## Combustion

| | |
|---|---|
| Complete | __ + O2 --> CO2 + H2O |
| Incomplete | __ + O2 --> CO +H2O |
| | __ + O2 --> C +H2O |

**Alkane/Ether**

Balance Carbon> Hydrogen> Oxygen

## Halogenation

| | |
|---|---|
| **Alkene** | H2C=CH2 + Br2 --> H2C(Br)CH-2(Br) |
| **Alkyne** | same as alkene, but double addition reagent |

+Cl2 or Br2

## Addition of Simple Acids

| | |
|---|---|
| **Alkene** | CH2=CH2+HCl --> CH3-CH2(Cl) |
| **Alkyne** | Same as Alkene, but twice addition reagent |

+HBr or HCl

*Markovnikov's Rule*: Hydrogen goes to Carbon with more Hydrogen; the rich get richer

## Hydration

| | |
|---|---|
| **Alkene** | H2C=CH2 + H-OH --> CH3-CH-2(OH) |
| **Alkyne** | Same as Alkene, but twice the addition reagent |

+H2O & Acid Catalyst (Pt, Pd, Ni)

*Markovnikov's Rule*: the rich get richer

## Hydrogenation

| | |
|---|---|
| **Alkene** | H2C=CH2 + H2 --> CH3-CH3 |
| **Alkyne** | Same as Alkene, but twice the addition reagent |
| **Aldehyde** | CH2(O) + H2 --> CH3(OH) |
| **Ketone** | H3CC(O)CH3 + H2 --> H3C-CH(OH)-CH3 |

Alkene/Alkyne --> Alkane
Aldehyde --> Primary Alcohol
Ketone --> Secondary Alcohol

## Polymerization

| | |
|---|---|
| Addition | CH2=CH+CH=CH2-->CH2-CH2-CH2-CH2 |
| Conden-sation | (OH)C(O)-(O)C(OH) + HO-CH2-OH --> |
| Polyamides | (Cl)C(O)-(O)C(Cl) + H2N-NH2 --> |

**Addition Polymerization**: linking together many Alkene molecules through addition reactions

**Carboxylic Acid**: Condensation

**Amide**: Polyamide

## Substitution

| | |
|---|---|
| **Aromatic** | Switch **1** Hydrogen with one of the addition reagents |

Aromatics= stable/chemically inert

## Dehydration

| | |
|---|---|
| **180*C** | H3C-CH2(OH) --> H2C=CH2 + H2O |
| **140*C** | H3C-OH + H3C-OH --> H3C-O-CH3 + H2O |

@180*C Alcohol --> Alkene
@140*C Alcohol + Alcohol --> Ether

*Requires Acid Catalyst (H2SO4)*

## Oxidation

Primary Alcohol --> Aldehyde
Secondary Alcohol --> Ketone
Tertiary Alcohol -- NR
Aldehyde --> Carboxylic Acid
Ketone --> NR
Thiols --> Disulfide

**Oxidizing Agents**: K2Cr2O7; KMnO4

**Tollens Reagent**: $2Ag(NH3)2^{+}$ --> 2 Ag

**Benedicts Reagent**: $2Cu^{2+}$ --> Cu2O (blue) --> (red precipitate)

## Dissociation

**Acid**: Carboxylic Acid, Phenol
Donate H from -OH to H2O --> $O^{-}$ +$H3O^{+}$

**Base**: Amine
Steal H from H2O --> NH_$^{+}$ + $OH^{-}$

Acid + H2O -->

Base + H2O -->

## Neutralization

Acid + Base --> Salt + H2O

Salt Ex) $O^{-}K^{+}$

Base: KOH, NaOH
Acid: Phenol, Carboxylic Acid