

CHEMISTRY STUDY MATERIALS FOR CLASS 10

(NCERT Based notes of Chapter -03)

GANESH KUMAR

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METALS AND NON-METALS

OCCURENCE AND EXTRACTION OF METALS

Metals occur in nature in free as well as combined form. Metals having low reactivity show little affinity for air, moisture, carbon dioxide or other non-metals present in nature. Such metals may remain in elemental or native (free) state in nature. Such metals are called "noble metals" as they show the least chemical reactivity. For example gold, silver, mercury and platinum occur in Free State.

On the other hand, most of the metals are active and combine with air, moisture, carbon dioxide and non-metals like oxygen, sulphur, halogens, etc. to form their compounds, like oxides, sulphides, carbonates, halides and silicates. i.e., they occur in nature in a combined state.

A naturally occurring material in which a metal or its compound occurs is called a *mineral*.

A mineral from which a metal can be extracted economically is called an *ore*.

An ore is that mineral in which a metal is present in appreciable quantities and from which the metal can be extracted economically.

Metals found at the bottom of reactivity series are least reactive and they are often found in nature in free-state; such as gold, silver, copper, etc. Copper and silver are also found in the form of sulphide and oxide ores.

Metals found in the middle of reactivity series, such as Zn, Fe, Pb, etc. are usually

found in the form of oxides, sulphides or carbonates.

Metals found at the top of the reactivity series are never found in free-state as they are very reactive, e.g. K, Na, Ca, Mg and Al, etc.

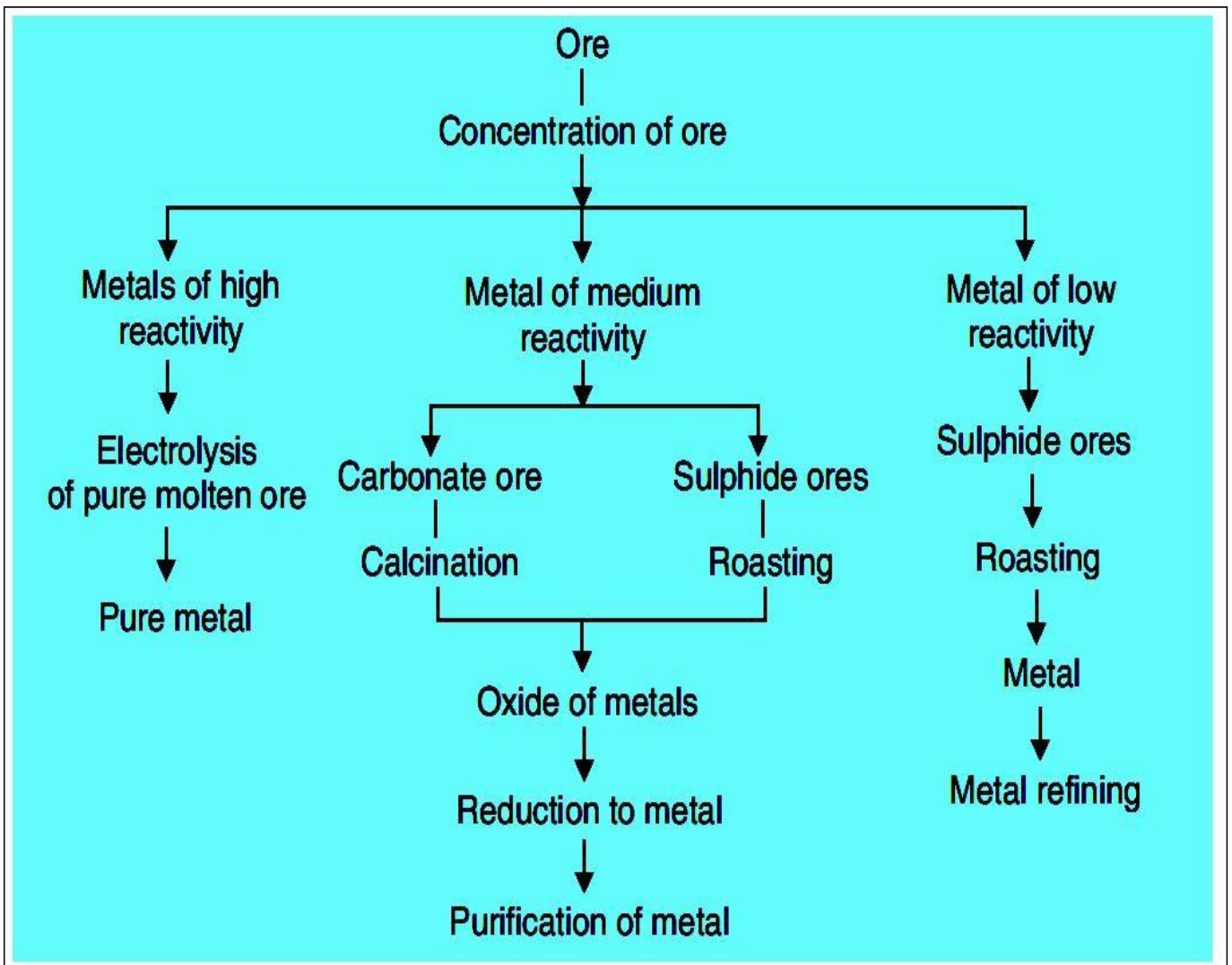
Many metals are found in the form of oxides because oxygen is abundant in nature and is very reactive.

TABLE: SOME IMPORTANT ORES

Type of Ore	Metals (Common Ores)
Native Metals	Gold (Au), silver (Ag)
Oxide ores	Iron (Haematite, Fe_2O_3); Aluminium (Bauxite, $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$); Tin (Cassiterite, SnO_2); Copper (Cuprite, Cu_2O); Zinc (Zincite, ZnO); Titanium (Ilmenite, FeTiO_3 , Rutile, TiO_2)
Sulphide ores	Zinc (Zinc blende, ZnS); Lead (Galena, PbS); Copper (Copper glance, Cu_2S); Silver (Silver glance or Argentite, Ag_2S); Iron (Iron pyrites, FeS_2)
Carbonate ores	Iron (Siferite, FeCO_3); Zinc (Calamine, ZnCO_3) , Lead (Cerrusite, PbCO_3)
Sulphate ores	Lead (Anglesite, PbSO_4)
Halide ores	Silver (Horn silver, AgCl); Sodium (Common salt or Rock salt, NaCl); Aluminium (Cryolite, Na_3AlF_6)
Silicate ores	Zinc (Hemimorphite, $2\text{ZnO} \cdot \text{SiO}_2 \cdot \text{H}_2\text{O}$)

EXTRACTION OF METALS

Metals can be categorized into three parts on the basis of their reactivity: most reactive, medium reactive and least reactive.



CONCENTRATION OF THE ORE:

Ores that are mined from the earth are usually contaminated with large amount of impurities such as soil and sand etc

Concentration or Dressing means, simply getting rid of as much of the unwanted rocky material as possible before the ore is converted into the metal. The impurities like clay are called *gangue*.

Enrichment of the ore: Physical methods are used to enrich the ore. In many cases, it is possible to separate the metal compound from unwanted rocky material by physical means. A common example of this involves ***froth flotation***.

The physical methods adopted in dressing the ore (or) enriching the ore depends upon difference between physical properties of ore and gangue.
