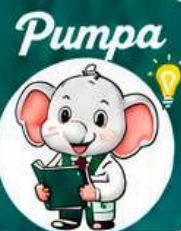




NCERT – GRADE 10 CHEAT SHEET METALS AND NON-METALS



Part B – Key Concepts and Reactions



How do Metals and Non-metals React?

- Metals usually lose electrons (form cations) and non-metals gain electrons (form anions).
- They form ionic compounds, covalent compounds or react with each other depending on the elements.

Examples:

- Metal + Non-metal $\rightarrow$ Ionic compound
(e.g. $\text{Na} + \text{Cl} \rightarrow \text{NaCl}$)
- Non-metal + Non-metal $\rightarrow$ Covalent compound
(e.g. $\text{H} + \text{Cl} \rightarrow \text{HCl}$)
- Metal + Oxygen $\rightarrow$ Metal oxide
(e.g. $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$)



Metals are usually electropositive and non-metals are electronegative.



Properties of Ionic Compounds

- Formed by transfer of electrons (metal + non-metal).
- Strong electrostatic forces between ions.
- High melting and boiling points.
- Usually soluble in water.
- Conduct electricity in molten state or in solution (but not in solid state).

Example: Sodium chloride (NaCl)



Na⁺ (cation)

Cl⁻ (anion)

Ionic compounds have a giant lattice structure.



Occurrence of Metals

- Metals are found in nature in the form of ores.
- Ores are minerals from which metals can be extracted economically.
- Metals also occur in the earth's crust, oceans and in living organisms (e.g. calcium in bones).

Examples:



Iron ore (Fe₂O₃)



Bauxite (Al₂O₃)



Copper ore (CuCO₃)



Gold (Au)



Silver (Ag)



Aluminium (Al)
(in the crust)



Extraction of Metals

- Metals are extracted from their ores by reducing agents or electrolysis.
- The method depends on the reactivity of the metal.



Steps: 1. Enrichment of ore 2. Reduction
3. Refining



Enrichment of Ores

- Ores are usually mixed with impurities, so they must be concentrated.
- Methods:** handpicking, magnetic separation, froth flotation, leaching.

Examples:



Magnetic separation
(for iron ore)



Froth flotation
(for sulphide ores)



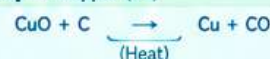
Leaching
(for low-grade ores)



Extracting Metals Low in the Activity Series

- These metals are less reactive (below carbon in the activity series).
- They are extracted by heating their oxides with carbon (or CO).

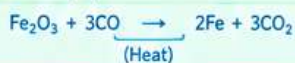
Example: Copper (Cu)



Extracting Metals in the Middle of the Activity Series

- These metals are moderately reactive (e.g. Zn, Fe, Pb).
- They are extracted by reduction with carbon (or CO) after converting ores to oxides.

Example: Iron (Fe)



Extracting Metals towards the Top of the Activity Series

- These metals are highly reactive (e.g. Na, K, Ca, Mg, Al).
- They are extracted by electrolysis of their molten compounds or by displacement reactions (for less reactive ones).

Example: Aluminium (Al)

Electrolysis of molten Al₂O₃ (in cryolite)



Refining of Metals

- Removes impurities to get pure metal.
- Methods: electrolytic refining, distillation, zone refining, liquation.

Example: Electrolytic Refining of Copper



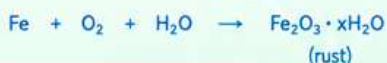
Impurities fall as anode mud and pure metal is deposited at the cathode.



Corrosion

- Corrosion is the slow conversion of metals into more stable compounds (e.g. oxides, hydroxides).
- It weakens the metal and reduces its usefulness.

Example: Rusting of iron



Prevention of Corrosion

- Use protective coatings (paint, oil, grease).
- Galvanisation (zinc coating).
- Cathodic protection (sacrificial anode).
- Alloying (e.g. stainless steel).
- Use of inhibitors (e.g. in water pipes).



Paint coating



Galvanisation
(zinc coating)



Cathodic protection



Stainless steel

Protect metals today,
for a stronger tomorrow!

Pumpa

Learn • Apply • Build
a better world!



Explore • Understand • Excel