Electrochemistry B.Sc. (II) sub.

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- The Value of electrode potential depends upon:

(1) the nature of electrode

(2) the Concentration of Solution

(3) the temperature

- Standard electrode Potential (E°):

If the Concentration of ions is unity, temperature is 25°C and Pressure is 1 atm (Standard Conditions), the Potential of the electrode is called Standard electrode potential.

- The given Value of electrode potential be regarded as reduction potential Unless it is specifically mentioned that it is an oxidation potential.

◆ Electro motive force of cell or cell Voltage:

The difference in the electrode potentials of the two electrodes of the cell is termed as electro motive force [EMF] or Cell Voltage.

$$E_{cell} = E_{red}(cathode) - E_{red}(anode)$$

or $$E_{cell} = E_{oxi}(anode) - E_{oxi}(cathode)$$

or $$E_{cell} = E_{oxi}(anode) + E_{red}(cathode)$$

8. ELECTRO CHEMICAL SERIES:

Standard Aqueous Electrode Potentials at 298K

'THE ELECTROCHEMICAL SERIES'

Elements	Electrode Reduction Reaction	Standard electrode Reduction Potential E°, Volts
Li	$Li^+ + e \rightarrow Li$	-3.05
K	$K^+ + e^- \rightarrow K$	-2.93
Ba	$Ba^{+2} + 2e^- \rightarrow Ba$	-2.90
Ca	$Ca^{+2} + 2e^- \rightarrow Ca$	-2.87
Na	$Na^+ + e^- \rightarrow Na$	-2.71
Mg	$Mg^{+2} + 2e^- \rightarrow Mg$	-2.37
Al	$Al^{+3} + 3e^- \rightarrow Al$	-1.66
Mn	$Mn^{+2} + 2e^- \rightarrow Mn$	-1.18
Zn	$Zn^{+2} + 2e^- \rightarrow Zn$	-0.76
Cr	$Cr^{+3} + 3e^- \rightarrow Cr$	-0.74

Fe	$Fe^{+2} + 2e^- \rightarrow Fe$	−0.44
Cd	$Cd^{+2} + 2e^- \rightarrow Cd$	−0.40
Ni	$Ni^{+2} + 2e^- \rightarrow Ni$	−0.25
Sn	$Sn^{+2} + 2e^- \rightarrow Sn$	−0.14
Pb	$Pb^{+2} + 2e^- \rightarrow Pb$	−0.13
H_2	$2H^+ + 2e^- \rightarrow H_2$	0
Cu	$Cu^{+2} + 2e^- \rightarrow Cu$	+0.34
I_2	$I_2 + 2e^- \rightarrow 2I^-$	+0.54
Hg	$Hg_2^{+2} + 2e \rightarrow 2Hg$	+0.79
Ag	$Ag^+ + e^- \rightarrow Ag$	+0.80
Hg	$Hg^{+2} + 2e^- \rightarrow Hg$	+0.85
Br_2	$Br_2 + 2e^- \rightarrow 2Br^-$	+1.08
Cl_2	$Cl_2 + 2e^- \rightarrow 2Cl^-$	+1.36
Pt	$Pt^{+2} + 2e^- \rightarrow Pt$	+1.20
Au	$Au^{+3} + 3e \rightarrow Au$	+1.50
F_2	$F_2 + 2e^- \rightarrow 2F^-$	+2.87

IMPORTANT POINTS ABOUT SERIES:

1. Electrode whose Standard reduction potential (SRP) is less, act as anode, and other one which has high reduction potential acts as cathode.

2. Metals near the top of the series are strongly electropositive.

3. Metals near the top of the series can displace more electronegative metal

below them from their salt.

For example!

$2AgNO_3 + Cu \longrightarrow Cu(NO_3)_2 + 2Ag$

$CuSO_4 + Ag \longrightarrow$ Reaction is not observed

4. Metal above hydrogen can displace H_2 from dilute acid

For example—

$Na + H_2SO_4 \longrightarrow Na_2SO_4 + H_2\uparrow$

$Cu + H_2SO_4 \longrightarrow$ Reaction is not observed

5. Hydroxides of metal in the upper part of series are strongly basic while hydroxides of a metal in lower part are weakly basic.

6. The activity of non metals increases from top to bottom.

7. The metals which come below copper, form unstable oxides i.e., these are decomposed on heating.