Materials: Metal and Non-metals

Check point 1

Q. 1. Name some common metals that we use in our daily life.

Answer: (1) Iron – It is used to make doors and windows.

(2) Copper – It is used to make electric wires.

(3) Gold – It is used to make ornaments.

(4) Silver – It is also used to make ornaments.

Q. 2. On which basis, materials can be divided?

Answer: Materials can be divided as metals and non-metals. Metals can be separated on the basis of physical and chemical properties.

Physical properties – Ductility, Malleability, Lustre and Hardness are physical properties.

Chemical properties –

(i) Metals on reaction with oxygen form basic oxides while non -metals on reaction with oxygen form acidic oxides.

(ii) Metals react with water but non-metals do not react with water.

(iii) Metals react with acids and produce hydrogen gas but non-metals do not react with acids.

(iv) Metals react with bases and produce hydrogen gas but reactions of non-metals with bases are complex.

Q. 3. Among the following which are metals?

Iron, Sulphur, Nitrogen, Copper, Oxygen, Aluminium

Answer: Iron, Copper and Aluminium are metals because these are hard and lustrous but Sulphur, Nitrogen and Oxygen are non-metals.

Check point 2

Q. 1. Why we cannot hold hot metal pan directly?

Answer: We cannot hold hot metal pan directly because metals are good conductor of heat and they hurt us. So we use plastic or wooden handle to hold the hot metal pan because plastic and wood are bad conductor of heat and they do not hurt us.

Q. 2. Connecting wires are made up of which metals and why?

Answer: Connecting wires are made up of copper and aluminium because these metals are ductile and good conductor of electricity.

Q. 3. Why we don't use non-metals for making jewellery?

Answer: We don't use non-metals for making jewellery because non-metals are not lustrous. We use metals for making jewellery because they are lustrous.

Q. 4. Name a non-metal which is very hard.

Answer: Diamond is a non-metal which is very hard. Diamond is an allotrope of carbon.

Check point 3

Q. 1. How do metal oxides differ from non-metal oxides?

Answer: Metal oxides are basic in nature while non-metal oxides are acidic in nature.

Q. 2. What happens when metals react with dilute acids?

Answer: When metals react with dilute acids then hydrogen gas is produced. This hydrogen gas burns with a pop sound.

$Na + dil.HCl \rightarrow NaCl + H_2$

Q. 3. Which acid is produced when sulphur dioxide reacts with water?

Answer: When sulphur dioxide reacts with water then sulphurous acid (H_2SO_3) is produced.

$SO_2 + H_2O \rightarrow H_2SO_3$

Q. 4. What happens when magnesium reacts with oxygen? What is the nature of the product?

Answer: When magnesium reacts with oxygen then magnesium oxide (MgO) is produced. Magnesium oxide is basic in nature.

Note- Oxides of metal are basic in nature while oxides of non-metals are acidic in nature.

Check point 4

Q. 1. Name two metals which are used to make ornaments.

Answer: Gold and silver are used to make ornaments.

Q. 2. Can copper displace zinc from its salt solution?

Answer: No. Copper cannot displace zinc from its salt solution because copper is less reactive than zinc. More reactive displaces less reactive metal from its salt solution.

Q. 3. What is the colour of the solution formed when copper sulphate reacts with zinc?

Answer: When copper sulphate reacts with zinc then zinc displaces to copper and zinc sulphate is formed because zinc is more reactive than copper. So the blue colour of copper sulphate disappears and a powdery red mass of copper is deposited at the bottom of the beaker. Hence the colour of the solution formed is red.

$CuSO_4$ (Blue) + Zn→ $ZnSO_4$ (colourless) + Cu (Red)

Chapter Test

Q. 1. When sulphur burns in air, it combines with oxygen in air to form sulphur dioxide gas. Is it acidic in nature?

Answer: Yes, Sulphur dioxide is acidic in nature because oxides of non-metal are acidic in nature.

Q. 2. Name two metals which are used for making cooking utensils and water boilers for factories.

Answer: Copper and aluminium are used for making cooking utensils and water boilers for factories.

Q. 3. Which metal is used to galvanise iron to protect it from rusting?

Answer: Zinc is used to galvanise iron to protect it from rusting.

Q. 4. State two physical properties on the basis of which metals can be distinguished from non-metals.

Answer: The physical properties on the basis of which metals can be distinguished from non-metals are:

(i) Hardness- Metals are hard while non-metals are soft.

(ii) Lustre- Metals are lustrous while non-metals are not lustrous.

Q. 5. Are the oxides of metals acidic or basic?

Answer: The oxides of metals are basic because they dissolve in water to form metal hydroxides which are basic in nature. These metal hydroxides release OH^- ions. So they are basic in nature.

Q. 6. Write the name of a metal which can react with steam.

Answer: Iron can react with steam because iron is less reactive so it reacts with steam.

Q. 7. Pencil lead is made up of which material?

Answer: Pencil lead is made up of graphite.

Q. 8. Write the name of a liquid non-metal.

Answer: Bromine is a liquid non-metal.

Q. 9. Bells used in temples are not made up of wood. Why?

Answer: Metals are sonorous. Sonorous means metals make noise on striking with another metal. So bells used in temples are made up of metals and not of wood which is a non-metal.

Q. 10. Write a word equation for heated iron and steam.

Answer: Heated iron + steam→ ferrous ferric oxide + Hydrogen gas

$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

Q. 11. Phosphorus is kept in water. Why?

Answer: Phosphorus is a very reactive element. It catches fire spontaneously in air. But it is insoluble in water so it is kept in water.

Q. 12. What is the nature of oxides formed

(a) when metals combine with oxygen?

(b) when non-metals combine with oxygen?

Answer: (a) When metals combine with oxygen then metal oxides are formed which are basic in nature because they dissolve in water to form metal hydroxides which are basic in nature. These metal hydroxides release OH- ions.

(b) When non-metals combine with oxygen then non-metal oxides are formed which are acidic in nature because these react with water to form acids or with bases to form salts.

Q. 13. Give reason why copper cannot displace zinc from its salt solution.

Answer: Copper cannot displace zinc from its salt solution because copper is less reactive than zinc. More reactive metal displaces less reactive metal from its salt solution.

Q. 14. (a) Define

(i) Malleability (ii) Ductility

(b) Name a non-metal which is very hard.

Answer: (a) (i) Malleability- Malleability is a property of metals in which metals can be beaten into sheets.

Example- Gold and aluminium

(ii) Ductility- Ductility is a property of metals in which metals can be drawn into wires.

Example- Copper

(b) Diamond is a non-metal which is very hard. Diamond is an allotrope of carbon.

Q. 15. Give reasons, why

(a) immersion rods for heating liquids are made up of metallic substances?

(b) Non metals cannot be used for making bells?

Answer: (a) Immersion rods for heating liquids are made up of metallic substances because metals are good conductors of heat and so metals conduct heat.

(b) Metals are sonorous. Sonorous means metals make noise on striking with another metal but non-metals do not make noise on striking. So non-metals cannot be used for making bells.

Q. 16. Distinguish between metals and non-metals on the basis of their chemical properties.

Answer:

Metals	Non-metals
(i) Metals on reaction with oxygen form basic oxides.	Non-metals on reaction with oxygen form acidic oxides.
(ii) Metals react with water.	Non-metals do not react with water.
(iii) Metals react with acids and produce hydrogen gas.	Non-metals do not react with acids.
(iv) Metals react with bases and produce hydrogen gas.	But reactions of non-metals with bases are complex.

Q. 17. State five uses of each, metals and non-metals.

Answer: Uses of metals are

(i) Metals are used in making machinery and automobiles.

(ii) Metals are used in making aeroplanes and trains.

(iii) Metals are used in making satellites.

(iv) Metals are used in making industrial gadgets.

(v) Metals are used in making cooking utensils and water boilers.

Uses of non-metals are

(i) Non metals are used in fertilisers to enhance the growth of plants.

(ii) Non metals used as a food preservative.

(iii) Non metals used in respiration.

(iv) Non metals used in firecrackers.

(v) Non metals used in water purification process.

Q. 18. Write the conditions under which rusting takes place.

Answer: (i) When metals come in contact with air and water then rusting takes place. In iron, rusting is a process in which iron is oxidised into ferric oxide (Fe_2O_3).

(ii) The presence of impurities in the iron like water vapours, acids, salts and carbon dioxide also responsible for rusting.

(iii) Iron does not rust in pure water which is free from dissolved salts.

(iv) Metals like chromium, zinc and magnesium prevent rusting. So zinc is used to galvanise the iron to prevent rusting of iron.

Q. 19. Sodium is more reactive than iron. How can you prove it?

Answer: (i) Sodium reacts vigorously with cold water and a large amount of heat releases but iron reacts with steam very slowly.

(ii) Sodium metal reacts with ferric oxide (Fe_2O_3) and forms sodium oxide by displacing iron.

$6Na + Fe_2O_3 \rightarrow 3Na_2O + 2Fe$

(iii) Sodium reacts with acids very quickly but iron takes some time to react with acids.

Q. 20. Write your observation when a piece of sodium is dropped in water.

Answer: When a piece of sodium is dropped in water then it reacts vigorously with water to form sodium hydroxide with the evolution of hydrogen gas in the form bubbles. This hydrogen gas catches fire and a large amount of heat releases. This is a highly exothermic reaction. The solution will be basic in nature because sodium hydroxide is formed.

$2Na + 2H_2O \rightarrow 2NaOH + H_2$