

Chem 225b - Comprehensive Organic Chemistry

Problem Set 7

Chapter 8, Reactions of Alkenes

Due: Monday, March 24, 2008

Reading assignments:

a) The alkene module in [ORGO](#).b) [Ozonolysis](#) module.

How do I approach solving problems like #1---5? [Here](#) is a step-by-step analysis of a typical problem.

1. An optically active compound **A** (C_8H_{14}) reacts with catalytic OsO_4 and stoichiometric H_2O_2 to form (*S,S*)-diol **B**. Ozonolysis and dimethyl sulfide reduction of **A** forms $OHC(CH_2)_6CHO$. What are the structures of **A-B**? Explain.



Vladimir Vasilovich
Markovnikov
(1838-1904)

2. Compound **A**, C_7H_{12} , affords a single ketoaldehyde **B** upon ozonolysis and dimethyl sulfide reduction. Hydrogenation of **A** gives methylcyclohexane and the reaction liberates 27.0 kcal/mol of heat. Treatment of **A** with HBr in the presence of peroxide gives two compounds, **C** and **D**. Compound **C** reacts with C_2H_5ONa/C_2H_5OH to give **E** while under the same conditions, compound **D** gives mainly **A** and some of compound **E**. Ozonolysis of **E** gives a single dialdehyde **F**. What are the structures of **A-F**? Explain and illustrate. Pay attention to stereochemistry.

3. Compound **A** reacts with Br_2 in CCl_4 to give **B**. The intermediate in this reaction (**C**) is a meso species. Ozonolysis of **A** affords only propanal (propionaldehyde). What are the structures **A-C**? Explain and illustrate. Pay attention to stereochemistry.

4. Optically active hydrocarbon **A** reacts with 2 molar equivalents of hydrogen to produce diastereomers **B** and **C**, both of which are optically inactive. Compound **B** has a smaller heat of combustion than **C**. Ozonolysis and dimethyl sulfide reduction of **A** affords pyruvaldehyde **D** ($C_3H_4O_2$) and (*S*)-isopropylsuccindialdehyde **E** (tartaric acid = 2,3-dihydroxysuccinic acid). What are the structures **A-E**? What are the sign and value of the optical rotation of **A** (Review [PS4](#))? Explain.

5. Compound **A** ($C_{10}H_{20}$) undergoes ozonolysis to produce a **single, optically active** compound (*R*)-**B**. The reaction of compound **A** with ethereal OsO_4 or aqueous $KMnO_4$ provides a single compound **C**. On the other hand, treatment of compound **A** with Br_2 in CCl_4 , affords two new compounds, **D** and **E**, both of which are optically active. There is insufficient information to distinguish between **D** and **E**. What are the

structures of **A-E**? Show their stereochemistry. Show your reasoning.

6. Provide the products, reagents, and/or reagents as required in each of the following problems. Explanations are required for all.

