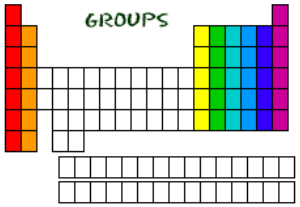
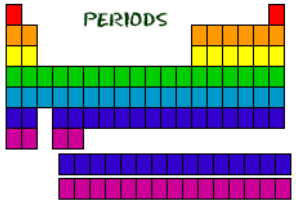
SCIENCE

Year 8: Chemical Reactions

1) The Periodic Table (Year 7 Particles and Periodic table Topic)

- Elements are arranged into **groups** (columns) and **periods** (rows) as shown below:





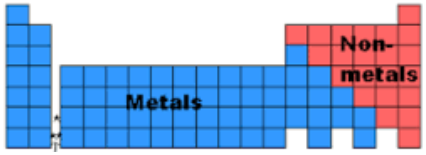
- **Elements** in the same **group** have similar properties
- The periodic table was developed through the work of a number of Scientists. The most successful of these was **Dmitri Mendeleev**.

- To develop his periodic table, he:
  - Ordered the elements by their atomic mass
  - Reversed order of elements to ensure that properties of elements fit.
  - Placed the elements with similar properties into vertical groups.
  - Left gaps in the periodic table where there was no element that fit the patterns. Properties were predicted and the element was subsequently found.

2) Metals and Non-metals

- The elements in the periodic table can be split up into 2 major groups:

Metals and Non-metals.

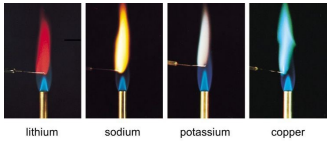


- Roughly 75% (3/4) of the elements are metals
- The key properties of **metals** are:
  - **Good conductors of Electricity**
  - **Good Conductors of Heat energy.**
  - **High densities**
  - **Tough**
  - **High melting and boiling points**
  - **Shiny (when polished)**
  - **Strong**
  - **Sonorous**
  - **Form alloys**
  - **Some are magnetic**
  - **Ductile**
  - **Malleable**
- The key properties of **non-metals** are:
  - **Poor conductors of Electricity**
  - **Poor Conductors of Heat energy.**
  - **Low densities**
  - **Weak**
  - **Low melting and boiling points**
  - **Non-magnetic**
  - **Brittle**
  - **Dull**

Keyword	Meaning	Keyword	Meaning
Compound	A substance made up from 2 or more elements chemically bonded together.	**Native**	A metal that is found as a metal (not a metal compound) in nature
Displacement	Where an object is moved from one position to another	**Ore**	A natural material e.g. rock that metal can be separated from economically
Element	A substance made up from a single type of atom.	**Period**	A horizontal row in the periodic table
Extraction	The process of separating one chemical from a mixture of chemicals or compound	**Periodic table**	A list of every element discovered. Each element is represented by a symbol
Group	A vertical column in the periodic table	**Reactivity**	A measure of how reactive a chemical is in reactions
Line spectrum	A sequence of coloured lines produced by a specific element	**Spectrometer**	A device that separates light from a object and allows it to be measured

3) Flame tests

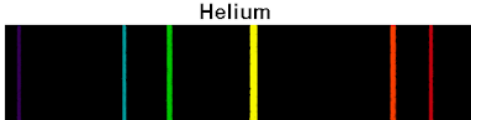
- Elements burn with different coloured flames when placed in a blue Bunsen burner flame.



- The colour of the flames are specific the element.

Here are some examples (you do not need to learn them.

- Unknown Elements can be identified using the colour of flame produced.
- Flame tests can be used to identify unknown elements or the elements in Compounds by burning them in a Bunsen burner flame.
- More detailed and accurate analysis of flame colours can be done using a **spectrometer**. This gives a **line spectrum**.
- Using a **line spectrum** of light from The Sun enabled Scientists to identify the element Helium.



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Year 8 Chemical Reactions

6) Reacting metals

There are 2 key reactions of metals:

A) With oxygen

- The reaction between a metal and oxygen forms a compound called an oxide.
  - The general equation for this reaction is:

Metal + Oxygen → Metal Oxide

B) With acid

- The reaction between a metal and acid forms a compound called an salt.
- The chemical name of the salt formed is based on the metal and acid used in the reaction **(See Yr 7 Chemical Reactions)**
- The reaction between a metal and acid forms bubbles of gas. This is Hydrogen gas.
- The general equation for this reaction is:

Metal + Acid → (Metal) Salt + Hydrogen

- An example of this reaction:

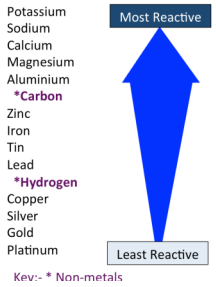
Zinc	+	Hydrochloric acid	→	Copper Chloride	+	Hydrogen
Zinc	+	Sulphuric acid	→	Copper Sulphate	+	Hydrogen
Zinc	+	Nitric acid	→	Copper Nitrate	+	Hydrogen

- **Test for Hydrogen gas:**

'Squeaky pop' is produced when a lit splint is inserted into the gas.

7) Reactivity Series of Metals

- Metals form similar products in a reaction e.g. metal reacting with acid, but each metal has different **reactivity**.
- Scientists investigated the **reactivity** of metals in different reactions and produced the **Reactivity Series**.
- The scientists also found the reactivity of the **non-metals Carbon** and **Hydrogen.** These were placed into the reactivity Series.
- You do not need to remember the reactivity series.

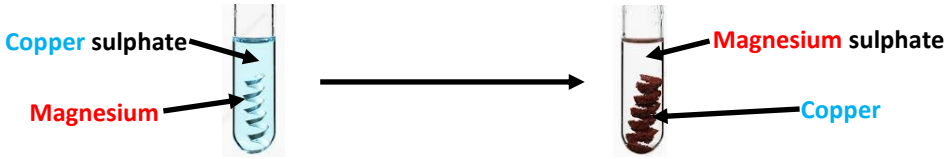


8) Displacement Reactions

- Reactions take place between **metals** and **metal compounds**.
- These reactions are called **Displacement reactions**.
- In displacement reactions, a **more reactive** metal will **displace** a **less reactive** metal from a metal compound.

8) Displacement Reactions continued

Magnesium + Copper sulphate → Copper + Magnesium sulphate



- **No displacement** reaction will occur if **less reactive** metal is reacted with a **more reactive** metal in a metal compound.

Copper + Magnesium sulphate → Magnesium + Copper sulphate

- An example of a displacement reaction is the Thermite reaction.

It is used to form molten iron to join railway track together

9) Extracting metals

- Most metals are found in **Ores.**
- In **ores**, the metals are found in compounds e.g. Iron ore contains Iron oxide
- This means that the metals need to be separated from the compounds in the ores by **extraction**

Reactivity series of metals	Method of extracting metals from their ores
Potassium, Sodium, Calcium, Magnesium, Aluminium	Extract through electrolysis
(Carbon)	
Zinc, Iron, Tin, Lead	Extract by burning with carbon
Copper, Mercury	Extract by burning directly in air
Silver, Gold	No extraction needed!

- The method **extraction** used to extract the metals depends on the **reactivity** of the metal (see diagram opposite)

Reduction with Carbon.

- Carbon is more reactive than some metals.
- It can displaces displace these metals from their compounds.

e.g. Carbon + Iron Oxide → Iron + Carbon dioxide

- **Low reactivity** metals do not form compounds whilst they are in the ground, so they are not found in **ores.**
- A Metal with no **ore** is a **Native** metal.

10) Rusting

- This is a **oxidation** reaction of Iron.
- The reaction is between Iron and oxygen to form Iron Oxide.
- The equation for rusting: **Iron + Oxygen → Iron Oxide**
- Iron oxide is flaky, powdery and nowhere near as strong as Iron

Preventing Rusting

- It is important to stop rusting. We can do this by covering iron with:

Paint **Oil** **Grease** **Plastic** **A more reactive metal (Galvanising)**