Corrosion: Iron and many other metals react with oxygen and moisture present in the atmosphere. This phenomenon is called **corrosion**. The process of slow eating away of a metal due to the attack of atmospheric gases and moisture on its surface is called corrosion.

- Iron reacts with oxygen and moisture present in the atmosphere to form a brown, flaky substance called rust. Rusting of iron in an undesirable reaction because the layer of rust formed falls off, exposing the metal to further rusting.

$4Fe + 3O_2 + 3H_2O \longrightarrow Fe_2O_3 + 2Fe(OH)_2$

Prevention of rusting: Both air and water are needed together to rust the iron. The only way to prevent iron from rusting is to keep air and water away from it. It can be done by:

By painting, By oiling and greasing, By using silica gel, By galvanization: The process of coating a thin layer of zinc on the surface of iron objects,

By electroplating: process of plating one meal over the other to protect rusting.

- Copper objects get coated with a green substance called basic **copper carbonate** with the passage of time. This green substance is formed due to the reaction of copper with carbon dioxide and moisture present in the atmosphere.
- Silver objects become blackened and lose their shine with the passage of time. This happens due to the reaction of silver with hydrogen sulphide gas present in the atmosphere.

1. Reaction with acids:

Metals: when a metal reacts with an acid, a salt and hydrogen gas are produced.

Metal + acid ⟶ Salt + hydrogen gas

Salt: are compounds formed when a metal replaces hydrogen in an acid. Different acids and metals react to form different salts.

Zinc reacts with sulphuric acid to form zinc sulphate and hydrogen gas.

$Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$

Zinc | Sulphuric acid | Zinc sulphate | Hydrogen gas

esi ith s agnesium sulphate and hydrogen gas.

$Mg + H_2SO_4 \longrightarrow MgSO_4 + H_2$

Magnesium | Sulphuric acid | Magnesium sulphate | Hydrogen gas

Aluminium reacts with hydrochloric acid to form aluminium chloride and hydrogen gas.

$2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$

Aluminium | Hydrochloric acid | Aluminium chloride | Hydrogen gas

With some metals, the reaction is very fast and vigorous, while with others it may be slow. Some metals do not react with acids at all.

Non-metals: generally, non- metals do not react with acids.

2. Reaction with bases:

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Metals: most metals do not react with bases. Only a few, like aluminium, zinc, and lead, react with solutions of strong bases like sodium hydroxide to produce a compound of that metal and hydrogen gas.

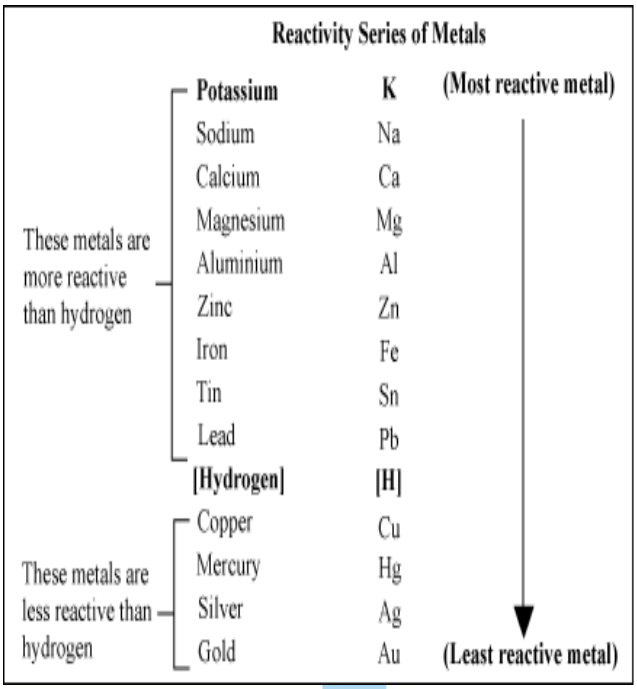
Non -metals: the reactions of non-metals with bases are complex.

Displacement reactions

In a displacement reaction, a metal reacts with a salt solution and 'displaces' (or replaces) the metal present in it. Displacement reactions are explained on the basis of the **activity series of metals**.

The activity series of metals is a list of common metals arranged in the decreasing order of reactivity.

This means that a metal which is placed higher in the activity series is more reactive than those placed below it.



A metal will only react with a salt solution if it is placed higher in the activity series than the metal in the salt.

For example, iron, which is placed higher in the activity series than copper, reacts with copper sulphate solution.

Silver does not react with zinc sulphate.

$$Ag + ZnSO_4 \longrightarrow \text{No reaction}$$

silver — Zinc sulphate

Zinc reacts with copper sulphate to form zinc sulphate and copper.

$$Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$$

Zinc — Copper sulphate — Zinc sulphate — Copper

Sliver does not react with copper sulphate.

$$Ag + CuSO_4 \longrightarrow \text{No reaction}$$

From the above reaction, we can conclude that the order of reactivity of zinc, copper, and silver is: Zn > Cu >Ag (i.e, Zinc is the most reactive of the three and silver, the least reactive).

Uses of metals and non- metals:

Uses of some common metals and non- metals are as follows.

Metals: iron is used for making automobiles, machinery, pipes, containers, nails, etc. gold and silver are used for making jewellery.

Copper:

1. For making electrical wires and utensils.
2. For making coins and statues
3. For making boilers

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Aluminium:

1. For king utensils
2. As foils used for wrapping chocolates etc
3. Mixed with other metals in the construction of aircraft.

Iron:

1. Pipes, storage tanks
2. Used in manufacture of nails, nuts and bolts etc.
3. Stainless steel is used for making utensils and surgical instruments.

Zinc

1. Mainly used as a protective coating for iron.

Non-metals

Hydrogen:

1. Used for making fertilisers by ammonia
2. Liquid Hydrogen is used as fuel in spaceships

Carbon:

1. Diamond is used as a gem, and for cutting glass.
2. Graphite is used as a lubricant and used in pencils.

Oxygen:

1. By Human beings and animals for breathing
2. For generation of flames used in welding

Phosphorus:

1. Used in firework industry.

Sulphur:

1. Used to manufacture sulphuric acid
2. Used manufacture of matches.

Alloy

An alloy is a mixture of two or more metals or one or more metals and a non-metal. Alloys can be used to increase hardness of metals. Examples of alloys are stainless steel (a mixture of iron, nickel, and chromium) and bronze (a mixture of iron and tin).

Name of the alloy	Composition	Uses
Steel	Iron + carbon	Construction material, machine parts.
Stainless steel	Iron+ chromium nickel	For making cooking utensils and cutlery, surgical implements
Brass	Copper + zinc	For making cooking utensils decorative statues, nuts and bolts

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Bronze	Copper + Tin	For making cooking utensils, coins medals, statues
German silver	Copper +zinc + nickel	For making table ware.
Duralumin	Aluminum + copper + magnesium + manganese	For making aircraft bodies, automobile parts.
Alnico	Aluminum + nickel + cobalt	For making magnets
Gun metal	Copper + tin + zinc	For making gun-barrels.

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