

No	Type	Description
1	Addition I Halogenation	<p>Halogens add across a C=C double bond e.g. F₂, Cl₂, Br₂, I₂</p> $ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{C}=\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} + \text{Cl}_2 \xrightarrow{\text{fast}} \begin{array}{c} \text{H} \quad \text{H} \quad \text{Cl} \quad \text{Cl} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} $
2	Addition II Hydration	<p>Water adds across a C=C double bond. Two products are possible.</p> $ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{C}=\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} + \text{H}_2\text{O} $ <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{OH} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$ </div> <div style="text-align: center;"> $\begin{array}{c} \text{H} \quad \text{H} \quad \text{OH} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$ </div> </div>
3	Addition III Hydrogenation	<p>Hydrogen adds across a C=C double bond</p> $ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{C}=\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} + \text{H}_2 \longrightarrow \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} $
4	Addition IV Hydrogen Halides	<p>Hydrogen Halides (HF, HCl, HBr, HI) add across a C=C double bond</p> $ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{C}=\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} + \text{H}-\text{Cl} $ <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{Cl} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$ </div> <div style="text-align: center;"> $\begin{array}{c} \text{H} \quad \text{H} \quad \text{Cl} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$ </div> </div>
5	Enthalpy of Combustion	<p>The energy change for the <i>complete</i> combustion of 1 mole of a substance:</p> $ \text{C}_3\text{H}_7\text{OH}(\text{l}) + 4\frac{1}{2}\text{O}_2(\text{g}) \longrightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{l}) $
6	Oxidation I	<p>Primary Alcohol \longrightarrow Carboxylic Acid</p> $ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{OH} \\ \quad \\ \text{H} \quad \text{H} \end{array} \xrightarrow{\text{hot CuO}} \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{C} \\ \quad // \quad \backslash \\ \text{H} \quad \text{O} \quad \text{O}-\text{H} \end{array} $ <p>NB: Aldehyde is produced in this reaction but is quickly turned into carboxylic acid</p>

7	Oxidation II	<p style="text-align: center;">Primary Alcohol → Aldehyde</p> $ \begin{array}{ccc} \text{H} & \text{H} & \\ & & \\ \text{H}-\text{C}-\text{C}-\text{OH} & \xrightarrow[\text{dichromate}]{\text{acidified}} & \text{H}-\text{C}-\text{C} \begin{array}{l} \text{=O} \\ \text{H} \end{array} \\ & & \\ \text{H} & \text{H} & \end{array} $ <p style="text-align: center;">orange → colour change → green</p>
8	Oxidation III	<p style="text-align: center;">Secondary Alcohol → Ketone</p> $ \begin{array}{ccc} \text{H} & \text{OH} & \text{H} & \\ & & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} & \xrightarrow[\text{dichromate}]{\text{acidified}} & \text{H}-\text{C}-\text{C}=\text{O}-\text{C}-\text{H} \\ & & & \\ \text{H} & \text{H} & \text{H} & \end{array} $ <p style="text-align: center;">orange → colour change → green</p>
9	Oxidation IVa	<p style="text-align: center;">Aldehyde → Carboxylic Acid</p> $ \begin{array}{ccc} \text{H} & & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C} \begin{array}{l} \text{=O} \\ \text{H} \end{array} & \xrightarrow[\text{Reagent}]{\text{Tollen's}} & \text{H}-\text{C}-\text{C} \begin{array}{l} \text{=O} \\ \text{O}-\text{H} \end{array} \\ & & \\ \text{H} & & \text{H} \end{array} $ <p style="text-align: center;">colour change → silver mirror produced</p>
10	Oxidation IVb	<p style="text-align: center;">Aldehyde → Carboxylic Acid</p> $ \begin{array}{ccc} \text{H} & & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C} \begin{array}{l} \text{=O} \\ \text{H} \end{array} & \xrightarrow[\text{Solution}]{\text{Fehling's}} & \text{H}-\text{C}-\text{C} \begin{array}{l} \text{=O} \\ \text{O}-\text{H} \end{array} \\ & & \\ \text{H} & & \text{H} \end{array} $ <p style="text-align: center;">blue → colour change → brick red</p>
11	Condensation (Esterification)	$ \begin{array}{ccc} \text{H} & & \text{H} & & \text{H} & \text{O} & \text{H} \\ & & & & & & \\ \text{H}-\text{C}-\text{OH} & + & \text{C}=\text{C}-\text{H} & \xrightarrow[\text{H}_2\text{SO}_4]{\text{conc}} & \text{H}-\text{C}-\text{O}-\text{C}-\text{C}-\text{H} \\ & & & & & & \\ \text{H} & & \text{H} & & \text{H} & & \text{H} \\ \text{methanol} & & \text{ethanoic acid} & & \text{methyl ethanoate} & & \\ & & & & & & + \text{H}_2\text{O} \end{array} $

12	Hydrolysis I Esters	$ \begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \\ \text{methyl ethanoate} \end{array} \longrightarrow \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H} \\ \text{methanol} \end{array} + \begin{array}{c} \text{O} \quad \text{H} \\ \quad \\ \text{HO}-\text{C}-\text{C}-\text{H} \\ \\ \text{H} \\ \text{ethanoic acid} \end{array} $ <p style="text-align: center;">+ H₂O</p>
13	Hydrolysis II Fats → Fatty Acids	$ \begin{array}{c} \text{H} \quad \text{O} \\ \quad \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{C}_{17}\text{H}_{35} \\ \\ \text{H} \\ \text{Fat/Oil} \end{array} \xrightarrow{3\text{H}_2\text{O}} \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{OH} \quad \text{OH} \quad \text{OH} \\ \text{glycerol} \end{array} + \begin{array}{c} \text{O} \\ \\ 3 \times \text{H}-\text{O}-\text{C}-\text{C}_{17}\text{H}_{35} \\ \text{3 fatty acids} \end{array} $
14	Hydrolysis III Protein → Amino Acids	$ \begin{array}{c} \text{H} \quad \text{R}_1 \quad \text{O} \quad \text{H} \quad \text{R}_2 \quad \text{O} \quad \text{H} \quad \text{R}_3 \quad \text{O} \\ \quad \quad \quad \quad \quad \quad \quad \quad \\ -\text{N}-\text{C}-\text{C}-\text{N}-\text{C}-\text{C}-\text{N}-\text{C}-\text{C}- \\ \quad \quad \quad \quad \quad \quad \\ \text{H} \quad \quad \text{H} \quad \quad \text{H} \end{array} $ <p style="text-align: center;">↓ H₂O</p> $ \begin{array}{c} \text{H} \quad \text{R}_1 \quad \text{O} \\ \quad \quad \\ \text{H}-\text{N}-\text{C}-\text{C}-\text{OH} \\ \quad \\ \text{H} \quad \quad \text{H} \end{array} + \begin{array}{c} \text{H} \quad \text{R}_2 \quad \text{O} \\ \quad \quad \\ \text{H}-\text{N}-\text{C}-\text{C}-\text{OH} \\ \quad \\ \text{H} \quad \quad \text{H} \end{array} + \begin{array}{c} \text{H} \quad \text{R}_3 \quad \text{O} \\ \quad \quad \\ \text{H}-\text{N}-\text{C}-\text{C}-\text{OH} \\ \quad \\ \text{H} \quad \quad \text{H} \end{array} $
15	Addition Polymerisation	$ \begin{array}{c} \text{H} \quad \text{Cl} \quad \text{H} \quad \text{Cl} \quad \text{H} \quad \text{Cl} \\ \quad \quad \quad \quad \quad \\ \text{C}=\text{C} + \text{C}=\text{C} + \text{C}=\text{C} \\ \quad \quad \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \text{chloroethene} \end{array} \longrightarrow \begin{array}{c} \text{H} \quad \text{Cl} \quad \text{H} \quad \text{Cl} \quad \text{H} \quad \text{Cl} \\ \quad \quad \quad \quad \quad \\ -\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}- \\ \quad \quad \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \text{poly(chloroethene)} \end{array} $
16	Reduction	$ \text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \longrightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O} $ <p style="text-align: center;">NB Electrons always <i>before</i> arrow in Reduction</p>
17	Oxidation	$ \text{Fe}^{2+} \longrightarrow \text{Fe}^{3+} + \text{e}^- $ <p style="text-align: center;">NB Electrons always <i>after</i> arrow in Oxidation</p>
18	Redox	$ \text{MnO}_4^- + 8\text{H}^+ + 5\text{Fe}^{2+} \longrightarrow 5\text{Fe}^{3+} + \text{Mn}^{2+} + 4\text{H}_2\text{O} $ <p style="text-align: center;">NB No Electrons appear in a Redox Equation</p>

19	Haber Process	Nitrogen + Hydrogen $\xrightarrow{\text{iron catalyst}}$ Ammonia
20	Ostwald Process	Ammonia + Oxygen $\xrightarrow[\text{catalyst}]{\text{platinum}}$ Nitrogen Monoxide + Water Nitrogen Monoxide dissolves in Water to make Nitric Acid
21	Neutralisation I Acid + Metal Oxide	$\text{ACID} + \text{Metal Oxide} \rightarrow \text{SALT} + \text{WATER}$ $\text{sulphuric acid} + \text{sodium oxide} \rightarrow \text{sodium sulphate} + \text{water}$
22	Neutralisation II Acid + Metal Hydroxide	$\text{ACID} + \text{Metal Hydroxide} \rightarrow \text{SALT} + \text{WATER}$ $\text{hydrochloric acid} + \text{sodium hydroxide} \rightarrow \text{sodium chloride} + \text{water}$
23	Neutralisation III Acid + Metal Carbonate	$\text{ACID} + \text{Metal Carbonate} \rightarrow \text{SALT} + \text{WATER} + \text{Carbon Dioxide}$ $\text{nitric acid} + \text{calcium carbonate} \rightarrow \text{calcium nitrate} + \text{water} + \text{carbon dioxide}$
24	1 st Ionisation Energy	The energy to remove 1 mole of electrons from 1 mole of atoms in the gaseous state: $\text{K}_{(g)} \rightarrow \text{K}^{+}_{(g)} + e^{-}$
25	2 nd Ionisation Energy	The energy to remove 1 mole of electrons from 1 mole of 1+ ions in the gaseous state: $\text{K}^{+}_{(g)} \rightarrow \text{K}^{2+}_{(g)} + e^{-}$
26	Initiation In Free Radical Chain Reaction	Free radicals are created in the initiation step of a free radical chain reaction: <ul style="list-style-type: none"> Free radicals are only found after the arrow. Ultraviolet light required to provide the energy for initiation $\text{Cl}_2 \longrightarrow \text{Cl}^{\cdot} + \text{Cl}^{\cdot}$
27	Propagation In Free Radical Chain Reaction	Free radicals react with molecules to form new molecules and other free radicals <ul style="list-style-type: none"> Free radicals found on both sides of the arrow $\text{Cl}^{\cdot} + \text{CH}_4 \longrightarrow \text{CH}_3^{\cdot} + \text{HCl}$ $\text{CH}_3^{\cdot} + \text{Cl}_2 \longrightarrow \text{Cl}^{\cdot} + \text{CH}_3\text{Cl}$
28	Termination In Free Radical Chain Reaction	Free radicals join together to form molecules. <ul style="list-style-type: none"> Free radicals only found before the arrow. $\text{CH}_3^{\cdot} + \text{Cl}^{\cdot} \longrightarrow \text{CH}_3\text{Cl}$ $\text{Cl}^{\cdot} + \text{Cl}^{\cdot} \longrightarrow \text{Cl}_2$ $\text{CH}_3^{\cdot} + \text{CH}_3^{\cdot} \longrightarrow \text{C}_2\text{H}_6$