

Summary Sheet Year 8 Metals and Non-Metals



Metals and Non-Metals

The common **properties** of most **metals** are:

- high melting and boiling points
- solids at room temperature
- hard
- strong
- shiny (when polished)
- good conductors of heat and electricity
- malleable (can be bent and shaped)
- ductile (can be stretched into wires)
- sonorous (make a ringing noise when hit)

The common properties of most **non-metals** are:

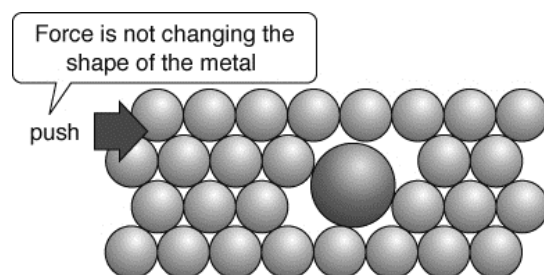
- low melting point and boiling points
- many are gases at room temperature
- brittle (when solid)
- dull (not shiny)
- poor conductors of heat and electricity.

The 3 **magnetic** metals are **iron, cobalt and nickel**

Alloys

Alloys - mixtures of a metal with one or more other elements.

Alloys are usually **harder** and **stronger** than pure metals because the **different sized atoms** make it **harder for the layers of atoms to slip over** each other.



Metal and Non-Metal Oxides

Many elements burn in air/oxygen to form oxides

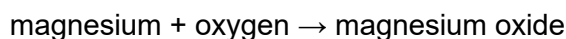
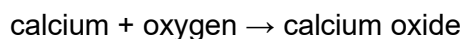
- calcium + oxygen → calcium oxide
- carbon + oxygen → carbon dioxide
- **metal oxides** tend to form **alkaline** solutions.
- **non-metal oxides** tend to form **acidic** solutions.

Metals and Oxygen

The reaction of metals with oxygen forms **metal oxides**



e.g. **word equation**



This is called an **oxidation** reaction.

Some metals like sodium react quickly with water and oxidise immediately when scratched. Other metals do not react easily, for example silver changes colour very slowly as it reacts with oxygen. Silver is a less reactive metal.

Metals and Water

Metals that react with water form a **metal hydroxide** (an alkaline solution) and **hydrogen** gas.



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The **test for hydrogen gas** is that **when lit** with a splint, it burns with a '**squeaky pop**'.

The equations can be written using words or symbols:

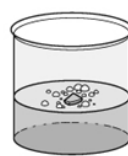
sodium + water → sodium hydroxide + hydrogen



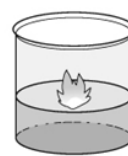
Other Examples:

potassium + water → potassium hydroxide + hydrogen

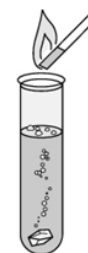
calcium + water → calcium hydroxide + hydrogen



lithium



potassium



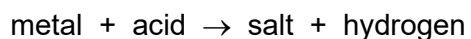
calcium



magnesium

Metals and Acids

When metals react with acids, they produce hydrogen and a salt.



The name of the salt formed depends on the name of the acid:

- hydrochloric acid → ____chloride
- sulfuric acid → ____sulfate
- nitric acid → ____nitrate

magnesium + sulfuric acid → magnesium sulfate + hydrogen

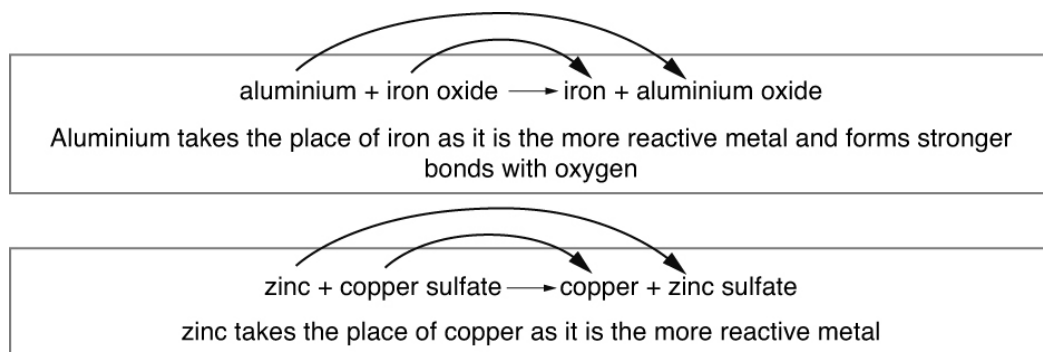


Other Examples: zinc + hydrochloric acid → zinc chloride + hydrogen

calcium + nitric acid → calcium nitrate + hydrogen

Reactivity Series and Displacement Reactions

The reactions of metals with oxygen, water and acids allows us to put the metals in order of reactivity.



Potassium
Sodium
Lithium
Calcium
Magnesium
Aluminium
Carbon
Zinc
Iron
Hydrogen
Copper
Silver
Gold

In a **displacement reaction** a more reactive metal takes the place of a less reactive metal in a compound.

However: copper + magnesium sulfate → copper + magnesium sulfate (ie. no reaction)

The **copper is less reactive** than the magnesium so is unable to displace it.

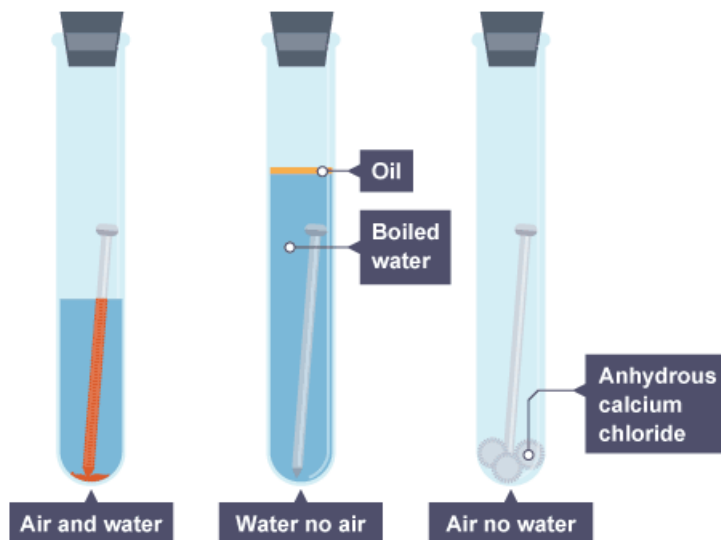
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Rusting and Corrosion

Iron (and steel which is mainly made from iron) will rust. This is a type of corrosion, where the metal breaks down and weakens.

Rusting will not occur without **oxygen and water**.



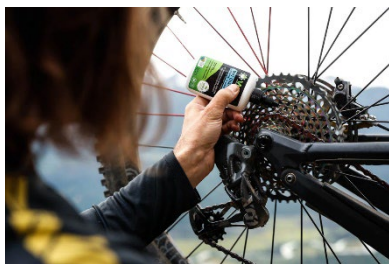
Only the iron nail in the first tube rusts, as it is the only one exposed to both **oxygen** and **water**.

Rusting can be prevented by removing either one of these.

Rust Prevention

Rusting is prevented in many objects by covering the iron of steel with something:

- paint
- oil or grease
- thin layer of plastic



Galvanizing will also prevent rusting. Here the iron is coated in a thin layer of **zinc** to protect it. The more reactive zinc oxidises rather than the iron beneath.



Sacrificial protection is also used to prevent rusting. Here a more reactive metal like magnesium is 'sacrificed' to protect the iron. The more reactive metal corrodes first. This idea is commonly used to protect the hull of boats.

