

Chapter 3 – Quick Revision Sheet

Metals and Non-Metals

Metals

Elements that lose electrons easily to form positive ions (cations) are called metals.

They are electropositive in nature and usually form basic oxides.

Examples: Na, Fe, Cu, Al

Exceptions / Special cases

- Mercury (Hg) → metal but liquid at room temperature.
- Sodium (Na) and Potassium (K) → metals but very soft that can be cut by knife

Non-Metals

Elements that gain electrons to form negative ions (anions) are called non-metals.

They are electronegative in nature and usually form acidic oxides.

Examples: O, Cl, S, N

Exceptions / Special cases

- Bromine (Br) → non-metal but liquid at room temperature.
- Iodine (I) → non-metal but lustrous (shiny).
- Graphite (form of carbon) → non-metal but good conductor of electricity.

Physical Properties

Property	Metals	Non-metals
Appearance	Lustrous (shiny)	Dull
Malleability	Can be beaten into sheets	Not malleable
Ductility	Can be drawn into wires	Not ductile
Conductivity	Good conductors of heat & electricity	Poor conductors
Sonorous	Produce sound when hit	Non-sonorous
State	Mostly solids	Solid / liquid / gas

Chemical Properties of Metals

1. Reaction with Oxygen: Metals react with oxygen to form metal oxides.

Example: $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

2. Reaction with Water: Metals react with water to form metal hydroxide + hydrogen gas.

Example: $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$

3. Reaction with Acids: Metals react with dilute acids to form salt + hydrogen gas.

Example: $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$

4. Reaction with Metal Salts: More reactive metal displaces less reactive metal from its compound.

Example: $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$

Ionic Compounds

Compounds formed by transfer of electrons between metals and non-metals.

Example: NaCl

Properties

- High melting & boiling points
- Hard and brittle
- Conduct electricity in molten/aqueous state
- Usually soluble in water

Metallurgical Process

Metallurgy: Process of extracting metals from their ores and purifying them.

1. **Concentration of Ore:** Removal of impurities (gangue) like sand and clay from the ore.
2. **Conversion to Oxide:** Concentrated ore is converted into metal oxide by roasting or calcination.
Example: $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$
Example: $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$
3. **Reduction:** Metal oxide is reduced to metal by removing oxygen.
Example: $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$
4. **Refining:** Purification of impure metal to obtain pure metal
Example (Copper refining): $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$, $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$