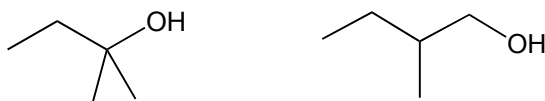


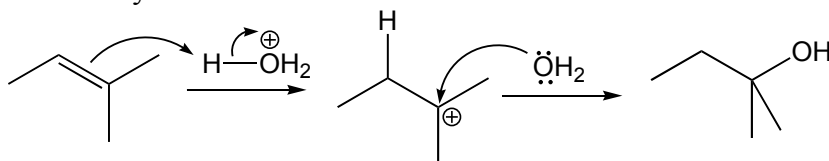
Chem 143 Problem Set 11

Friday 12th November 2010

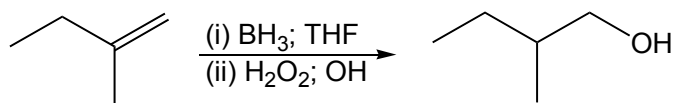
1. Provide starting materials, reagents and conditions for the preparation of the following alcohols:



- (a) using addition chemistry

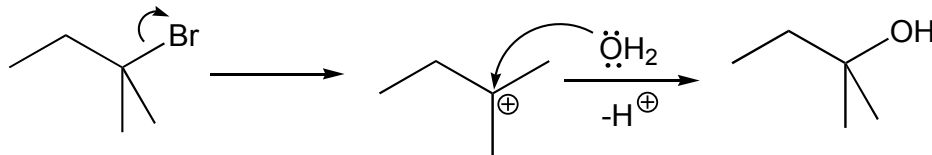


Markovnikov addition. Oxymercuration-demercuration would be a better strategy if the carbocation is unstable

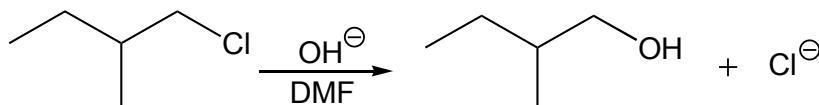


Anti-Markovnikov addition.

- (b) using substitution chemistry



We want a tertiary alcohol, so an $\text{S}_{\text{N}}1$ reaction would be appropriate. This means a good leaving group (Br) and a protic solvent (H_2O). We might expect some $\text{E}1$ by-product.

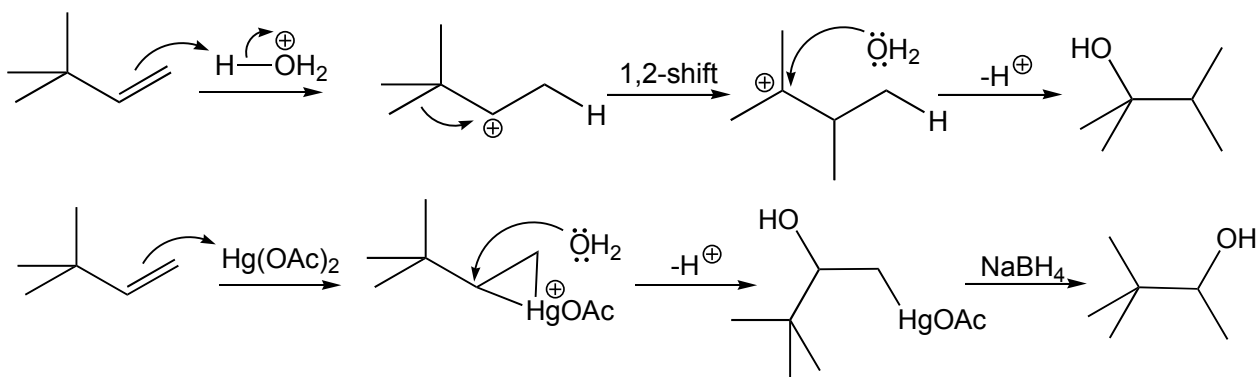
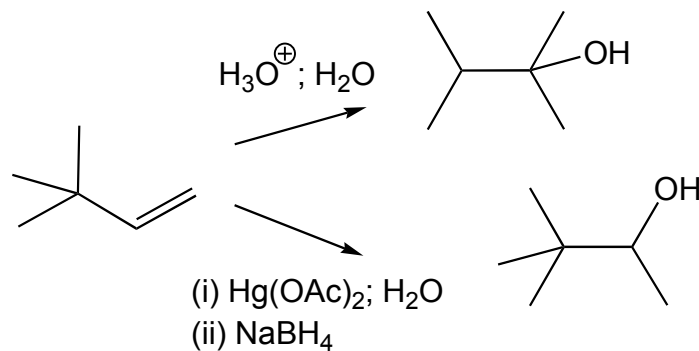


Here we want an $\text{S}_{\text{N}}2$ reaction, so we don't need such a good leaving group. A strong base is good (OH^- rather than H_2O), and we want a polar, aprotic solvent. We could disfavor the competing $\text{E}2$ reaction by keeping the temperature low.

2. Name the alcohols in Q1 (ignore any stereochemistry)

2-methyl-2-butanol and 2-methyl-1-butanol

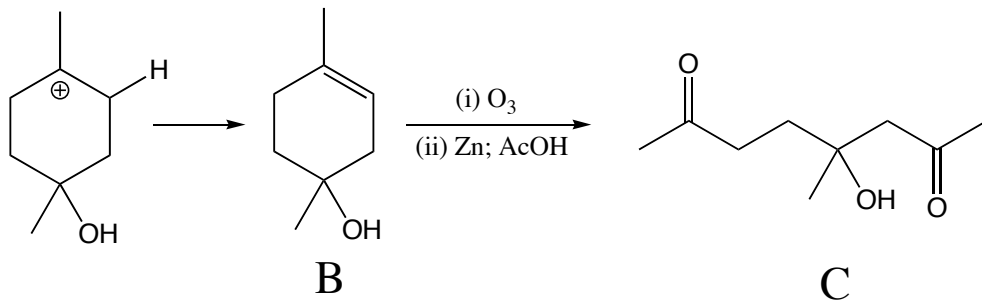
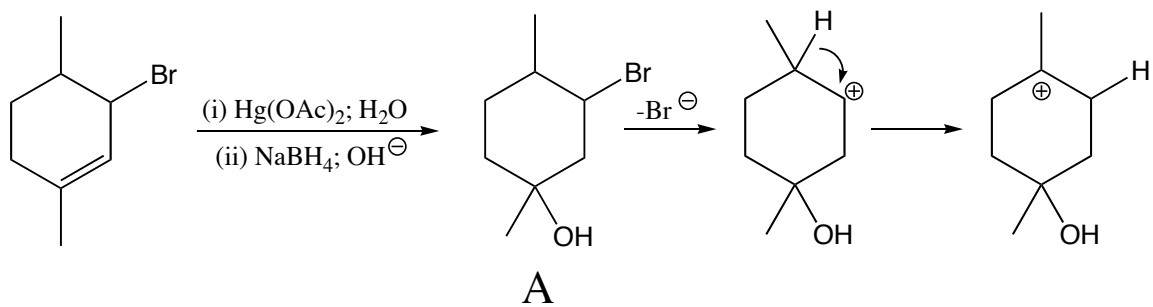
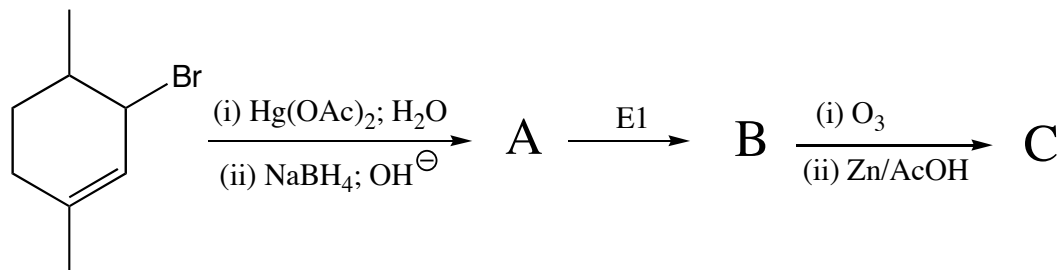
3. Draw mechanisms to explain the different outcomes of the following hydration reactions.



4. Name the alcohols in Q3 (ignore the stereochemistry)

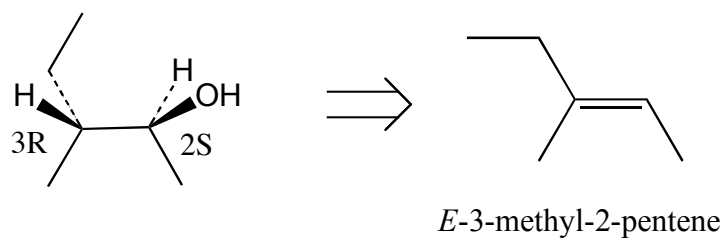
2,3-dimethyl-2-butanol and 3,3-dimethyl-2-butanol

5. Identify molecules/reagents A - C.



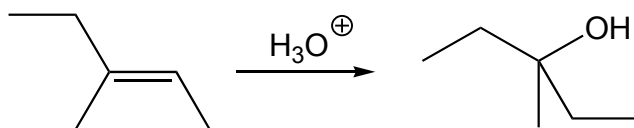
6. Hydroboration of an alkene gives a racemic mixture of (2*S*,3*R*)-3-methyl-2-pentanol and (2*R*,3*S*)-3-methyl-2-pentanol. Name the starting alkene using *E* or *Z* to designate the stereochemistry.

Hydroboration means anti-Markovnikov addition of H₂O. Start with one of the products drawn so that you can see the *syn* orientation of the H and the OH with the OH on the least substituted carbon:



The other substituents are in the correct positions for the alkene. The strange arrow is a *retrosynthetic* arrow, showing that the alcohol can be prepared from the alkene.

7. Treatment of the alkene in Q7 with dilute aqueous acid also gives an alcohol. Is this alcohol also formed as a racemic mixture?



Markovnikov addition gives an *achiral* product with 2 ethyl groups on the quaternary carbon.