

Lesson at a Glance

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

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.

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.

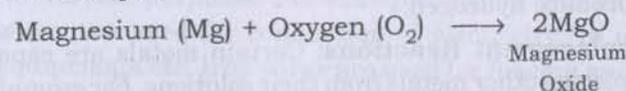
- They are poor conductors of heat and electricity.
- They do not possess metallic lustre.
- They possess no malleability and ductility.

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

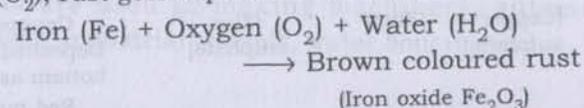
Chemical Properties of Metals

- **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 is generated in this reaction.

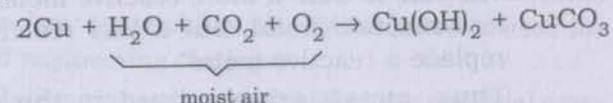
For Example,



- **Rusting of Iron:** In presence of moisture and air (O₂), rust gets deposited over iron.



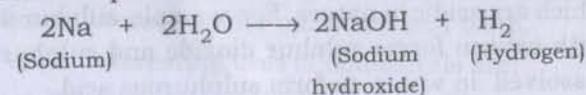
- **Greenish deposit on the surface of copper vessels:** The dull greenish material deposited on the surface of copper is a mixture of copper hydroxide [Cu(OH)₂] and copper carbonate (CuCO₃) that takes place:



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

Reaction of Metals with Water

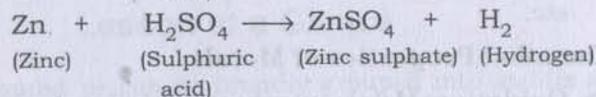
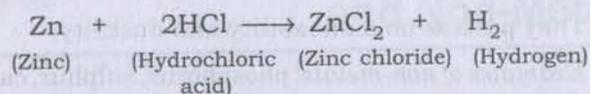
Some metals like *sodium* (Na) react vigorously with water at room temperature.



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.

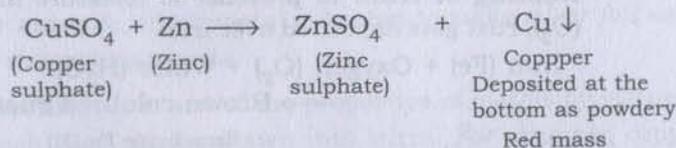
- **Reaction with Acids:** Acids react with metals to liberate hydrogen and corresponding salt of the metal.



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.



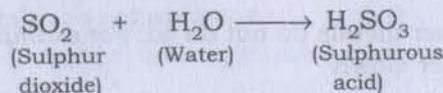
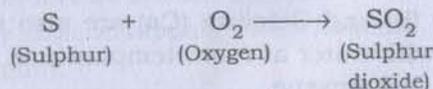
In general, more active metals displace less active metals from their solutions. In this case, Zinc is more reactive than Cu, so it replaces copper (Cu) from copper sulphate solution.

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*.

• 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.

• 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, automobiles, utensils, industrial gadgets, water boilers etc.

• 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.

• 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 (Cl_2) is used in water purification process.
- Non-metal (I_2) is used in the purple coloured solution (Iodine solution) on wounds as antiseptic.
- Non-metal such as sulphur is used in crackers.

TEXTBOOK QUESTIONS SOLVED

Q. 1. Which of the following can be beaten into thin sheets?

- (a) Zinc (b) Phosphorus
(c) Sulphur (d) Oxygen

Ans. (a) Zinc.

Q. 2. Which of the following statements is correct?

- (a) All metals are ductile.
(b) All non-metals are ductile.
(c) Generally, metals are ductile.
(d) Some non-metals are ductile.

Ans. (c) Generally metals are ductile.

Q. 3. Fill in the blanks.

- (a) Phosphorus is a very _____ non-metal.
(b) Metals are _____ conductors of heat and _____.
(c) Iron is _____ reactive than copper.
(d) Metals react with acids to produce _____ gas.

Ans. (a) reactive (b) good, electricity
(c) more (d) hydrogen

Q. 4. Mark 'T' if the statement is true and 'F' if it is false.

- (a) Generally, non-metals react with acids. ()
(b) Sodium is a very reactive metal. ()
(c) Copper displaces zinc from zinc sulphate solution. ()
(d) Coal can be drawn into wires. ()

Ans. (a) F (b) T (c) F (d) F.

Q. 5. Some properties are listed in the following Table. Distinguish between metals and non-metals on the basis of these properties.

Properties	Metals	Non-metals
1. Appearance		
2. Hardness		
3. Malleability		
4. Ductility		
5. Heat Conduction		
6. Conduction of Electricity		

Ans.

Properties	Metals	Non-metals
1. Appearance	lustrous	non-lustrous
2. Hardness	hard except sodium and potassium	generally soft except diamond
3. Malleability	generally malleable	non-malleable
4. Ductility	generally ductile	non-ductile
5. Heat Conduction	good conductors	poor conductors
6. Conduction of Electricity	good conductors	poor conductors

Q. 6. Give reasons for the following.

- (a) Aluminium foils are used to wrap food items.
(b) Immersion rods for heating liquids are made up of metallic substances.
(c) Copper cannot displace zinc from its salt solution.
(d) Sodium and potassium are stored in kerosene.

Ans. (a) Aluminium is malleable, soft and does not react with food items, so it is used to wrap food items.
(b) Metals are good conductor of heat and electricity, so immersion rods are made up of metallic substances.
(c) Copper is less reactive than zinc, so it can not displace zinc from its salt solution.
(d) Sodium and Potassium are very reactive; they react with air and water, so they are stored in kerosene.

Q. 7. Can you store lemon pickle in an aluminium utensil? Explain.

Ans. No, we cannot store the lemon pickle in aluminium utensil because aluminium is a metal and lemon is acidic. The acids react with metals to give hydrogen which would spoil the food and makes it unfit to use.

Q. 8. Match the substances given in Column A with their uses given in Column B.

Column A	Column B
(i) Gold	(a) Thermometers
(ii) Iron	(b) Electric wire
(iii) Aluminium	(c) Wrapping food
(iv) Carbon	(d) Jewellery
(v) Copper	(e) Machinery
(vi) Mercury	(f) Fuel

Ans.

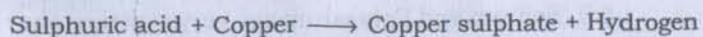
Column A	Column B
(i) Gold	(d) Jewellery
(ii) Iron	(e) Machinery
(iii) Aluminium	(c) Wrapping food
(iv) Carbon	(f) Fuel
(v) Copper	(b) Electric wire
(vi) Mercury	(a) Thermometers

Q. 9. What happens when

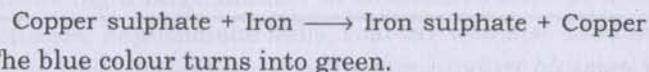
- (a) Dilute sulphuric acid is poured on a copper plate?
 (b) Iron nails are placed in a copper sulphate solution?

Write word equations of the reaction involved.

Ans. (a) When dilute sulphuric acid is poured on a copper plate, copper reacts with acid to give copper sulphate and hydrogen.



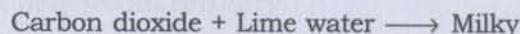
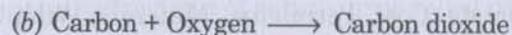
- (b) When iron nails are placed in copper sulphate solution, displacement reaction takes place in which iron displaces copper.



Q. 10. Saloni took a piece of burning charcoal and collected the gas evolved in test tube.

- (a) How will she find the nature of the gas?
 (b) Write down word equations of all the reactions taking place in this process.

Ans. (a) When charcoal burnt then carbon dioxide gas is formed. This gas turns lime water into milky substance. It can also be tested by red and blue litmus. The solution of gas turns blue litmus into red so it is acidic.



Q. 11. One day Reeta went to a jeweller's shop with her mother. Her mother gave an old gold jewellery to the goldsmith to polish. Next day when they brought the jewellery back, they found that there was a slight loss in its weight. Can you suggest a reason for the loss in weight?

Ans. Gold is a metal which is washed in acidic solution. Some gold dissolves in acid to form oxide. This causes the loss of gold in the form of gold oxide. In this process certain amount of gold is lost to the acidic solution.