Galvanic Cell

eg Daniel Cell.

5.14 ELECTROCHEMICAL CELL

An **electrochemical cell** *is a device in which a redox reaction is utilized to get electrical energy.* An electrochemical cell is also commonly referred to as **voltaic** or **galvanic cell.** *The electrode where* **oxidation** *occurs, is called* **anode** ; *while the electrode where* **reduction** *occurs, is called* **cathode.** .

The practical application of an electrochemical or galvanic cell is **Daniel cell.** It consists of *zinc electrode*, dipping in $ZnSO_4$ solution (where *oxidation* takes place) and a *copper electrode*, dipping in $CuSO_4$ solution (where *reduction* takes place). In other words, each electrode may be regarded as a *half-cell.* The two solutions are separated by a *salt bridge*. The two solutions can seep through the salt bridge, and so come in contact with each other automatically. The electrode reactions in Daniel cell are :

At anode (or *–ve electrode*) : $Zn \longrightarrow Zn^{2+} + 2e^-$ (*Oxidation*)

At cathode (or *+ ve electrode*) : $Cu^{2+} + 2e^- \longrightarrow Cu$ (*Reduction*)

Cell reaction : $Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$

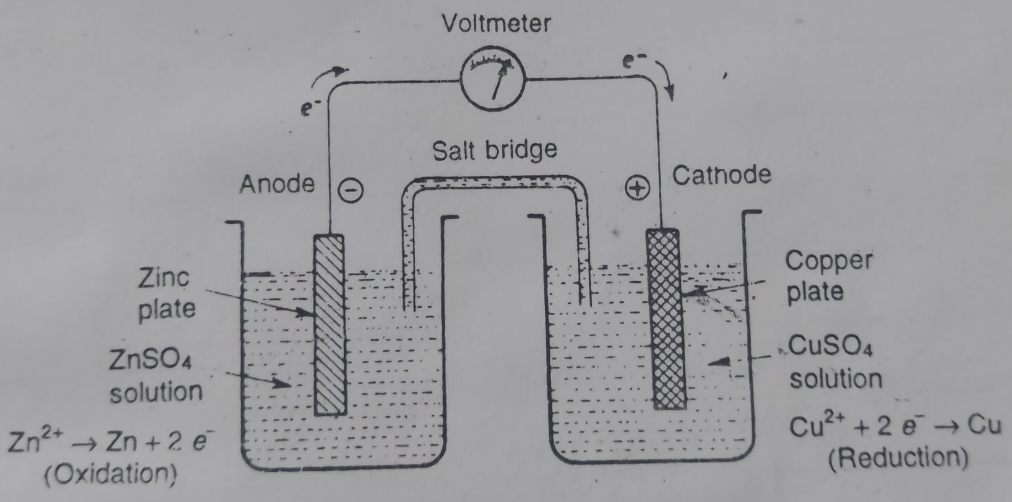

Fig. 10. Daniel cell.

The tendency of Zn to form Zn^{2+} is greater than the tendency of Zn^{2+} to get deposited as *Zn* and hence, *Zn metal acquires a negative charge.* On the other hand, tendency of copper to go into solution is less than the tendency of Cu^{2+} to get deposited as Cu and hence, *copper electrode becomes positively charged.* The e.m.f. of the cell is 1.1 volts.

Nernst's equation :

$$E_{cell} = (E^\circ_{cathode} - E^\circ_{anode}) - \frac{0.0592}{n} \log \frac{[Zn^{2+}]}{[Cu^{2+}]}$$

$$(E^\circ_{Cu^{2+}/Cu} - E^\circ_{Zn^{2+}/Zn}) = E^\circ$$