CHAPTER

4

The World of Metals and Non-metals

CLASS 7TH

NCERT SOLUTIONS - SCIENCE

P1 P2

1. Which metal is commonly used to make food packaging materials as it is cheaper, and its thin sheets can be folded easily into any shape?

(i) Aluminium (ii) Copper

(iii) Iron (iv) Gold

ANSWER:

(i) Aluminium

Explanation:

- Aluminium is **cheap, lightweight, malleable, and non-toxic.**
- It can be beaten into **very thin sheets (aluminium foil)** that can be folded into any shape.
- This makes it suitable for wrapping food, chocolates, medicines, and other packaging.
- Copper, iron, and gold are more expensive or not as suitable for food wrapping.

2. Which of the following metal catches fire when it comes in contact with water?

(i) Copper (ii) Aluminium

(iii) Zinc (iv) Sodium

ANSWER:

(iv) Sodium

Explanation:

- Sodium is a very reactive alkali metal.
- When it comes in contact with water, it reacts vigorously, producing sodium hydroxide and hydrogen gas, which catches fire.
- Reaction:

  $2Na + 2H_2O \rightarrow 2NaOH + H_2\uparrow$(heat + fire) $Na + 2H_2O \rightarrow 2NaOH + H_2 \uparrow$ (heat + fire) $Na + 2H_2O \rightarrow 2NaOH + H_2\uparrow$(heat + fire)
- That's why sodium is stored in kerosene to prevent reaction with air and moisture.
- Copper, aluminium, and zinc do not catch fire on contact with water.

3. State with reasons whether the following statements are True [T] or False [F].

(i) Aluminium and copper are examples of non-metals used for making utensils and statues.

ANSWER

False

- Aluminium and copper are metals, not non-metals.
- They are used for utensils and statues because they are malleable, ductile, and good conductors of heat.

(ii) Metals form oxides when combined with oxygen, the solution of which turns blue litmus paper to red.

ANSWER

False

- Metals form basic oxides, which turn red litmus blue.
- **Example:** Magnesium oxide in water → $Mg(OH)_2$ (basic).
- Acidic oxides (turning blue litmus red) are formed by non-metals like CO_2, SO_2.

(iii) Oxygen is a non-metal essential for respiration.

ANSWER

True

- Oxygen is a non-metal and is vital for life.
- It helps in the process of respiration, where food is oxidised to release energy.

(iv) Copper vessels are used for boiling water because they are good conductors of electricity.

ANSWER

False

- Copper vessels are used for boiling water because they are good conductors of heat, not electricity.
- High thermal conductivity allows heat to spread evenly.

4. Why are only a few metals suitable for making jewellery?

ANSWER

- Only metals like gold, silver, and platinum are used for jewellery.
- Reasons:

1. They are lustrous (shiny) and attractive.
2. They are malleable and ductile, so they can be beaten into thin sheets or drawn into wires for designs.
3. They are resistant to corrosion (do not rust or tarnish easily).
4. They are non-toxic and safe to wear.

- Common metals like iron or aluminium corrode easily and do not look attractive, so they are not used for jewellery.

5. Match the uses of metals and non-metals given in Column I with the jumbled names of metals and non-metals given in Column II.

Column I	Column II
(i) Used in electrical wiring	(a) ENXYGO
(ii) Most malleable and ductile	(b) NECOHIRL
(iii) Living organisms cannot survive without it.	(c) PEPORC
(iv) Plants grow healthy when fertilisers containing it are added to the soil.	(d) TENGOINR
(v) Used in water purification	(e) OGDL

ANSWER

- (i) Copper → (C) PEPORC
- (ii) Gold → (e) OGDL
- (iii) Oxygen → (a) ENXYGO
- (iv) Nitrogen → (d) TENGOINR
- (v) Chlorine → (b) NECOHIRL

Explanation:

(i) Used in electrical wiring → (c) PEPORC → COPPER

Copper is a very good conductor of electricity, so it is widely used in electrical wiring.

(ii) Most malleable and ductile → (e) OGDL → GOLD

Gold is the most malleable and ductile metal. It can be beaten into very thin sheets (gold leaf) and drawn into wires.

(iii) Living organisms cannot survive without it → (a) ENXYGO → OXYGEN

Oxygen is essential for respiration in living beings.

(iv) Plants grow healthy when fertilisers containing it are added to the soil → (d) TENGOINR → NITROGEN

Nitrogen is used in fertilisers; it helps plants grow healthy.

(v) Used in water purification → (b) NECOHIRL → CHLORINE

Chlorine is used to kill germs in drinking water.

6. What happens when oxygen reacts with magnesium and sulfur? What are the main differences in the nature of products formed?

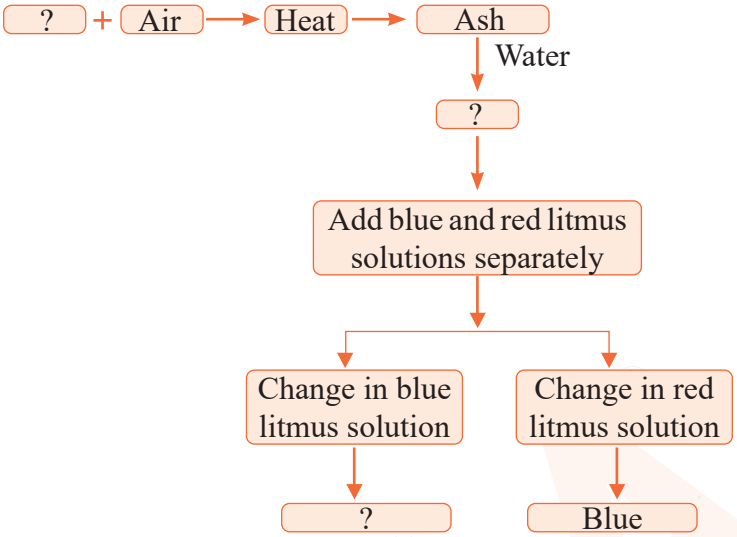
ANSWER

- Magnesium + Oxygen → Magnesium oxide (MgO)
  - Magnesium burns with a dazzling white flame and forms magnesium oxide, a basic oxide.
  - MgO turns red litmus blue (basic).
- Sulfur + Oxygen → Sulfur dioxide (SO_2)
  - Sulfur burns with a blue flame to form sulfur dioxide, an acidic oxide.
  - SO_2 dissolves in water to form sulfurous acid, turning blue litmus red.

Main difference: Magnesium forms a basic oxide, while sulfur forms an acidic oxide.

7. Complete the following flow chart:

ANSWER



Completion:

1. The first blank: Wood / Coal (a fuel, when burnt, gives ash).
2. Ash + Water → Basic solution (alkaline solution).
3. Add litmus:
   - Blue litmus → No change
   - Red litmus → Turns blue

Completed Flowchart:

Wood/Coal + Air + Heat → Ash → (add Water) → Basic solution → (Litmus test):

- Change in blue litmus → No change
- Change in red litmus → Turns blue

8. You are provided with the following materials: Iron, Copper, Sulfur, Coal, Plastic, Wood, Cardboard. Discuss which material would be your choice to make a pan that is most suitable for boiling water and why?

ANSWER

Copper.

Reason:

- Copper is a good conductor of heat, so water heats up quickly and evenly.
- It is strong, durable, and does not burn.
- Non-metals like sulphur, coal, plastic, wood, and cardboard are poor conductors and unsuitable.
- Iron also conducts heat but corrodes easily; copper is more suitable.

9. You are provided with three iron nails, each dipped in oil, water, and vinegar. Which iron nail will not rust, and why?

ANSWER

The nail dipped in oil will not rust.

Reason:

- Oil forms a protective layer around iron and prevents contact with air and moisture, which are necessary for rusting.
- Nails in water and vinegar (acidic) will rust faster because both conditions allow oxygen and water to react with iron.

10. How do the different properties of metals and non-metals determine their uses in everyday life?

ANSWER

- **Metals:**
  - Good conductors of heat → used in utensils, pans (copper, aluminium).
  - Malleable and ductile → used in wires, foils, jewellery (gold, silver).
  - Strong and hard → used in construction (iron, steel).
- **Non-metals:**
  - Poor conductors → used as insulators (plastic, rubber).
  - Oxygen → essential for respiration.
  - Nitrogen → used in fertilisers.
  - Sulfur and chlorine → used in medicines and disinfectants.

  Their uses are directly linked to their physical and chemical properties.

11. One of the methods of protecting iron from rusting is to put a thin coating of zinc metal over it. Since sulfur does not react with water, can it be used for this purpose? Justify your answer.

ANSWER

No, sulfur cannot be used.

Reason:

- Sulfur is a non-metal, it is brittle and cannot form a thin, strong protective coating on iron.
- Zinc is a metal that adheres well and forms a protective layer. Even if zinc layer is scratched, zinc reacts preferentially (sacrificial protection) and prevents rusting of iron.
- Sulfur cannot provide such protection.

12. An ironsmith heats iron before making tools. Why is heating necessary in this process?

ANSWER:

- Iron is very hard at room temperature, so it cannot be shaped easily.
- On heating, it becomes soft and malleable, allowing the ironsmith to hammer, bend, and mould it into desired shapes.
- After cooling, the iron tool becomes hard again and is ready for use.