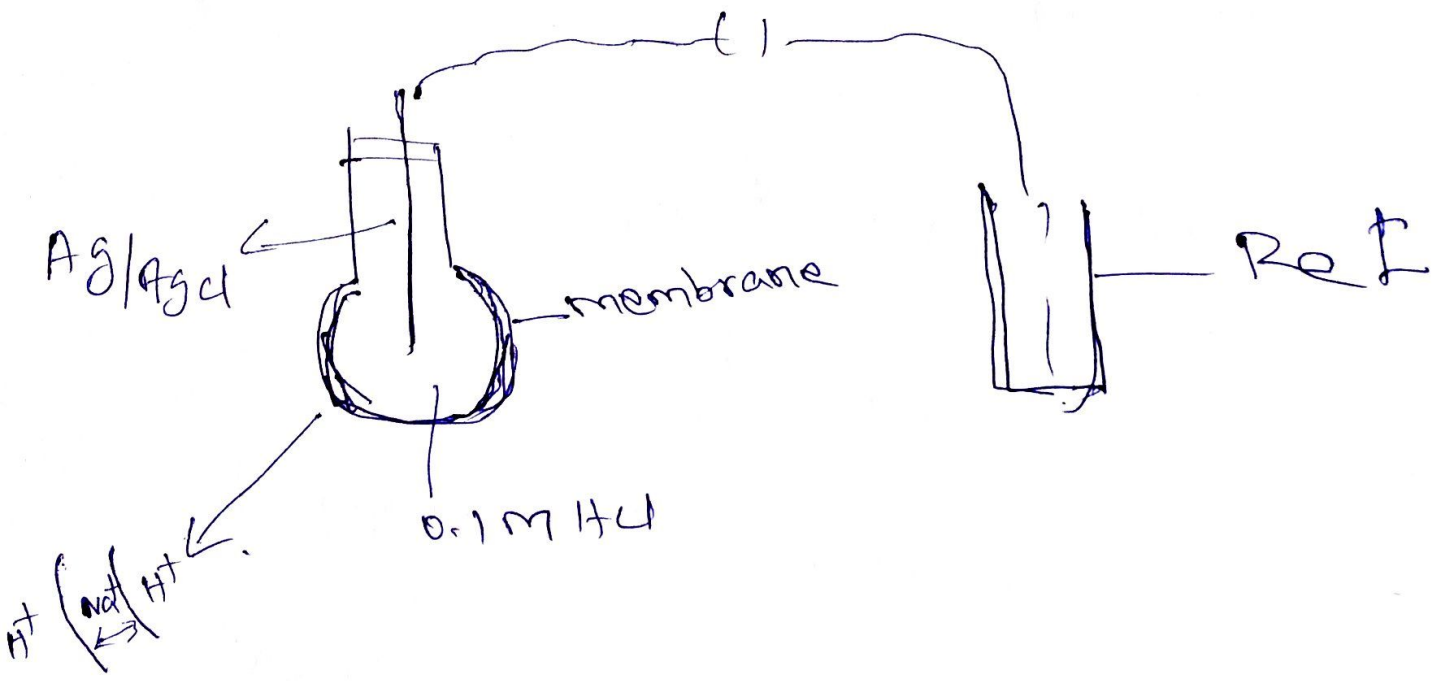
Application of potential measurements

Ion selective electrode

- selectively respond
  ignore all other ion

Sensors

Ex: Glass electrode - pH measure



↳ concentration cell $\frac{c_1}{c_2}$
Developed.

Glass electrode potential

$$E_{glass} = E^{\circ}_{glass} - 0.0591 \log [H^+]$$

$$= E^{\circ}_{g} - 0.0591 [-pH]$$

$$= E^{\circ}_{g} + 0.0591\ pH$$

pH - measurement

$$E_{cell} = E_{RHS} - E_{LHS}$$

$$= E_{SCE} - E_{g}$$

$$= 0.2422 - (E^{\circ}_{g} + 0.0591\ pH)$$

$$E_{cell} = 0.2422 - E^{\circ}_{g} - 0.0591\ pH$$

$$0.0591\ pH = 0.2422 - E^{\circ}_{g} - E_{cell}$$

$$\boxed{pH = \frac{0.2422 - E^{\circ}_{g} - E_{cell}}{0.0591}}$$

Application of EMF series

F	2.87
Au^{3+}	1.5
Ag^{+}	0.8
$Cu^{2+} + 2e^- \rightarrow Cu$	0.34
$H^+ + e^- \longrightarrow H_2$	0
Pb^{2+}	−0.13
Ni^{2+}	−0.24
Cd^{2+}	
Zn^{2+}	
Al^{3+}	
⋮	
Li^+	−3.5

① Relative oxidation/Reduction behaviour

② H_2 Displacement in Acid

③ Standard EMF

$$E^{\circ}_{cell} = E^{\circ}_{RHS} - E^{\circ}_{LHS}$$

④ Feasibility of the reaction

$$\Delta G = -nFE \; ; \; \Delta G^{\circ} = -nFE^{\circ}$$

$E_{cell} = (+)ve \longrightarrow \Delta G = (-)ve$

Feasible spontaneous.

$E_{cell} = (-)ve \longrightarrow \Delta G = (+)ve.$

Not feasible and not spontaneous.