Galvanic Cell :-

Working :-

Anode :- $Zn_{(s)}$ rod dipped in $ZnSO_{4(aq.)}$ Soln

Cathode :- $Cu_{(s)}$ rod dipped in $CuSO_{4(aq.)}$ Soln

Anode :- (Oxidation)

$$Zn_{(s)} \longrightarrow Zn^{2+} + 2e^-$$

Cathode (reduction) :-

$$Cu^{2+}_{(aq.)} + 2e \longrightarrow Cu_{(s)}$$

Cell rexn :-

$$Zn_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Zn^{2+}_{(aq)} + Cu_{(s)}$$

Observation :-

(i) Mass of Zn rod ↓ while mass of Cu rod ↑

(ii) Concentration $ZnSO_4$ Soln ↑ while
Conc. $CuSO_4$ Soln ↓

(iii) In external circuit is Complete by flow of e^- while internal circuit is Complete by flow of ion.

(iv) In external circuit Current flow from Cathode to anode while in internal circuit Current flow from anode to Cathode.

(v) In external circuit e^- flow from anode to Cathode, there is no flow of ions in internal circuit.

Salt bridge and its function :-

Salt bridge in inverted U-tube containing Concentrated of inert electrolyte with gelatin or agar-agar to form in Semi-Solid.

Inert electrolyte :- Those electrolyte which do not participate in chemical reaction / change -

Ex :- KCl, KNO_3, NH_4NO_3 e.t.c.

Function :- (i) It Complete the Circuit.

(ii) It maintain electrical neutrality in both anode & Cathode by providing Cation toward Cathode & anion toward anode.

(iii) It prevent liquid liquid junction potential

L.L.J.P. :- A potential difference arised when two liquid are in Contact.

(iv) Both the end of Salt bridge plucked

with Cotton in order to prevent diffusion.

(v) In electrolyte (inert) will be selected (those electrolyte) which have

Same mobility of Cation and anion.

* (vi) $Ag^+ + Cl^- \xrightarrow{KCl \to KNO_3} AgCl_{(s)}$ (P.P.t.)

NO_3^- $AgNO_{3(aq)}$

If Ag^+, Pb^{2+}, Tl^+ Hg_2^{2+} ions are present in Soln then do not use KCl in Salt bridge due to formation of Percipitation ($AgCl$, $PbCl_2$, $TlCl$, Hg_2Cl_2) then we can use KNO_3

Representation of Cell :- (Galvanic Cell)

Brahmastra

L - left side

O - oxidation

A - at anode

N - -ve terminal

Anode || Cathode

|| → Salt bridge

metal(s) | metal ion(aq) || metal ion(aq) | metal(s)

Ex :- (i) $Zn_{(s)} | Zn^{2+}_{(aq)} || Cu^{2+}_{(aq)} | Cu_{(s)}$

always ions.

Anode :- $Zn_{(s)} \longrightarrow Zn^{2+}_{(aq)} + 2e^-$

Cathode $Cu^{2+} + 2e^- \longrightarrow Cu_{(s)}$

Cell rexn :- $Zn_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Zn^{2+}_{(aq)} + Cu_{(s)}$

Ex (ii) :- $Cr_{(s)} | Cr^{+3}_{(aq)} || Fe^{2+}_{(aq)} | Fe_{(s)}$

Anode :- $Cr_{(s)} \longrightarrow Cr^{+3} + 3e^-$ $\times 2$

Cathode :- $Fe^{2+} + 2e^- \longrightarrow Fe_{(s)}$ $\times 3$

Cell Rexn :- $2Cr_{(s)} + 3Fe^{2+} \longrightarrow 2Cr^{+3} + 3Fe_{(s)}$

Ex(iii) $Pt, Cl_2^{\circ}{}_{(g)} | Cl^-_{(aq)} || H^+_{(aq)} | H_{2(g)}, Pt$

it is inert electrolyte which is providing surface to flow of e^-

Anode :- $2Cl^-_{(aq)} \longrightarrow Cl_2^{\circ}{}_{(g)} + 2e^-$

Cathode :- $2H^+ + 2e^- \longrightarrow H_{2(g)}$

Cell rexn :- $2Cl^-_{(aq)} + 2H^+_{(aq)} \longrightarrow Cl_{2(g)} + H_{2(g)}$

Electrode Potential :-

A potential differen arises b/w metal electrode and it's ions in Soln is k/a electrode potential.

OR

The tendency of an electrode to loose or gain of e^-s when dipped in it own Aq. Soln is called electrode potential.

There are two types of electrode potential

Oxidation potential (O.P.)

metal strip → Zn (rod)

acquire -ve charge w.r.t. to its ion

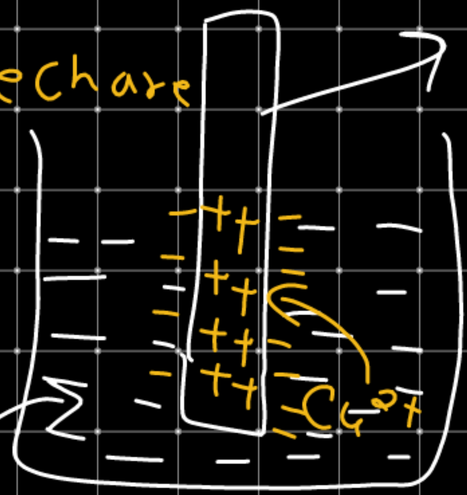
$ZnSO_{4(aq)}$

$Zn_{(s)} \longrightarrow Zn^{2+} + 2e^-$

Reduction potential (R.P.)

metal strip → Cu (rod)

acquire +ve charge w.r.t. to its ions.



$CuSO_{4(aq)}$

$Cu^{2+} + 2e^- \longrightarrow Cu_{(s)}$

A potential difference arises b/w metal electrodes it's ions due to loose of e^-s. of metal. is k/a as O.P.

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due to gain of e^-s in metal ion

$$R.P. = -O.P.$$

or

$$O.P. = -R.P.$$