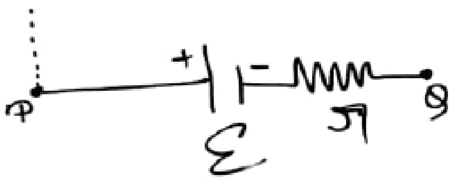
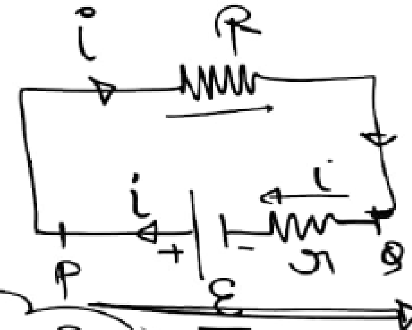
→ **Cell:-**



$V_P - V_Q = \varepsilon$

(ii) When battery is **discharging**.

⇒



$R_{eq} = R + r$

$T.P. < \varepsilon$

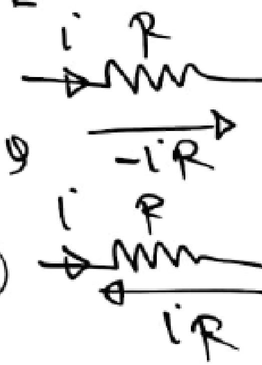
KVL

$i = \dfrac{\varepsilon}{R + r}$

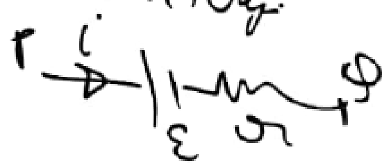
$V_P - \varepsilon + ir = V_Q$

$V_P - V_Q = \varepsilon - ir$

$T.P = \varepsilon - ir$



(iii) charging of battery.



$V_P - \varepsilon - ir = V_Q$

$V_P - V_Q = \varepsilon + ir$

$T.P > \varepsilon$

⇒ Electrical Cell

⇒ Internal resistance of cell $r \propto d$ —(i)

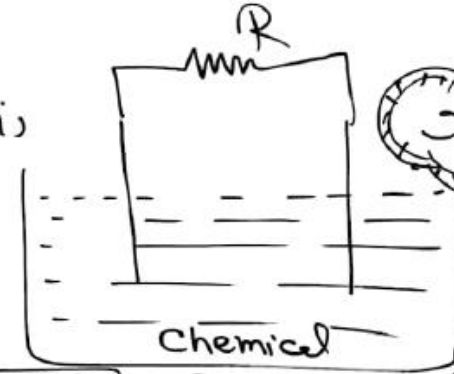
⇒ dependency of internal resistance. $r \propto \frac{1}{T}$

⇒ How to increases or decreases internal resistance of cell $r \propto$

$r \propto C$ $\quad r \propto \frac{d}{T}$ $\quad r \propto \frac{1}{A}$

$$r = \frac{dC}{AT}$$

A↑ r↓
T↑ r↓
d↓ r↓
C↓ r↓



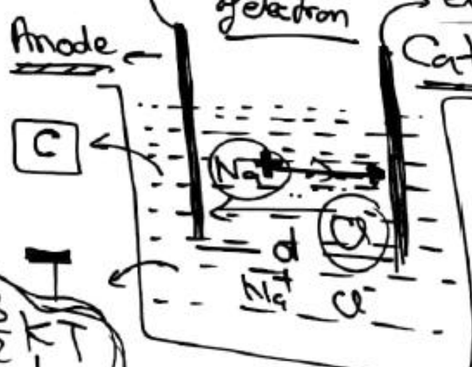
⇒ Electrical cell - It Convert Chemical Energy into Electrical Energy.

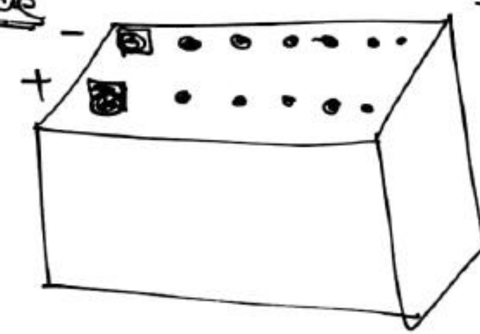
$k = 1.38 \times 10^{-23}$ J/K

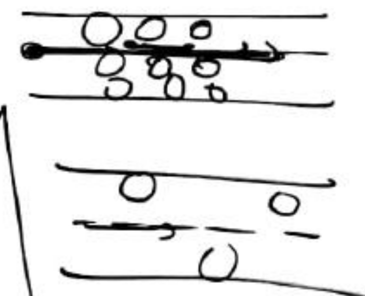
T = temperature in kelvin

$$K.E = \frac{3}{2} kT$$

↳ boltzmann Constant





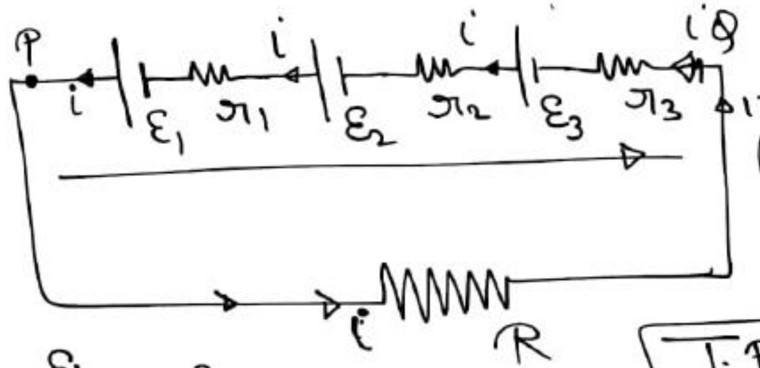


→ Series Connection -

→ Parallel Connection -

→ Mixed -

→



(1) $R_{eq} = R + r_1 + r_2 + r_3$

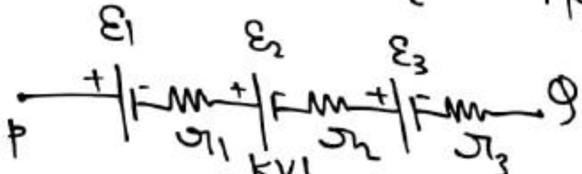
$\varepsilon_{net} = \varepsilon_1 + \varepsilon_2 + \varepsilon_3$

$$i = \frac{\varepsilon_{net}}{R_{net}}$$

$$i = \frac{\varepsilon_1 + \varepsilon_2 + \varepsilon_3}{R + r_1 + r_2 + r_3}$$

$T.P = V_P - V_Q = iR$

≡

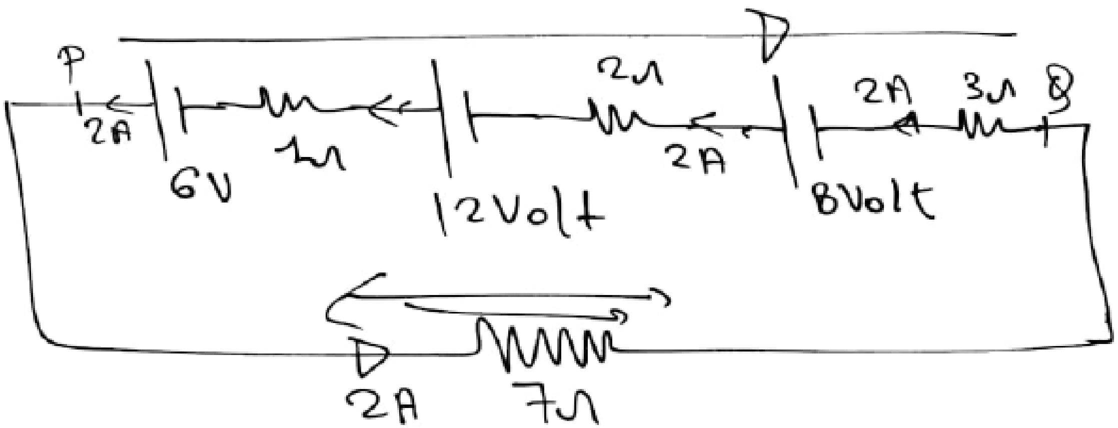


KVL →

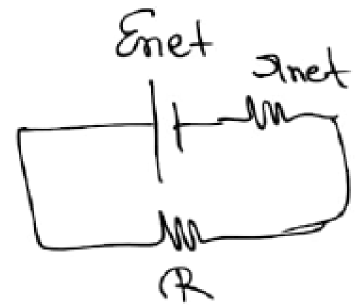
$V_P - \varepsilon_1 - \varepsilon_2 - \varepsilon_3 = V_Q$

$V_P - V_Q = \varepsilon_1 + \varepsilon_2 + \varepsilon_3$

$T.P = \varepsilon_1 + \varepsilon_2 + \varepsilon_3$



⟹



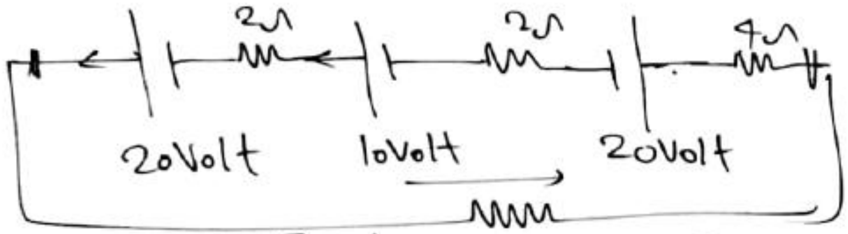
(i) $\mathcal{E}_{net} = \mathcal{E}_1 + \mathcal{E}_2 + \mathcal{E}_3 = 6 + 12 + 8 = 26$ Volt.

(ii) Req. ⟹ $R_{eq} = r_{net} + R_{ext} = 6 + 7 = 13\,\Omega$

(iii) i in ckt $\quad i = \dfrac{\mathcal{E}_{net}}{R_{net}} = \dfrac{26V}{13\,\Omega} = 2$ Amp

(iv) T.P across the battery $\quad V_P - V_Q = 2 \times 7 = 14$ Volt

#



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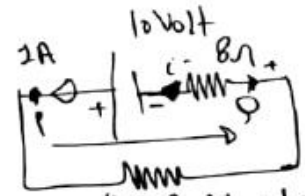


$V_P - 10 + 1\times 8 = V_Q$

$iR = 1\times 2 = 2\text{Volt}$

$V_P - V_Q = 2\text{Volt}$

(i) i in ckt $= \frac{\mathcal{E}_{net}}{R_{net}} = \frac{10}{10} = 1$ Amp

$\mathcal{E}_{net} = \mathcal{E}_1 + \mathcal{E}_2 + \mathcal{E}_3$

$= 20 + 10 - 20$

$\mathcal{E}_{net} = 10$ Volt

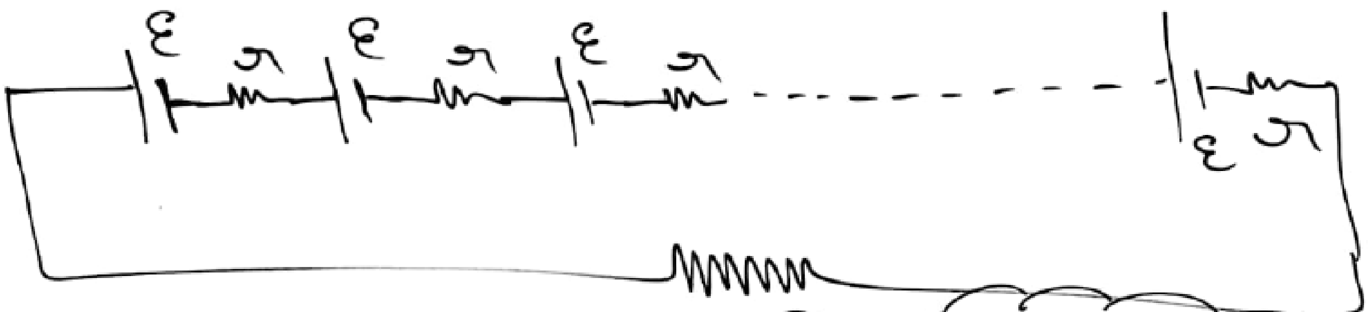
(ii) $\mathcal{E}_{net} = 10$ Volt.

(iii) r_{net}, Req of the ckt

$r_{net} = 8\ \Omega$

(iv) T.P across the Combination of battery.

n-cell of emf ε & internal resistance r. Connected in same polarity. find ε_{net}, r_{net} if it is with external resistance R.



$\Rightarrow \varepsilon_{net} = \varepsilon + \varepsilon + \varepsilon + \text{-- -- n times}$

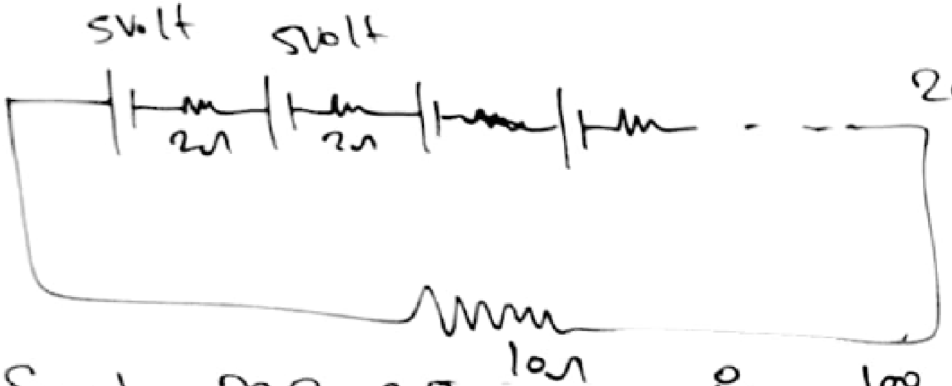
$= n\varepsilon$

$\Rightarrow r_{net} = r + r + \text{----- n times}$

$= nr$

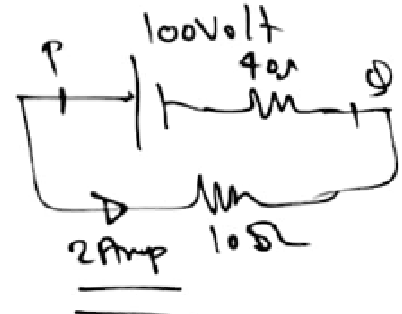
$R_{eq} = R + nr$

$i = \dfrac{\varepsilon_{net}}{R_{net}} = \dfrac{nE}{nr + \varepsilon}$



20 cell

=



→ $E_{net} = nE = 20 \times 5$

$E_{net} = 100$ Volt

$i = \frac{100}{50}$

$i = 2$ Amp

$r_{net} = 20 \times 2 = nr$

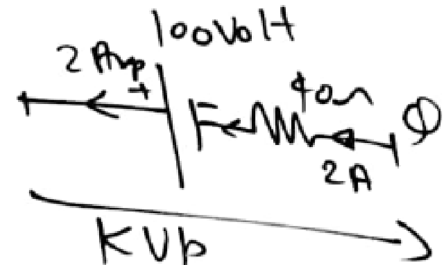
$r_{net} = 40\Omega$

T.P

$R_{net} = r_{net} + R$

$= 50\Omega$

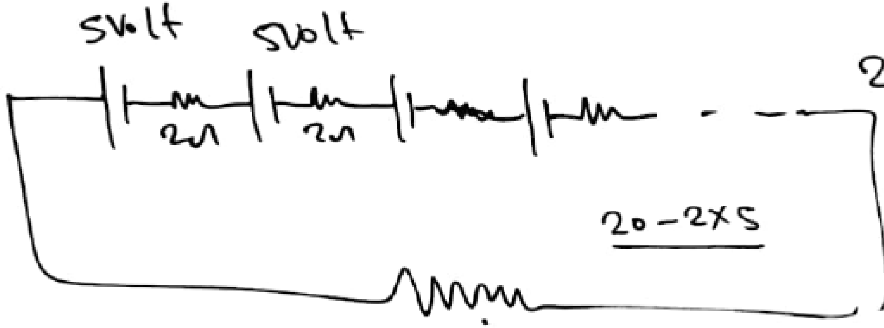
$V_P - V_Q = 2 \times 10 = 20$ Volt



KVL

$V_P - 100 + 2 \times 40 = V_Q$

$V_P - V_Q = 20$ Volt



20 cell

n cell m cell reverse

20 cell 5 cell

$(n - 2m)$

$20 - 2 \times 5 = 10$ cell $= 50$ Volt

⇒ If 5 cell connected opposite polarity in out of 20 cell.

(1) $E_{net} = ?$