NCERT – GRADE 10 CHEAT SHEET

METALS AND NON-METALS

EXTRACTION, CORROSION, AND ALLOYS

Key Concepts, Functions & Facts at a Glance

1. EXTRACTION OF METALS – OVERVIEW

- Metals occur in nature in the form of compounds called ores.
- Since metals are electropositive, they cannot be obtained by simple reduction with carbon.
- The method of extraction depends on the reactivity of the metal.

Reactivity Series (in decreasing order)

K > Na > Ca > Mg > Al > Zn > Fe > Pb > (H) > Cu > Hg > Ag > Au

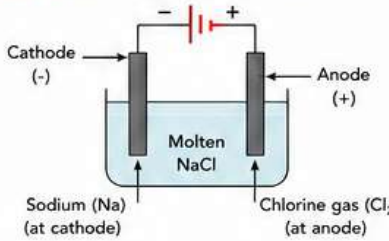
Most reactive → Least reactive

2. METHODS OF EXTRACTION

(a) Metals above Carbon (e.g., K, Na, Ca, Mg, Al)

Extracted by electrolytic reduction of the molten compound.

Example: Electrolysis of molten NaCl



(b) Metals between Carbon and Hydrogen (e.g., Zn, Fe, Pb)

Extracted by reduction with carbon (coke) in a furnace.

Example: Reduction of zinc oxide

$$ZnO + C \rightarrow Zn + CO$$

(c) Metals below Hydrogen (e.g., Cu, Hg, Ag, Au)

Extracted in the free state; only concentrated ore is heated in the absence of air.

Example: Heating copper(II) sulphide

$$2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$$

$$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$$

3. CORROSION OF METALS

- Corrosion is the gradual destruction of metals by their reaction with substances in the environment.

Examples:

- Rusting of iron, tarnishing of silver, green coating on copper.

RUSTING OF IRON

- Iron reacts with oxygen and moisture to form hydrated iron(III) oxide (rust).

$$4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O \text{ (Rust)}$$

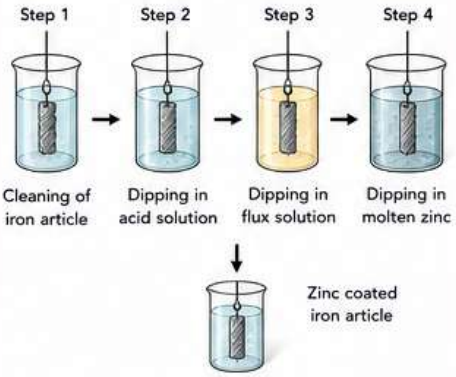
PREVENTION OF CORROSION

- By applying a coating of paint, oil, grease, plastic.
- By galvanisation (coating with zinc).
- By electroplating (coating with another metal).
- By alloying (e.g., stainless steel).

4. GALVANISATION (PROTECTION BY ZINC COATING)

- A protective zinc coating is applied on iron to prevent rusting.
- Zinc is more reactive than iron. If the coating is scratched, zinc corrodes and protects iron.
- Commonly used for water pipes, iron sheets, screws, nuts, etc.

Process (Hot-dip galvanisation)



5. ALLOYS

- An alloy is a homogeneous mixture of one metal with one or more other elements (metals or non-metals).
- Alloys have better properties than pure metals.
- Examples:

Alloy	Constituents	Properties / Uses
Brass	Copper + Zinc	Hard, corrosion resistant; used in utensils, screws.
Bronze	Copper + Tin	Hard, strong; used in statues, medals.
Solder	Lead + Tin	Low melting point; used for joining electrical wires.
Stainless Steel	Iron + Chromium + Nickel	Corrosion resistant; used in cutlery, kitchenware.
Duralumin	Aluminium + Copper + Magnesium + Manganese	Light, strong; used in aircraft bodies.

6. ADVANTAGES OF ALLOYS

- Harder and stronger than pure metals.
- More resistant to corrosion.
- Have lower melting points (in some cases).
- More durable and suitable for various uses.

Example Comparison

Property	Pure Metal	Alloy
Strength	Lower	Higher
Corrosion Resistance	Lower	Higher
Melting Point	Generally higher	Often lower
Uses	Limited	Wide range

QUICK FORMULA / EQUATIONS

- Rusting of iron:
  $4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 \cdot xH_2O$
- Reduction of zinc oxide:
  $ZnO + C \rightarrow Zn + CO$
- Heating copper(II) sulphide:
  $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$
  $2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$

TIPS / QUICK FACTS

- ✓ Above carbon → Electrolysis
- ✓ Between carbon and hydrogen → Reduction with carbon
- ✓ Below hydrogen → Extracted in free state
- ✓ Corrosion can be prevented by coating, galvanisation, alloying.
- ✓ Alloys are stronger, harder and more useful.

COMMON MISTAKES

- ✗ Thinking iron is extracted from haematite by electrolysis.
- ✗ Forgetting that rust is hydrated iron(III) oxide.
- ✗ Confusing galvanisation with electroplating.
- ✗ Considering alloys as chemical compounds.
- ✗ Ignoring the role of zinc in protecting iron (galvanisation).

COMMON TERMS & UNITS

- Ore : Naturally occurring compound of a metal.
- Smelting : Heating the concentrated ore with suitable reducing agent.
- Flux : Substance added to remove impurities.
- Corrosion : Gradual destruction of metals.
- Alloy : Homogeneous mixture of metals or metal with non-metal.
- xH_2O : Water of crystallisation.

KEY TAKEAWAY: Metals are extracted from their ores using different methods based on reactivity. Corrosion is a natural process that can be prevented. Alloys have improved properties and are widely used in our daily life.