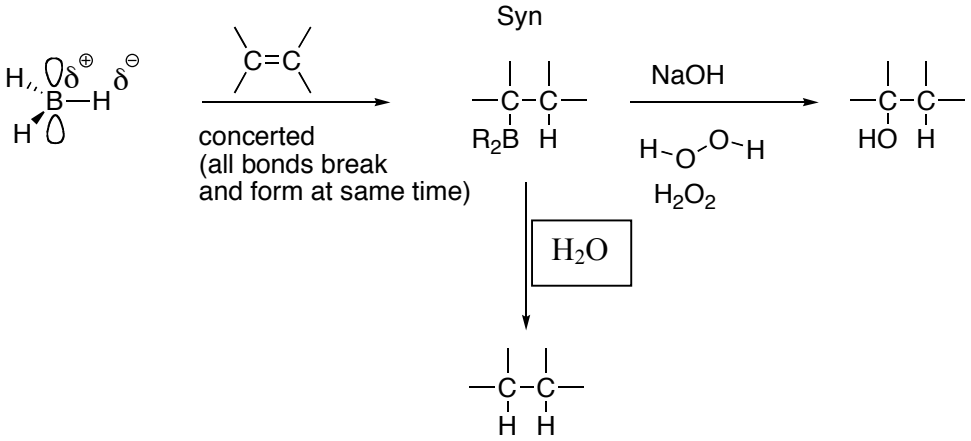
Anti-Markovnikov Addition: Hydroboration

- **Hydroboration** → Protonation (alkane)
  → Oxidation (alcohol)

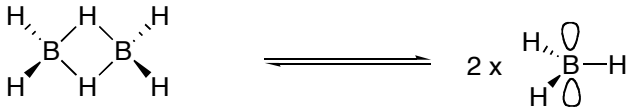
General Scheme:



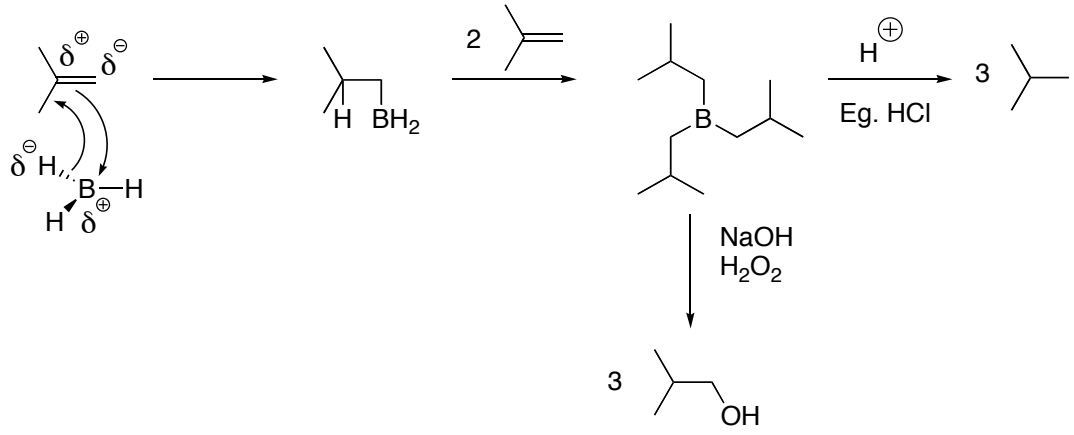
Boron is a Lewis acid. It has an empty p-orbital and can accept 2 electrons to get 8 in its valence shell, but takes on a negative charge in doing so.

Hydroboration is formally **anti-Markovnikov**. H^+ ends up attaching to the more substituted end of the alkene.

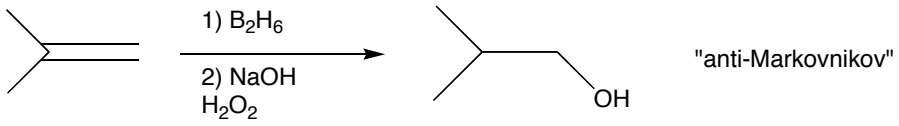
B_2H_6 – diborane (behaves like BH_3)

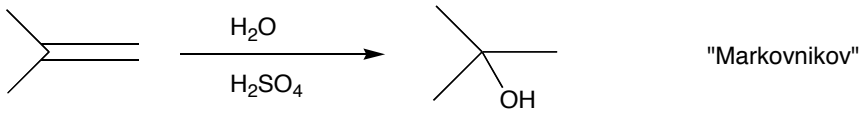


Example 1

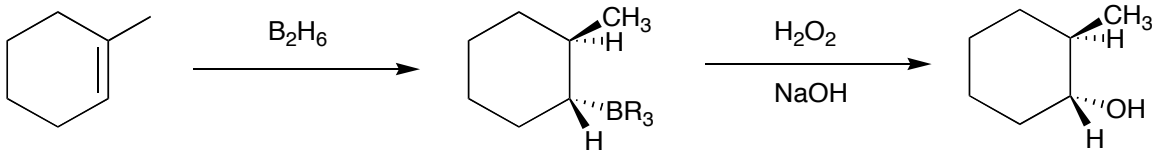


Hydration of Alkenes:



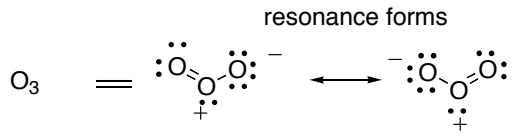


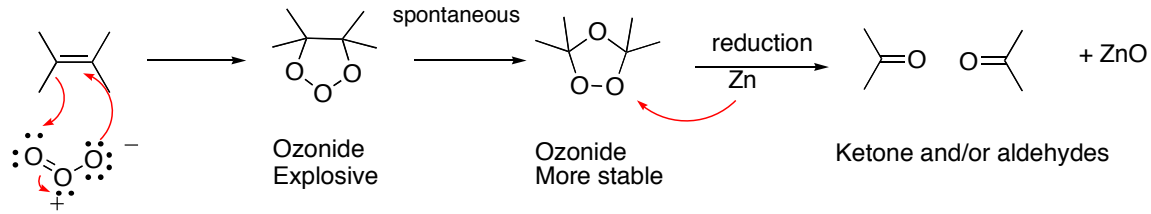
Example 2



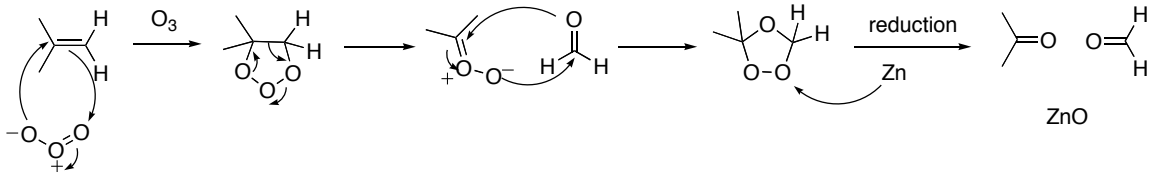
<u>Ozonolysis: Cleavage of Alkenes by Ozone (O_3)</u>

Ozone is a resonance stabilized electrophile that adds to alkenes

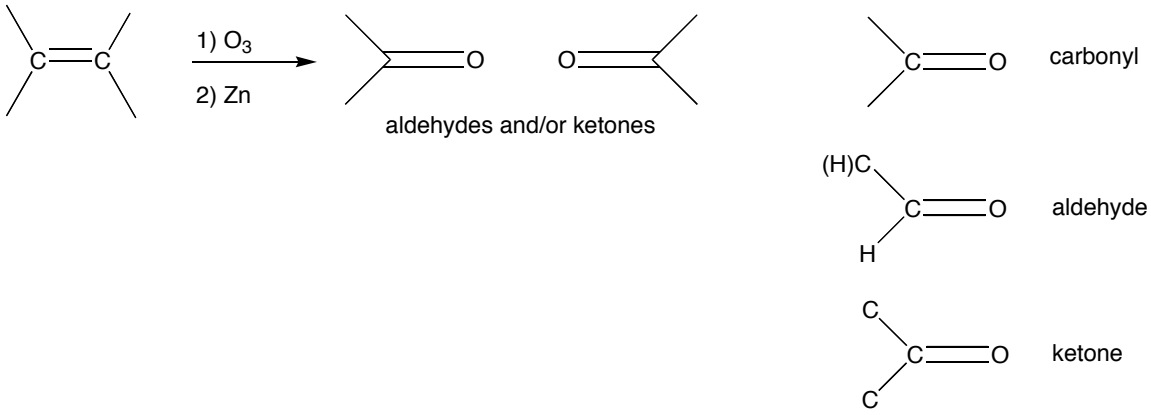




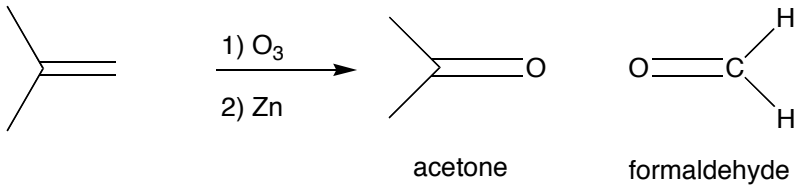
Mechanism (not responsible for):



Overall:



Example 1



Example 2