ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

STUDY MATERIAL - 4 (PART - I)

Subject : PHYSICS

Topic : Current Electricity

CLASS : XII Date : 17.6.20

A : Important Formulae Concepts

1. IMPORTANT FORMULAE

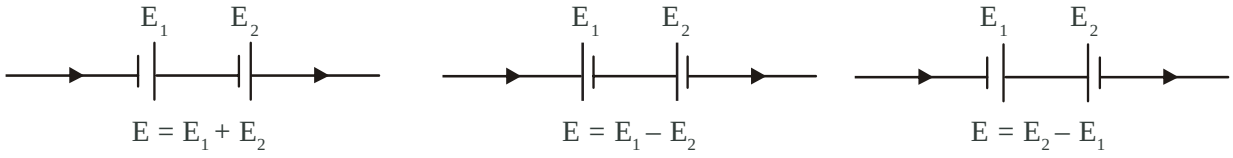
S. No.	Name of physical quantity	Formula
1.	Electric Current	$I = \frac{Q}{t} = \frac{ne}{t}$
2.	Electric resistance	$R = \frac{V}{I} = \frac{\rho l}{A}$
3.	Drift velocity	$v_d = \frac{eE_r}{m} = \frac{I}{neA}$
4.	Current density	$J = \frac{I}{A} = nev_d$
5.	Resistivity	$\rho = \frac{RA}{l} = \frac{m}{ne^2\tau}$
6.	Mobility	$\mu = \frac{v_d}{E} = \frac{e\tau}{m}$
7.	Resistance at temperature θ	$R = R_0(1+\alpha\Delta\theta)$
8.	Temperature coefficient of resistance	$\alpha = \frac{R - R_0}{\Delta\theta}$
9.	Terminal potential difference	$V = E - Ir$
10.	Internal resistance of a celL	$r = \left(\frac{E}{V} - 1\right)R$
11.	Current in a circuit having *n* cells connected in series	$I = \frac{nE}{R + nr}$
12.	Current in circuit having *m* cells connected in paralleL	$I = \frac{mE}{R + mR}$
13.	Current in a circuit having *m* x *n* cells connected in *m* rows and each row has *n* cells	$I = \frac{nE}{R + \frac{nR}{m}}$

2. Series combination of cells is meaningful if $R >> nr$, in that case, $I = n\left(\frac{E}{R}\right)$

   Parallel combination of cells is meaningful if $R << r$, in that case, $I = m\left(\frac{E}{r}\right)$

3. Mixed grouping of cells gives maximum current, if $R = \frac{nr}{m}$ i.e. internal resistance of mixed group of cells.

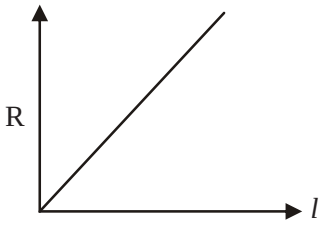
4. Equivalent e.m.f. of two cells connected in series in the following three different modes :



B. Graphs

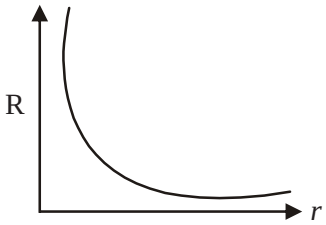
1. Resistance of a conductor

   = slope of V-I graph = $\frac{I}{Slope\ of\ I-V\ graph}$

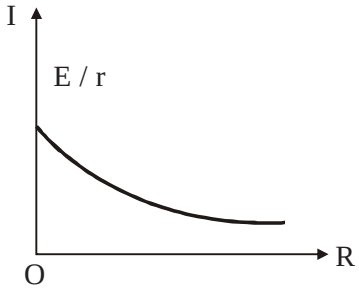


2. Graph between 'R' and '*l*' is shown in figure if '*l*' and temperature of conductor remain constant.

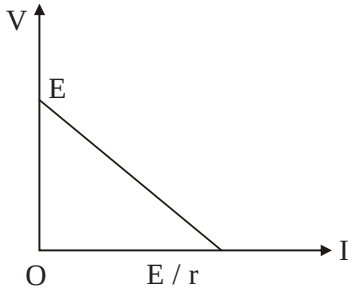
   Graph between 'R' and 'r' is shown in figure if '*l*' and temperature of conductor remain constant.



3. For a cell, variation of current (I) with load (R) is shown in figure (A).
   For a cell, variation of terminal voltage (V) with I is shown in figure (B).

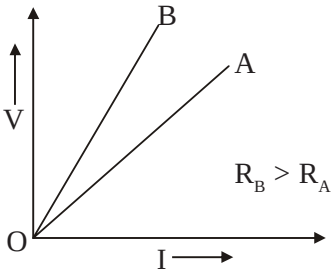


(A)

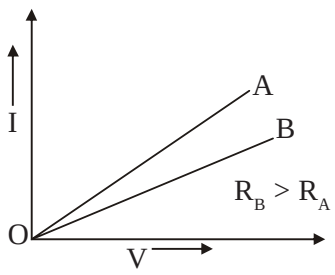


(B)

4. V-I Characteristics



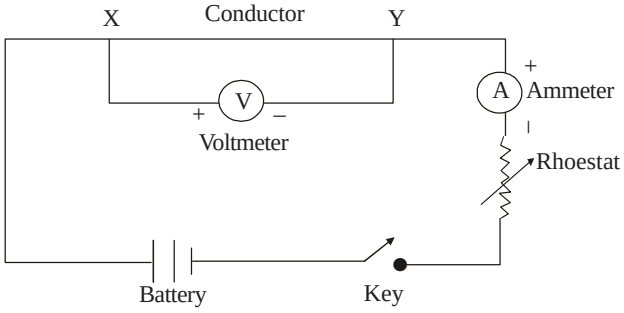
(a)



(b)

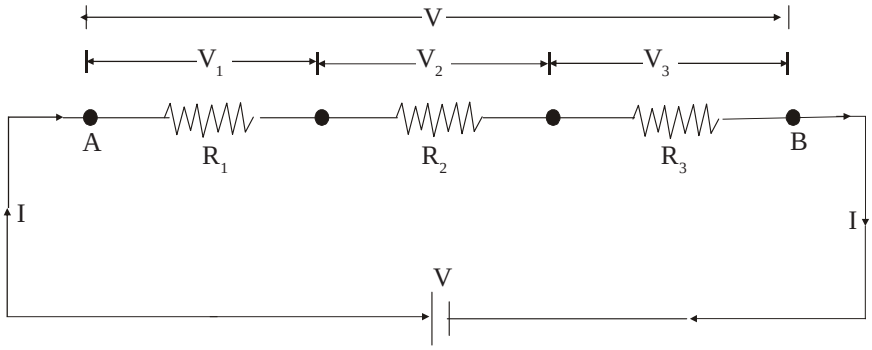
C. Circuit Diagrams

1.



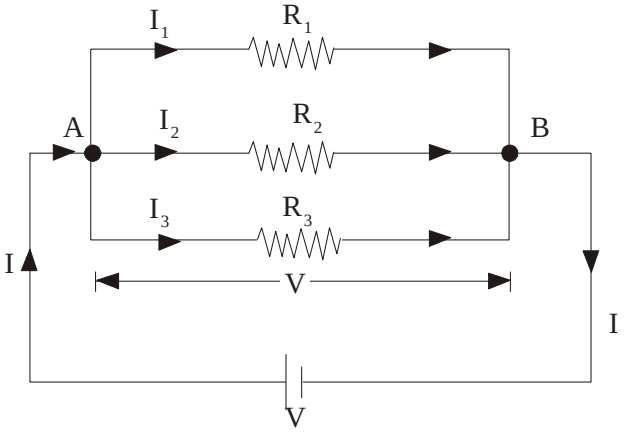
Verification of ohm's law

2.



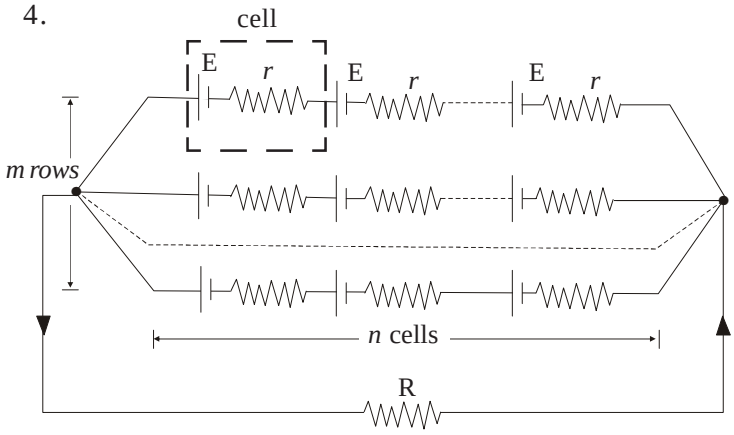
Series combination of resistances

3.



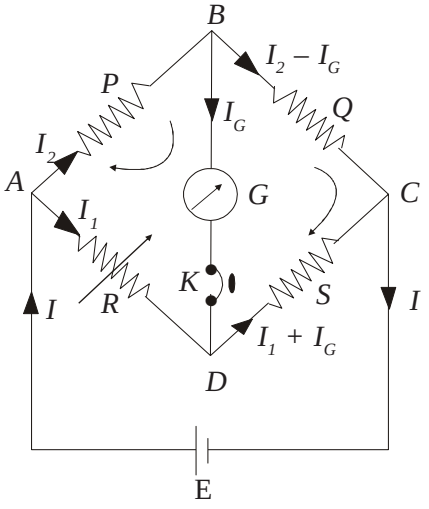
Parallel combination of resistances

4.



Mixed grouping of cells

5.



Wheatston Bridge

Ambarnath Banerjee