Applications of Nernst equations.

Nernst equation is used to calculate electrode potential of unknown metal.

Corrosion tendency of metals can be predicted.

Applications of emf series.

Reference electrodes (or) Standard electrodes

The electrode potential is found out by coupling the electrode with another reference electrode, the potential of which is known or arbitrarily fixed as Zero. The important primary reference electrode used is a standard hydrogen electrode. Standard electrode potential of which is taken as zero.

It is very difficult to set up a hydrogen electrode. So other electrodes called secondary reference electrodes like Calomel electrode are used.

Need for Secondary reference electrode:

It is not convenient to set up standard hydrogen electrode (SHE) because.

1) It is very difficult to maintain the concentration of H^+ ions at 1M and the pressure of H_2 gas at 1 atm.

ii) Hydrogen electrode gets poisoned if there is traces of impurities in the solution (or) gas.

Primary reference Electrode:

Standard Hydrogen Electrode (SHE)

Construction:-

Hydrogen Electrode consists of platinum foil, that is connected to a platinum wire and sealed in a glass tube.

Hydrogen gas is passed through the side arm of the glass tube. This electrode, when dipped in a 1N HCl and hydrogen gas at 1 atmospheric pressure is passed forms a Standard hydrogen Electrode. The electrode potential of SHE is zero at all temperatures.


H_2 gas

HCl Solution

Platinum foil
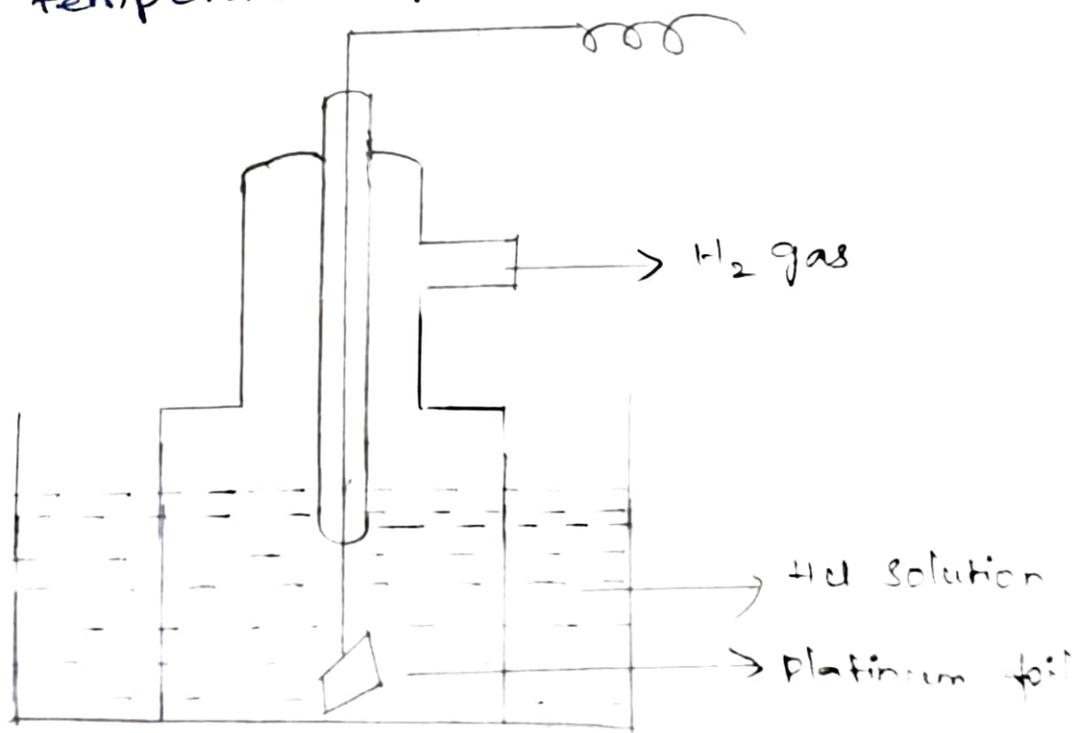
Standard hydrogen electrode is represented as,

$$Pt, H_2 (1 \text{ atm}) / H^+ (1M); E° = 0V$$

In a Electrochemical cell,

i) If this electrode acts as anode,

The electrode reaction can be written as,

$$H_2(g) \longrightarrow 2H^+ + 2e^- \quad (\text{oxidation})$$
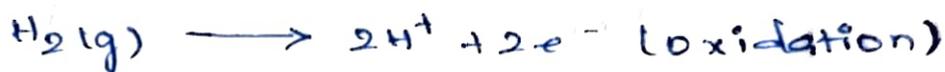
ii) If this electrode acts as cathode,

The electrode reaction can be written as,

$$2H^+ + 2e^- \longrightarrow H_2(g) \quad (\text{Reduction})$$
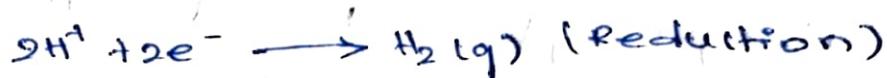
Limitations :-

i) It requires hydrogen gas and is difficult to set up and transport.

ii) It requires considerable volume of test solution.

iii) The solution may poison the surface of the platinum electrode.

iv) The potential of the electrode is altered by changes in barometric pressure.

Secondary reference electrode :-

Saturated calomel electrode (Metal - Metal insoluble salt electrode)