rows may not necessarily correspond to the maximum number of alcohols but provides guidelines to facilitate grading. Refer to Carey, end-of-chapter 4, Q

Bond-line structural formula	IUPAC name
	1-Butanol OR Butan-1-ol OR Butyl alcohol OR n-Butyl alcohol
	2-Butanol OR Butan-2-ol OR 1-Methylpropyl alcohol OR sec-Butyl alcohol
	2-Methyl-1-propanol OR 2-Methylpropan-1-ol OR 2-Methylpropyl alcohol OR Isobutyl alcohol
	2-Methyl-2-propanol OR 2-Methylpropan-2-ol OR 1,1-Dimethylethyl alcohol OR tert-butanol

2. (10 points) Write a clear, legible, stepwise mechanism for the reaction of methanol with hydrobromic acid. Label each step as Step 1, Step 2, etc. and indicate whether it is a slow or fast step. For the slow step, label the mechanism as S_N1 , S_N2 , E1 or E2. Please show ALL lone pairs, formal charges, and the arrow-pushing mechanism.

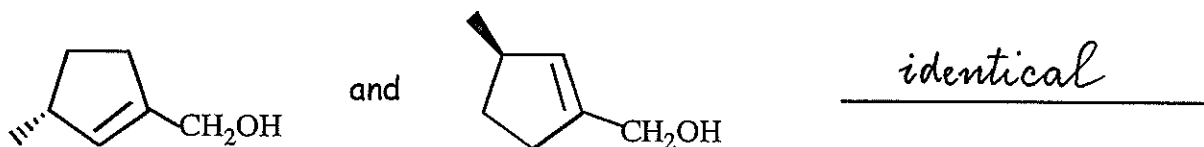


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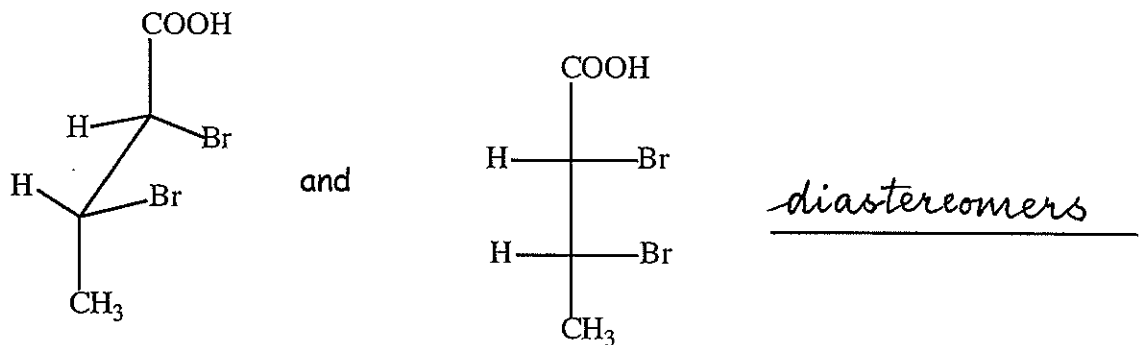
3. (12 points)

Identify the relationship in each of the following pairs as constitutional isomers, enantiomers, diastereomers, or identical (different ways of drawing the same compound). Write your answer on the line for each pair.

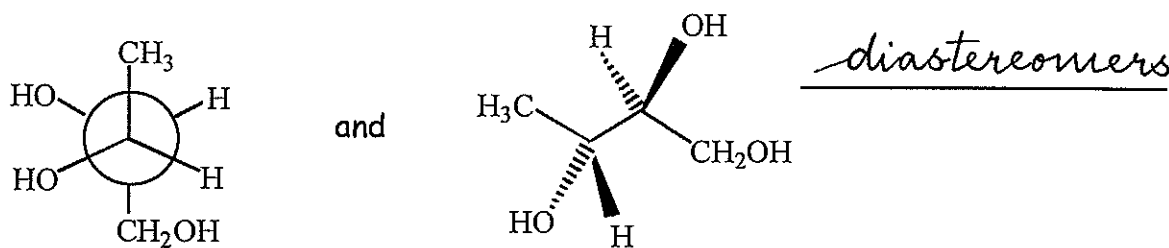
(A)



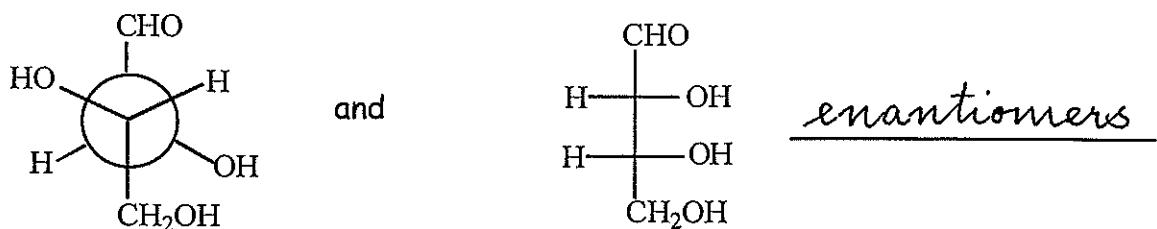
(B)



(C)

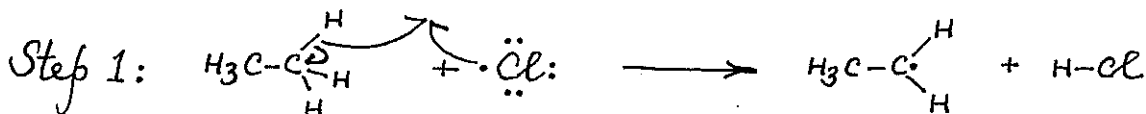


(D)



Name: Answer Key

4. (12 points) Consider the gas-phase reaction of ethane with chlorine at high temperatures (420°C). Show the **detailed mechanism** for the propagation steps in the formation of chloroethane. Please write each step in the rectangular box provided. The number of boxes shown has no relation to the number of steps. Please show all lone pairs or unpaired electrons and the appropriate arrows CLEARLY.



5. (12 points)

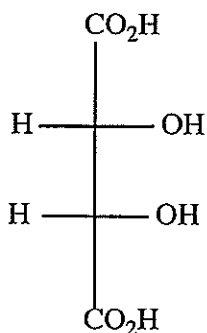
Identify each compound as achiral, chiral, and/or meso by circling the correct label(s) listed below each compound. Do NOT circle labels that are NOT relevant to the molecule shown (points will be deducted).



achiral

chiral

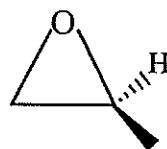
meso



achiral

chiral

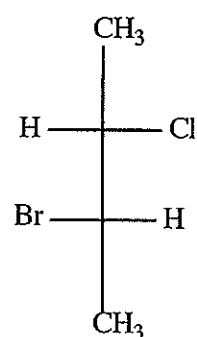
meso



achiral

chiral

meso



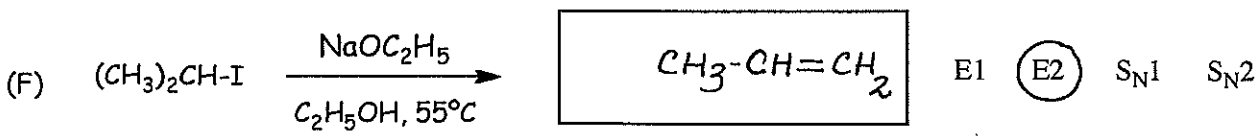
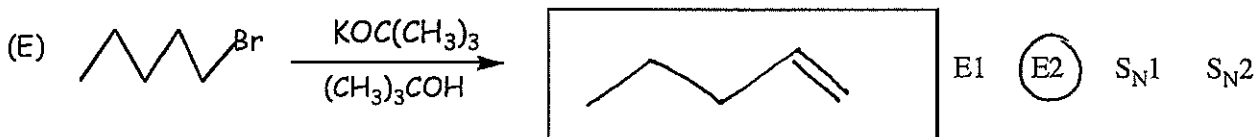
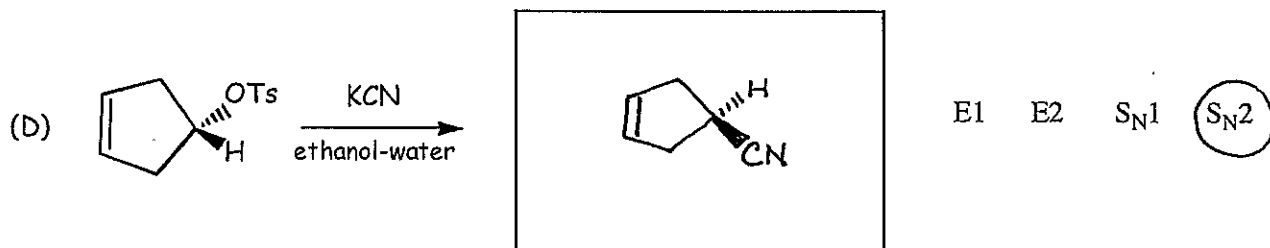
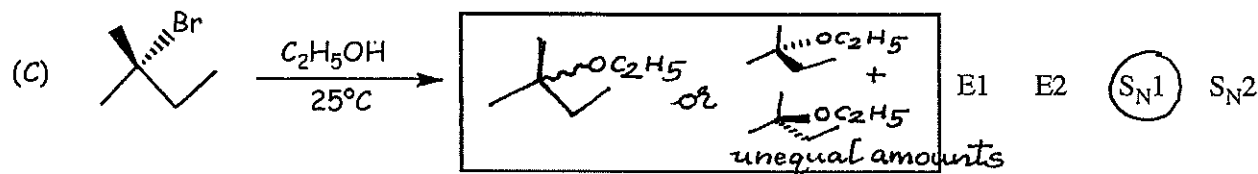
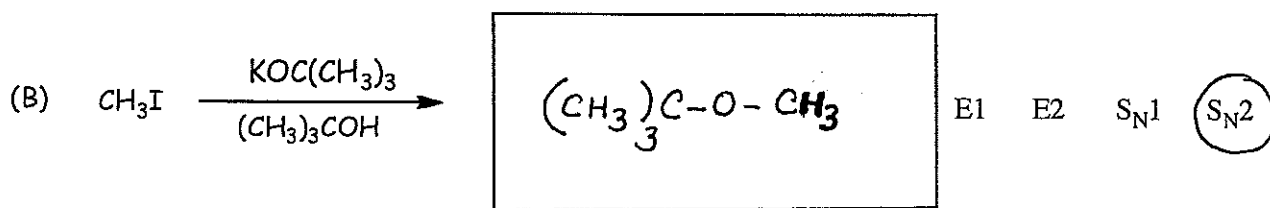
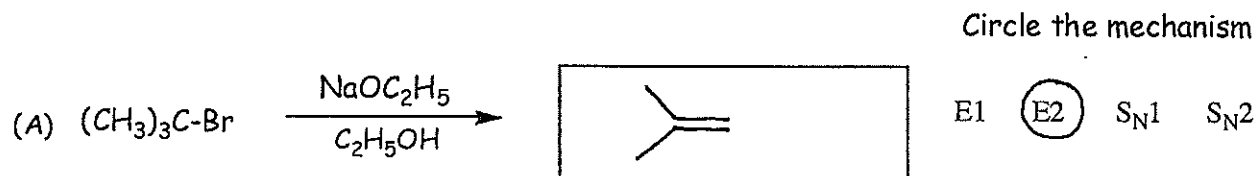
achiral

chiral

meso

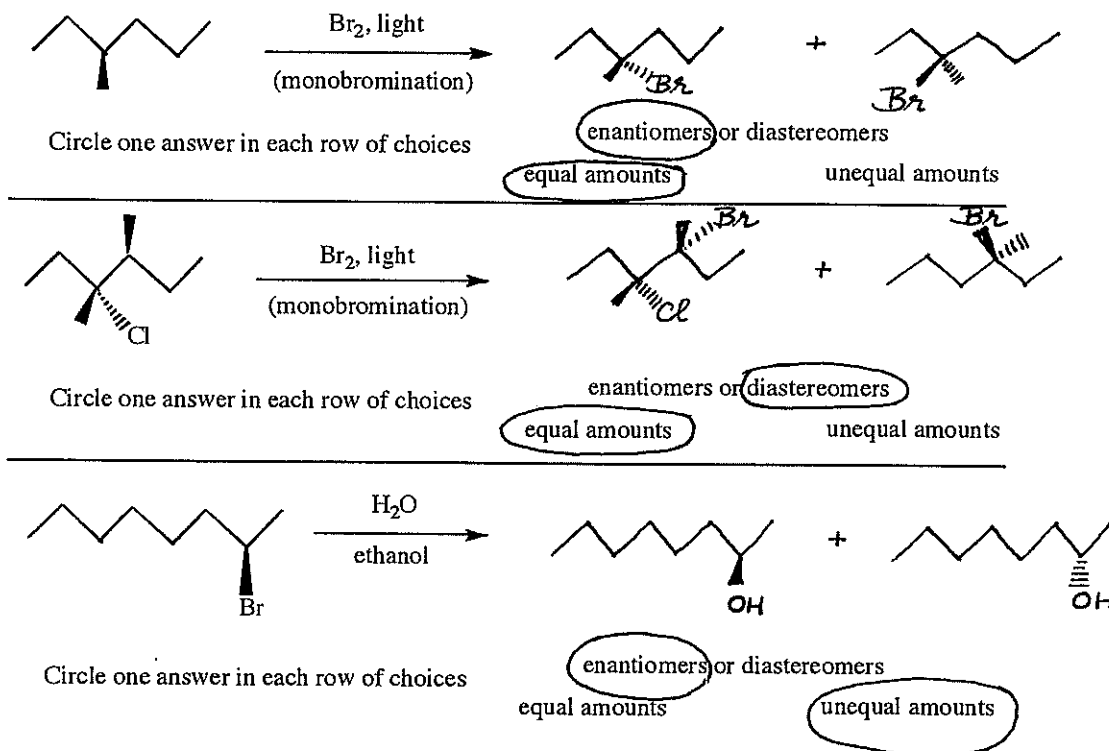
Name: _____

6. (22 points) Draw the structure of the major product(s) of each reaction. Circle the mechanism that accounts for the formation of this product.



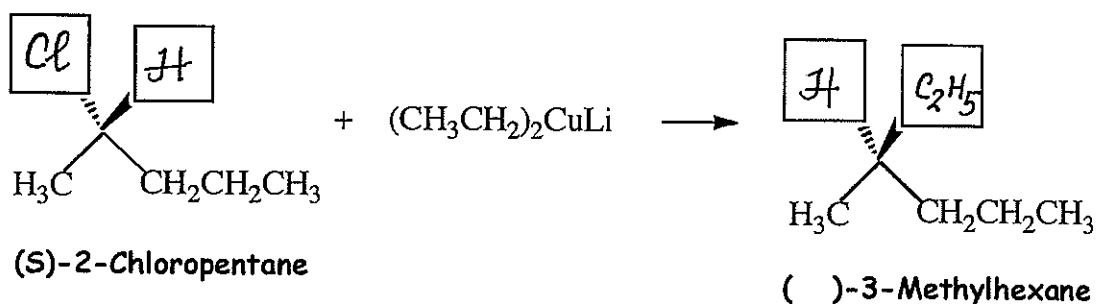
Name: _____

7. (12 points) Draw the correct stereochemistry of the product(s) for each reaction and specify, where necessary, whether you obtain equal or unequal amounts of enantiomers or diastereomers.



8. (10 points)

When (S)-2-chloropentane is reacted with lithium diethylcopper under S_N2 conditions, an optically pure 3-methylhexane is formed. The nucleophile is the ethyl carbanion. Complete the reaction shown below by placing the information requested in the appropriate boxes. Circle the absolute configuration at the stereogenic center in the product of the reaction.



Place the appropriate atom or group of atoms in each box to complete the structure of (S)-2-Chloropentane

Place the appropriate atom or group of atoms in each box to complete the structure of optically pure (?) -3-Methylhexane

The absolute configuration at the chiral carbon in the optically pure (?) -3-Methylhexane is:

R

(S)

(Circle the correct answer)