

## Types of organic reactions

**Combustion reactions** - any hydrocarbon or organic compound reacting with oxygen to produce the most common oxides of each element ( $C \rightarrow$  carbon dioxide,  $H \rightarrow$  water)

- If the oxygen concentration is low then incomplete combustion reactions occur. It creates less common oxides and/or other compounds ( $C \rightarrow$  carbon monoxide and pure carbon) along with their common oxides.

**Substitution reactions** - occurs with alkanes and aromatic compounds - the reactions are slow and there is always some by product being formed - catalysts are required (heat, UV, other chemical)

- Halogenation
- Alkylation
- Nitration (Nitric acid)

**Addition reactions** - occurs with alkenes and alkynes - the reactions are much faster and there is no by product being formed the reaction occurs at the double bond location

- Halogenation
- Hydrogenation (heat, pressure)

### Markovnikov's Rule

In addition reactions that involve hydrogen and some other element the hydrogen will always go towards the carbon that has more hydrogens. The rich get richer.

- Halohydrogenation
- Hydration (acidic conditions)

## Elimination reactions - forming alkenes

halides need a strong base ( $\text{conc NaOH}$ )

alcohols need a strong acid ( $\text{conc H}_2\text{SO}_4$ )

## Dehydration reactions

## Condensation reactions

need  $\text{H}_2\text{SO}_4$

## Esterification

forming esters

need  $\text{H}_2\text{SO}_4$

## Amide Formation

need heat

## Hydrolysis reactions

Need  $\text{H}_2\text{O}$

## Ammonification

Works best with Iodo- compounds

## Saponification

ester  $\rightarrow$  salt of acid and alcohol

forming soap using  $\text{NaOH}$

## Oxidation reactions      $+\text{[O]} \rightarrow \text{H}_2\text{O}$

does not work with tertiary alcohols

## Reduction reactions [R]

need  $\text{H}_2$  and catalyst (heat and pressure)

Alkanes  
from alkenes

Alkenes  
from haloalkanes  
from alcohols

Haloalkanes  
from alkenes  
from alkanes

Alcohols  
from alkenes  
from haloalkanes

Ether  
from alcohols

Aldehyde  
from a primary alcohol

Ketone  
from a secondary alcohol

Carboxylic Acid  
from a primary alcohol

Amines  
from a haloalkane and ammonia

Esters  
from an alcohol and a carboxylic acid

Amides  
from an amine and a carboxylic acid