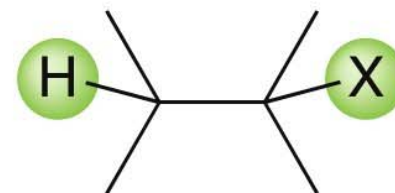
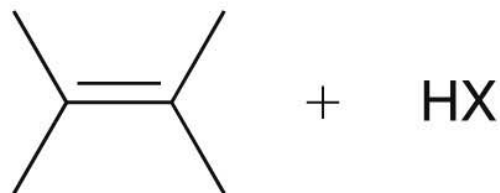


## Chapter 8 part 2:

### Acid Catalyzed Addition of Water

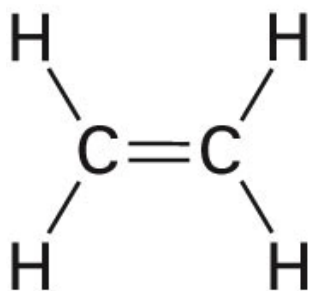
- Today – (8.4 – 8.7) Addition reactions Acid Catalyzed Hydration/Oxymercuration-Reduction
- Friday – (8.7-8.10) Hydrogenation Halogenation/Halohydrin formation

Let's go back a little bit.....



# Addition of Water

- **Hydration of an alkene** is the addition of H-OH to to give an alcohol
- Acid catalysts are used in high temperature industrial processes: ethylene is converted to ethanol

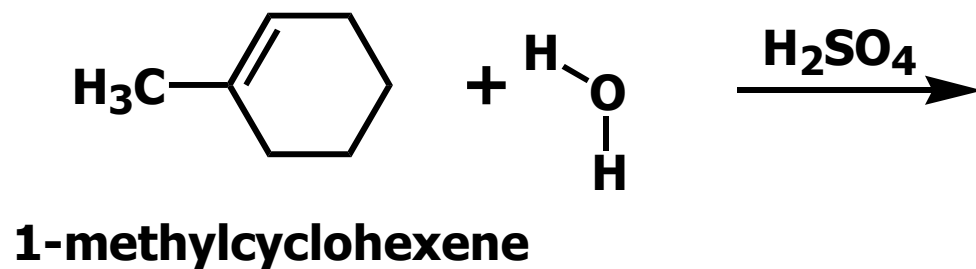
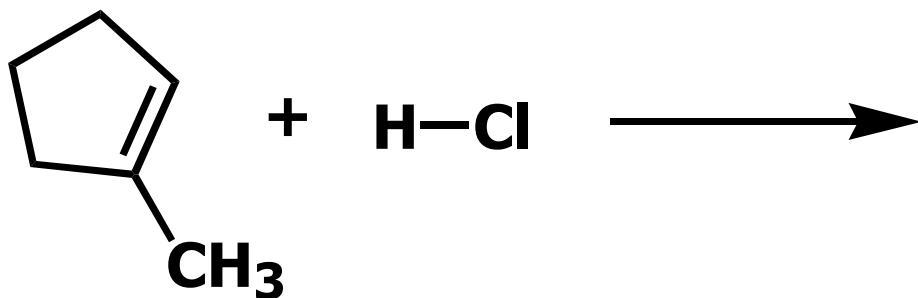


**Ethylene**



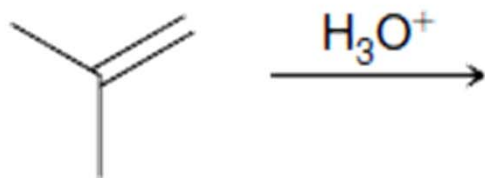
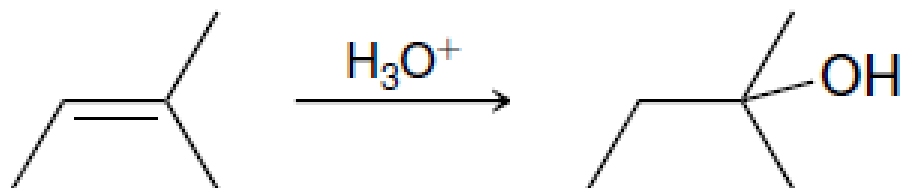
**Ethanol**

# Electrophilic Addition to Alkenes

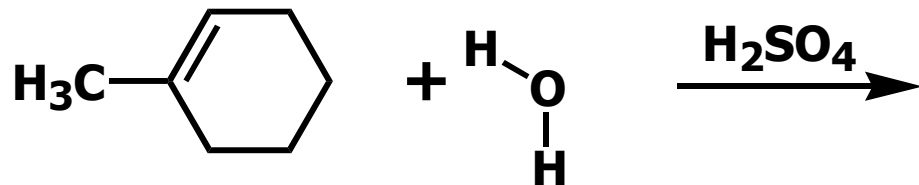


# Acid Catalyzed Hydration

- The components of water ( $-H$  and  $-OH$ ) are added across a  $C=C$  double bond.



# Addition of Water to an Alkene

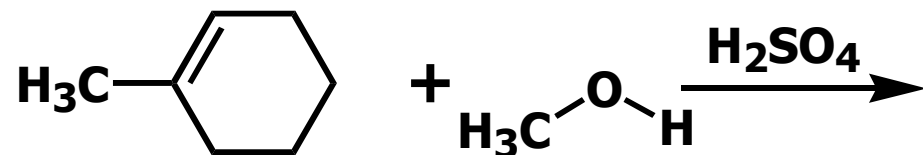


**1-methylcyclohexene**

# Acid-Catalyzed Addition of Alcohol

Reaction progress

# Addition of an Alcohol to an Alkene



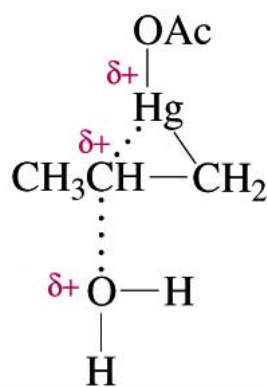
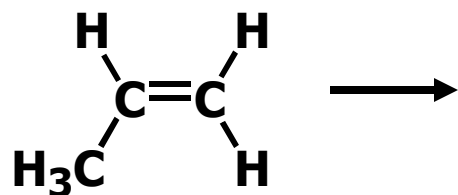
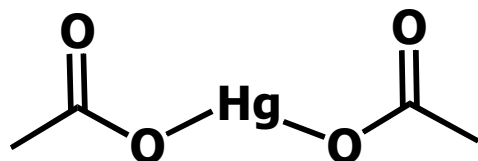
**1-methylcyclohexene**

# Oxymercuration-Demercuration

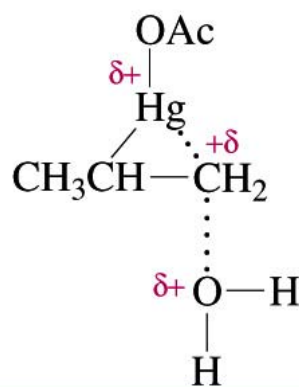
- Because rearrangements often produce a mixture of products, the synthetic utility of Markovnikov hydration reactions is somewhat limited.
- OXYMERCURATION-DEMERCURATION is an alternative process that can yield Markovnikov products more cleanly.



# Oxymercuration-reduction of an Alkene

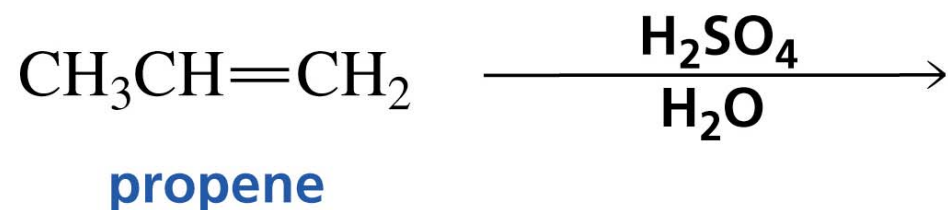


more stable transition state

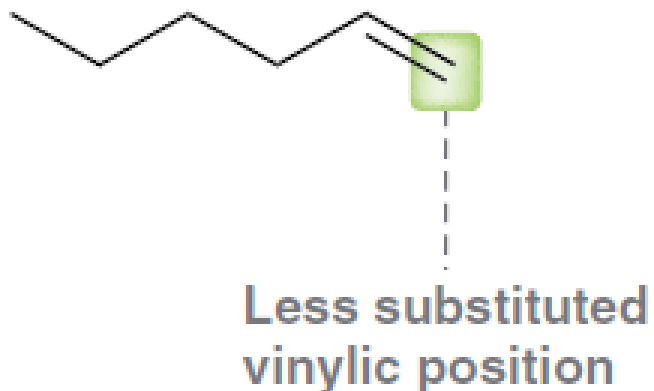


less stable transition state

# How do we Synthesize a Primary Alcohol?



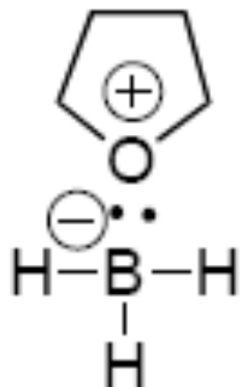
Anti-Markovnikov's addition of an OH group?



# Diborane

Diborane  $B_2H_6$  is example of molecule that can't be treated by simple Lewis Dot or M.O. theory.

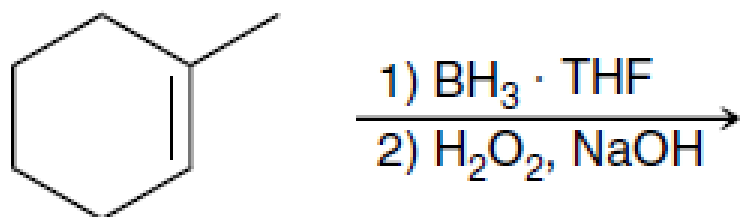
It is very useful (and dangerous!!) reagent. In solvents such as diethyl ether and tetrahydrofuran, forms Lewis Acid-Base adducts:



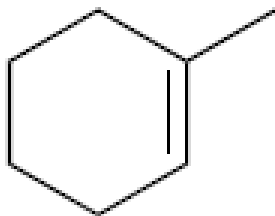
We write  $BH_3/THF$ .  $B_2H_6$  is also o.k.

# Hydroboration-Oxidation

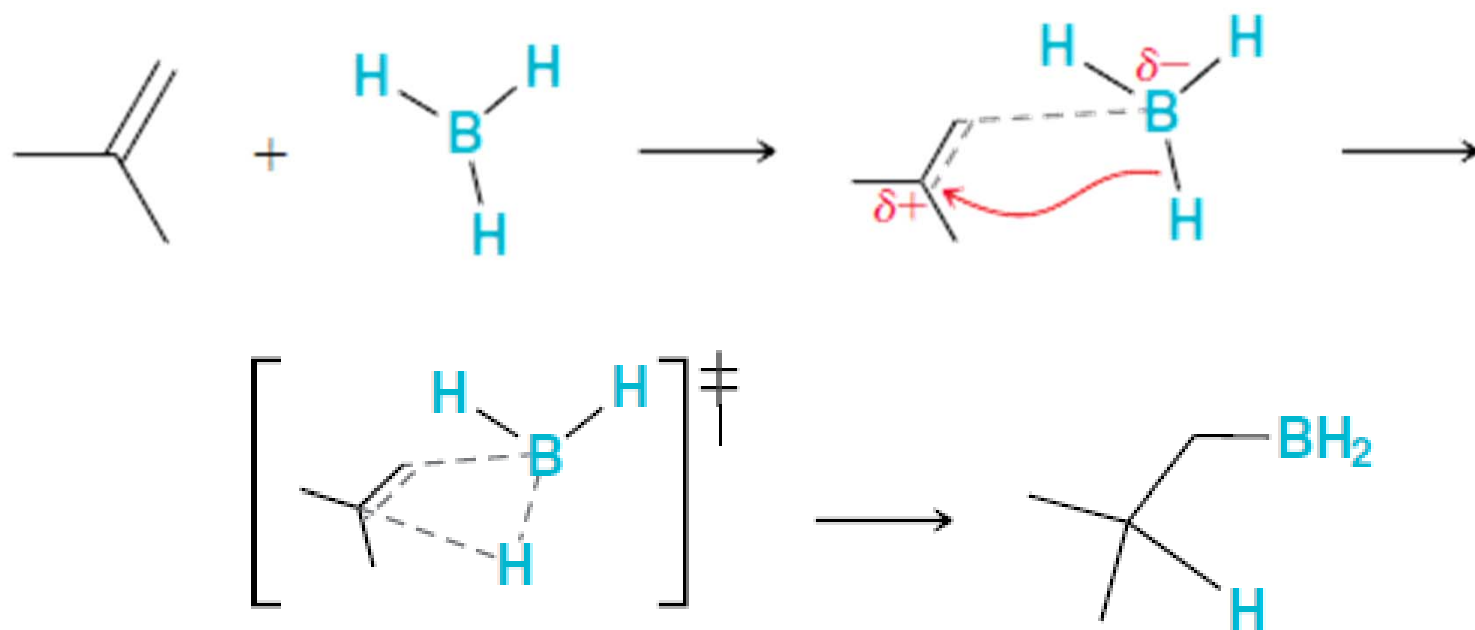
- Hydroboration-oxidation reactions achieve SYN addition.



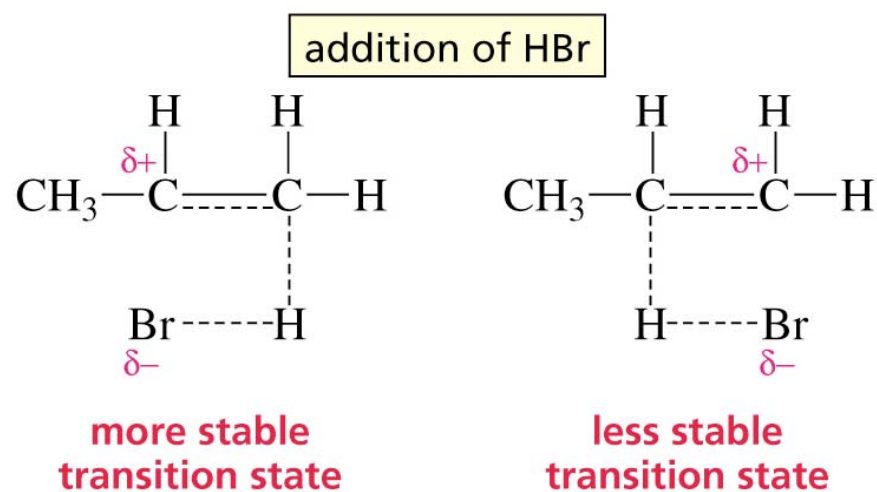
- ANTI addition is NOT observed.



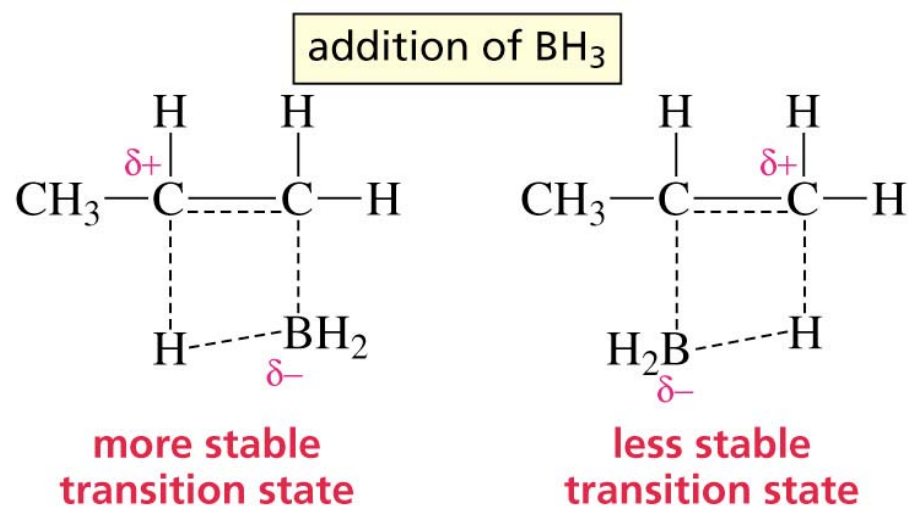
# Hydroboration-Oxidation – The Hydroboration Step



## Markovnikov addition

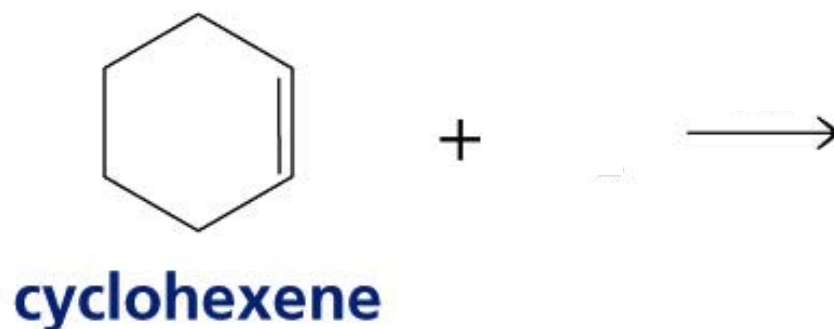
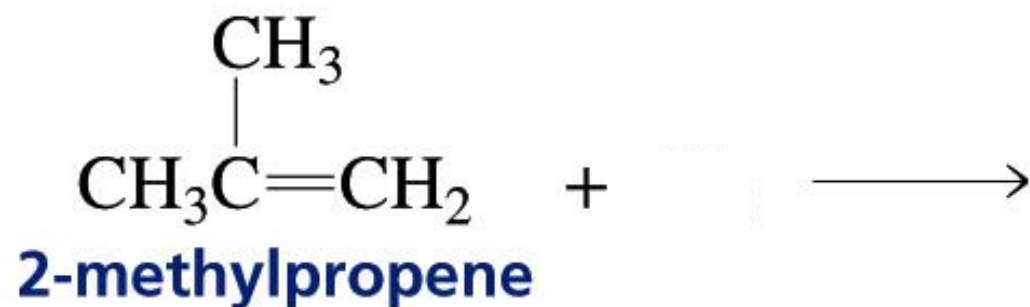
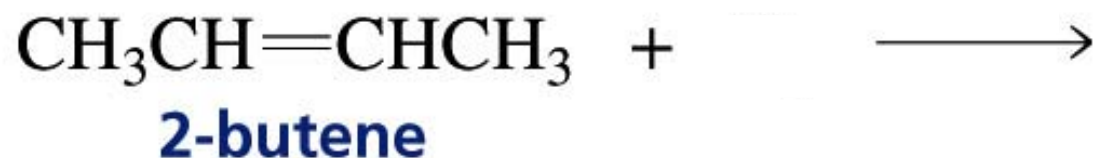


## Anti-Markovnikov addition



(a pericyclic reaction)

How do we make an Alkene back into an alkane?



Addition of Hydrogen to Alkenes

# For Next Time....

## Suggested Homework Problems Chapter 8

# 1, 2, 5, 9, 12,13, 18, 24, 27, 31, 42-46, 52, 57,62,63