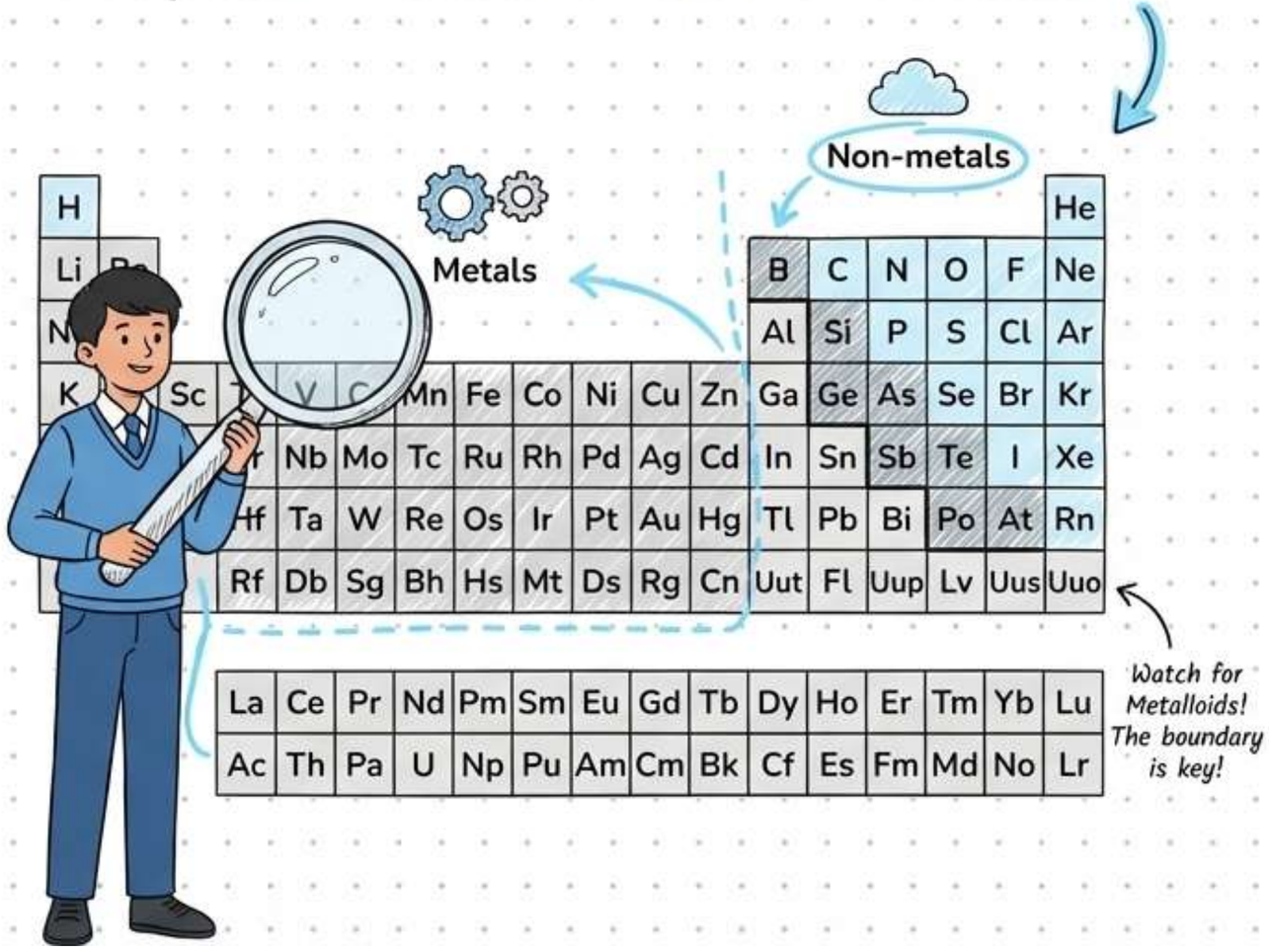
Revision Notes | Class 8 | Chemistry

Chapter: Metals and Non-metals



Chapter Snapshot

Core Idea:

All elements around us are broadly divided into **Metals**, **Non-Metals**, and **Metalloids** based on their physical and chemical behaviors.

Why it Matters:

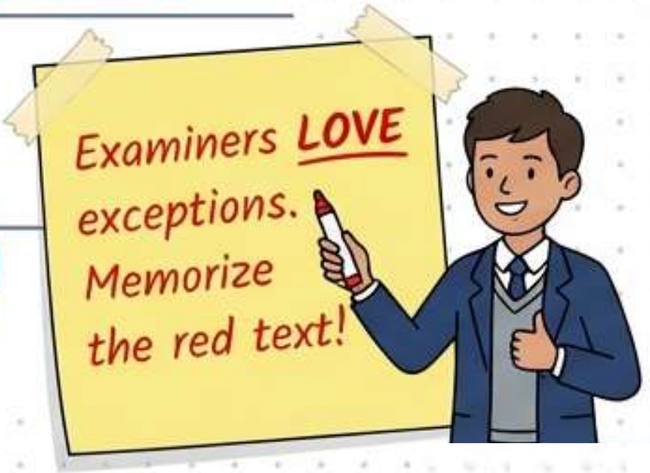
From the **oxygen** we breathe to the iron in our bridges and the silicon in our electronics, these elements are the building blocks of our world.

Quick Flow:

Physical Properties → Chemical Reactions → Reactivity Series → Real-world Uses

The Physical Divide: Metals vs. Non-Metals

	Metals	Non-Metals
State at Room Temp:	Solid. **Except** Mercury – liquid	Solid or Gas. **Except** Bromine - liquid
Appearance (Lustre):	Lustrous/Shiny. Can be polished.	Dull. **Except** Iodine & Graphite
Hardness:	Very hard. **Except** Na & K - can be cut with a knife	Soft or Brittle. **Except** Diamond - hardest natural substance
Malleability & Ductility:	High (can be beaten into sheets / drawn into wires).	Non-malleable & Not ductile. Snaps when stretched.
Conductivity:	Good conductors of heat/electricity.	Poor conductors. **Except** Graphite



Chemical Properties: Oxygen & Water

Reaction with Oxygen (O_2)

Metal + O_2 → **Basic Oxide**

- Water nams and warminy metals.
- Na & K react violently (stored in kerosene!)
- Ag, Au, Pt do not react even on heating (Noble metals).

(e.g., $2Mg + O_2 \rightarrow 2MgO$)

Non-Metal + O_2 → **Acidic Oxide**

(e.g., $S + O_2 \rightarrow SO_2$)

Reaction with Water (H_2O)

Metal + H_2O → **Metal Hydroxide/Oxide + H_2 gas**

- Na/K react violently with cold water.
- Mg reacts with hot water.
- Fe/Al/Zn react with steam only.

Non-Metals → Generally **DO NOT react with water.**

(This is why reactive non-metals like Phosphorus are stored under water!)

Chemical Properties: Acids & Bases

Reactions with Acids & Bases

Metals + Dilute Acid:

→ Salt + Hydrogen (H_2) gas.

Equation: $Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$

Exception! Nitric Acid (HNO_3) is a strong oxidizing agent. It oxidizes H_2 to form water (H_2O) instead!

Non-Metals + Acid:

→ No reaction with dilute acids.

(Only react with concentrated acids on heating).

Metals + Bases:

→ Metals like Zn and Al react with strong bases (like NaOH) to produce H_2 gas.

Pop Test

How do we know H_2 gas is released? Bring a burning matchstick near the test tube. Hydrogen gas burns with a characteristic POP sound!

Key Definitions & Flashcards

Malleability

The ability of a substance to be beaten into very thin sheets without breaking.

Example: Aluminium foil used for wrapping food.

Ductility

The ability of a substance to be drawn or stretched into thin wires.

Example: Copper wires used in household electrical circuits.

Sonorous

The property of producing a ringing, twangy sound when struck with a hard object.

Example: Metal school bells or church bells.

Metalloids

Elements that possess intermediate properties of both metals and non-metals (often making good semiconductors).

Example: Silicon (Si), Germanium (Ge), Arsenic (As).

Basic Oxides

Metallic oxides that dissolve in water to form bases. They turn red litmus paper blue.

Example: Magnesium Oxide (MgO), Calcium Oxide (CaO).

Acidic Oxides

Non-metallic oxides that dissolve in water to form acids. They turn moist blue litmus paper red.

Example: Sulphur Dioxide (SO2) forming sulphurous acid.

The Reactivity Series & Displacement

Reactivity Staircase

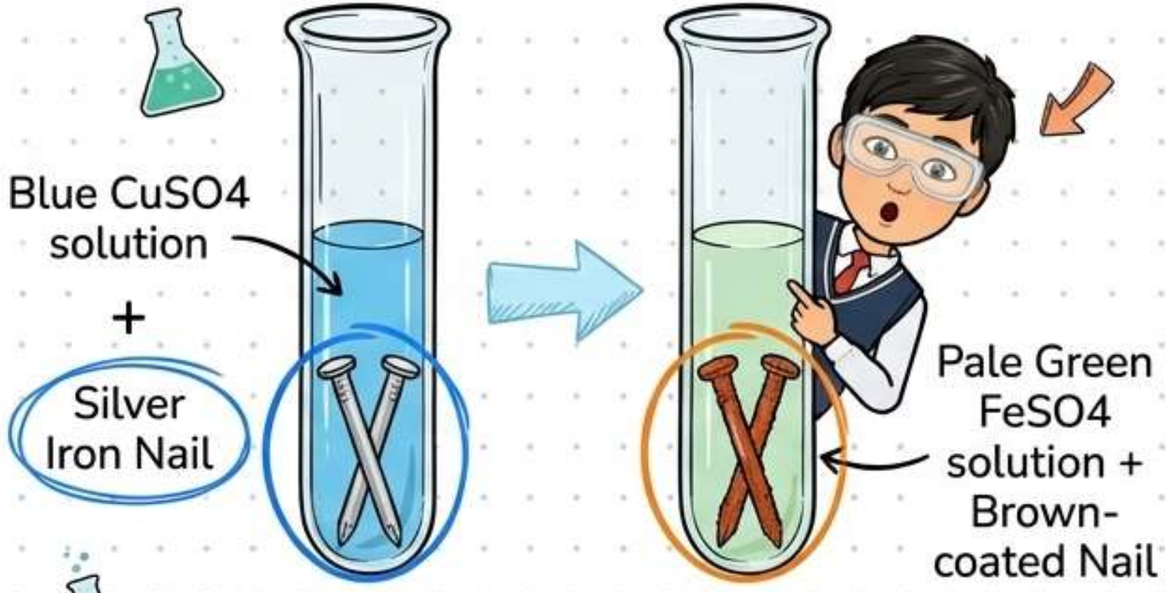
Most Reactive
Potassium (K), Sodium (Na), Calcium (Ca), Magnesium (Mg), Aluminium (Al)

Decreasing
Zinc (Zn), Iron (Fe), Lead (Pb)

HYDROGEN (H) - Non-metal used as a reference.

Least Reactive
Copper (Cu), Silver (Ag), Gold (Au)

The Rule: A more reactive metal displaces a less reactive metal from its salt solution.



$$Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$$

Most Asked Board Questions

Q1: Why is sodium kept immersed in kerosene?

A: Sodium is highly reactive. It catches fire spontaneously when it reacts with **oxygen and moisture** in the air. Kerosene cuts off this contact.

Q2: Why are bells made of metals and not wood?

A: Metals are **sonorous**, meaning they produce a characteristic ringing sound when struck, whereas wood is not.

Q3: What happens when a copper coin is dropped in iron sulphate solution?

A: **No reaction** takes place. Copper is placed below iron in the reactivity series, meaning it is **less reactive** and cannot displace iron.

Q4: How do you prove a metallic oxide is basic in nature?

A: Dissolve the metallic oxide in water and test it with litmus paper. A basic oxide will turn **red litmus paper blue**.

Q5: Why is aluminium used to make cooking utensils despite being highly reactive?

A: It forms a protective layer of **aluminium oxide** (Al_2O_3) on its surface that prevents further corrosion, and it is a **good conductor of heat**.

Common Mistakes & Exam Traps

The Trap: Thinking ALL metals are hard and solid.

The Fact: Sodium (Na) and Potassium (K) are so soft they can be cut with a knife! Mercury (Hg) is a liquid at room temperature.

The Trap: Assuming ALL non-metals are insulators.

The Fact: Graphite (a form of carbon) has free electrons and is an excellent conductor of electricity!

The Trap: Getting Displacement backwards (e.g., saying $Cu + ZnSO_4 \rightarrow CuSO_4 + Zn$).

The Fact: A weaker metal CANNOT kick out a stronger one. Copper cannot displace Zinc. Always check the Reactivity Series hierarchy!

The Trap: Assuming Hydrogen is a metal because it appears in the reactivity series.

The Fact: Hydrogen is a non-metal. It is included in the series as a benchmark because, like metals, it forms positive ions (H^+).

Rapid Revision Sheet

METALS (The Builders)

Physical:

- Solid, Shiny (Lustrous),
- Hard, Malleable,
- Ductile, Sonorous,
- High Density.

Electrical:

Good conductors of heat/electricity.

Chemical:

Form Basic Oxides.
Displace H2 from dilute acids.

NON-METALS (The Insulators)

Physical:

- Solid/Gas
- Dull, Brittle
- Non-sonorous
- Low Density

Electrical:

Bad conductors (Insulators).

Chemical:

Form **Acidic** Oxides.
Do **NOT** react with dilute acids or water.

Super Exceptions

Liquid Metal
→ Mercury (Hg)

Liquid Non-metal
→ Bromine (Br)

Conducting Non-metal
→ Graphite

Lustrous Non-metal
→ Iodine

Soft Metals
→ Sodium (Na), Potassium (K)

Answer Writing Framework (3-Mark Questions)

Question Type: What happens when [Metal A] is added to [Metal B Salt Solution]?

Step 1: State the balanced chemical equation. **(1 Mark)**

Step 2: State the physical observation (color change, gas evolved, precipitate). **(1 Mark)**

Step 3: State the scientific reason (Reactivity Series rule). **(1 Mark)**

Perfect Answer Example:

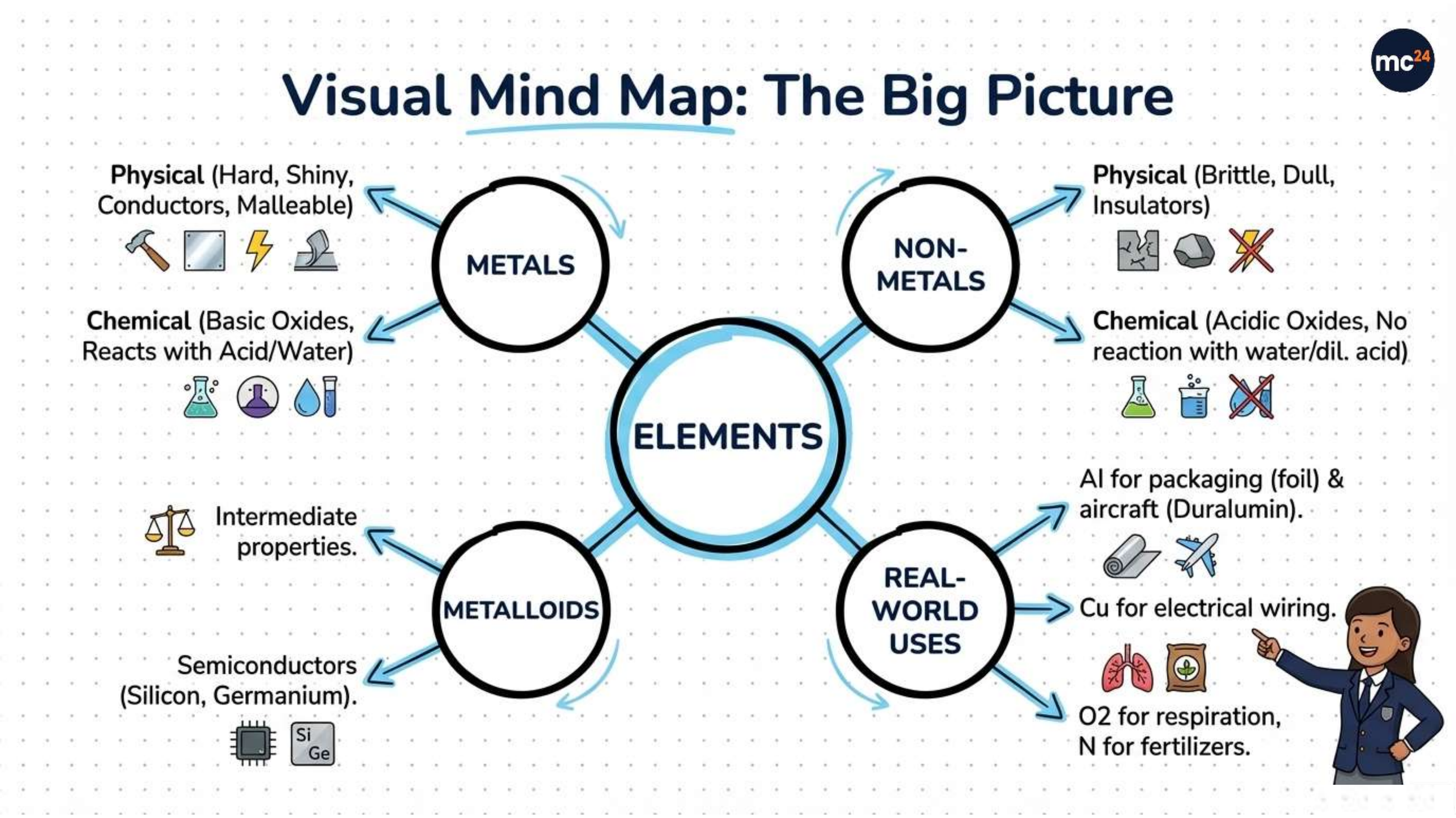
Question: What happens when a Zinc plate is added to Copper Sulphate?

Step 1 (Equation): $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ ✓

Step 2 (Observation): The blue color of the Copper Sulphate solution fades to colorless, and a reddish-brown deposit of copper forms on the zinc plate.

Step 3 (Reason): Zinc is placed higher than Copper in the reactivity series. Hence, Zn displaces Cu from its salt solution.

Visual Mind Map: The Big Picture



Memory Tricks: The Reactivity Series

Please → Potassium (K) [Most Reactive]
Stop → Sodium (Na)
Calling → Calcium (Ca)
Me → Magnesium (Mg)
A → Aluminium (Al)
Careless → Carbon (C) [Non-metal Reference]
Zebra → Zinc (Zn)
Instead → Iron (Fe)
Try → Tin (Sn)
Learning → Lead (Pb)
How → Hydrogen (H) [Non-metal Reference]
Copper → Copper (Cu)
Saves → Silver (Ag)
Gold → Gold (Au) [Least Reactive]

Remember: Carbon and Hydrogen are non-metals, but we use them as reference points to see which metals can extract from their ores or acids!

Final Exam Checklist

- [ ] I can list at least 5 physical differences between metals and non-metals.
- [ ] I have memorized all the physical property exceptions (Mercury, Bromine, Graphite, Diamond, Sodium/Potassium).
- [ ] I can write the balanced chemical equations for a metal reacting with oxygen, water, and dilute acid.
- [ ] I know the Reactivity Series mnemonic by heart from Potassium down to Gold.
- [ ] I can explain what a displacement reaction is, give an example, and write it in the 3-step format.
- [ ] I know 3 everyday uses for common metals (like Al and Cu) and non-metals (like Oxygen).

All checked? You're ready to crush the exam. Good luck!