

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, cycloalkanes 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 (aromatics)
- Nitration (Nitric acid)

Addition reactions - occurs with alkenes and alkynes NOT with aromatics - 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 ($\text{NaOH}_{\text{conc}}$)

alcohols need a strong acid ($\text{H}_2\text{SO}_{4 \text{ conc}}$)

Dehydration reactions

Condensation reactions

need H_2SO_4

Esterification

forming esters

need H_2SO_4

Amide Formation

need heat

Hydrolysis reactions

Need H_2O

Ammonification

Works best with Iodo- compounds

Saponification

ester \rightarrow salt of acid and alcohol

forming soap using NaOH

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

does not work with tertiary alcohols

Reduction reactions [R]

need 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