

EXAM 3

CHEMISTRY 220a

Friday, November 9, 2001

NAME (print): _____

TA: _____ Section Day: _____ Section Time: _____

Take a few moments to look over the exam. Answer each question on the exam paper.

Important clues and instructions 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. There is a Periodic Table on the last page of the exam.

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) _____

2. (20 pts) _____

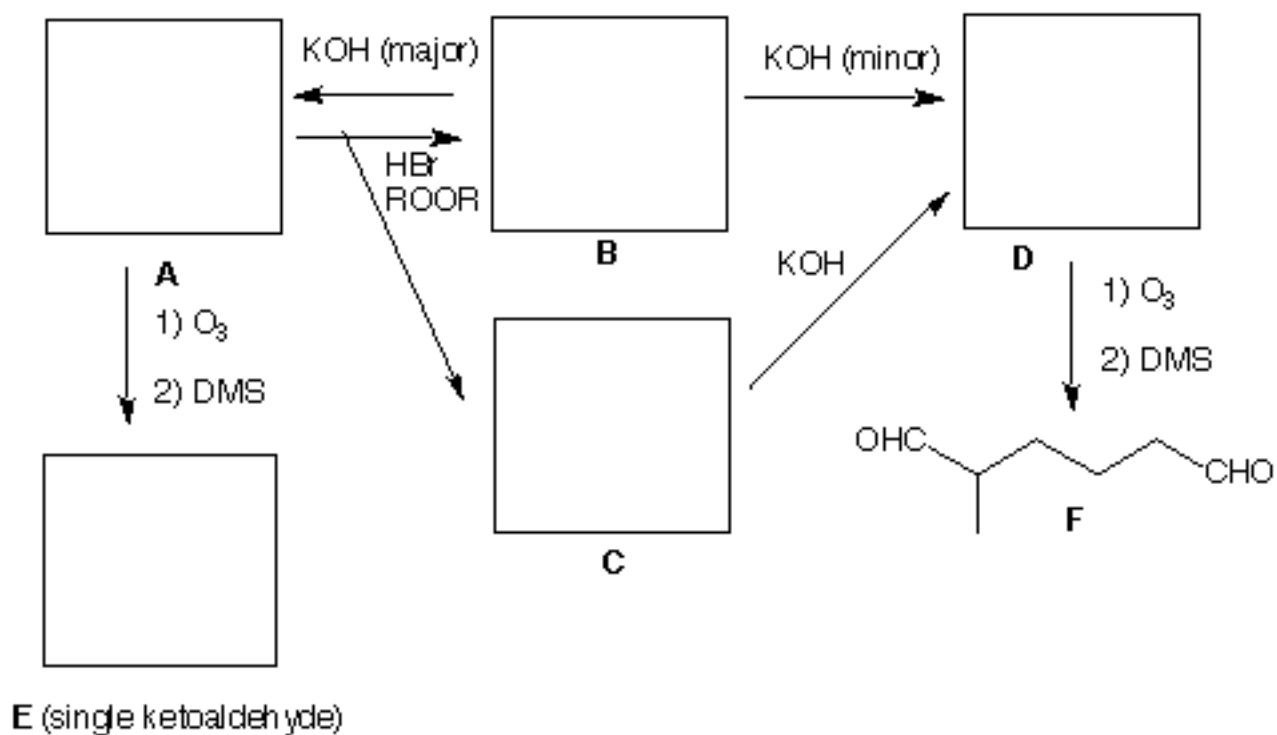
3. (20 pts) _____

4. (25 pts) _____

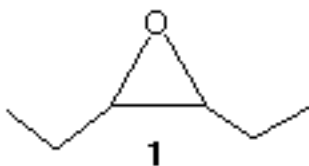
5. (15 pts) _____

Total (100 pts)

1. (20 pts.) Compound **A** (C_7H_{12}) reacts with O_3 followed by dimethyl sulfide reduction to provide a single compound **E**, which contains a ketone and aldehyde group, i.e., ketoaldehyde **E**. When **A** reacts with HBr in the presence of peroxide, two stereoisomeric bromides, **B** and **C**, are formed. Bromide **B** reacts with KOH to give mainly **A** and some **D**, whereas bromide **C** affords only compound **D** upon reaction with KOH . Ozonolysis of **D** provides dialdehyde **F**. What are the structures **A-E**? Provide a **very brief** conformational rationale for the assignment of structures to **B** and **C**. Place the structures in the appropriate boxes. [Hint: **F** is a good place to start.]

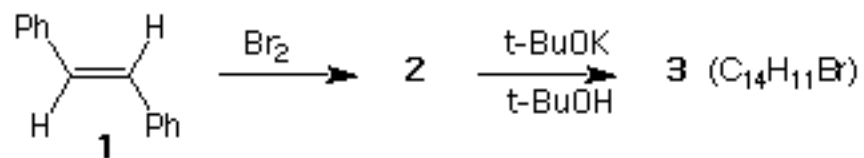


2. (20 pts.) Design a synthesis of meso [achiral and not (\pm)] epoxide **1** from 1-butyne and ethylene as your two sources [Note: 4 + 2 = 6] of carbon. All other reagents are available to you.

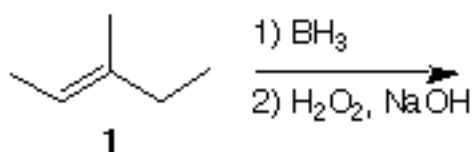


3. (20 pts.) Provide reagents and/or the structure of products in **4 of 5** of the following questions. **Pay attention** to stereochemistry where applicable.

a) ORGO, Alkene 8:



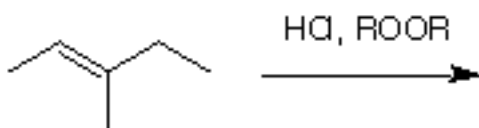
b) ORGO, Alkene 5:



c) 2-hexyne



d)



e)

1-butyne



4. (25 pts.) **Circle** the best answer(s) for each of the following questions:

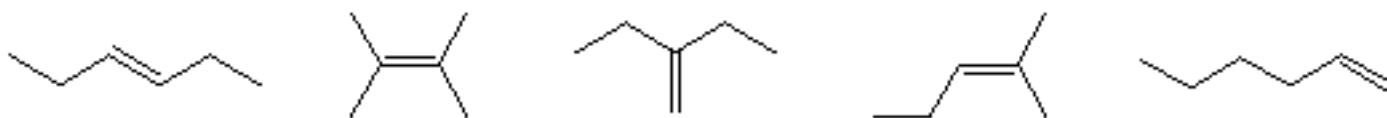
a) The compounds that are deprotonated by 1-lithio-1-propyne (CH_3CCLi)

NH_3	ethanol	ethane	CH_3NH_2	ethylene
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b) Given ΔH_f° (pentane) = -35 kcal/mol and the ΔH° (hydrogenation) of 2-pentyne to n-pentane is -66 kcal/mol, what is the best estimate for the ΔH_f° (kcal/mol) of 2-pentyne?

-31	+4	-100	+32	-4
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c) The hexene with the smallest heat of combustion



d) The terms that describe the product derived from the reaction of OsO_4 with (Z)-3-hexene.

oxidation	1,2-diol	stereospecific	achiral	meso
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e) The compound(s) with degree of unsaturation = 3.

$\text{C}_8\text{H}_{18}\text{OS}$	$\text{C}_8\text{H}_{10}\text{ClN}$	$\text{C}_{12}\text{H}_{19}\text{Br}_2\text{N}$
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5. (15 pts.) Provide a mechanism, curved arrow formalism, **for one, and only one**, of the following chemical transformations. **Pay attention** to stereochemistry where applicable.

a) The reaction of HBr with 1-butene in the presence of a peroxide

b) The conversion of 1-butene to n-butyl alcohol (1-butanol) via hydroboration.

c) The epoxidation of (E)-2-butene via the halohydrin route.

[Periodic Table](#)

