



19CH201 - ENGINEERING CHEMISTRY

UNIT-1 - ELECTROCHEMISTRY

EMF OF A CELL

Definition

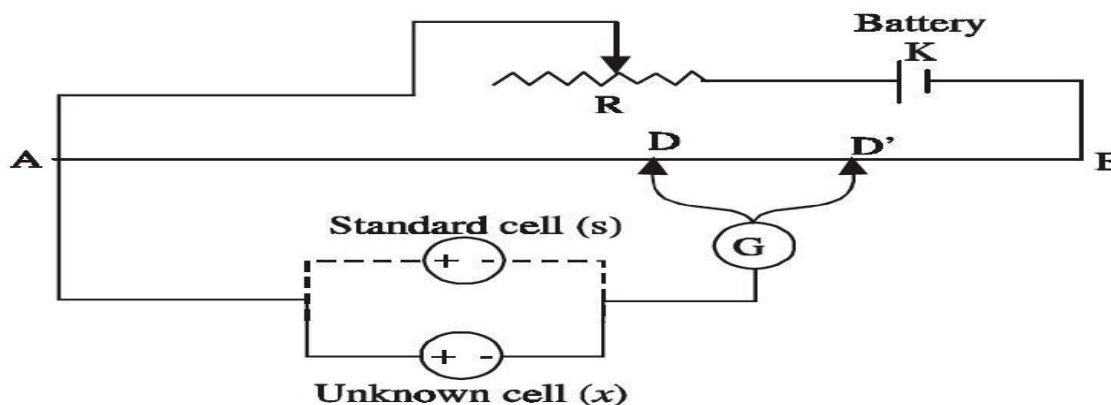
Electromotive force is defined as, "the difference of potential which causes flow of current from one electrode of higher potential to the other electrode of lower potential.

Thus, the emf of a galvanic cell can be calculated using the following relationship.

$$\text{EMF} = \left\{ \begin{array}{l} \text{Standard reduction} \\ \text{potential of right} \\ \text{side electrode} \end{array} \right\} - \left\{ \begin{array}{l} \text{Standard reduction} \\ \text{potential of left} \\ \text{hand side electrode} \end{array} \right\}$$
$$E^{\circ}_{\text{cell}} = E^{\circ}_{\text{right}} - E^{\circ}_{\text{left}}$$

Measurement of emf of a cell

The potential difference or emf of a cell can be measured on the basis of poggendorff's compensation principle. Here the emf of the cell is just opposed or balanced by an emf of standard cell (external emf), so that no current flows in the circuit.





The potentiometer consists of a uniform wire AB (Fig. 1.8). A storage battery (K) is connected to the ends A and B of the wire through a rheostat (R). The cell of unknown emf (x) is connected in the circuit by connecting its positive pole to A and the negative pole is connected to a sliding contact (D) through a galvanometer G. The sliding contact is freely moved along the wire AB till no current flows through the galvanometer. Then the distance AD is measured. The emf of unknown cell is directly proportional to the distance AD.

$$E_x \propto AD$$

Then the unknown cell (x) is replaced by a standard cell (s) in the circuit. The sliding contact is again moved till there is null deflection in the galvanometer. Then the distance AD' is measured. The emf of standard cell E_s is directly proportional to the distance AD'.

$$E_s \propto AD'$$

Then, the emf of the unknown cell can be calculated from the following equation.

$$\frac{\text{Emf of the unknown cell } x}{\text{Emf of the standard cell } s} = \frac{\text{Length AD}}{\text{Length AD}'}$$

$$\frac{E_x}{E_s} = \frac{AD}{AD'}$$

$$\therefore \text{Emf of the unknown cell} = E_x = \frac{AD}{AD'} \times E_s$$