

# AQA C4a Chemical Changes: Metal & acid reactions

## TRIPLE CHEMISTRY

### RP – Making salts



#### Strong & Weak acids

<b>Strong acids</b>	Completely ionise in water
<b>Weak acids</b>	Partially ionise in water
<b>Hydrogen ions</b>	As pH decreases by 1, H <sup>+</sup> concentration goes up x10
$H^+ + ^-OH \rightleftharpoons H_2O$	

#### Metal salt production

Acid Name	Salt Name
Hydrochloric acid	Chloride
Sulfuric acid	Sulfate
Nitric acid	Nitrate

#### Reactivity Series

<b>Metals form positive ions when they react</b>	<i>The reactivity of a metal is related to its tendency to form positive ions</i>	The reactivity series arranges metals in order of their reactivity
<b>Carbon and hydrogen</b>	<i>Carbon and hydrogen are non-metals but included in the reactivity series</i>	These 2 non-metals are included as they can be used to extract some metals from their ores, depending on their reactivity.
<b>Displacement</b>	<i>A more reactive metal can displace a less reactive metal from a compound.</i>	Silver nitrate + Sodium ↓ Sodium nitrate + Silver

From most to least reactive	Reaction with water	Reaction with dilute acid	Extraction Method
<b>Potassium</b>	Bubbles, gives off hydrogen and leaves an alkaline solution	Explode	Electrolysis
<b>Sodium</b>			
<b>Lithium</b>			
<b>Calcium</b>	Bubbles, gives off hydrogen and forms a salt	Bubbles, gives off hydrogen and forms a salt	Reduction (removal of oxygen) with carbon
<b>Magnesium</b>			
<b>Aluminium</b>			
<b>Zinc</b>			
<b>Iron</b>	Slight reaction with steam	Slow reaction with warm acid	Found as native metal
<b>Tin</b>			
<b>Lead</b>	No reaction	No reaction	Found as native metal
<b>Copper</b>			
<b>Silver</b>			
<b>Gold</b>			

#### Neutralisation of acids

<b>Neutralisation</b>	<i>Acids can be neutralised by bases</i>	A <b>base</b> is a substance that neutralises an acid e.g. a metal carbonate, metal oxide. or soluble metal hydroxide, An <b>alkali</b> is a soluble base e.g. a metal hydroxide.
-----------------------	--	--



#### Ionic Half Equations

<b>Displacement Reactions</b>	<i>Ionic half equations show what happens to each of the reactants during reactions</i>	The ionic equation for the reaction between iron and copper (II) ions is: $Fe + Cu^{2+} \rightarrow Fe^{2+} + Cu$ The half-equation for iron (II) is: $Fe \rightarrow Fe^{2+} + 2e^-$ The half-equation for copper (II) ions is: $Cu^{2+} + 2e^- \rightarrow Cu$
-------------------------------	---	--

#### Oxidation, Reduction and Metal Oxides

<b>Metals and oxygen</b>	<i>Metals react with oxygen to form metal oxides</i>	<b>magnesium + oxygen → magnesium oxide</b> $2Mg + O_2 \rightarrow 2MgO$
<b>Reduction</b>	<i>When oxygen is removed during a reaction</i>	e.g. metal oxides reacting with hydrogen, extracting low reactivity metals
<b>Oxidation</b>	<i>When oxygen is gained during a reaction</i>	e.g. metals reacting with oxygen, carbon during extraction of some metals from their ores

Reactions between metals and acids are **redox reactions**. The metal donates electrons to the hydrogen ions. This displaces hydrogen as a gas while the metal ions are left in the solution.

**OIL RIG** - **O**xidation **I**s **L**oss (of electrons), **R**eduction **I**s **G**ain (of electrons)

#### Reactions of Acids

<b>Acid + Metal → Metal Salt + Hydrogen</b> Sulfuric acid + Iron → Iron sulfate + Hydrogen
<b>Acid + Metal Oxide → Metal Salt + Water</b> Sulfuric acid + Iron Oxide → Iron sulfate + Water
<b>Acid + Metal Hydroxide → Metal Salt + Water</b> Sulfuric acid + Iron Hydroxide → Iron sulfate + Water
<b>Acid + Metal Carbonate → Metal Salt + Water + Carbon Dioxide</b> Sulfuric acid + Iron carbonate → Iron sulfate + Water + Carbon dioxide