

Exam 2

Professor R. Hoenigman

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 hour and 30 minutes 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
211	Monday	8 am	Noel
251	Monday	2 pm	Carolynn
291	Monday	5 pm	Heather
252	Tuesday	12 pm	Sam
293	Tuesday	5 pm	Carolynn
212	Wednesday	8 am	Noel
253	Wednesday	1 pm	Tom
292	Wednesday	5 pm	Heather
213	Friday	8 am	Heather

Score:

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TOTAL _____/100

1. (12 pts) Naloxone (shown below) has a structure that is similar to heroin. In fact, naloxone is often used to reverse a heroin overdose. Circle **all** of the terms below that describe one or more structural feature of naloxone.

Amine

Alkene

Aldehyde

Amide

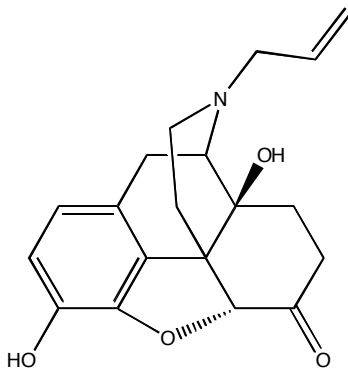
Ester

Aromatic ring

Alcohol

Ether

Ketone



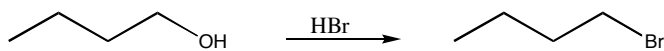
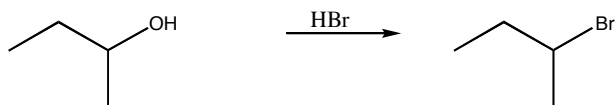
Naloxone

2. (9 pts) For each of the following pairs, circle the compound that has the *lower* heat of combustion. In the box, give a brief reason for your choice.

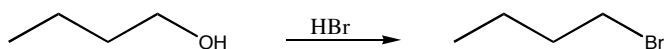
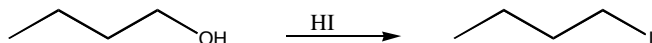
A. *cis*-2-methylcyclohexanol*or**trans*-2-methylcyclohexanol
B. *cis*-3-methylcyclohexanol*or**trans*-3-methylcyclohexanol
C. (*E*)-cyclopentene*or*(*Z*)-cyclopentene

3. (6 pts) Which reactions in the following pairs will take place more rapidly?
Circle your answer. In the box, give a brief reason for your choice.

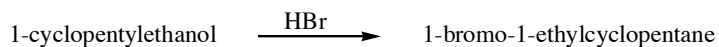
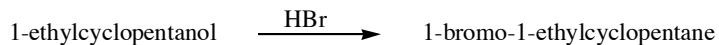
A.

*or*

B.

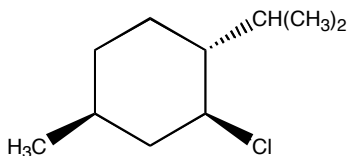
*or*

C.

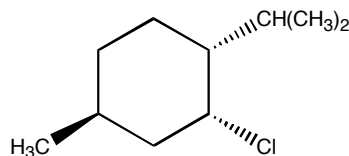
*or*

4. (8 pts) Write an arrow pushing mechanism for the preparation of methyl bromide from methanol and hydrogen bromide. In the box below, state whether this is an S_N1 or S_N2 reaction.

5. (15 pts) Menthyl chloride and neomenthyl chloride have the structures shown below. One of these stereoisomers undergoes elimination on treatment with sodium ethoxide in ethanol much more readily than the other.



Menthyl chloride



Neomenthyl chloride

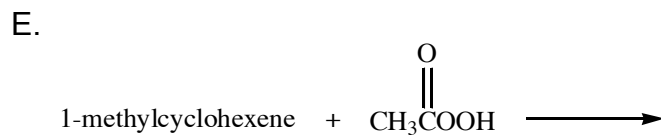
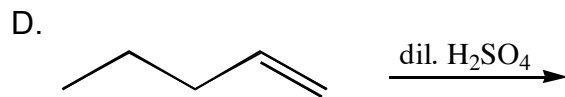
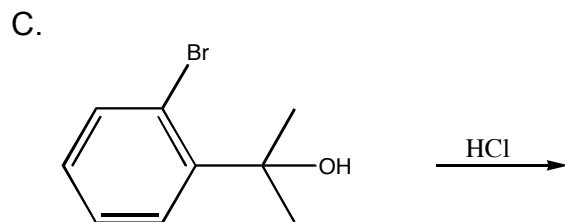
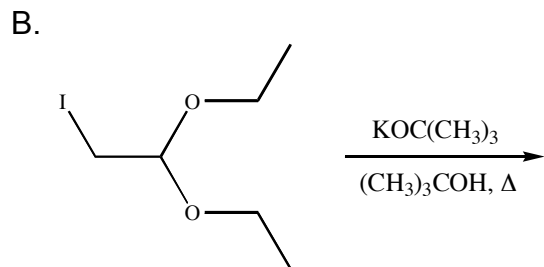
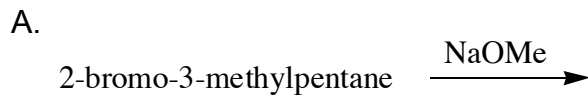
A. Using arrows to show the flow of electrons, draw a mechanism to account for the dehydrohalogenation of each of the isomers. Be sure to draw neat chair cyclohexanes.

Menthyl chloride:

Neomenthyl chloride:

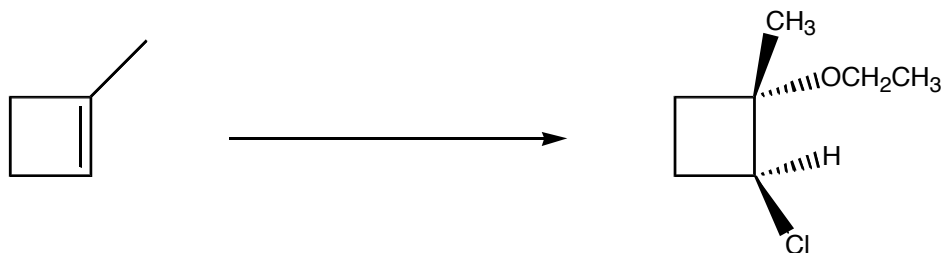
B. Which reacts faster, menthyl chloride or neomenthyl chloride? Why?

6. (15 pts) Give the single major organic product of the following reactions.

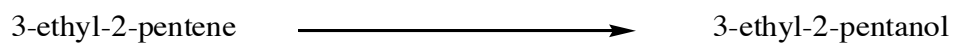


7. (15 pts) Propose reagents for accomplishing the following transformations. The desired product should be the major product of the reaction.

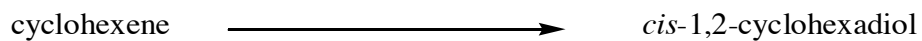
A.



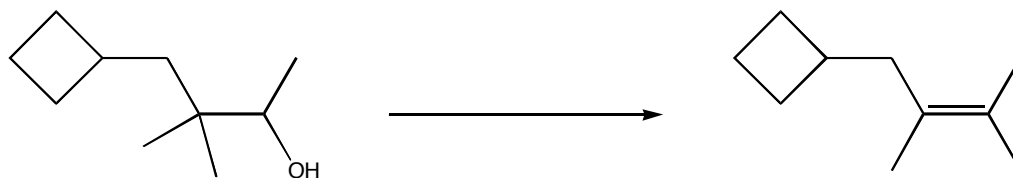
B.



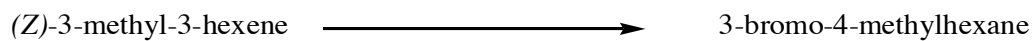
C.



D.



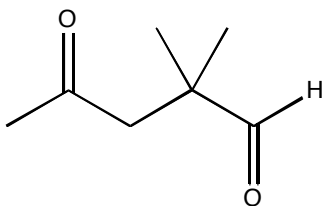
E.



8. (20 pts) Propose an efficient synthesis for the following transformations. You may use any reagents you like.

A. cyclohexane starting from bromocyclohexane

B. *tert*-butyl iodide starting from isobutyl iodide

C.  from a cycloalkane

The structure shows a five-carbon chain. The first carbon is an aldehyde group (CHO). The second carbon is a methylene group (CH₂). The third carbon is a quaternary carbon atom bonded to two methyl groups and the second and fourth carbons. The fourth carbon is a carbonyl group (C=O). The fifth carbon is a methyl group (CH₃).

Scratch Page

Scratch Page