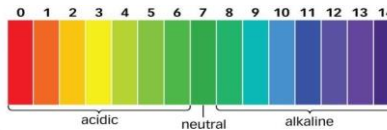


# AQA C4a Chemical Changes: Metal & Acid Reactions

## TRIPLE CHEMISTRY

### RP – Making salts



#### Reactivity Series

metals form positive ions when they react	<i>The reactivity of a metal is related to how easily it forms positive ions</i>	The reactivity series arranges metals in order of their reactivity
carbon and hydrogen	<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.
displacement	<i>A more reactive metal can displace a less reactive metal from a compound.</i>	silver nitrate + sodium ↓ sodium nitrate + silver

#### 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

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	reduction (removal of oxygen) with carbon	
<b>magnesium</b>			
<b>aluminium</b>			
<b>zinc</b>	very slow reaction	slow reaction with warm acid	found as native metal
<b>iron</b>	slight reaction with steam		
<b>tin</b>	no reaction	no reaction	
<b>lead</b>			
<b>copper</b>			
<b>silver</b>			
<b>gold</b>			

#### Neutralisation of Acids

neutralisation	<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.
<b>acid + base → metal salt + water</b>		

#### Ionic Half Equations

displacement reactions	<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: <b>Fe + Cu<sup>2+</sup> → Fe<sup>2+</sup> + Cu</b> The half-equation for iron (II) is: <b>Fe → Fe<sup>2+</sup> + 2e<sup>-</sup></b>  The half-equation for copper (II) ions is: <b>Cu<sup>2+</sup> + 2e<sup>-</sup> → Cu</b>
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#### Oxidation, Reduction and Metal Oxides

metals and oxygen	<i>metals react with oxygen to form metal oxides</i>	<b>magnesium + oxygen → magnesium oxide</b> <b>2Mg + O<sub>2</sub> → 2MgO</b>
reduction	<i>when oxygen is removed during a reaction</i>	e.g. metal oxides reacting with hydrogen, extracting low reactivity metals
oxidation	<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