ORGANIC CHEMISTRY **CH 384, Fall 2010**

WORKSHOP 5, 6, 7

Alkene Reactions, Eliminations, Stereochemistry

1. All of the following reactions occur by analogous mechanisms. Write a single, general mechanism that explains all of these reactions. Make a table listing the electrophiles and the nucleophiles, reaction by reaction, for the first mechanistic step and also for the second mechanistic step.

$RCH{=}CH_2 + HBr \text{ ---> } RCHBrCH_3$

$RCH{=}CH_2 + HI \text{ ---> } RCHICH_3$

$RCH{=}CH_2 + Cl_2 \text{ ---> } RCHClCH_2Cl$

$RCH{=}CH_2 + Cl_2 \text{ (in } H_2O) \text{ ---> } RCH(OH)CH_2Cl$

$RCH{=}CH_2 + Br_2 \text{ ---> } RCHBrCH_2Br$

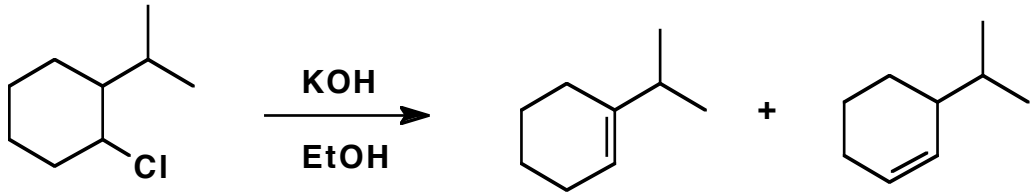
$RCH{=}CH_2 + Br_2 \text{ (in } CH_3OH) \text{ ---> } RCH(OCH_3)CH_2Br$

$RCH{=}CH_2 + H_2SO_4 \text{ ---> } R(CH_3)CHOSO_3H$

$RCH{=}CH_2 + H_2SO_4 \text{ (in } H_2O) \text{ ---> } RCH(OH)CH_3$

$RCH{=}CH_2 + H_2SO_4 \text{ (in } CH_3OH) \text{ ---> } RCH(OCH_3)CH_3$

2. Elimination from 1-chloro-2-isopropylcyclohexane can give different products, as shown below. Write good chair forms for the two conformations of the cis isomer and write a detailed electron-pushing mechanism to predict the preferred product in this case. Do the same with the trans isomer. Explain the distinctive differences in the two cases.
One of the isomers reacts much faster than the other. Predict which is faster and explain the difference.



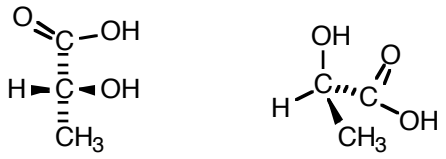
cis	**75%**	**25%**
trans	**0%**	**100%**

3. a. The reaction of 3-methyl-2-butanol with HBr gives 2-bromo-2-methylbutane. Write a complete mechanism that explains why this is the major reaction product.

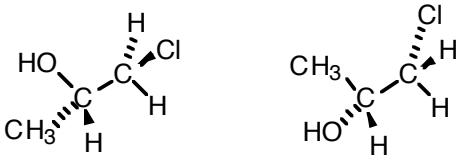
b. The reaction of 3-methyl-2-butanol with hot H_3PO_4 gives three elimination products, in yields of 64%, 33% and 3%. Write a complete mechanism, which should start out analogously to part (a) above, and predict the structures of the three products. Why are substitution products formed in part (a) but are not formed in this case?

4. Tell whether the compounds in each of the following pairs are **non-isomeric**, **identical**, **constitutional isomers**, **enantiomers**, or **diastereomers**. Also, assign **configuration (R or S)** to all stereocenters. Identify the **optically active (chiral)** compounds. Identify any meso compounds. Make molecular models of these compounds to confirm your assignments.

a.



b.



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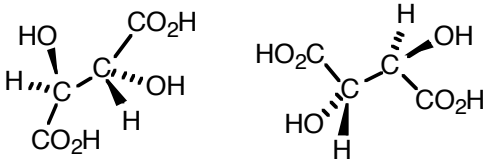
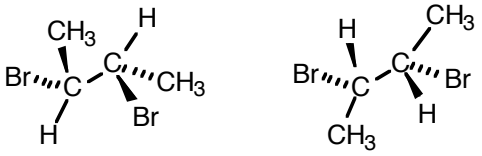


d.



e.

f.