

Natural Substances in which metals or their compounds occur
e.g. Bauxite, Haematite etc.

Mineral

METALLURGY

Gangue

Impurities associated with minerals are collectively known as gangue or matrix.

Mineral from which the metal can be conveniently and profitably extracted

Ore

Conversion of big rocks (ore) into reasonable size particles

Crushing by gyratory crusher

Crushing & Grinding

Grinding or Pulverisation by stamp mill or ball mill

Crust ore particles are reduced to fine powder

Hydraulic washing or gravity separation

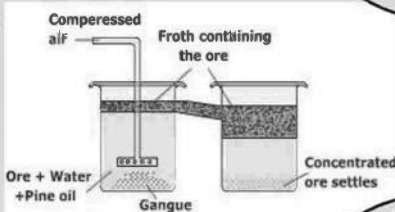
This method is based upon the difference in the densities of ore particles and impurities (gangue)

Concentration of ore

Used for sulphide ores such as galena (PbS), HgS etc.

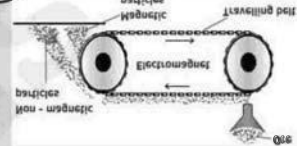
Froth floatation

This method is based on the principle on difference in the wetting properties of the ore and gangue particles with oil and water respectively



Magnetic separation

Used for ore of iron such as haematite (Fe_2O_3)



Conversion of ore into metal oxide

Calcination

Heating of concentrated ore in absence of oxygen

Used for carbonate, oxide and hydrated ores e.g. calamine ($ZnCO_3$), Siderite ($FeCO_3$)

Roasting

Heating of concentrated ore in presence of air (Oxygen)

Used for sulphide ores e.g. galena (PbS), Cinnabar (HgS) etc.

Conversion of metal oxide into metal

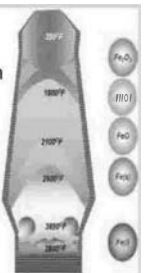
Reduction by heating

Used for ores of low reactive metals e.g. HgS

Chemical reduction

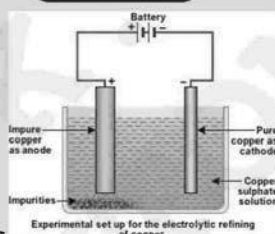
Used for ores of moderately reactive metals e.g. Fe_2O_3 , MnO_2 etc.

Reduction by carbon
Reduction by carbon monoxide
Reduction by aluminium



Electrolytic reduction

Used for carbonate, oxide and hydrated ores e.g. calamine ($ZnCO_3$), Siderite ($FeCO_3$)



It is used for refining of many metals such as Cu, Sn, Ni, Ag etc.

Electrolytic refining

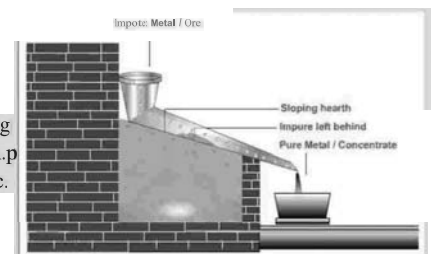
Refining of metal

Distillation

It is used for the purification of volatile metals such as Hg, Zn etc.

Liquation

It is used for refining of metals having low m.p. such as Sn, Pb, Bi etc.



Van arkel method

It is used for refining of Ti, Zr etc.

Zone refining

It is used for refining of Si, Ge etc.

