

7. Metals and Non-metals

Metals

- **Physical properties**
- Shining surface (in pure state) [called metallic lustre]
- Generally hard [varies from metal to metal]
- Malleable [i.e. can be made thin sheets by beating]
- Ductile [i.e. can be drawn into thin wires]
 - [Gold → Highly ductile]
- Good conductors of heat
- High melting point
- Conduct electricity
- Produce sound [some metals; these are called sonorous]

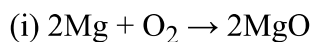
Non-metals

- Non-metals are found in all the three states i.e. solid, liquid and gas, at room temperature.
- Iodine (non-metal) has lustre
- Carbon has allotropes (exists in different forms)
 - Diamond is hard
 - Graphite (Conducts electricity)

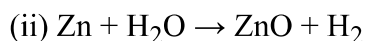
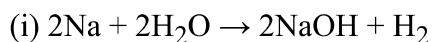
Metals	Non-metals
1. Generally, these are hard and lustrous.	These are soft and have no lustre.
2. These are malleable and ductile (Malleable: can be beaten into sheets; Ductile: can be drawn into wires).	These are non-malleable and non-ductile.
3. These are sonorous (produce ringing sound when struck).	These are not sonorous.
4. These are good conductors of heat and electricity.	These are poor conductors of heat and electricity.

Chemical properties of metals

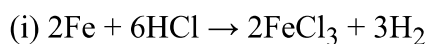
1. Metals react with oxygen to form their oxides, peroxides and superoxides.



2. Metals react with water to liberate hydrogen gas and form hydroxide or oxide.

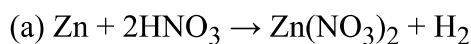


3. Metals react with dilute acids to form their respective salts, along with liberation of hydrogen gas.

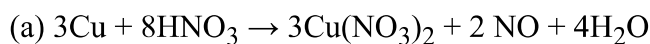


4. Reaction with nitric acid:

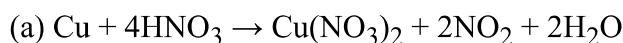
(i) Dilute nitric acid forms nitrate with evolution of hydrogen gas.



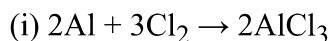
(ii) Moderately concentrated nitric acid forms nitrate and nitric oxide.



(iii) Concentrated nitric acid forms nitrates and nitrogen dioxide.



5. Metals react with chlorine to form their respective chloride salts.



- **Uses of metals:**

- In making machinery, automobiles, jewellery, trains, aeroplanes, cooking utensils, etc.
- Gold is used for making jewellery, wires, and coins and in dentistry.
- Silver is used for making coins, ornaments, very thin wires, table cutlery and in photographic films.
- Copper is used for making wires, utensils, statues, alloys and coins.
- Iron is used for construction of ships, buildings, automobiles and railway bridges etc.
- Tin is used for tinning food cans, and making alloys.
- Lead is used for making batteries, and alloys.
- Zinc is used in prevention of rusting, making brass and bronze and in dry cells.
- Aluminium is used in making wires, foils, and alloys.
- Mercury is used for making amalgams and in thermometers.
- Magnesium is used for making fire works, and alloys.

- **Uses of non-metals:**

- They are used in fertilizers, in water purification process, crackers, etc. Oxygen, a non-metal, is essential for our life as all living beings inhale it during breathing.
- Nitrogen dilutes the activity of oxygen in air. It is used by plants to manufacture proteins.
- Oxygen is essential for respiration and combustion of fuels.
- Chlorine is used for bleaching fabrics, sterilization of drinking water, and in manufacturing insecticides and pesticides.
- Iodine is essential for proper functioning of human body, and in photographic films.
- Graphite is used as pencil lead, dry lubricant, in electrolytic cells and nuclear reactors.
- Helium is a noble gas which is used in weather observation balloons.
- Argon is a noble gas which is used for filling electric bulbs.

Corrosion:

The process of breaking down of metals because of their reactions with moisture and gases present in the air is known as corrosion. Rusting of iron is the most common example of corrosion.

Factors Affecting Corrosion

- **Reactive nature of metal:** Highly reactive metals corrode easily.

- Presence of dissolved salts: They act as electrolyte and increase the rate of corrosion.
- Presence of pollutants: They increase the rate of corrosion.
- Presence of less reactive metal: If a less reactive metal is present, it will make the more reactive metal susceptible to corrosion.

Methods to prevent corrosion:

- Rusting can be prevented by painting, oiling, and greasing of iron articles. In fact, paints and grease should be applied regularly to prevent rusting.
- Rusting can also be prevented by applying a layer of a metal such as chromium or zinc on the surface of iron articles. **The process of depositing zinc on iron is called galvanization.**
- Rusting can also be prevented by connecting the iron object with a more reactive metal like zinc with the help of a wire. **The process of connecting iron with a more reactive metal through a wire is called cathode protection.**
- Alloying can also be used to prevent rusting or corrosion.

Alloys

An alloy is a homogeneous mixture of two or more elements, at least one of which is a metal. Some common alloys are stainless steel (iron+nickel+chromium), brass (copper+zinc) and bronze (copper+tin).