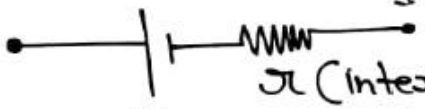
Current - Electricity

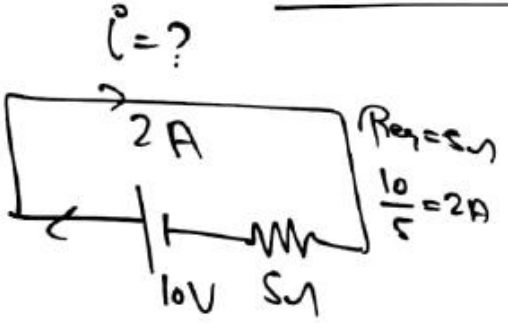
Emf: ⟶ terminal potential / terminal voltage.

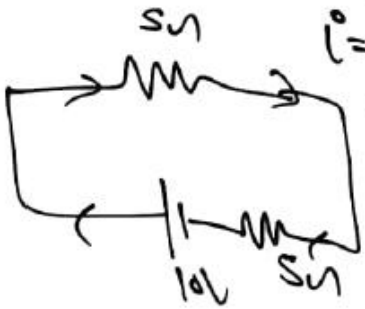
terminal potential difference OR terminal Potential



(Emf) → (Electromotive force → Unit volt)

Ex #1





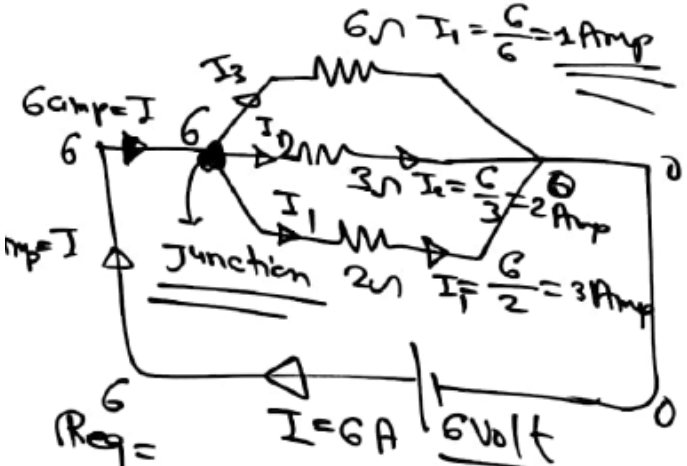
$R_{eq} = 5 + 5 = 10\Omega$

$i = \frac{V}{R_{eq}} = \frac{10}{10} = 1\ Amp$

Kirchhoff's Law :-

Prove

first law :- [based on Conservation of charge]



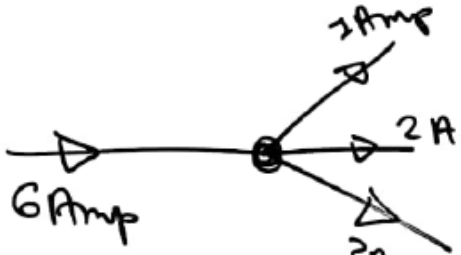
$\frac{1}{R_{eq}} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$

$\frac{1}{R_{eq}} = \frac{3+2+1}{6} = 1\Omega$

$\frac{1}{R_{eq}} = 1 \quad R_{eq} = 1\Omega$

$\frac{1}{R_{eq}} = 1\Omega$

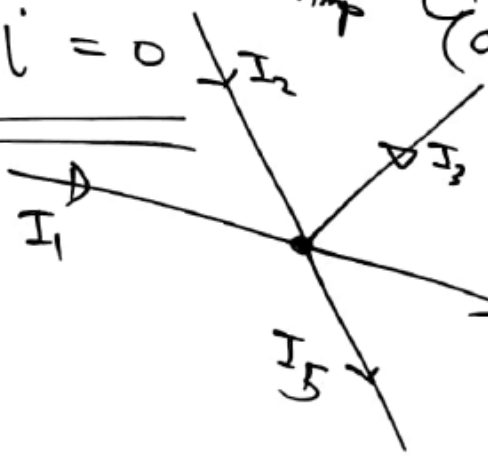
$R_{eq} = 1\Omega$



Incoming current.
||
outgoing current.

$\sum i = 0$

[Incoming current = +ive
(outgoing current = -ive)]



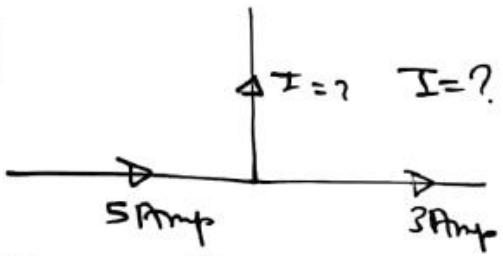
$I_1 + I_2 - I_3 - I_4 - I_5 = 0$

$I_1 + I_2 = I_3 + I_4 + I_5$

Incoming current
||
outgoing current

ent - Electricity

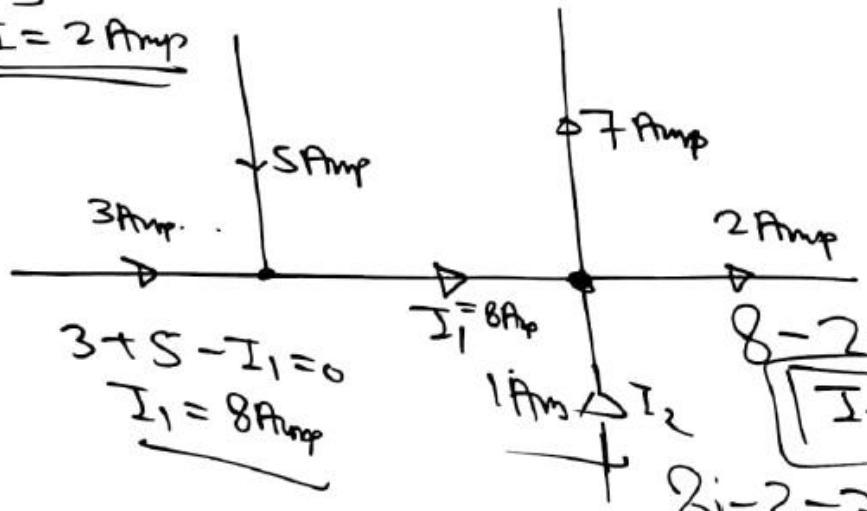
Q1)



$5 - 3 - I = 0$

$I = 2\ \text{Amp}$

Q2)



$3 + 5 - I_1 = 0$

$I_1 = 8\ \text{Amp}$

$8 - 2 - 7 + I_2 = 0$

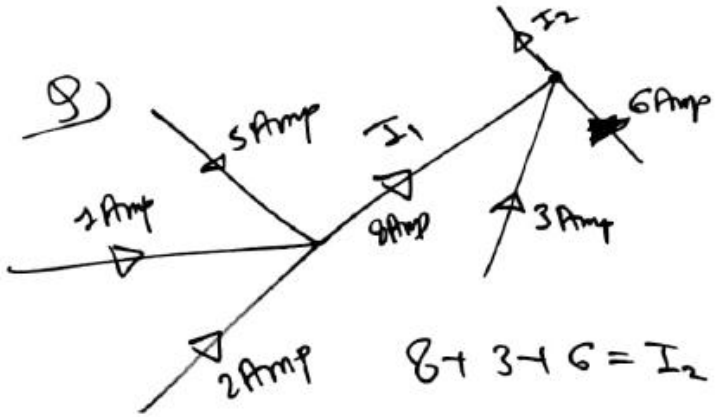
$I_2 = 1\ \text{Amp}$

$8 - 2 - 7(+I_2) = 0$

$-1 + I_2 = 0$

$I_2 = 1\ \text{Amp}$

Q)



$8 + 3 + 6 = I_2$

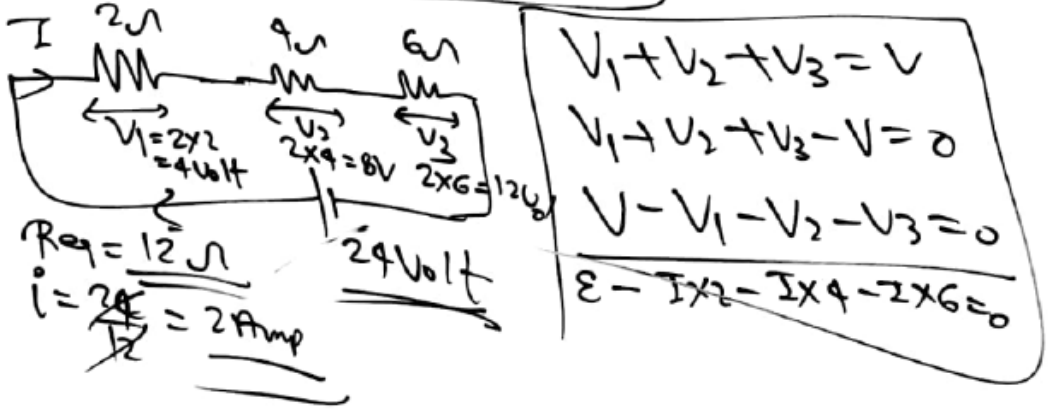
$I_2 = 17\ \text{Amp}$

Kirchhoff's Second Law :- [based on Conservation of Energy]

$\Rightarrow$ (KVL)

[Kirchhoff's Voltage Law] :-

$\Rightarrow$ $\sum IR + \sum \mathcal{E} = 0$



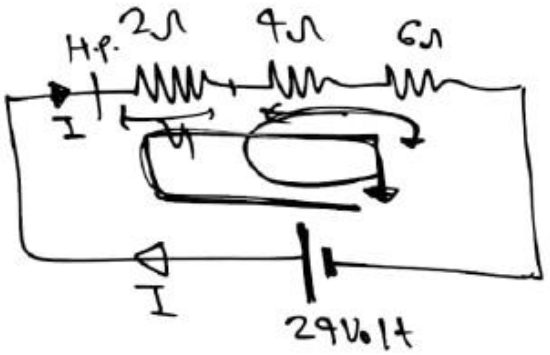
$V_1 + V_2 + V_3 = V$

$V_1 + V_2 + V_3 - V = 0$

$V - V_1 - V_2 - V_3 = 0$

$\mathcal{E} - I\times2 - I\times4 - I\times6 = 0$

Kirchhoff's Second Law :- [based on Conservation of Energy] In a circuit



$$\Rightarrow \sum \varepsilon + \sum iR = 0$$

$$29 + (-I \times 2) + (-I \times 4) + (I \times 6) = 0$$

$$29 - 2I - 4I - 6I = 0$$

$$29 = 12I$$

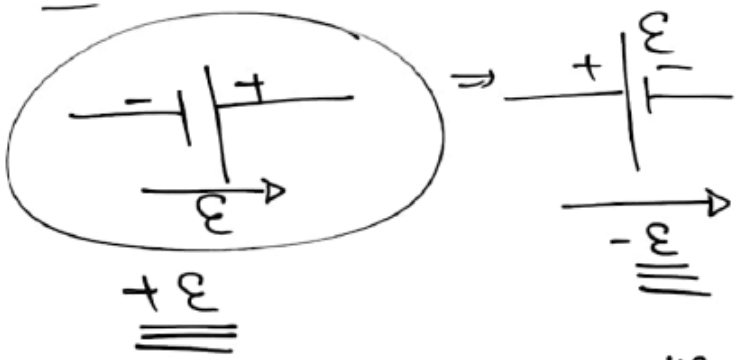
$$\boxed{I = 2\ \text{Amp}}$$

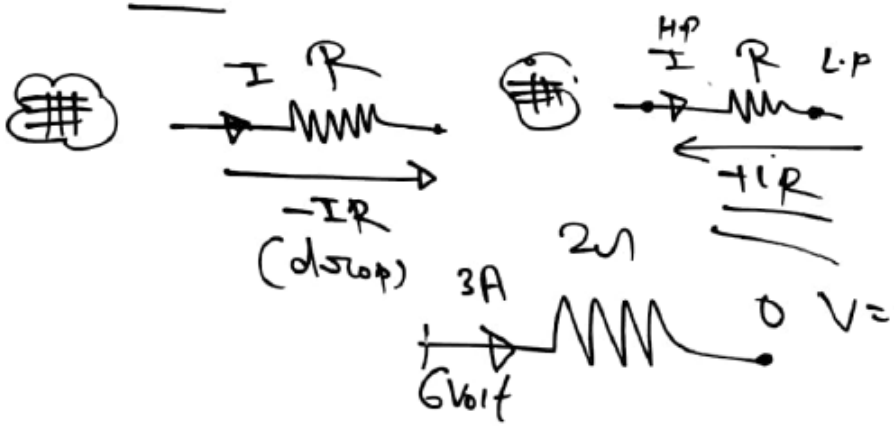
$$\Rightarrow \sum IR + \sum \varepsilon = 0$$

$R_{eq} = R_1 + R_2 + R_3 = 12\ \text{Volt}$

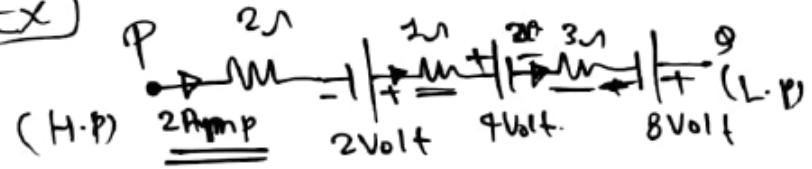
$V = 29\ \text{Volt}$ $\quad i = \frac{29}{12} = 2\ \text{Amps}$

Kirchhoff's Second Law :-





Ex)



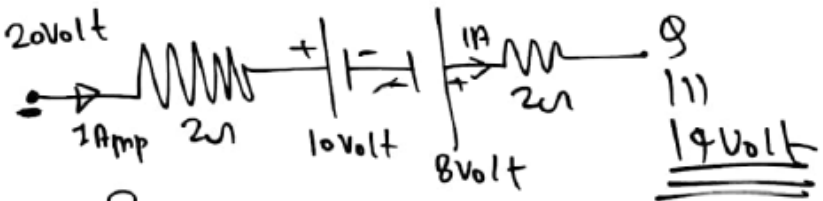
$V_p - 2\times2 + 2 - 2\times1 - 4 - 6 + 8 = V_Q$

$V_p - 4 + 2 - 2 - 4 - 6 + 8 = V_Q$

$V_p - 8 - 6 + 8 = V_Q$

$V_p - V_Q = 6\ \text{Volt}$

Kirchhoff's Second Law :-



Find Potential of Q.

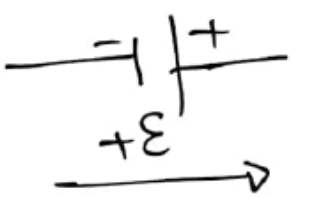
K.V.L)

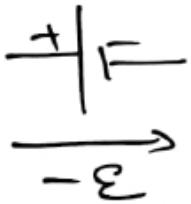
$20 - 1\times2 - 10 + 8 - 1\times2 = V_Q$

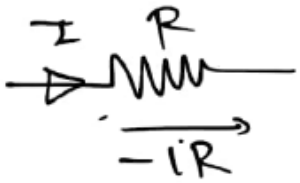
$20 - 2 - 2 - 2 = V_Q$

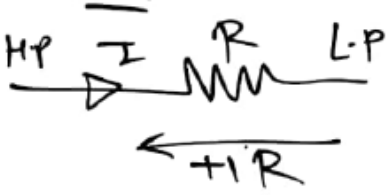
$20 - 6 = V_Q$

$V_Q = 14$ Volt

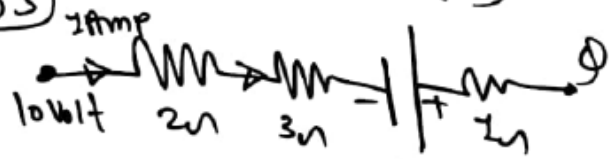








Q3)



Potential of Q.

$10 - 1\times2 = 1\times3 + 1 - 1\times1 = V_Q$

$10 - 2 - 3 + 1 - 1 = V_Q$

$5 = V_Q$ $\quad V_Q = 5$ Volt

Q) find Potential of Q.