

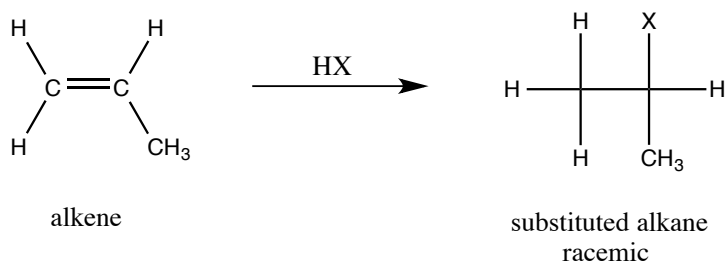
## Chem 343 – Organic Reactions

### Chapters 4, 5 & 7

Prepared by José Laboy, MS

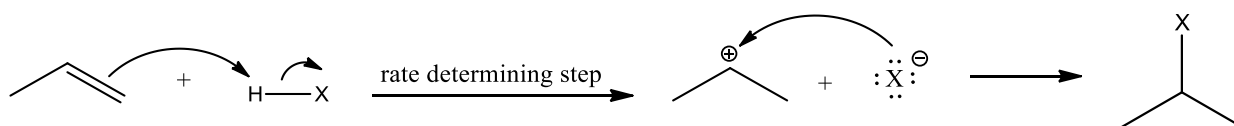
<http://www.chem.wisc.edu/areas/clc> (Resource page)

#### Alkene Reactions #1: Summary of Addition Reactions to Alkenes



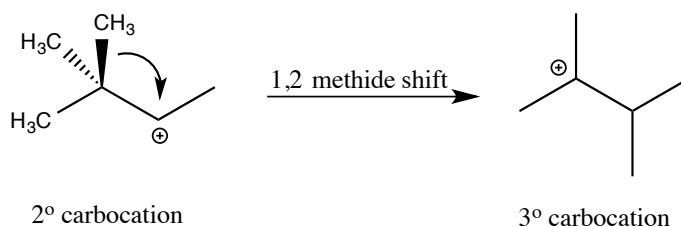
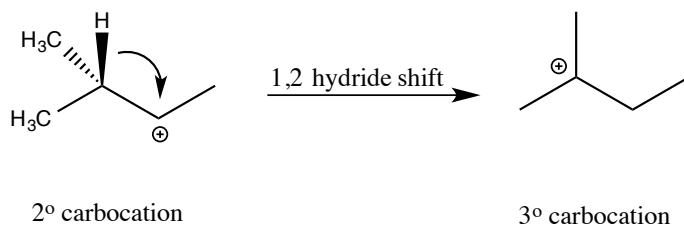
X = Cl, Br, I

#### Mechanism



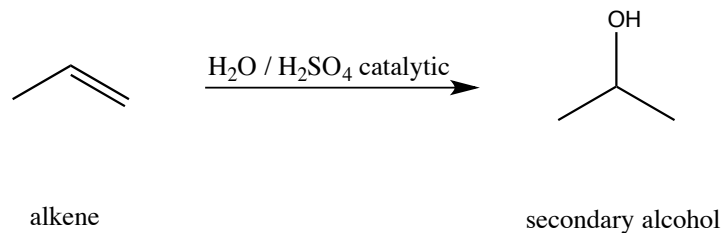
There are two possible products when HX is added across a double bond. If there is a preference of one product over the other the reaction is said to be **regioselective**. The regiochemistry of addition of HX to an alkene follows **Markovnikov's Rule**, that is, the hydrogen atom adds to the carbon atom (in the double bond) that has the most hydrogen atoms, the X group adds to the carbon atom that has the least number of hydrogen atoms.

The rate-determining step of the reaction is the formation of a carbocation, which represents the most stable on the immediate double bond. The order of carbocation stability is  $3^\circ > 2^\circ > 1^\circ$ . Carbocations can undergo rearrangement to produce a more stable carbocation ( $2^\circ$  to  $3^\circ$ ) as shown below. These are called 1,2-shifts.



The shifting group migrates with its pair of electrons therefore the name hydride ( $\text{H}^-$ ) or methide ( $\text{CH}_3^-$ ). The order of migrating groups is  $\text{H} > \text{CH}_3$ .

Alcohols can be produced by addition of water around the double bond in the process called **hydration**. This is accomplished by using an acid catalyst such as  $\text{H}_2\text{SO}_4$ .



Best to use this reaction when the carbocation formed as the intermediate does not rearrange. There are better ways to prepare alcohols that result in a predicted regiochemistry.

Mechanism

