

◆ Chapter 3 – Metals and Non-Metals: Exercise Solutions

Q1. Give an example of a metal which

(i) is a liquid at room temperature

☞ **Answer:** Mercury (Hg)

(ii) can be easily cut with a knife

☞ **Answer:** Sodium (Na)

(iii) is the best conductor of heat

☞ **Answer:** Silver (Ag)

(iv) is a poor conductor of heat

☞ **Answer:** Lead (Pb)

Q2. Explain the meanings of malleable and ductile.

☞ **Malleable:** A metal is said to be malleable if it can be beaten into thin sheets.

☐ Example: Gold and silver are highly malleable.

☞ **Ductile:** A metal is ductile if it can be drawn into thin wires.

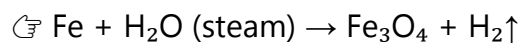
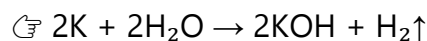
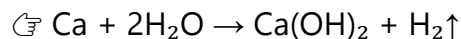
☐ Example: Copper and aluminum are good examples of ductile metals.

Q3. Why is sodium kept immersed in kerosene oil?

☞ **Answer:**

Sodium is a very reactive metal. It reacts vigorously with oxygen and moisture in the air, which may even cause fire. Hence, it is stored under kerosene to prevent accidental ignition.

Q4. Write equations for the reactions of

(i) Iron with steam**(ii) Calcium and potassium with water**

Note: Reaction with potassium is explosive.

****Q5. Samples of four metals A, B, C and D were taken.**

When they were added to the following solutions one by one, the following observations were made:**

Metal	CuSO_4	ZnSO_4	FeSO_4	AgNO_3
A	No reaction	No reaction	No reaction	Displacement
B	Displacement	No reaction	Displacement	Displacement
C	No reaction	No reaction	No reaction	No reaction
D	Displacement	Displacement	Displacement	Displacement

(a) Which is the most reactive metal?

Answer: Metal **D** (displaces all others)

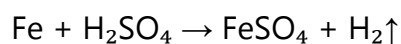
(b) What would be the order of reactivity?

Answer: $\text{D} > \text{B} > \text{A} > \text{C}$

Q6. Which gas is produced when dilute hydrochloric acid is added to a reactive metal? Write the chemical reaction when iron reacts with dilute H_2SO_4 .

Answer: Hydrogen gas (H_2) is produced.

Reaction:



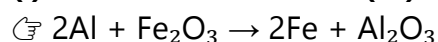
Q7. What do you think would happen if a solution of iron(III) chloride is kept open?

☞ **Answer:**

Iron(III) chloride (FeCl_3) is **hygroscopic**, so it absorbs moisture from the air. On long exposure, it forms hydrochloric acid fumes and rusts.

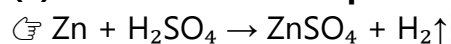
Q8. Write balanced equations for the reaction of

(i) Aluminium with iron(III) oxide



(*Thermite reaction*)

(ii) Zinc with dilute sulphuric acid



Q9. What are alloys? How are they prepared? Give examples.

☞ **Answer:**

An **alloy** is a homogeneous mixture of two or more metals, or a metal and a non-metal.

Preparation:

Alloys are prepared by melting the primary metal, and then dissolving the other element(s) into it, followed by cooling.

Examples:

- Brass = Copper + Zinc
- Bronze = Copper + Tin
- Steel = Iron + Carbon

☐ Exercise Solutions – Chapter 3: Metals and Non-Metals

1. Which of the following pairs will give displacement reactions?

- (a) NaCl solution and copper metal ✗
- (b) MgCl₂ solution and aluminium metal ✗
- (c) FeSO₄ solution and silver metal ✗
- (d) AgNO₃ solution and copper metal ✓

☞ **Answer:** (d)

Explanation: A displacement reaction occurs when a **more reactive metal displaces a less reactive metal** from its salt solution.

Copper is **more reactive than silver**, so copper displaces silver from AgNO₃.

2. Which method prevents rusting of an iron frying pan?

- (a) Applying grease ✓
- (b) Applying paint ✓
- (c) Applying zinc coating ✓
- (d) All of the above ✓✓✓

☞ **Answer:** (d) All of the above

Explanation: Rusting occurs due to air and moisture. All these methods block moisture and oxygen from reaching the iron surface.

3. Element forms oxide with high melting point & soluble in water:

- (a) calcium ✓
- (b) carbon ✗
- (c) silicon ✗
- (d) iron ✗

☞ **Answer:** (a) Calcium

Explanation: Calcium reacts with oxygen to form **calcium oxide (CaO)**, which has a **high melting point** and is **soluble in water**, forming **alkaline calcium hydroxide**.

4. Why are food cans coated with tin and not zinc?

☞ **Answer:** (c) Zinc is more reactive than tin

Explanation: If coating is damaged, **zinc (being more reactive)** would react with food items causing spoilage. **Tin is less reactive**, hence safer.

5. Identify metal or non-metal using given tools:

(a)

- Use **hammer**: Metals are malleable, non-metals are brittle.
- Set up circuit using **battery, bulb, wires, switch**:
 - Metals conduct electricity → bulb glows
 - Non-metals do not → bulb doesn't glow

(b)

- These tests are **effective** and simple to distinguish between metals and non-metals.
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6. What are amphoteric oxides? Give examples.

☞ **Answer:** Oxides that react with **both acids and bases** to form salt and water are called **amphoteric oxides**.

Examples:

- Aluminium oxide (Al_2O_3)
 - Zinc oxide (ZnO)
-

7. Name two metals that:

Displace hydrogen from acids:

- Zinc (Zn)
- Iron (Fe)

Do not displace hydrogen:

- Copper (Cu)
 - Silver (Ag)
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8. Electrolytic refining of metal M:

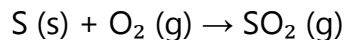
- **Anode:** Impure metal M
 - **Cathode:** Pure metal M
 - **Electrolyte:** Solution of salt of metal M (like CuSO_4 for copper)
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9. Sulphur heated – Reaction observation:

(a)

- (i) Dry litmus: No effect
- (ii) Moist litmus: Turns **blue litmus red** (due to acidic SO_2)

(b) **Balanced equation:**



10. Two ways to prevent rusting:

- **Galvanization** (coating with zinc)
 - **Painting/Oiling/Greasing** (to block air and moisture)
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11. Type of oxides formed by non-metals:

☞ **Answer: Acidic oxides**

Example:



12. Give reasons:

(a) Platinum, gold, silver:

- Highly **lustrous, non-reactive, malleable** → ideal for jewellery.

(b) Na, K, Li stored under oil:

- **Very reactive with air and water**, oil prevents contact.

(c) Aluminium for cooking:

- Forms **protective oxide layer, good conductor, lightweight, non-toxic**.

(d) Ores converted to oxides:

- Oxides are **easier to reduce** than carbonates/sulphides.

13. Why lemon/tamarind clean tarnished copper vessels?

☞ Sour substances contain **acids** like citric or tartaric acid which react with **basic copper carbonate** (formed on tarnishing) and remove it.

14. Differentiate: Metals vs Non-Metals (Chemical properties)

Property	Metals	Non-Metals
Reaction with Oxygen	Form basic oxides	Form acidic oxides
Reaction with Acids	Evolve hydrogen gas	No reaction (usually)
Reaction with Water	Some react, produce H ₂ gas	Generally do not react
Electron transfer	Lose electrons (cation)	Gain electrons (anion)

15. Detective case – What was the solution?

☞ He used **aqua regia** (a mixture of conc. **HCl and HNO₃**) – it dissolves gold by forming chloroauric acid.

Hence the gold **shone but lost weight!**

16. Why copper is used in hot water tanks, not steel?

☞ Copper:

- **Good conductor, resistant to corrosion, non-reactive with water**
- Steel (iron alloy): May **corrode** over time in water, especially hot water.



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