



Pre-Health Post-Baccalaureate Program  
CHM2210 Study Guide & Practice Problems

Topics Covered:

Reactions Involving Reactive Intermediates

Addition of HX

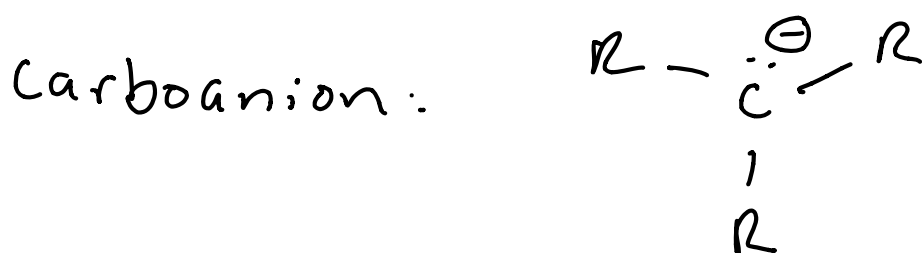
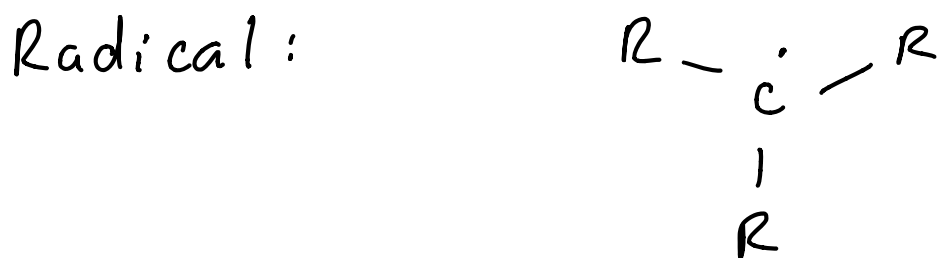
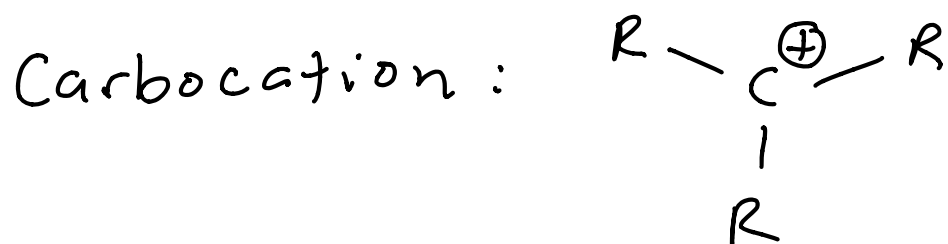
Carbocation Stability

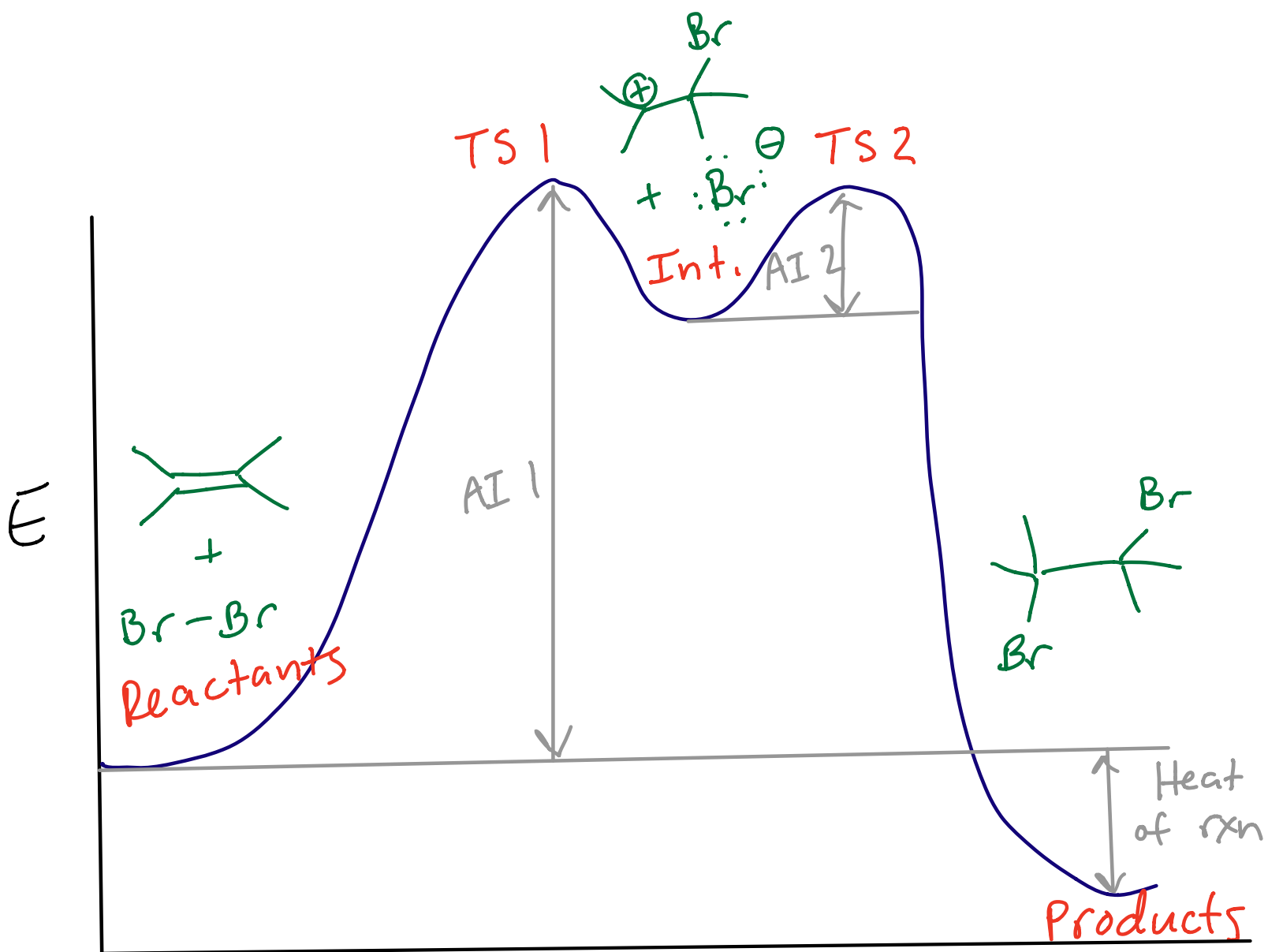
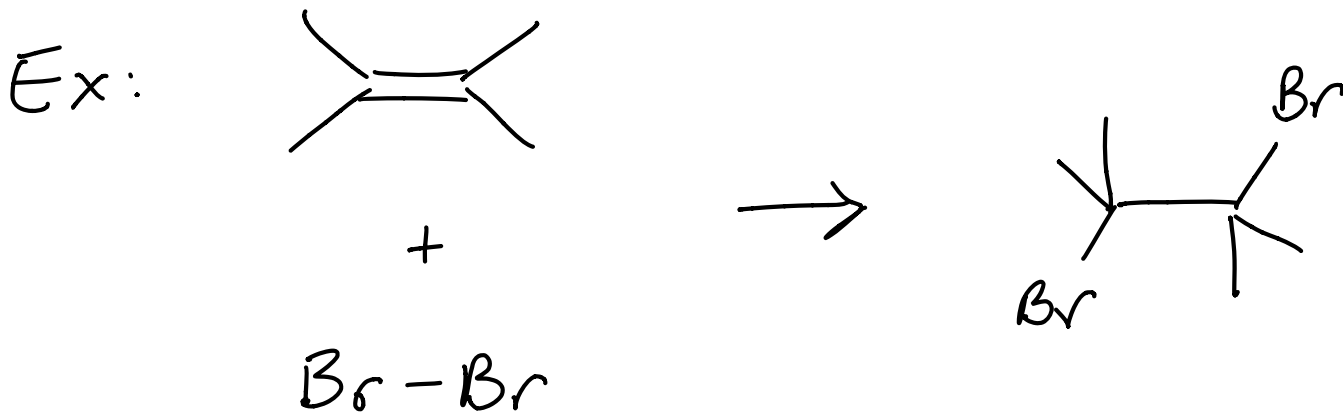
Created by Isaac Loy

# Organic Reactions Involving Reactive Intermediates

→ A reactive intermediate is a high energy species that forms (usually momentarily) as an energy minimum between the reactants and products

→ Common intermediates include:





$$\Delta H_{\text{rxn}}^{\circ} = \text{BDE}_R - \text{BDE}_P$$

$$= (\text{C}=\text{C } \pi + \text{Br}-\text{Br } \sigma) - (2 \text{ C}-\text{Br } \sigma)$$

# Mechanisms

→ Mechanisms show the chemistry of a reaction by using arrows to demonstrate electron flow

→ Arrow-pushing rules

① Arrows indicate the movement of electrons

② Arrows never indicate the movement of atoms directly

③ Nucleophiles always "attack" electrophiles

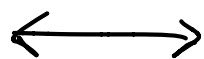
→ Types of arrows



two electrons moving



one electron moving



resonance

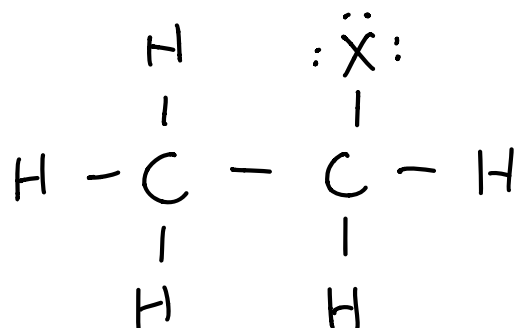
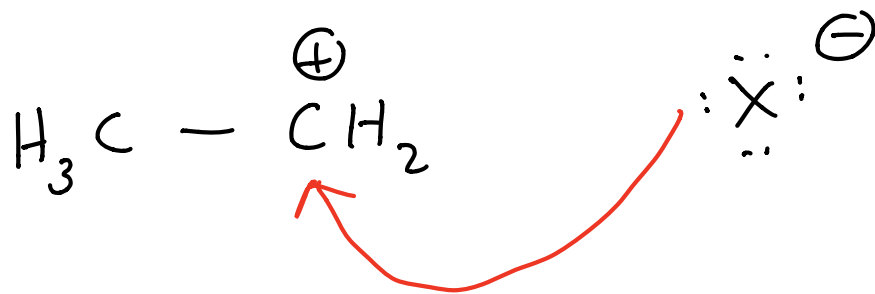
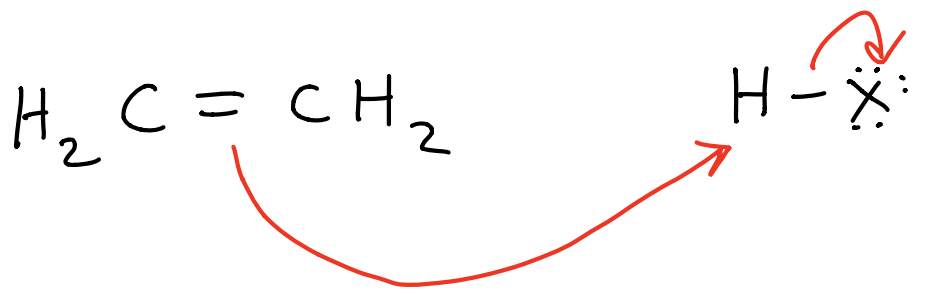


reaction arrow

# Addition of H-X

→ H-X is any hydrogen halide  
(H-Cl, H-Br, H-I, etc.)

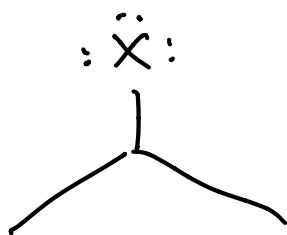
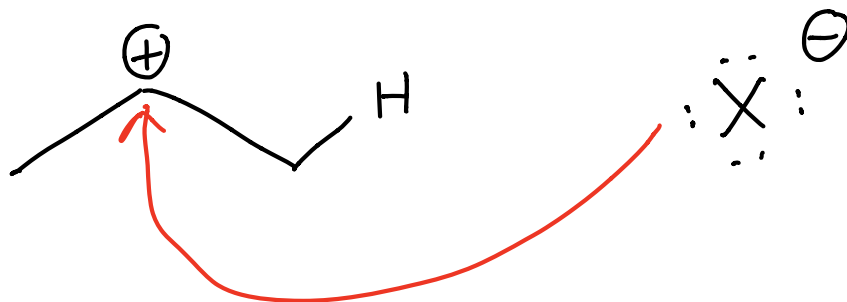
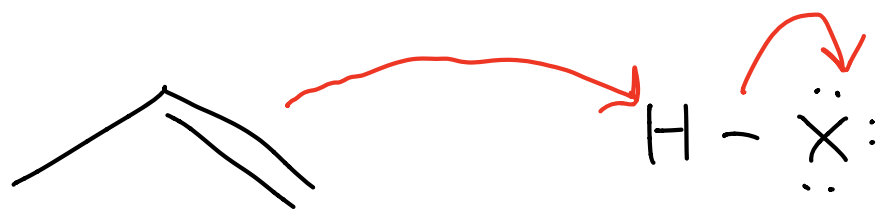
Ex:



→ Regioselective reactions are reactions that can potentially form more than one product

→ Markovnikov's rule says that hydrogen from  $H_2O$ ,  $HX$ , or  $ROH$  will add to the less substituted carbon atom of a double bond

Ex:

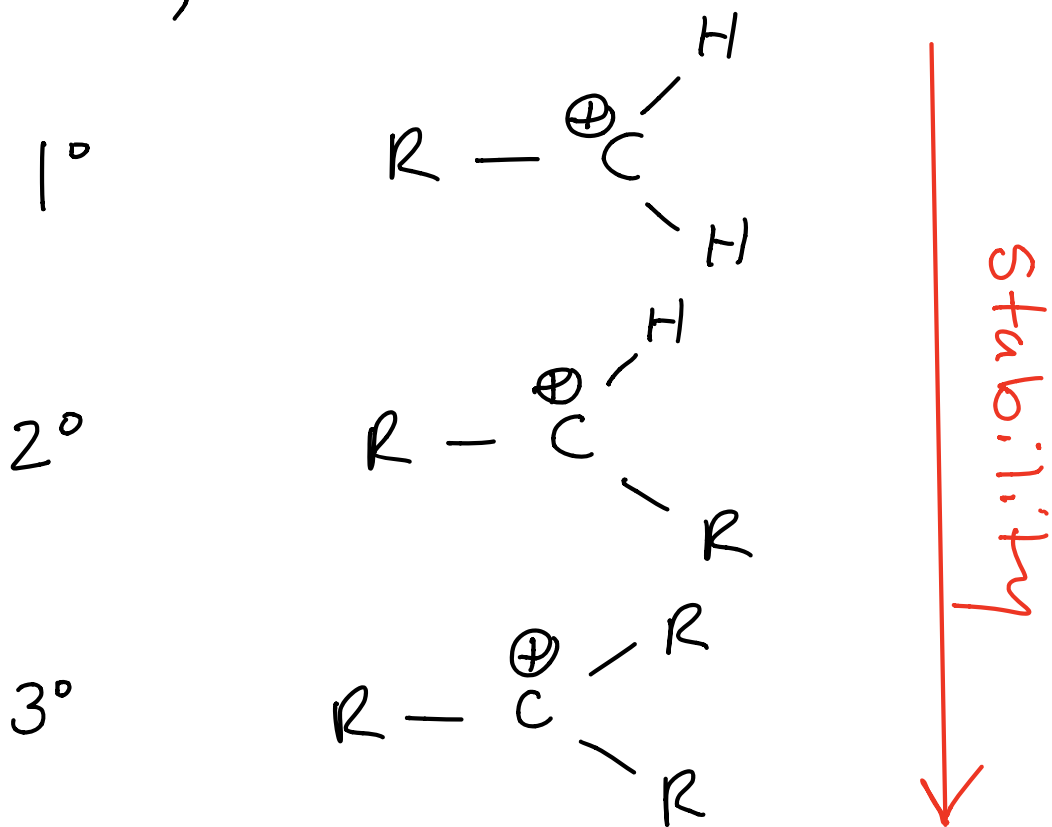


expected/  
major  
product

# Carbocation Stability

→ Carbocations are positively charged carbon atoms

→ Carbocations can be  $1^\circ$ ,  $2^\circ$ , or  $3^\circ$



→ Carbocations are electrophiles and Lewis Acids

→ Carbocations form more selectively at more substituted sites ( $3^\circ \gg 2^\circ \gg 1^\circ$ )