DETERMINATION OF K USING NERNST EQUATION

$$aA + bB \rightleftharpoons cC + dD$$

- When the reaction is at equilibrium, no net reaction occurs and no net transfer of electron occurs.

$\Rightarrow E_{cell} = 0$, and $Q = K$

- Nernst Equation :

$$E_{cell} = E^{o}_{cell} - \frac{0.0592}{n} \log Q$$

$$E^{o}_{cell} = \frac{0.0592}{n} \log K$$

Example

Calculate the equilibrium constant (K) for the following reaction.

$$Cu(s) + 2Ag^{+}(aq) \longrightarrow Cu^{2+}(aq) + 2Ag(s)$$

Solution :

$$E^{o}_{cell} = E^{o}_{cathode} - E^{o}_{anode}$$

$$= E^{o}_{Ag^{+}/Ag} - E^{o}_{Cu^{2+}/Cu}$$

$$= +0.80 - 0.34$$

$$= +0.46\ V$$

At equilibrium, $E_{cell} = 0$, $Q = K$

$$E_{cell} = E^o_{cell} - \frac{0.0592}{n} \log Q$$

$$0 = E^o_{cell} - \frac{0.0592}{2} \log K$$

$$E^o_{cell} = \frac{0.0592}{2} \log K$$

$$0.46 = \frac{0.0592}{2} \log K$$

$$\log K = 15.54$$

$$K = 3.467 \times 10^{15}$$