NCERT – GRADE 10 CHEAT SHEET

METALS & NON-METALS – IONIC COMPOUNDS & OCCURRENCE OF METALS

Key Concepts, Reactions & Facts at a Glance

1. METALS & NON-METALS

PROPERTIES OF METALS	PROPERTIES OF NON-METALS
• Generally solid (except Hg) • Lustrous (shiny) • Good conductors of heat and electricity • Malleable (can be beaten into sheets) • Ductile (can be drawn into wires) • High melting and boiling points (generally) • High density (generally) • Electropositive in nature – lose electrons	• May be solid, liquid or gas • Generally non-lustrous (dull) • Poor conductors of heat and electricity (except graphite) • Non-malleable • Non-ductile (brittle) • Low melting and boiling points (generally) • Low density (generally) • Electronegative in nature – gain or share electrons

PHYSICAL STATE AT ROOM TEMPERATURE

Metals	Non-metals (Solid)	Non-metals (Gases)	Non-metal (Liquid)
Na, K, Ca, Al, Fe, Cu, Zn, Ag, Au, Pb, etc.	C, S, P, I_2, Br_2 (solid), Si	H_2, O_2, N_2, Cl_2, F_2	Br_2

REACTIVITY OF METALS

- Reactivity of metals decreases down a group.
- More reactive metals displace less reactive metals from their salts.

DISPLACEMENT REACTIONS

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

More reactive metal + Salt solution of less reactive metal
→ Salt solution of more reactive metal + Less reactive metal

ACTIVITY SERIES OF METALS (High to Low Reactivity)

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

More reactive ⟷ Less reactive

TESTS TO DISTINGUISH

Test	For Metals	For Non-metals
Luster	Shiny	Dull
Conductivity	Good conductor	Poor conductor
Malleability	Malleable	Not malleable
Ductility	Ductile	Not ductile
Sonority	Sonorous	Non-sonorous

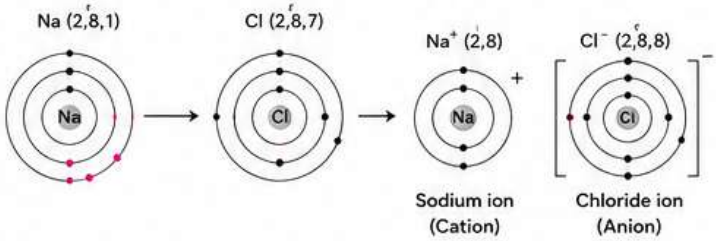
2. IONIC COMPOUNDS

Ionic compounds are formed by the transfer of electrons from a metal to a non-metal.

FORMATION

1. Metal atom loses electron(s) → forms positive ion (cation).
2. Non-metal atom gains electron(s) → forms negative ion (anion).
3. Electrostatic attraction between oppositely charged ions forms an ionic compound.

EXAMPLE: FORMATION OF SODIUM CHLORIDE (NaCl)



$Na^+ + Cl^- \longrightarrow NaCl$

PROPERTIES OF IONIC COMPOUNDS

- Hard and brittle solids
- High melting and boiling points
- Soluble in water
- Conduct electricity in molten state or in aqueous solution
- Do not conduct in solid state

3. OCCURRENCE OF METALS

1. NATIVE (FREE) STATE

Found in nature in free state. (Very unreactive metals)

Examples: Au, Ag, Pt, Cu

2. COMBINED STATE

Found in nature in the form of compounds.

a) **As Oxides**
Examples: Haematite (Fe_2O_3), Zincite (ZnO)

b) **As Carbonates**
Examples: Calamine ($ZnCO_3$), Magnesite ($MgCO_3$)

c) **As Sulphides**
Examples: Galena (PbS), Zinc blende (ZnS)

d) **As Sulphates**
Examples: Copper pyrites ($CuFeS_2$), Barite ($BaSO_4$)

e) **As Silicates**
Examples: Feldspar ($KAlSi_3O_8$), Mica

4. KEY REACTIONS

1. Metal + Oxygen → Metal Oxide
   $2Mg + O_2 \rightarrow 2MgO$
2. Metal + Water (if reactive) → Metal Hydroxide + H_2
   $2Na + 2H_2O \rightarrow 2NaOH + H_2\uparrow$
3. Metal + Acid → Salt + H_2
   $Zn + 2HCl \rightarrow ZnCl_2 + H_2\uparrow$
4. Metal Oxide + Acid → Salt + Water
   $CuO + 2HCl \rightarrow CuCl_2 + H_2O$
5. Displacement Reaction
   $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

5. QUICK FACTS

- ☑ Metals are electropositive; non-metals are electronegative.
- ☑ Ionic compounds are generally soluble in water and conduct electricity in solution.
- ☑ Reactivity of metals decreases down a group.
- ☑ More reactive metals displace less reactive metals from their salts.
- ☑ Native metals are usually unreactive.

6. COMMON EXAMPLES

- **Metals:** Na, K, Ca, Mg, Al, Fe, Cu, Zn, Ag, Au
- **Non-metals:** H, C, N, O, S, P, Cl, Br, I
- **Ionic Compounds:** NaCl, MgO, $CaCl_2$, K_2O, ZnS, $CuSO_4$
- **Native Metals:** Au, Ag, Pt, Cu
- **Ores:** Haematite (Fe_2O_3), Calamine ($ZnCO_3$), Galena (PbS), Feldspar ($KAlSi_3O_8$)

KEY TAKEAWAY: Metals are useful and reactive (lose electrons).
Non-metals are generally non-lustrous and gain/share electrons.
Ionic compounds are formed by transfer of electrons and occur widely in nature.