

Class VIII Science
Notes for Materials: Metals and Non-Metals

Facts that Matter

- Materials around us can be broadly grouped into metals and non-metals.

(a) Physical Properties of Metals

- **Lustre:** Metals in the pure state generally shine. The shine on the metallic surface is called the metallic lustre.
- **Malleability:** The property of metals by which they can be beaten into thin sheets is known as malleability. For example, silver metal is beaten to make silver foil used for decorating sweets.
- **Ductility:** It is one of the properties of metals by virtue of which they can be drawn into wires. For example, copper and iron can be drawn into wires.
- **Conductivity:** Metals are good conductor of heat and electricity. Heat and electricity can pass through them.
- **Sonorous:** Metals produce a ringing sound when struck hard. So, they are called sonorous.
- **Solid:** All metals are solid except Mercury, the only metal which is liquid at room temperature. We can cut sodium (Na) and potassium (K) metals with the help of a knife. Mercury, sodium and potassium are exceptional metals. Examples of metals: iron, copper, gold, aluminium, silver, calcium etc.

(b) Physical Properties of Non-Metals

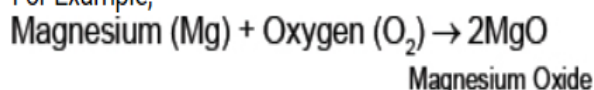
- Solid non-metals are soft and dull. They break down into a powdery mass on tapping with a hammer. For example, coal and sulphur.
- Non-metals are not sonorous.
- They are poor conductors of heat and electricity.
- They do not possess metallic lustre.
- They possess no malleability and ductility.

Examples of non-metals: phosphorus, sulphur, carbon, oxygen etc.

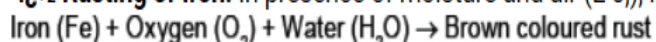
(c) Chemical Properties of Metals

- **Oxidation:** Metals except gold and silver (noble metals) react with oxygen to form basic oxides. Sodium also reacts vigorously with O₂. A lot of heat generated in this reaction.

For Example,

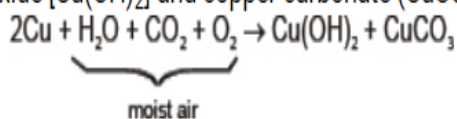


½ Rusting of Iron: In presence of moisture and air (L O), rust gets deposited over iron.



(Iron oxide Fe₂O₃)

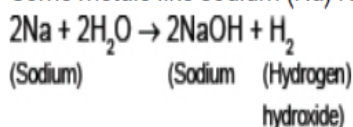
½ **Greenish deposit on the surface of copper vessels:** The dull greenish material deposited on the surface of copper is a mixture of copper hydroxide [Cu(OH)₂] and copper carbonate (CuCO₃) that takes place:



½ **Metallic oxides** are basic in nature.

- Reaction of Metals with Water

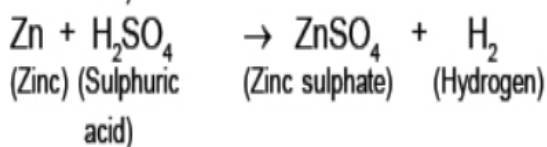
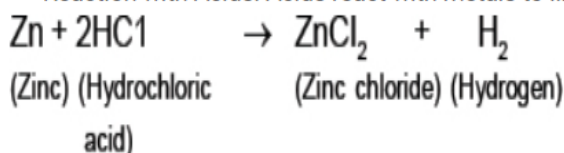
Some metals like sodium (Na) react vigorously with water at room temperature.



Potassium (K) and Calcium (Ca) are also active metals and react with water at room temperature. Such metals are stored in kerosene.

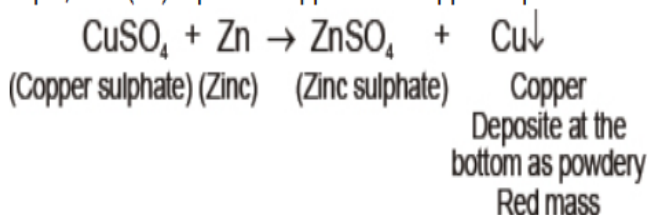
Some other metals do not do so. For example, iron reacts with water slowly.

- Reaction with Acids: Acids react with metals to liberate hydrogen and corresponding salt of the metal.



Hydrogen burns with a 'pop' sound, when a burning match-stick is brought near it.

- Reaction with Bases: Metals react with sodium hydroxide to produce hydrogen.
- Displacement Reactions: Certain metals are capable of displacing other metals from their solutions. For example, zinc (Zn) replaces copper from copper sulphate solution.



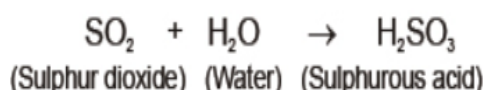
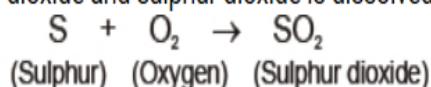
In general, more active metals displace less active metals from their solutions. In this case, Zinc is more reactive than Cu, so it replaces copper (Cu) from copper sulphate solution.

The rule is that 'a more reactive metal can replace a less reactive metal, but a less reactive one cannot replace a reactive metal'.

Thus, metals are arranged in the order of their decreasing activity. This arrangement is called the activity series.

(d) Chemical Properties of Non-Metals

- Oxidation. Non-metals react with oxygen to form oxides which are acidic in nature. For example, sulphur when reacts with oxygen forms sulphur dioxide and sulphur dioxide is dissolved in water to form sulphurous acid.



The sulphurous acid turns blue litmus paper red i.e. it is acidic in nature.

- Reaction of Non-Metals with Water: Generally, non-metals do not react with water though they may be very reactive in air.

Some non-metals such as phosphorus, react with the air. It catches fire if exposed to air. So, phosphorus is stored in water.

(e) Uses of Metals

- Metals are used in making wires and sheets, which are used for various purposes. For example, copper and aluminium wires are used for conduction of electricity, in electrical equipments etc. Iron wires are used for fencing and various other purposes. Iron sheets are often used for making roof sheds.
- Metals are used in making machinery, auto mobiles, utensils, industrial gadgets, water boilers etc.

(f) Alloys

- An alloy is a solid mixture of two or more metals or a metal and a non-metal. Alloys of metals are used in making coins, satellite, stainless steel, wooden ships sheathing and casting (Muntz Metal, alloys of Cu 60% + Zn 40%).

Alloy like duralium has great strength. It is used in aircrafts, pressure cooker, automobiles etc. Naval brass is used for marine and engineering castings.

- Some metals like iron, sodium and calcium are essential parts of our body.

(g) Uses of Non-Metals

Non-metals are widely used in our daily life. Many non-metals like iodine, chlorine, sulphur are used in medicine. Phosphorus is essential for our bones and teeth.

Some of the interesting uses of non-metals are:

- Non-metal (oxygen) is essential for our life, as oxygen is required for respiration.
- Carbon dioxide (CO₂) is essential for green plants to carry out photosynthesis.
- Non-metals like nitrogen and phosphorus are used in fertilisers for better plant growth.
- Non-metal like chlorine (Cl₂) is used in water purification process.
- Non-metal (I₂) is used in the purple coloured solution (Iodine solution) on wounds as antiseptic.
- Non-metal such as sulphur is used in crackers.