EXAM 3

CHEMISTRY 220a

Friday, November 4, 2005

NAME (print): _____

TA:_____ Section Day:_____ Section Time:_____

No Calculators! Take a few moments to look over the exam. Answer each question on the exam paper.

Important clues and structures are in **bold**.

Do all **preliminary** drawing or computations on the work sheets at the end of the exam. The work sheets will not be graded.

The exam is 55 minutes.

STOP writing and hand in your exam when you are asked to do so.

REMEMBER: Neatness is to your advantage.

1. (20 pts) Structure _____

2. (30 pts) Reactions (5 of 6) _____

3. (25 pts) Potpourri _____

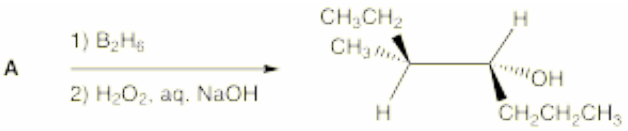
4. (25 pts) Mechanisms (do 1 of 4) _____

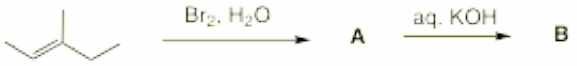
_____

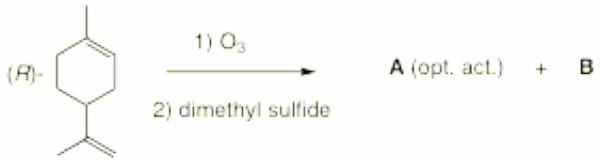
Total (100 pts)

1. **Structure:** (20 pts) Treatment of compound **A**, $C_{10}H_{20}$, with O_3 and then dimethyl sulfide provides a **single, branched-chain** ketone **B**. Exposure of **A** to bromine water affords (±)-**C**, which, when treated with aqueous NaOH, produces meso-epoxide **D**. What are the structures **A-D**? Explain and illustrate.

2. **Reactions:** (30 pts) **Complete 5 of 6 of the following questions.** Specify the structures in each one with a brief rationale for your choice. Pay attention to stereochemistry, optical activity, etc. where they apply. . **If you do six questions, cross out the one that you do not want graded.**

a) 

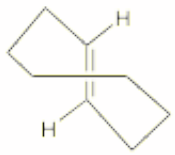
b) 

c) 

…continued next page

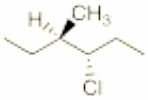
2. continued.

d) (*E*)-3,4-dimethyl-3-hexene $\xrightarrow[\text{2) } H_3O^+]{\text{1) } RCO_3H}$ **A**

e) 

optically active

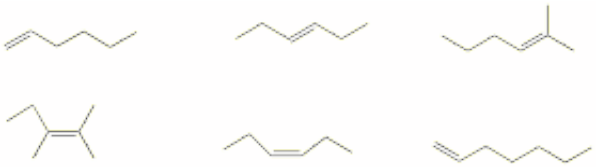
$\xrightarrow[H_2O_2]{\text{cat. } OsO_4}$ **A** (optically active?)

f) 

$\xrightarrow[\text{2) } BH_3 \text{ 3) } H_2O_2\text{, aq. NaOH}]{\text{1) } C_2H_5ONa/C_2H_5OH}$ **A**

3. **Potpourri:** (25 pts) Complete the following questions.

a) **Circle** the hexene(s) with the greatest heat of hydrogenation.



b) **Circle** the terms that apply to the addition of bromine to the 2-pentenes.

stereospecific regiospecific meso anti bromonium ion

c) **Circle** the terms that apply to the conversion of (*E*)- or (*Z*)-3-methyl-2-pentene to the alcohol 3-methyl-2-pentanol by hydroboration/NaOOH.

presence of diastereomers optically active stereospecific

common intermediate anti addition

d) Of the following additions to alkenes, **circle** the operations that we do **not** know how to accomplish.

form a 1,2-diol anti add Br_2 syn form a chlorohydrin syn

form a 1,2-diol syn add chlorine anti

e) Circle the reactions that form meso compounds with (E)-3-hexene.

Br_2/CCl_4 OsO_4/H_2O_2 1) peracid; 2) H_3O^+

alkaline, aq. permanganate ozone/$(CH_3)_2S$

4. **Mechanisms:** (25 pts) Provide a mechanism for **one** of the following reactions. Use the curved arrow formalism. Be as explicit as possible. If the mechanism of some particular step is not known, just write the reagent. Briefly address issues of stereospecificity, regiochemistry, stereochemistry and stoichiometry as they may apply. **If you work on more than one solution, cross out the one that you do not want graded. Two pages are provided.**

a) The ozonolysis of (*E*)-2-hexene.
b) The reaction of (*Z*)-2-hexene with m-chloroperbenzoic acid and the subsequent reaction of the product with aqueous mineral acid.
c) Epoxidation of (*E*)-2-hexene via the halohydrin route.
d) Formation of an alcohol from (Z)-3-methyl-3-hexene by the borane method.

Continued work space on the next page…

4. Continued….

Work Sheets

Work Sheets

Work Sheets