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EXCELLENCE PROGRAM S.Y.J.C Physics H.S.C Weightage 13M (1)
Current electricity :- Synopsis

(*) Kirchoff's first law :- The algebric sum of electric current any junction is always equal to zero.

$$\Sigma I = 0$$

Sign conventions :- The current flowing towards the junction is positive and current flowing away from the junction is negative.

(*) Kirchoff's second law :-

In a closed loop of electrical net work, the algebric sum of potential differences for all components plus the algebric sum of all E.M.F. is equal to zero.

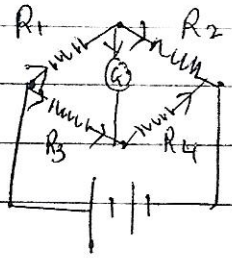
$$\Sigma IR + \Sigma E = 0.$$

Sign conventions :-

(i) If the direction of tracing is same as that of conventional current flow then p.d. across the resistance is considred as -ve else it is +ve.

(ii) E.M.F. is positive if we traverse from -ve terminal to +ve terminal inside the cell and e.m.f. is negative if ~~we~~ travewed from the +ve terminal to the negative terminal.

(*) Balanced condition for wheatstones Network :



$$\frac{R_1}{R_2} = \frac{R_3}{R_4}$$

$$i_g = 0$$

(*) Principle of potentiometer:

The potential difference between any two points of the potentiometer coire is directly proportional to the length of coire between these two points.

(*) potential gradient:- The fall of potential per unit length of potentiometer wire.

P.G = constant

$$P.G = \frac{V}{L}$$

(*) Advantage of potentiometer over Voltmeter:

(1) The voltmeter is used to measure terminal P.D. of cell while potentiometer is used to measure small terminal P.D. as well as E.m.f of the cell.

(2) The accuracy of potentiometer can be easily increased by increasing the length of wire.

(3) A small P.D. can be measured accurately with the help of potentiometer. The resistance of voltmeter is high but not infinity so would as an ideal voltmeter.

4) The internal resistance of a cell can be measured with the help of potentiometer.

Formulae -

(1) Kirchoff's laws:

(i) $\Sigma I = 0$ (ii) $\Sigma IR + \Sigma E = 0$

(2) Wheatstone's network:

$$\frac{R_1}{R_2} = \frac{R_3}{R_4}$$

(3) Meter bridge:

(i) $x = R\left(\frac{l_1}{l_2}\right)$

(ii) Kelvin's method $G = IR\,\frac{l_g}{l_2}$.

(4) Potentiometer:-

(i) potential gradient = $\frac{V}{L} = I\sigma$

$$P.g. = \frac{IR}{L} = \frac{I\rho L}{LA} = \frac{I\rho}{A}$$

$\rho \rightarrow$ resistivity of material of wire

(5) $\frac{E_1}{E_2} = \frac{l_1}{l_2}$ [individual method]

(6) $\frac{E_1}{E_2} = \frac{l_1 + l_2}{l_1 - l_2}$ [Sum and diff. method]

(7) $r = R\left(\frac{l_1 - l_2}{l_2}\right)$

$r \rightarrow$ internal resistance of a cell.

(8) $P.g. = \frac{ER}{(R + r + R')L}$

$E \rightarrow$ E.m.f.

$R \rightarrow$ resistance of wire.

$r \rightarrow$ internal resistance of a cell

$R' \rightarrow$ extenal resistance of a cell.