Chapter -4

MATERIALS AND NON-METALS

NOTES:

- Metals can be distinguished from non-metals on the basis of their physical and chemical properties.

PHYSICAL PROPERTIES OF METALS AND NON-METALS

Sl. No.	**METALS**		**NON-METALS**
1.	Metals are generally malleable and can be beaten into thin sheet except zinc, arsenic & antimony.	1.	Non-metals are not malleable.
2.	Metals are generally good conductors of heat and electricity.	2.	Non- metals are generally bad conductors of heat and electricity except graphite.
3.	The property of metals which can be drawn into wires is called ductility. Metals are generally ductile except zinc, arsenic & antimony.	3.	Non- metals are not ductile except carbon fibre.
4.	Metals produce ringing sounds when struck with hard material and are said to be sonorous.	4.	Non- metals do not produce ringing sound when struck with hard material and are said to be non-sonorous.
5.	Metals are generally hard. However sodium and potassium are soft.	5.	Non- metals are generally not very hard except diamond.
6.	Metals have a luster (shiny).	6.	Non- metals are dull in appearance and have no luster except iodine and graphite.
7.	Metals are generally solid at room temperature except mercury and Gallium (liquid at room temperature).	7.	Non- metals are generally brittle and it can be in the form of solids, liquids or gases.

- The materials which are generally hard, lustrous, malleable, ductile, sonorous and good conductors of heat and electricity are called metals. Example: iron, copper, calcium etc.
- The materials which are soft and dull in appearance, brittle, non-sonorous and poor conductors of heat and electricity are called non-metals. Example: Carbon, Oxygen, Phosphorus etc.

CHEMICAL PROPERTIES OF METALS AND NON-METALS

Reaction of metals with Oxygen

- Metals when burnt with oxygen form metal oxides
- Rust is formed when iron react with Oxygen and water vapour present in the air.

  Iron (Fe) + Oxygen (O_2) + Water (H_2O) $\longrightarrow$ $Fe_2O_3.H_2O$ (s)
  Hydrated ferric oxide (rust)
- When magnesium is burnt over a flame, magnesium oxide (ash) is produced.

  Magnesium (2Mg) + Oxygen (O_2) (from air) $\longrightarrow$ Magnesium oxide (2MgO)
- When the ash (Magnesium oxide) is dissolved in water, it formed Magnesium hydroxide solution.

  Magnesium oxide (MgO) + Water (H_2O) $\longrightarrow$ Magnesium hydroxide $Mg(OH)_2$
- Magnesium hydroxide turns colour of red litmus to blue. So oxide of Magnesium is basic in nature.
- In general, metallic oxides are basic in nature.

Reaction of non-metals with Oxygen

- Non metals when burnt with oxygen form non metal oxides.
- When sulphur is burnt, it formed sulphur dioxide gas.
  Sulphur (S) + Oxygen (O_2) $\longrightarrow$ Sulphur dioxide (SO_2)
- When sulphur dioxide gas in dissolved in water Sulphurous acid is formed.
  Sulphur dioxide (SO_2) + Water (H_2O) $\longrightarrow$ Sulphurous acid (H_2SO_3)
- The sulphurous acid turns blue litmus paper to red when tested for its acidic/ basic nature.
- Thus, non-metal oxides are generally acidic in nature.

Reaction of metals with Water

- Some of the metals react vigorously with water e.g sodium.
- Some other metals do not do so. e.g iron react with water slowly

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Reaction of non-metals with Water

- Generally, non-metals do not react with water though they may be very reactive in air.
- Phosphorus is a very reactive non-metal. It catches fire if exposed to air. So it is stored in water.

Reaction of metals with Acids

- Generally metals react with acids and produce hydrogen gas that burns with a 'pop' sound when the burning match stick is brought near to it.
- However copper does not react with dilute Hydrochloric acid even on heating but reacts with sulphuric acid.

Reaction of non-metals with Acids

- Generally, non-metals do not react with acids.

Reaction of metals with Bases

- Only few metal like zinc, aluminium, tin, lead and silicon react with strong bases such as Sodium hydroxide to produce a compound of that metal and hydrogen gas.

Reaction of non-metals with Bases

- Reactions of non-metals with bases are complex.

Displacement Reactions

- A more reactive metal can replace a less reactive metal, but a less reactive one can not replace a more reactive metal.
- A reaction in which more reactive metal displace the less reactive element from the solution is called Displacement reaction.

USES OF METALS AND NON-METALS

Some uses of Metals are as follows:

- Cooking utensils, water boiler are made up of metals.
- Metals are used in the construction of building and bridges.
- Metals are used in the manufacture of machinery automobiles, aeroplanes, trains, satellites etc.
- Silver and gold are used in making jewellery.
- They are also used in making coins.

Some uses of Non-metals are as follows:

- Non-metal like oxygen is essential for living our life.
- Non-metals are used in the manufacture of fertilizer.
- Non- metal like chlorine is used in water purification process.
- Non-metal like red phosphorous is used in making fire work (match stick).
- Non- metal like sulphur is used in making skin ointments which is used as an antiseptic.