

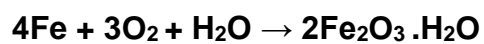
Elements are classified as Metals and Non-Metals based on their physical and chemical properties. A comparative study of their physical properties is as follows:

Metals	Non-Metals
Metals are lustrous, that is, they have a shiny surface.	They are not lustrous, that is, they do not have shiny surface. Except, graphite and Iodine.
They are hard and tough except sodium and potassium that can be cut with a knife.	Solid non-metals are brittle and break down into powdery mass on striking with a hammer except diamond which is the hardest non-metal.
Metals can be drawn into wires, that is they are Ductile.	They are non- ductile.
Metals are malleable, that is, they can be beaten into sheets. For example Aluminium foil used for packing food.	They are non- malleable.
All metals are solids except mercury which is liquid at room temperature.	They are generally soft, except Diamond.
They are good conductors of electricity and heat. Except Lead and mercury.	They are poor conductors of electricity and heat. Exception-graphite is good conductor of electricity.
They have high density and high melting point, except Sodium and Potassium which have low melting points.	They have low density compared to metals and low melting point. Diamond is an exception which has high melting point.

Chemical properties of metals

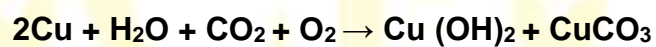
Reaction with Oxygen

- Metals reacts with atmospheric oxygen to produce metal oxides which are basic in nature because on reaction with water they produce bases.
- When iron reacts with oxygen in the presence of air and moisture, it forms rust (hydrated ferric oxide).



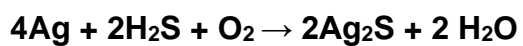
Rusted iron object

- Metallic copper reacts with oxygen, carbon- dioxide and atmospheric moisture to produce copper hydroxide and copper carbonate. This appears as a green colour coating.



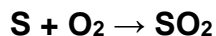
Rusted copper utensils

- Silver articles get tarnished due to the reaction of metallic Silver with Hydrogen Sulphide or Sulphur present in air.



Reaction of Non-metal with Oxygen

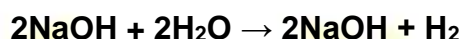
- Non- metals react with Oxygen to form non- metallic oxides which are acidic in nature. They turn blue litmus red.
- Sulphur burns in air to combine with oxygen and forms sulphur dioxide.



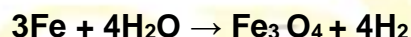
- When Sulphur dioxide is dissolved in water, it produces Sulphurous acid solution which turns blue litmus to red. This indicates its acidic nature and also shows that sulphur dioxide is acidic in nature.

Reaction of metal with water

- Sodium metal being very reactive reacts vigorously with oxygen and water with the liberation of lot of heat. It is, therefore, stored in kerosene.



- Iron reacts with water slowly.

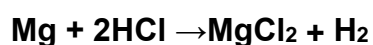


Reaction of non- metal with water

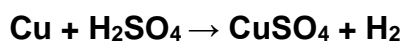
- Phosphorus being a very reactive non-metal catches fire when exposed to air. To prevent the contact of phosphorus with atmospheric oxygen, it is stored in water.

Reaction of metal with Acid

- Metals react with acids to produce hydrogen gas. If a matchstick is brought near the mouth of the tube in which the reaction is occurring then we hear a pop sound. This is because of Hydrogen gas.
- For example, Magnesium reacts with dilute hydrochloric acid to produce magnesium chloride and hydrogen gas.



- Copper reacts with Sulphuric acid to produce copper sulphate.

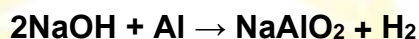


Reaction of non-metal with Acid

- Non-metals do not react with acids. This is due to the fact that a substance which reacts with acids, donates electrons to the H^+ ions produced by the acids. But non-metals, being an electrons acceptor are unable to do so. As a result, they do not react with dilute acids. But Sulphur being an exception reacts with acid.

Reaction of metal with bases

- Metals react with sodium hydroxide to produce hydrogen gas.
- For example, aluminium reacts with sodium hydroxide to give sodium aluminate and hydrogen gas.

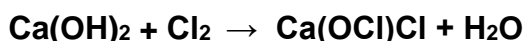


- Zinc metal reacts similarly to produce sodium zincate and hydrogen gas.



- Reactions of non-metals with bases are quite complex. They react with bases to form salt. No hydrogen gas is produced.

When calcium hydroxide reacts with chlorines bleaching powder is produced.




Displacement Reactions

- Reactive metals have a tendency of displacing less reactive metals from solutions of their compounds. This kind of reactions are known as displacement reactions.
- The list of metals arranged in the order of their decreasing activities is known as Reactivity Series.

K
Na
Ca
Mg
Al
Zn
Sn
Pb
H
Cu
Ag
Au

More reactive



Less reactive

Take 5 beakers A, B, C, D, E and add the following:

Beaker A: Copper sulphate (CuSO_4) + Zinc granule (Zn)

Beaker B: Copper sulphate (CuSO_4) + Iron nail (Fe)

Beaker C: Zinc sulphate (ZnSO_4) + Copper turnings (Cu)

Beaker D: Iron sulphate (FeSO_4) + Copper turnings (Cu)

Beaker E: Zinc sulphate (ZnSO_4) + Iron nail (Fe)

- In Beaker A, Zn being more reactive displaces copper from its solution and forms Zinc sulphate.
- In Beaker B, Fe being more reactive displaces zinc from its solution and forms Iron sulphate.
- In Beaker C, no reaction takes place because copper being less reactive cannot displace zinc from its solution.
- In Beaker D, no reaction takes place because copper being less reactive cannot displace iron from its solution.
- In Beaker E, no reaction takes place because iron cannot displace zinc from its solution.

Uses of Metals

- Metals are used in manufacturing automobiles, machinery, trains, satellites, aeroplanes, industrial gadgets.
- Metals being good conductors of electricity and having ductility are used in making wires, electrical appliances, circuits and many more.
- Metals are used in making utensils, water boilers etc because they are good conductors of heat.

Uses of Non-Metals

- Non-metal is essential for our life. Oxygen is inhaled during Breathing.
- Non-metal are used as disinfectant.
- Non-metals are used in crackers.
- Non-metals are used in water purification process.
- Non-metals are used in fertilisers to enhance the growth of plants.

