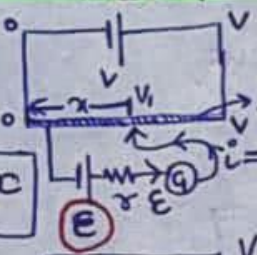
$1mA = 10^{-3} A$

Current Electricity

Potentiometer :-



$V' = \frac{V}{\ell} x$

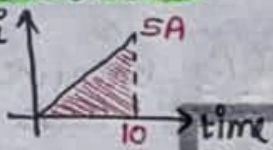
$E = \frac{V}{\ell} x$

V = V across the wire

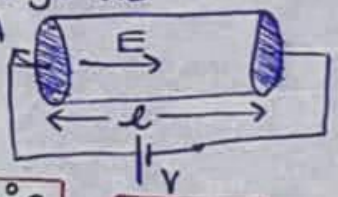
Potential for an unknown battery.

Electric Current :-

$i = \frac{dq}{dt}$



$\int dq = \int i \cdot dt$



$V = iR$ $\quad V = E\ell$

$i = neAV_d$

$V_d = \frac{eE\tau}{m}$ $\quad e = q$

τ = Relaxation time

$R = \frac{m\ell}{ne^2A\tau}$ $\quad R = \frac{\rho\ell}{A}$

$\rho = \frac{m}{ne^2\tau}$

V_d = drift velocity

$e = 1.9 \times 10^{-19} C$

n = no° of charge per unit time

$\mu = \frac{V_d}{E}$ → mobility

Temp dependance of Rson :

$R = \frac{m\ell}{ne^2A\tau}$

Conductor

T↑↑ (n same), τ↓↓

R↑↑

Semi-conductor

T↑↑, τ↓↓, n↑↑, → R↓↓

$R = R_0(1 + \alpha\Delta T)$

R_0 = room

α = Temp coefficient

ΔT = Temp change

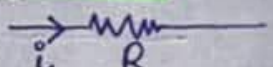
Conductor → +α

Semicond → −α

Insulator → −α

2020

Power :



$P = i^2R$, $P = Vi$

Heat = i^2RT $\quad P = \frac{V^2}{R}$



$\uparrow R = \frac{V^2}{P\downarrow}$

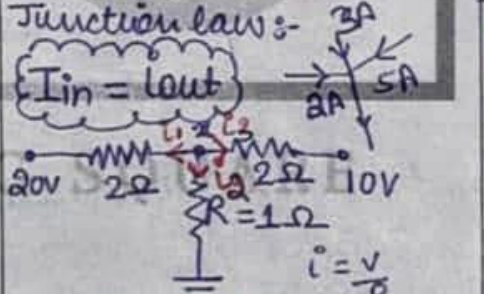
In series - $P = i^2R$

In Parallel - $P = V^2/R$

Kirchoff's Rule :

Junction law :-

$I_{in} = I_{out}$



$\Sigma \Rightarrow i_1 + i_2 + i_3 = 0$

$\frac{x-20}{2} + \frac{x-0}{1} + \frac{x-10}{2} = 0$

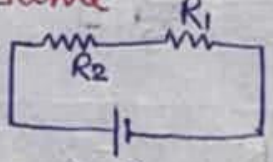
$4x - 30 = 0$

$x = 30/4 = 7.5V$

Circuit Theory :

Series → $R_{eq} = R_1 + R_2$

i = same



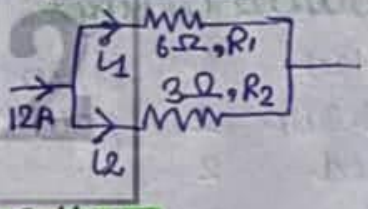
$V_1 = \frac{R_1 V}{R_1 + R_2}$

$\frac{V_1}{V_2} = \frac{R_1}{R_2}$ $\quad V_2 = \frac{R_2 V}{R_1 + R_2}$

Parallel :- $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$

$i \propto \frac{1}{R_1}$ $\quad i_1 = \frac{R_2 i}{R_1 + R_2}$

$i_2 = \frac{R_1 i}{R_1 + R_2}$



Cells :

Series ⇒ $E_{eq} = E_1 + E_2 + E_3$

always consider the polarity.

Parallel ⇒



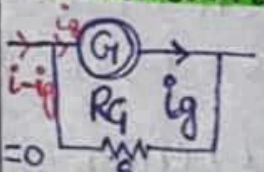
$E_{eq} = \frac{\frac{E_1}{r_1} + \frac{E_2}{r_2} + \frac{E_3}{r_3}}{\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}}$

#Moving coil galvanometer

detection of current

→ only for small current.

#Ammeter :



i_g = max current of galvanometer

R_g = Resistance of galvanometer

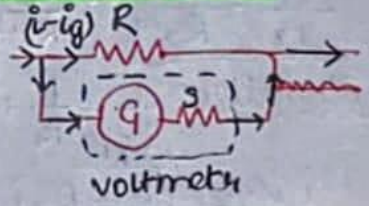
S = Shunt (n Resistance)

$V_g = V_S$

$i_g R_g = (i - i_g)(S)$

Shunit Parallel

Voltmeter:



$$V = i_g(r_g + S)$$

Shunt in series

Colour coding:

Black	0	silver → 10% error
Brown	1	gold → 5% error
Red	2	
Orange	3	
Yellow	4	
Green	5	
Blue	6	
Violet	7	
Grey	8	
White	9	

Q. x, y, z = 7 4 1

$R = (10x + y)10^z$

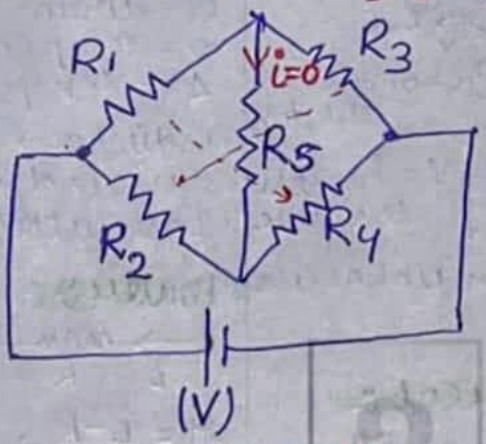
$R = (7 \times 10) + 4) \times 10^1$

$= (70 + 4) \times 10$

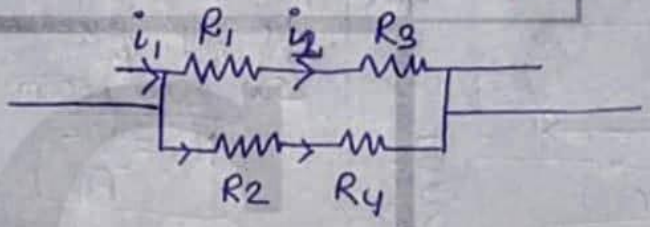
$R = 740\,\Omega$ Ans

* Wheatstone bridge:

$i_{R_5} = 0$ (Balanced wheat stone)



$R_1R_4 = R_2R_3$ Balanced check



EMF

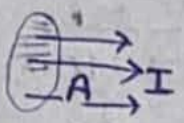
When no current in circuit, the its power is EMF.

$$\mathcal{E} = \frac{W}{q}$$

Current density:

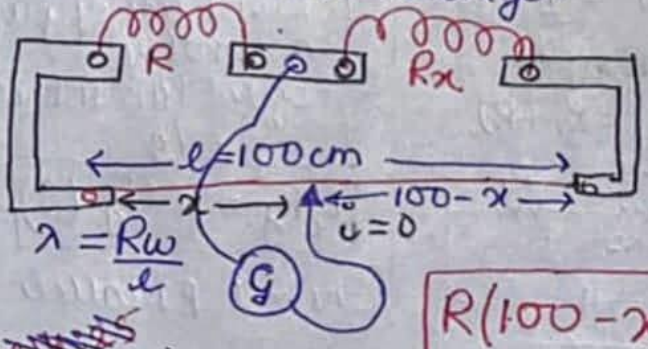
$$J = \frac{q/t}{A} = \frac{I}{A}$$

$$I = JA\cos\theta$$



* Meter bridge:

Works on the principle of wheat stone bridge.



$\lambda = \frac{R_w}{l}$

$R(100 - x) = R_x x$