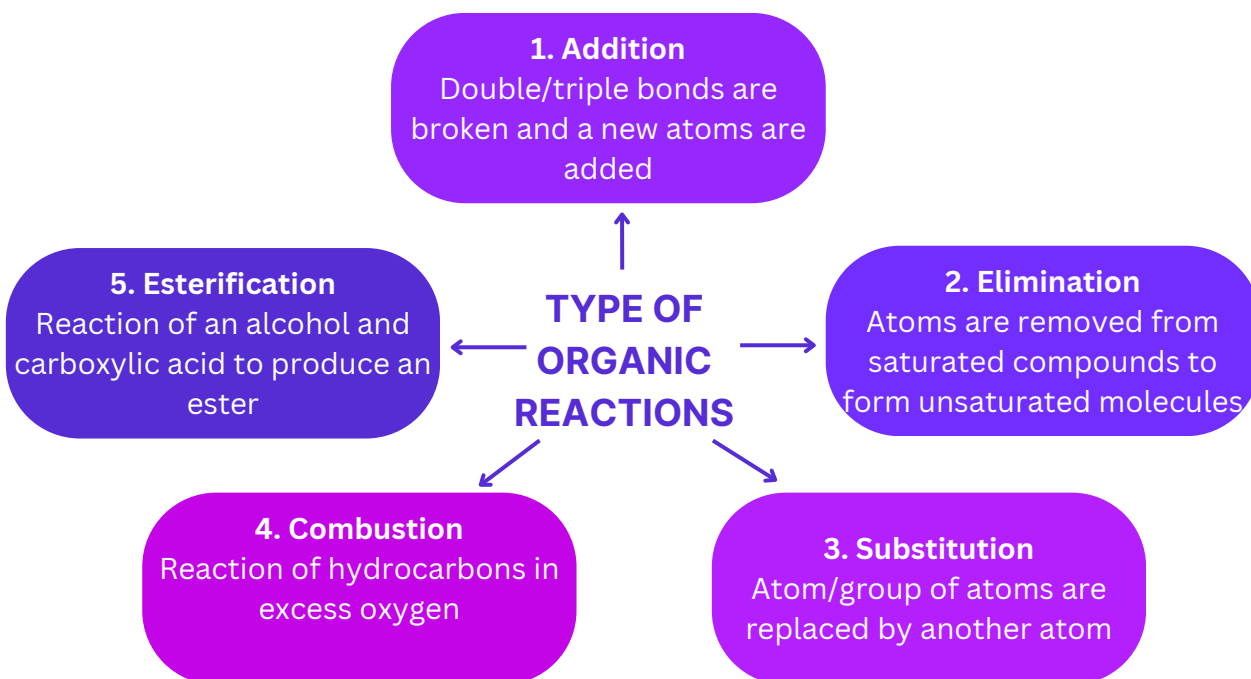




Organic reactions:

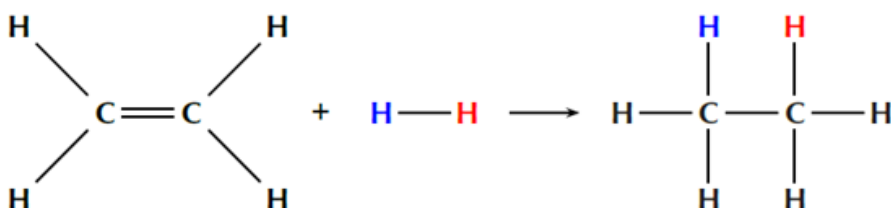
- Identify addition, elimination and substitution reactions
- Describe the structural changes and reaction conditions for the 4 addition reactions:
 - Hydrogenation
 - Hydrohalogenation
 - Halogenation
 - Hydration
- Describe the structural changes and reaction conditions for the 3 elimination reactions:
 - Dehydrohalogenation
 - Dehydration
 - Cracking (thermal and catalytic)
- Describe the structural changes and reaction conditions for the 2 substitution reactions:
 - Halogenation of alkanes
 - Hydrolysis
- Define and balance combustion reactions of alkanes
- Describe the esterification process





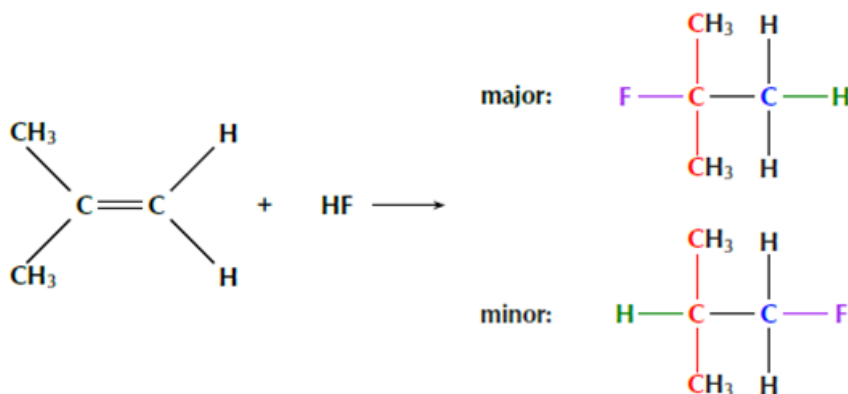
ADDITION REACTIONS

HYDROGENATION - the addition of hydrogen gas to an alkene



Reaction conditions:
Pt, Ni or Pd catalyst
and heating is required

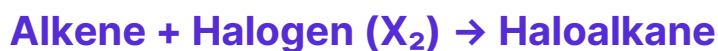
HYDROHALOGENATION - the addition of a hydrogen and halogen (HX) to an alkene



Reaction conditions:
No water must be present

Halogen is always added to the carbon directly bonded to the fewest hydrogen atoms (Markovnikov's rule)

HALOGENATION - the addition of a halogen (X₂) e.g. Br₂, I₂ etc. to an alkene



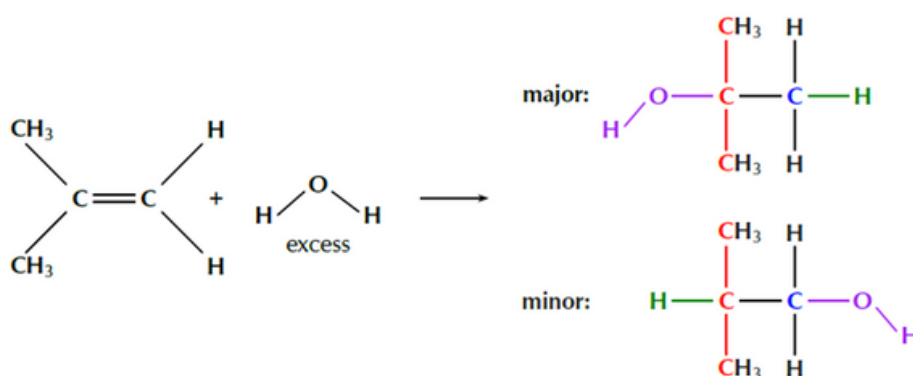
Reaction conditions:
occurs spontaneously



ADDITION REACTIONS

HYDRATION - the addition of a water (H_2O) molecule to an alkene

Alkene + water (H_2O) \rightarrow alcohol



Reaction conditions:

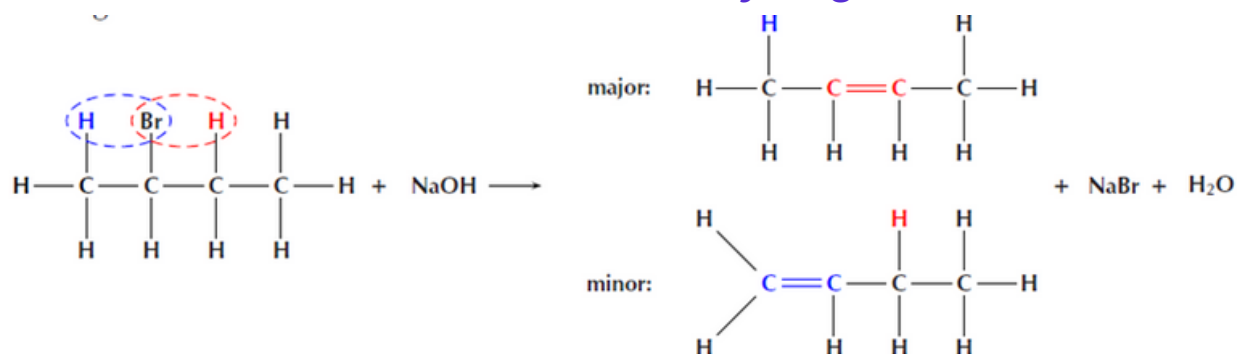
excess water and a dilute strong acid e.g. H_2SO_4

Hydroxide is always added to the carbon directly bonded to the fewest hydrogen atoms (Markovnikov's rule)

ELIMINATION REACTIONS

DEHYDROHALOGENATION - the removal of a hydrogen and halogen from a haloalkane

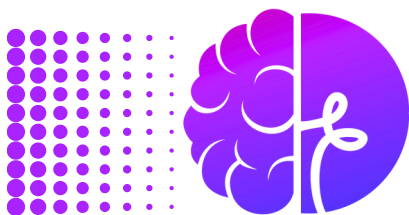
Haloalkane \rightarrow Alkene + hydrogen halide



The hydrogen atom is always removed from the carbon atom bonded to the least H atoms (Zaitzev's rule)

Reaction conditions:

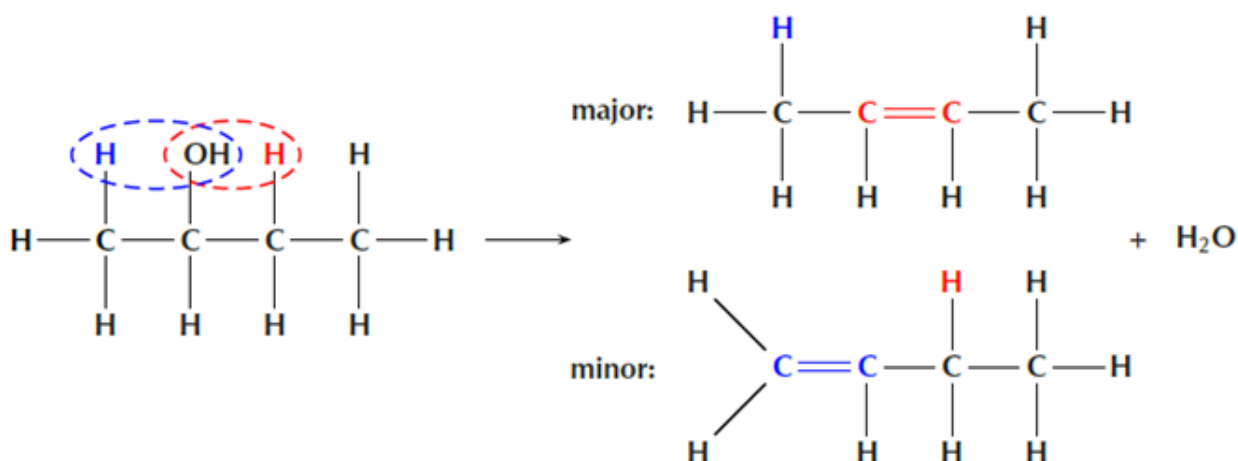
concentrated strong base e.g. NaOH and heat under reflux



ELIMINATION REACTIONS

DEHYDRATION - the removal of a water (H_2O) molecule from an alcohol

Alcohol \rightarrow Alkene + water (H_2O)



The hydrogen atom is always removed from the carbon atom bonded to the least H atoms (Zaitzev's rule)

Reaction conditions:
excess concentrated strong acid H_2SO_4 and heat

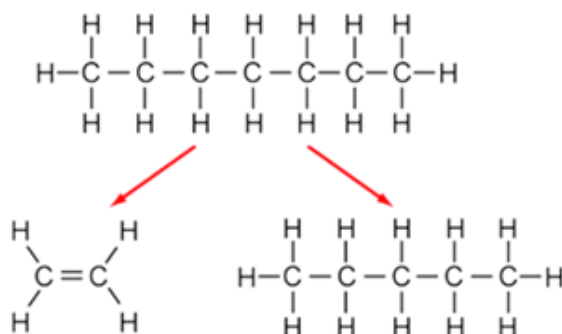
CRACKING - the process where long chain alkanes are broken up into smaller alkenes and alkanes

THERMAL CRACKING

Occurs under high pressure and high temperatures

CATALYTICAL CRACKING

Occurs at lower temperatures and pressures with a catalyst



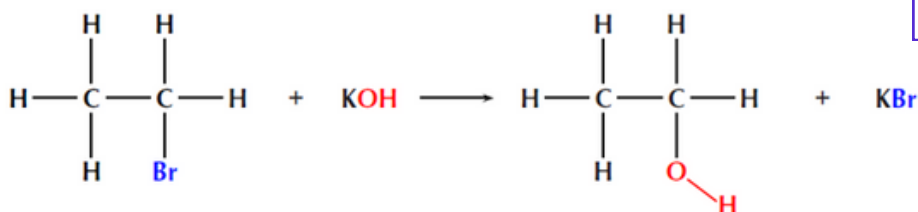


SUBSTITUTION REACTIONS

HYDROLYSIS - the substitution of an H atom in an alkane with a halogen

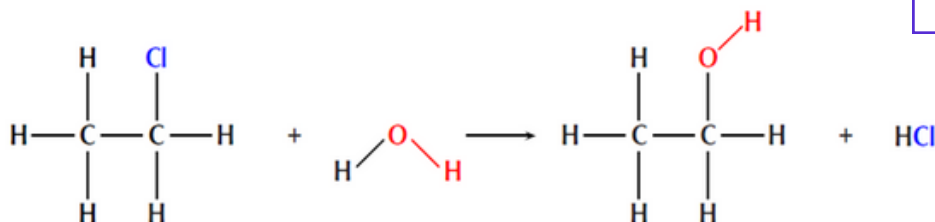
Haloalkane → Alcohol

1. In the presence of a strong base



Reaction conditions:
dilute strong base e.g.
NaOH and mild heat

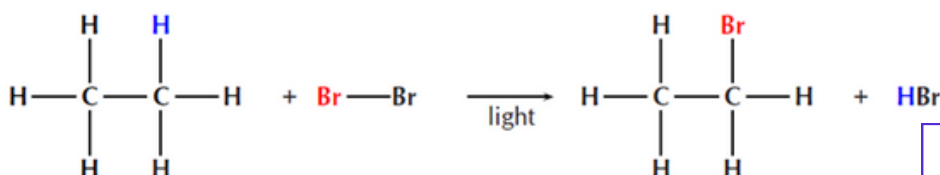
2. In the presence of water



Reaction conditions:
excess water and heat

HALOGENATION OF ALKANES - the substitution of atom in an alkane with a halogen

Alkane + Halogen (X₂) → Haloalkane



Reaction conditions:
presence of sunlight or
sufficient heat



COMBUSTION REACTIONS

During combustion the hydrocarbon is reacted in excess oxygen to produce carbon dioxide and water.



Reaction conditions:
excess oxygen is needed from complete combustion

ESTERIFICATION

Esters are produced through the reaction of alcohols with carboxylic acids.

