Chem 220a

Problem Set 7

Chapter 8

Due: Monday, October 25, 2004

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1. Reading assignments:

a)The alkene module in ORGO.

b) Ozonolysis module.

How do I approach solving problems like #2-6? These problems require factual knowledge and an ability to reason. Pretend you are a doctor and patient has certain symptoms (the facts presented) and you must call upon your knowledge to provide a diagnosis (solution). Here is a step-by-step analysis (diagnosis) of #2 PS7 from F2000.

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(1838-1904)

2. Compound **A** is reduced with hydrogen to n-octane. Treatment of **A** with Br_2/ CCl_4 produces (±)-**B** ($C_8H_{16}Br_2$). Ozonolysis of **A** produces a single compound **C**. What are the structures **A-C**? Explain and illustrate.

3. Nonane **A** undergoes free radical chlorination to produce two, and only two, monochlorides **B** and **C**. Treatment of **B** with aqueous sodium hydroxide affords **D** ($C_9H_{20}O$) and **E**. Under the same conditions, **C** gives rise to only **E**. A product of ozonolysis of **E** is aldehyde **F** ($C_8H_{16}O$). Treatment of **E** with H_2SO_4 provides **G** and **G'**, both of which afford ketone **H** and 3-pentanone upon ozonolysis. **G** has a more negative heat of formation than **G'**. What are the structures of **A-H**? Explain and illustrate.

4. Consider the diastereomer (2R*, 3S*)-2-bromo-3-methylpentane **A**. Show how you can prepare the corresponding alcohol, (2R*, 3R*)-3-methyl-2-pentanol, **B** from **A** without doing an S_N2 displacement.

5. Optically active compound **A** ($C_{10}H_{16}$) absorbs two equivalents of H_2 to give optically active **B**. Ozonolysis of **A** provides a **single** compound **C**, (*S*)-2-methyl succindialdehyde ($C_5H_8O_2$: see Table 20-3).

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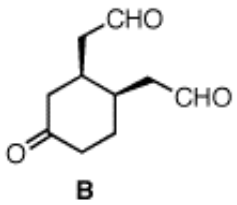
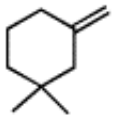
6. Compound **A** ($C_{13}H_{20}$) liberates 54.5 kcal/mol of heat upon hydrogenation. Compound **A** undergoes ozonolysis; **B** is isolated. What are the structures of **A** and **B**? What two structures of **B** may be eliminated and why? [Use the heat of formation tables here and not the data in Table 7-1. The answers differ by a few tenths of a kilocalorie.]



B

7. Provide solutions to each of the following problems. Pay attention to stereochemistry and mechanisms.

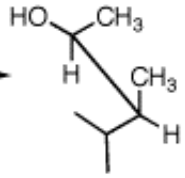
a)



HCl, peroxide → ?

b) Draw and name me

1) B_2H_6
2) aq. NaOH, H_2O_2



c)

C_6H_{12} —cat. OsO_4, H_2O_2→ d,l-**A**

C_6H_{12} —Cl_2, CCl_4→ meso-**B**

C_6H_{12} —aq. Br_2→ **C** → **D** (aq. NaOH) —H_3O^+→ meso-**A**

d) (Z)-3-methyl-3-hexene

1) B_2H_6
2) aq. NaOH, H_2O_2

(Z)-3-methyl-3-hexene

3) PCl_5 (remember Walden)
4) aq. KOH

e) (E)-3-methyl-3-hexene $\xrightarrow[\text{bromoform}]{\text{KO-t-}C_4H_9}$