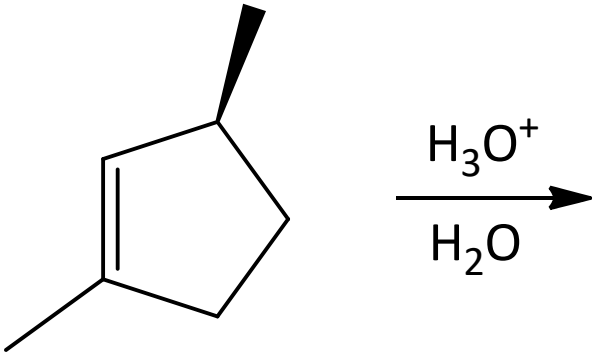
Chapter 8 part 3:

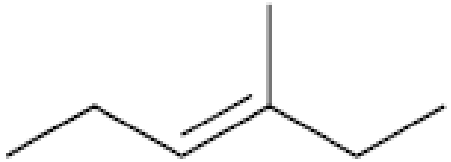
Halogenation/Halohydrins formation

- Today (8.7-810) Hydrogenation Halogenation/Halohydrin formation

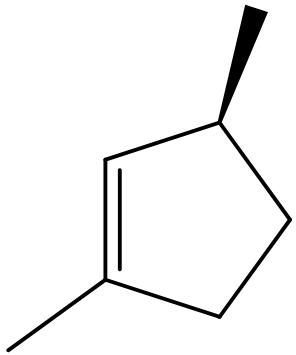


H_3O^+

H_2O



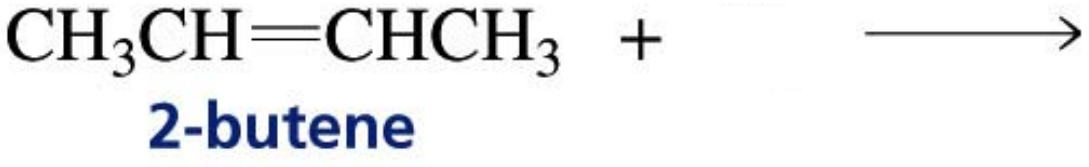
H_3O^+



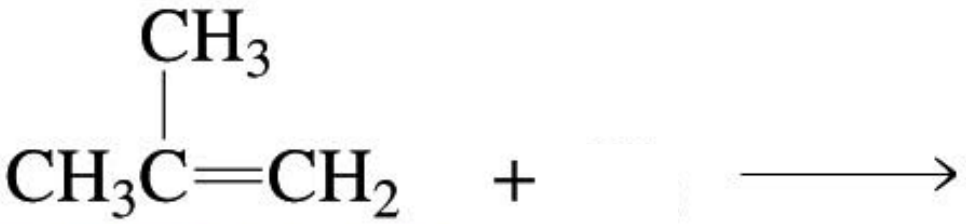
1) $BH_3 \bullet THF$

2) H_2O_2 / NaOH

How do we make an Alkene back into an alkane?



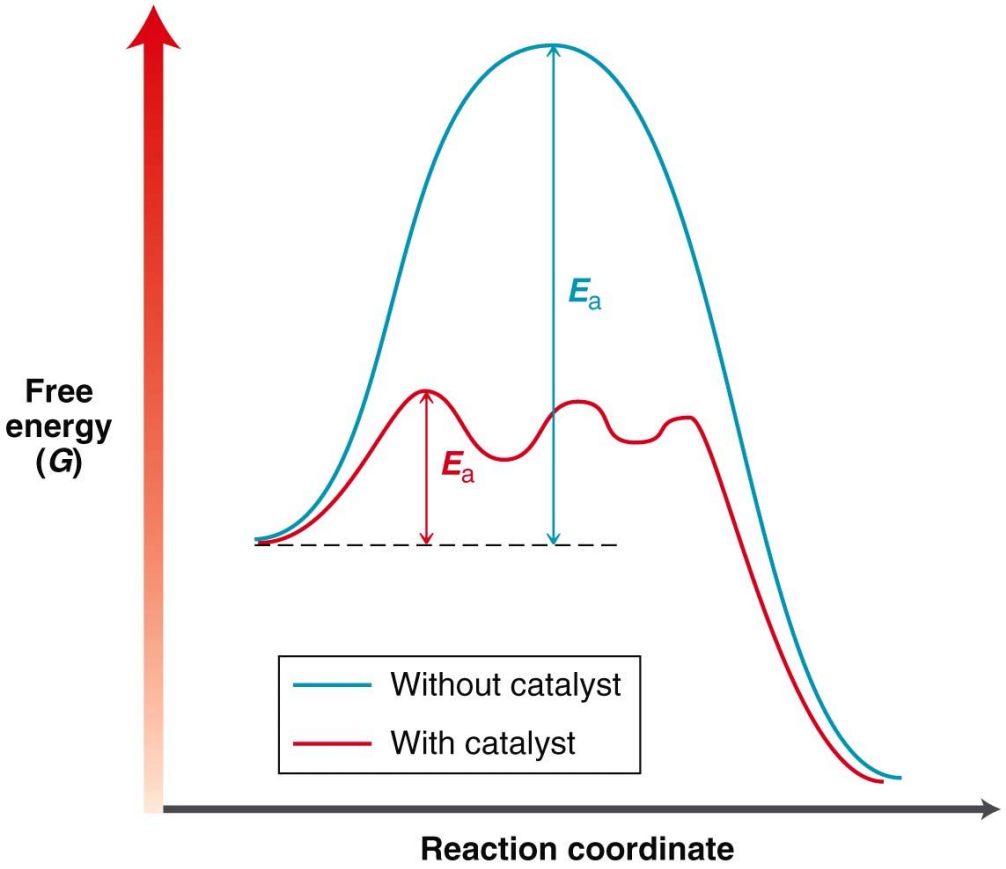
2-butene



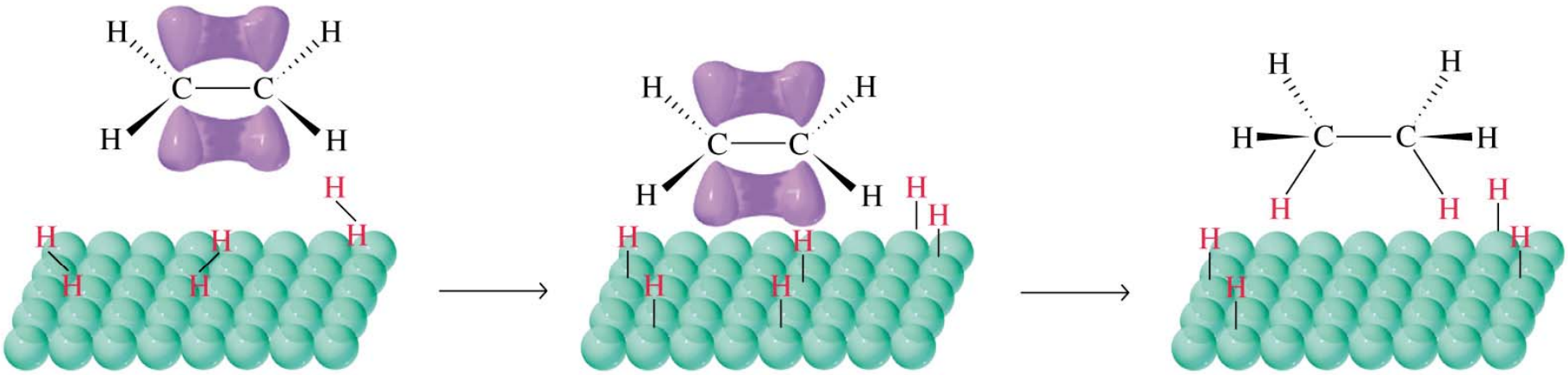
2-methylpropene

cyclohexene

9.7 Hydrogenation – Catalytic

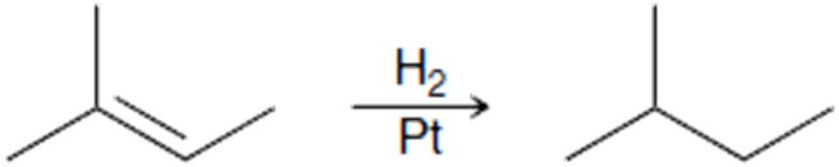


Catalytic Hydrogenation of an Alkene



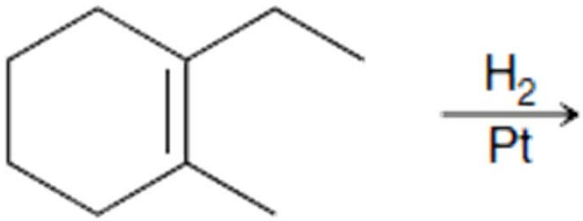
Hydrogenation – Catalytic

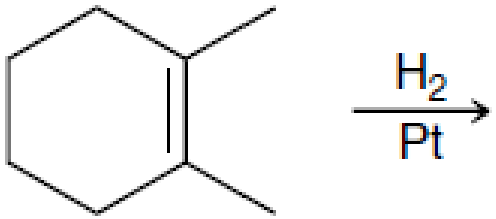
- The addition of H_2 across a C=C double bond:



(100%)

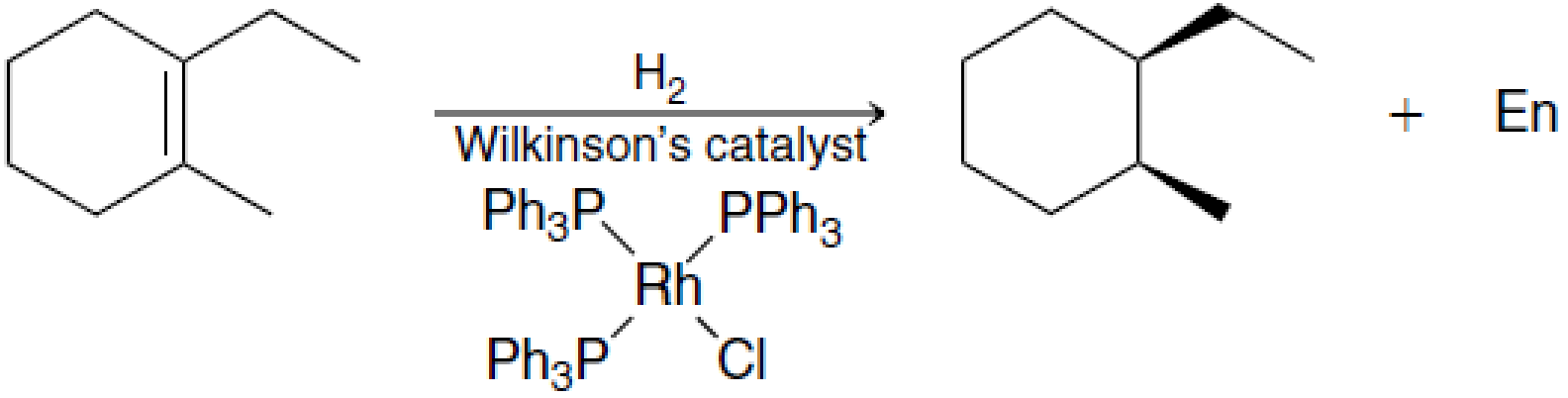
- If a chirality center is formed, SYN addition is observed





Hydrogenation – Catalytic

- If catalysis takes place on the surface of a solid surrounded by solution, the catalyst is HETEROGENEOUS.
- HOMOGENEOUS catalysts also exist.



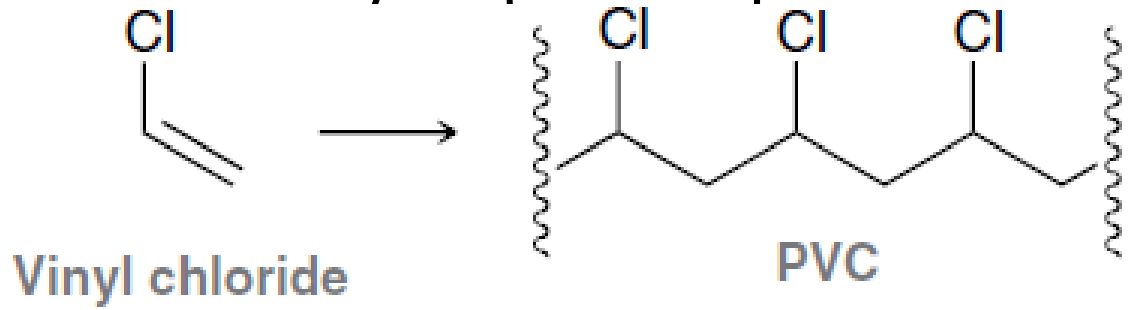
- What advantage might a homogeneous catalyst have?

Halogenation

- Halogenation involves adding two halogen atoms across a C=C double bond.

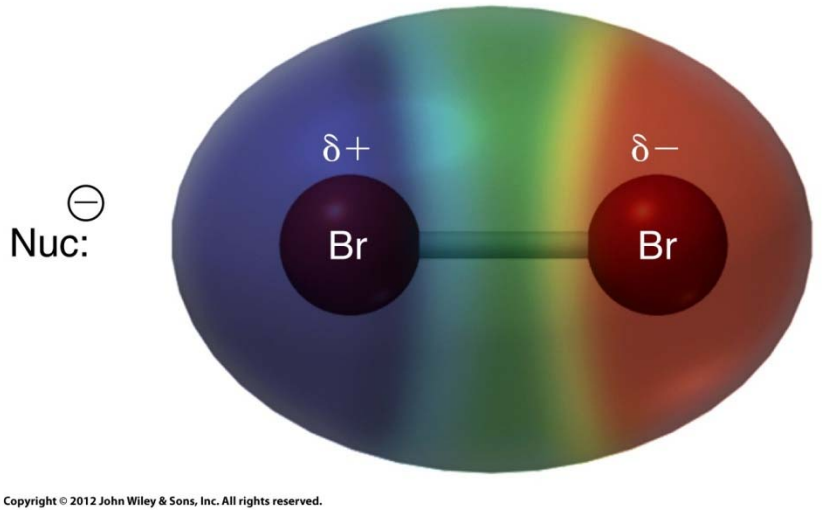
Petroleum ⟶

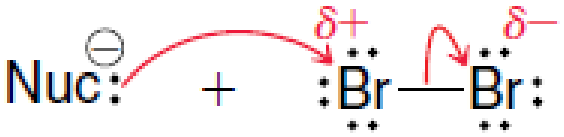
- Halogenation is a key step in the production of PVC.



Halogenation

- Let's look at the reactivity of Br_2. Cl_2's reactivity is similar.

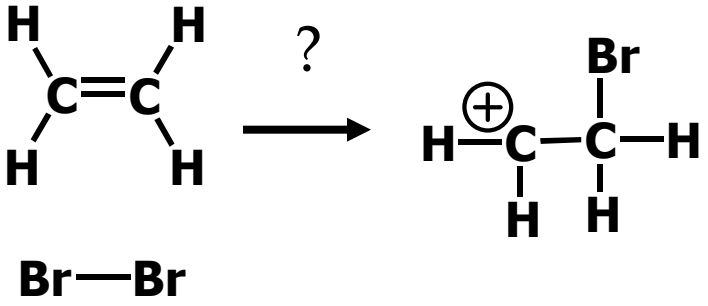




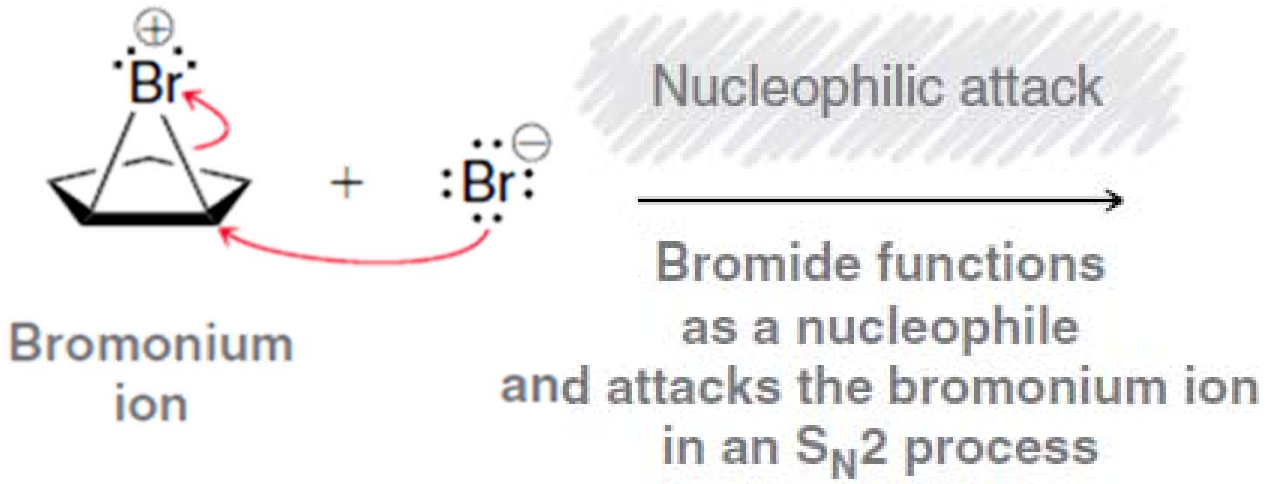
Addition of Halogens to Alkene

Imagine an alkene attacking Br_2.

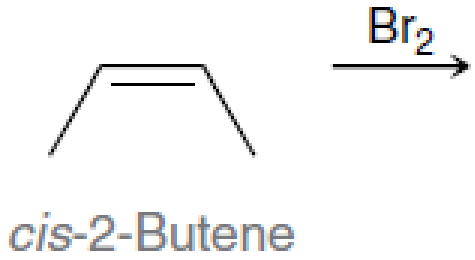
Imagine an alkene attacking Br_2. You might imagine the formation of a carbocation.



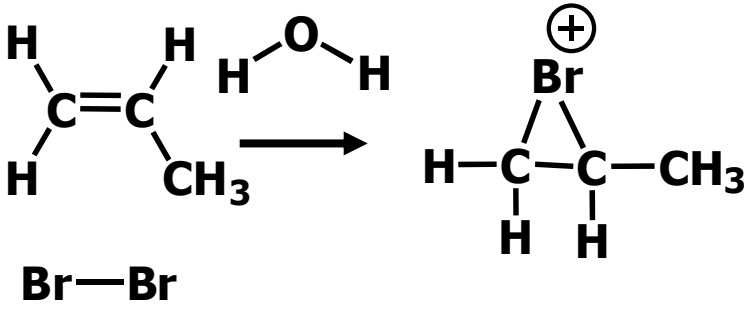
Halogenation



- Only ANTI addition is observed. WHY?



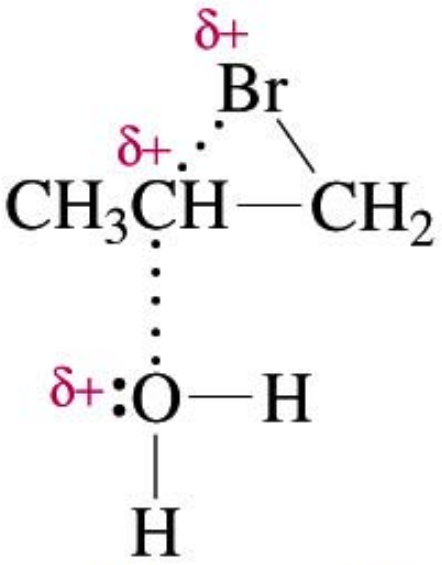
Addition of Halogens in or with Water



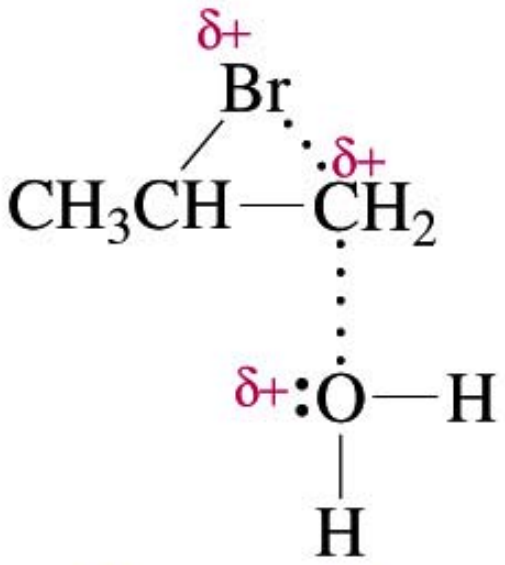
Halohydrins are formed when halogens (Cl_2 or Br_2) are added to an alkene with WATER as the solvent.

The bromonium ion forms from Br_2 + alkene, and then it is attacked by water.

Consider the transition states …



more stable transition state

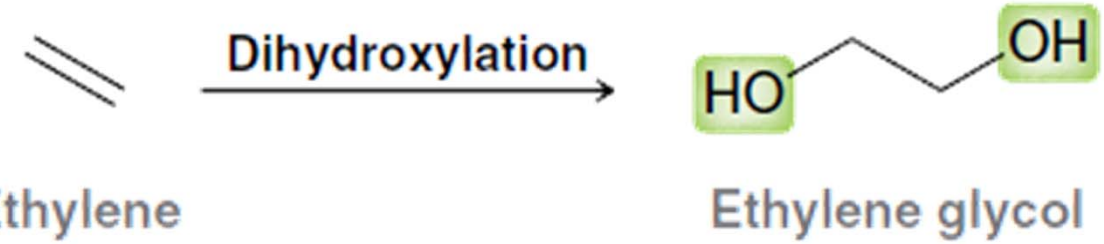


less stable transition state

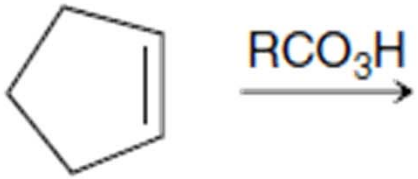
When water attacks the bromonium ion, it will attack the side that goes through the lower energy transition state.

Anti Dihydroxylation

- Dihydroxylation occurs when two –OH groups are added across a C=C double bond.



- ANTI dihydroxylation is achieved through a multi-step process.



For Next Time….

Suggested Homework Problems Chapter 8

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