

**Copper and its compounds**

**Electron configuration of copper**

[Ar]4s13d10

**Properties of copper as a transition element**

1. Forms colored compounds; for instance Cu2+ is blue
2. Has variable oxidation states; +1, +2,
3. Forms complexes, e.g. Cu(NH3)42+.
4. CuSO4 is a catalyst in preparation of hydrogen from dil. sulphuric acid

Trial 1

(i) Write the electron configuration of copper. (01mark)

(ii) State properties which show copper as a d-block element. (01mark)

**Properties and uses of copper**

Copper has a melting point of 1083*0C* and a density of 8.94 *g cm-3.* It is a tough, malleable and ductile metal with an attractive golden color. It has electrical and thermal conductivity, thus used for electric cables and calorimetres.

**Extraction of copper**

copper pyrites, CuFeS2,

copper glance, CuS,

cuprite, Cu2O.

Extraction of copper from pyrites

1. **Concentration of the ore by floatation method**

 The finely pulverized ore is mixed with water, containing ‘frothing’ agent (s).

Air is blown into the mixture, froth is produced and the earthly material is "wetted" and sinks.

The sulphide ore particles, rise to the surface in the froth and are skimmed off the surface.

Anti- frothing agent is added to break up the froth, the concentrated ore is filtered and dried.

**2. Roasting**

The ore is then roasted in a limited supply of air to convert the iron into iron (II) oxide.

2CuFeS2 (s) + 4O2 (g) → Cu2S (s) + 3SO2 (g) + 2FeO (s)

**3. Addition of SiO2 to remove impurities**

Silica, SiO2, is added to the mixture and heated in the absence of air to convert the iron (II) oxide into a slag of iron (II) silicate, FeSiO3, which is poured away.

* FeO(s) + SiO2 → FeSiO3(s) (slag)

**4. Conversion of copper sulphide to copper**

The copper (I) sulphide is reduced to copper by heating in a controlled amount of air.

 Cu2S (s) + O2 (g) → 2Cu (s) + SO2 (g)

**5. Purification of copper by electrolysis**

Anode: Impure copper: Cu(s) – 2e → Cu2+ (aq)

Cathode; pure copper strip: Cu2+(aq) + 2e → Cu(s)

Electrolyte: Copper sulphate