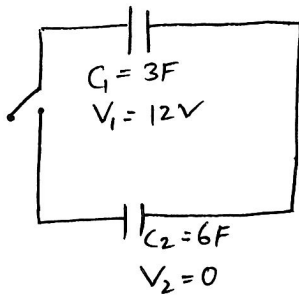
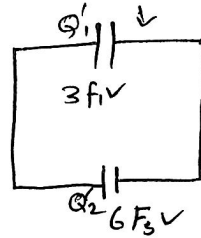


Sol-1



$$V = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$$

$$V = \frac{3 \times 12 + 0}{9} = 4 \text{ volt}$$

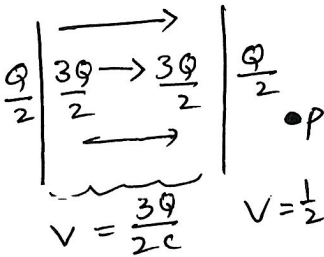


$$Q_1' = 3 \times 4 = 12 \text{ C}$$

$$Q_2 = 6 \times 4 = 24 \text{ C}$$

Ans - B

Sol-2



$$V = \frac{1}{2} \frac{Q^2}{C} = \frac{1}{2} \times \frac{9Q^2}{4C} = \frac{9Q^2}{8C}$$

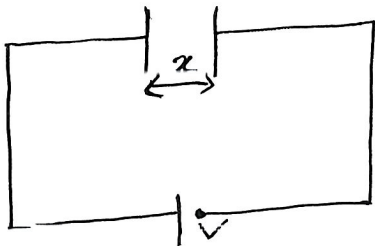
$$F = \frac{Q^2}{2\epsilon_0 A}$$

$$F = \frac{9Q^2}{4 \times 2\epsilon_0 A}$$

$$F = \frac{9Q^2}{8\epsilon_0 A}$$

Ans - D

Sol-3



$$V = \frac{1}{2} C V^2$$

$$V = \frac{1}{2} \frac{\epsilon_0 A}{x} \cdot V^2$$

$$\frac{dv}{dt} = \frac{1}{2} \epsilon_0 A \cdot V^2 \left(\frac{-1}{x^2} \right) \left(\frac{dx}{dt} \right)$$

$$\frac{dv}{dt} = \frac{1}{2} \epsilon_0 A V^2 \left(\frac{-1}{d^2} \right) \times V$$

$$\frac{dv}{dt} \propto \frac{1}{d^2}$$

Ans - B

Sol-4

$$I = I_0 e^{-t/\tau}$$

$$\log I = \log I_0 + \log e^{-t/\tau}$$

$$\log I = \frac{-t}{CR} + \log I_0$$

$$y = mx + c$$

$$m = \frac{-1}{CR}$$

$$y \text{ intercept} = \log I_0$$

$$= \log \frac{E}{R}$$

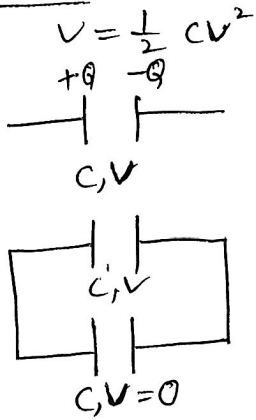
$$R \rightarrow 2R$$

$$m' = \frac{-1}{2CR} = -\frac{m}{2}$$

$$y \text{ intercept} = \log \frac{E}{2R} (\downarrow)$$

Ans - B

Sol-5



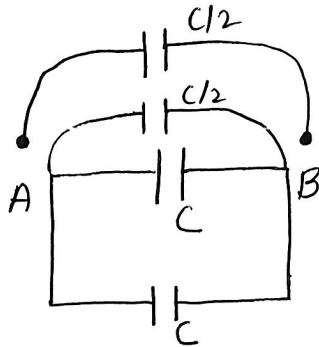
$$H = \frac{1}{2} \frac{C_1 V_2}{C_1 + C_2} (V_1 - V_2)^2$$

$$= \frac{1}{2} \times \frac{C}{2} \times V^2$$

$$= \frac{V}{2}$$

Ans - B

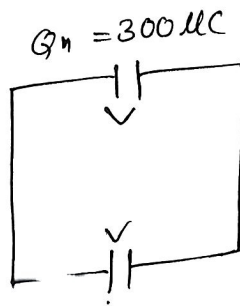
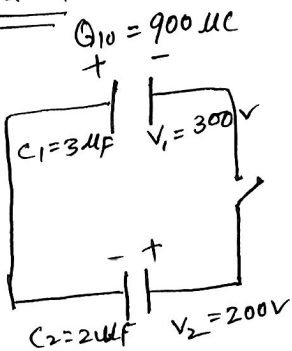
Sol-6



$$C_{eq} = 3C$$

Ans - C

Sol-7



$$V = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$$

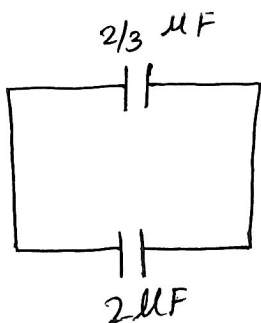
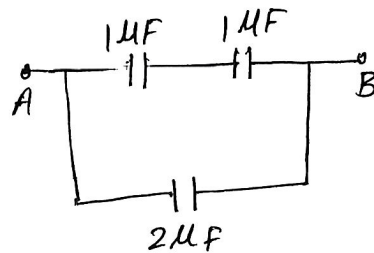
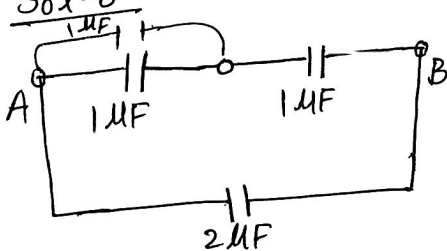
$$\pm \frac{900 - 400}{5} = 100 \text{ volt}$$

$$Q_{1f} = C_1 V = 3 \times 100 = 300 \mu C$$

$$Q_{flowing} = 600 \mu C$$

Ans - B

Sol-8



$$C_{eq} = \frac{8}{3} \mu F$$

Ans - C

Sol-9

$$\frac{C_1 C_2}{C_1 + C_2} = 3$$

$$C_1 + C_2 = 16 \mu F \text{ --- (1)}$$

$$C_1 C_2 = 48 \text{ --- (2)}$$

$$C_1 - C_2 = \sqrt{(C_1 + C_2)^2 - 4C_1 C_2}$$

$$C_1 - C_2 = 8 \mu F \text{ --- (3)}$$

$$C_1 - C_2 = 16$$

$$2C_1 = 24$$

$$C_1 = 12 \mu F$$

$$C_2 = 4 \mu F$$

Ans - C

Sol-10

$$I = \frac{dq}{dt} = \text{const} \Rightarrow q = It$$

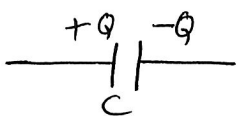
$$q = CV \quad \boxed{V \propto t}$$

$$It = CV$$

$$\boxed{V = \frac{I}{C} \times t}$$

Ans - C

Sol-11



$$V = \frac{Q}{C}$$

$$V = \frac{1}{2} \frac{Q^2}{C}$$



$$C_N = KC$$

$$V_N = \frac{Q}{C_N} = \frac{V}{K}$$

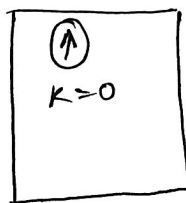
$$V_N = \frac{1}{2} \frac{Q^2}{KC} \text{ (dec)}$$

Ans - C

Sol-12 Polar dielectric



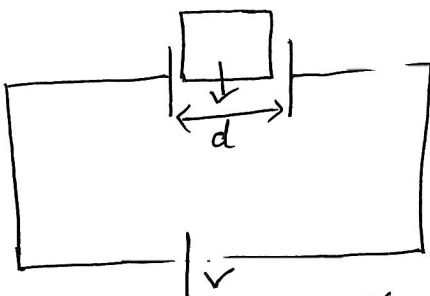
$$K_N = 0$$



Non Polar

Ans - C

Sol-13



$$E = \frac{Q_N}{K\epsilon_0 A} \text{ or } E_N = \frac{V}{d} = E$$

$$V = \frac{1}{2} CV^2$$

$$\uparrow V \propto C \uparrow$$

Ans - D

Sol-14 Ans - A

Sol-15

$$I = \frac{10}{5} = 2A$$

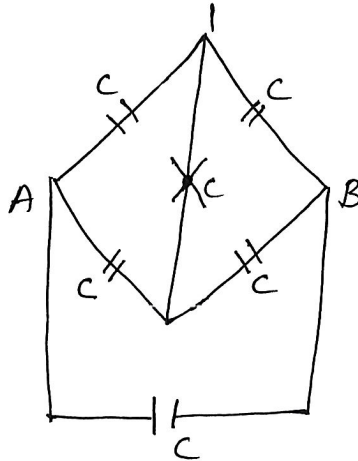
$$\frac{q}{3} + 0 + \frac{q}{3} = I \times 4$$

$$\frac{2q}{3} = 8$$

$$q = 12 \mu C$$

Ans - A

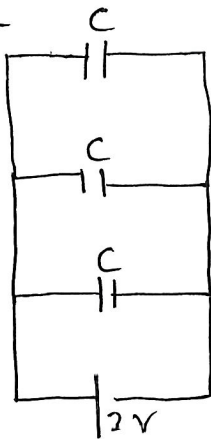
Sol-16



$$C_{eq} = 2C$$

Ans - C

Sol-17



$$3C \times 2 = 1.8 \mu C$$

$$C = 0.3 \mu C$$

In Series

$$C_{eq} = C/3 = 0.1 \mu F$$

$$q = C_{eq} V = 0.1 \times 2 = 0.2 \mu C$$

Ans - D

Sol-18

$$C = 500 \mu F$$

$$I = \frac{100 \mu C}{\text{Sec}}$$

$$q = CV$$

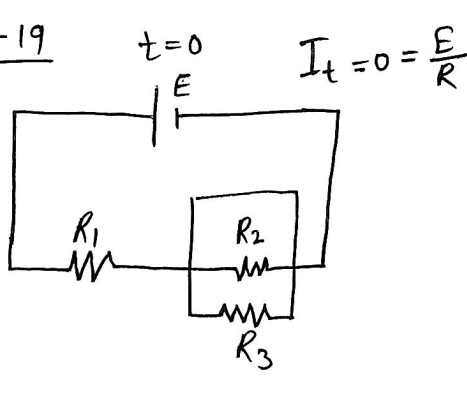
Ans - A

$$It = C \times V$$

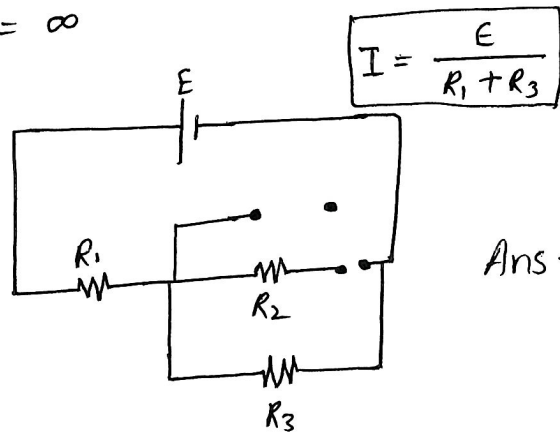
$$\frac{100 \mu C}{2} \times t = 500 \mu F \times 20V$$

$$t = 100 \text{ sec}$$

Sol-19

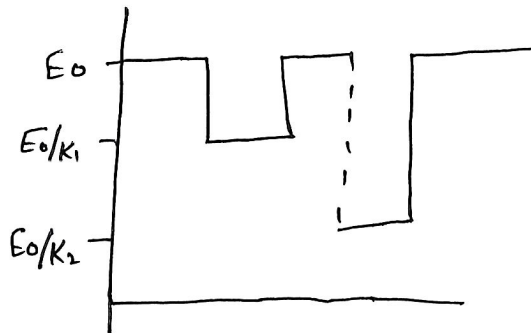
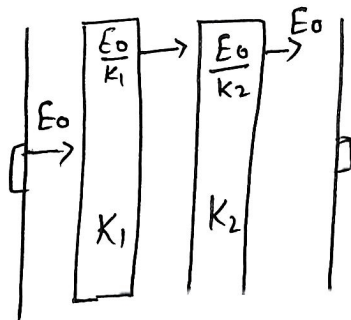


$t = \infty$



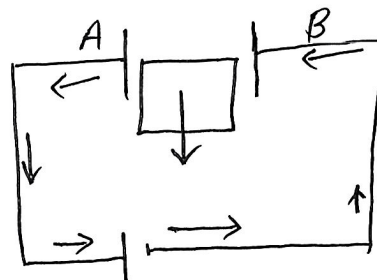
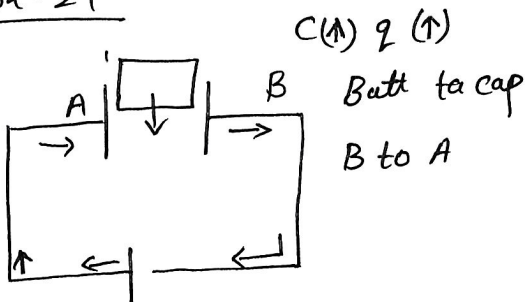
Ans - A

Sol-20



Ans - C

Sol-21



C(+) q(+) $\downarrow$
Cap to Batt
A to B

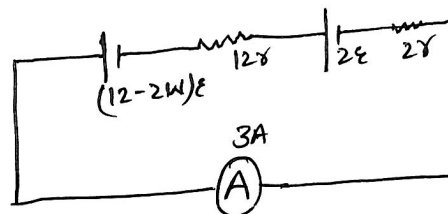
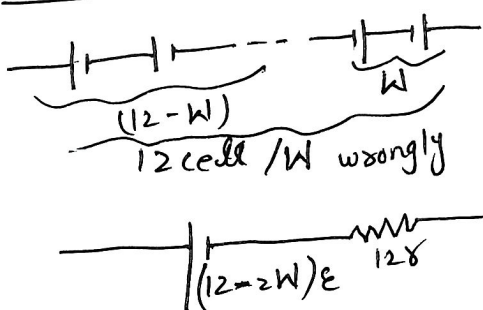
Ans - B

Sol-22

$$V_x - V_y = 3 - 2 = 1 \text{ volt}$$

Ans - A

Sol-23



$$(12-2W)E + 3E = 3(148)$$

$$E \cdot (14-2W) = 3 \times 148 \quad \text{--- (1)}$$

I opp move

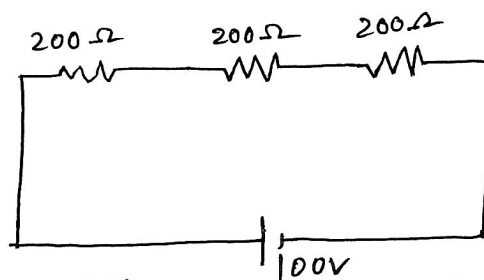
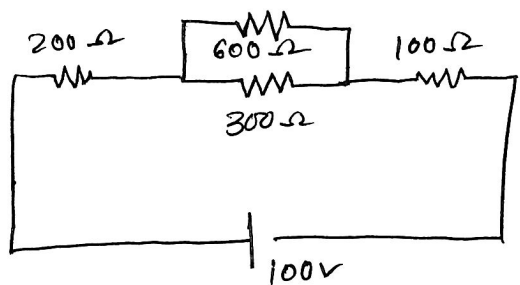
$$(12-2W)E - 2E = 2 \times 148 \quad \text{--- (2)}$$

$$(10-2W)E = 2 \times 148$$

$$\frac{14-2W}{10-2W} = \frac{3}{2}$$

$$W = 1$$

Ans - A

Sol-24

$$V_2 = \frac{200}{500} \times 100 = 40V \quad \text{Ans - C}$$

Sol-25 Sensitivity $\propto \frac{1}{K} \propto \frac{l}{V}$ Ans B

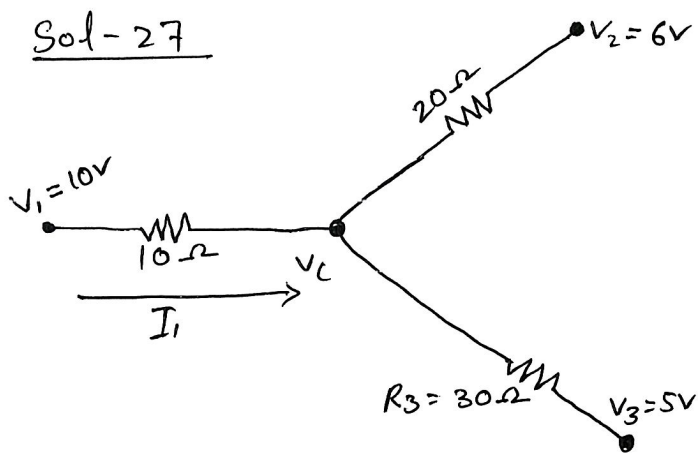
Sol-26 $I \times 2 = K \times 50$ — ①

$$I \times 4 = K \times l$$

$$\frac{1}{2} = \frac{50}{l}$$

$$l = 100 \text{ cm}$$

Ans - B

Sol-27

$$V_c = \frac{\sum V/R}{\sum 1/R}$$

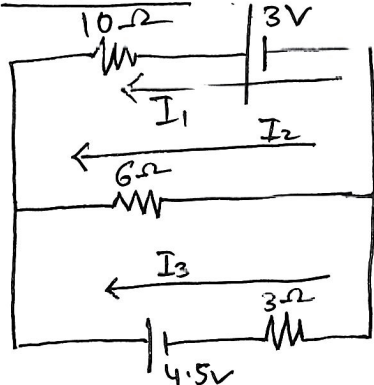
$$V_c = \frac{\frac{10}{10} + \frac{6}{20} + \frac{5}{30}}{\frac{1}{10} + \frac{1}{20} + \frac{1}{30}}$$

$$V_c = 0$$

$$I_1 = \frac{10 - V_c}{10}$$

$$= \frac{10 - 0}{10} = 1A$$

Ans - B

Sol-28

$$V_c = \frac{\sum \varepsilon/R}{\sum 1/R}$$

$$V_c = \frac{\frac{3}{10} + 0 + \frac{4.5}{3}}{\frac{1}{10} + \frac{1}{6} + \frac{1}{3}}$$

$$V_c = 3V$$

$$I_1 = \frac{\varepsilon - V_c}{R}$$

$$= \frac{3 - 3}{10} = 0$$

Ans - A

Sol-29 Balanced W.S.B

$$V_A = V_B$$

$$V_A - V_B = 0$$

Ans - D

Sol-30

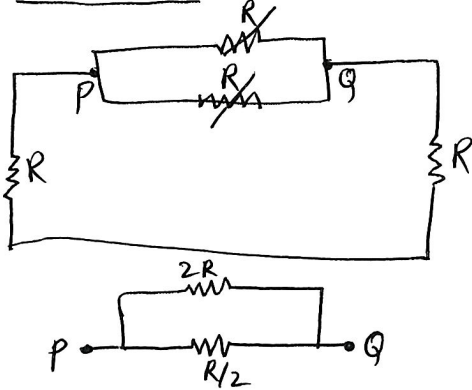
$$R_1 = \frac{\pi r}{2}$$

$$R_2 = 2r$$

$$R_3 = \frac{8\pi r}{2}$$

$$\frac{1}{R_{AB}} = \frac{2}{\pi r} + \frac{1}{2r} + \frac{2}{3\pi r}$$

$$R_{AB} = \frac{6\pi r}{16 + 3\pi}$$

Ans - BSol-31

$$R_{PQ} = \frac{2R}{5}$$

Ans - BSol-32

$$R = R_1 + R_2$$

$$\frac{P_{eq} + 2l}{A} = \frac{P_1 l}{A} + \frac{P_2 l}{A}$$

Ans - B

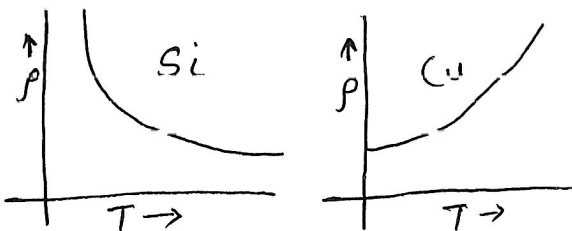
$$P_{eq} = \frac{P_1 + P_2}{2}$$

Sol-33

$$K = \frac{V_{rating}}{P_{rating}}$$

Ans - A

$$R \propto \frac{1}{P_{rating}}$$

Sol-34Ans - ASol-35

$$\mathcal{E} = 2.2 \text{ V}$$

$$r = R \left(\frac{\mathcal{E}}{V} - 1 \right)$$

$$r = 5 \left(\frac{2.2}{1.8} - 1 \right)$$

$$r = \frac{10}{9} \Omega$$

Ans - A

Sol-36

$$t_1 = 10 \text{ min}$$

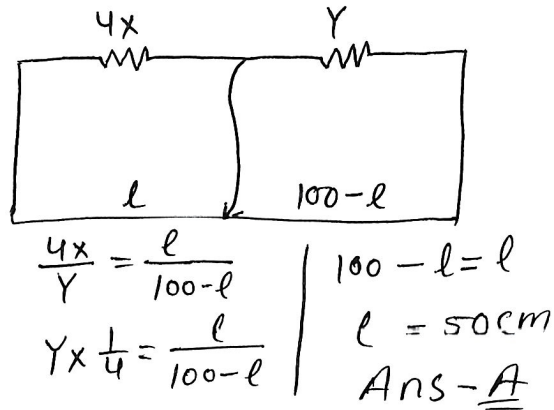
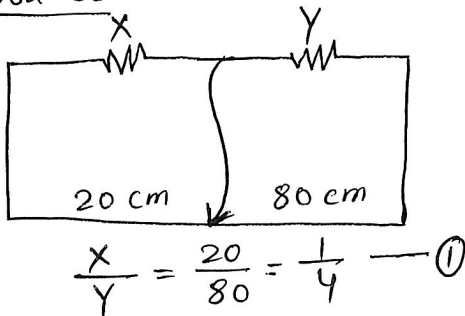
$$t_2 = 40 \text{ min}$$

$$t_{\text{parallel}} = \frac{t_1 t_2}{t_1 + t_2} = \frac{40 \times 10}{50} = 8 \text{ min}$$

Ans - C

Sol-37 Ans - D

Sol-38



Sol-39

$$H = I^2 R t$$

$$\text{or}$$

$$H = \frac{V^2}{R} \times t$$

$$H \propto \frac{1}{R}$$

$$R \rightarrow R/2$$

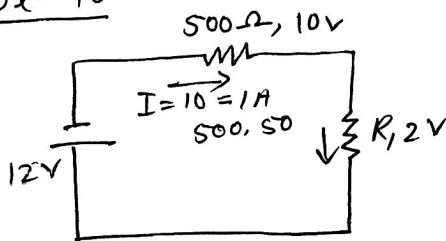
$$H \rightarrow 2H$$

$\therefore$ Supply voltage is same

$$H = \frac{V^2}{R} \times t$$

Ans - A

Sol-40

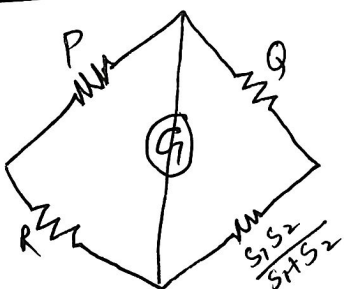


$$V = \mathcal{E} R$$

$$2 = \frac{1}{50} \times R \quad \boxed{R = 100 \Omega}$$

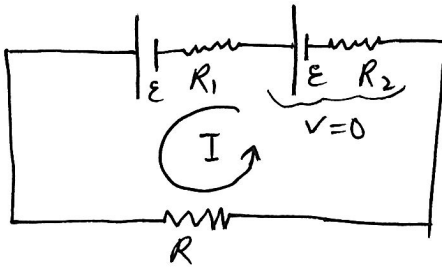
Ans - B

Sol-41



$$\frac{P}{Q} = \frac{R (S_1 + S_2)}{S_1 S_2}$$

Sol-42



$$V = E - I r = 0$$

$$E - I R_2 = 0$$

$$I = \frac{E}{R_2} \quad \text{--- (1)}$$

$$I = \frac{2E}{R + R_1 + R_2} \quad \text{--- (2)}$$

$$\frac{E}{R_2} = \frac{2E}{R + R_1 + R_2}$$

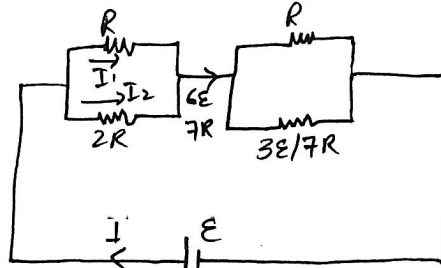
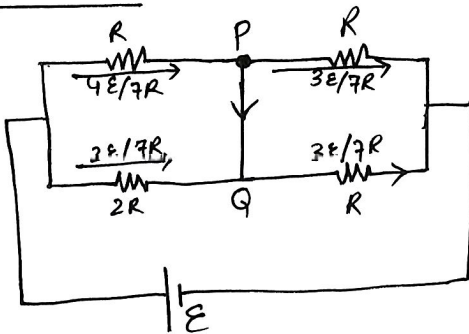
$$R + R_1 + R_2 = 2R_2$$

$$R = R_2 - R_1$$

Ans - B

Sol-43 Ans - A

Sol-44



$$R_{eq} = \frac{2R}{3} + \frac{R}{2} = \frac{7R}{6}$$

$$I = \frac{6E}{7R}$$

$$I_1 = \frac{2R}{3R} \times \frac{6E}{7R}$$

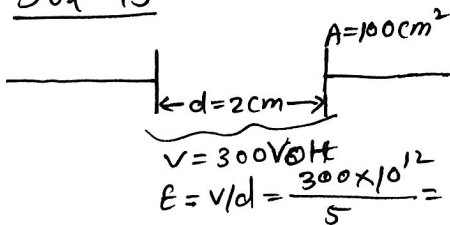
$$I_1 = \frac{4E}{7R}$$

$$I_2 = \frac{2E}{7R}$$

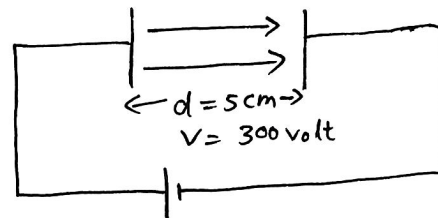
$$I_{PQ} = \frac{4E}{7R} - \frac{3E}{7R} = \frac{E}{7R}$$

Ans - B

Sol-45

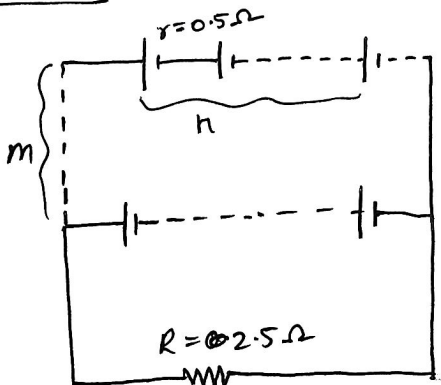


$$E = V/d = \frac{300 \times 10^{12}}{5} = 6 \times 10^3 \frac{V}{m}$$



Ans - D

Sol-46



$$R = \frac{n \times r}{m} \quad \text{--- (1)}$$

$$2.5 = \frac{n \times 0.5}{m}$$

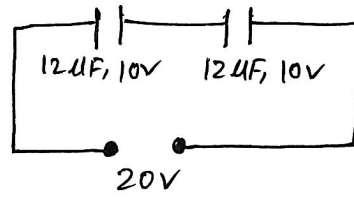
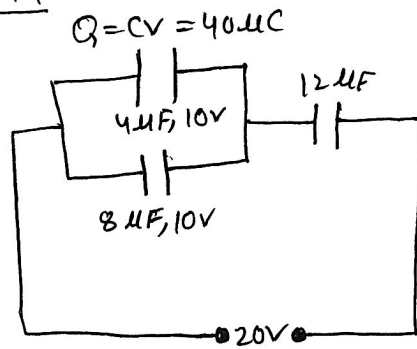
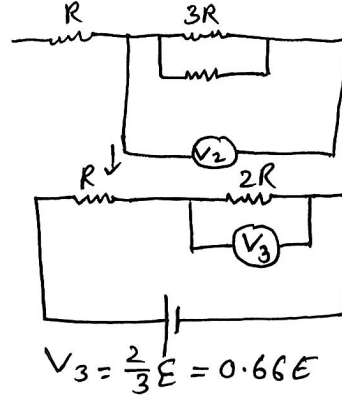
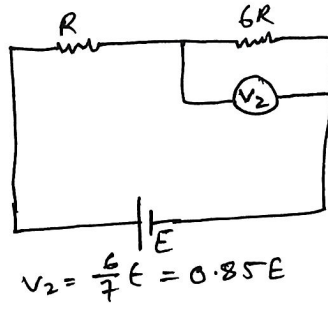
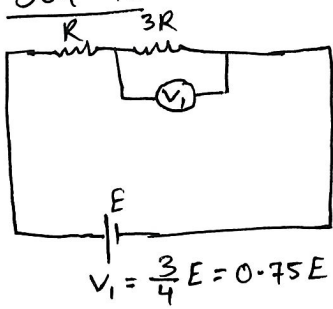
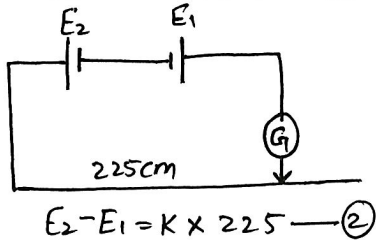
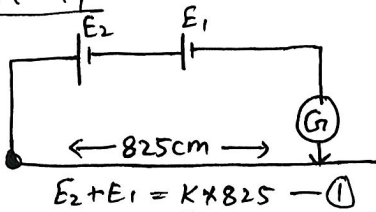
$$n = 5m$$

$$mn = 45 \quad \text{--- (2)}$$

$$5m^2 = 45$$

$$\begin{matrix} m = 3 \\ n = 15 \end{matrix}$$

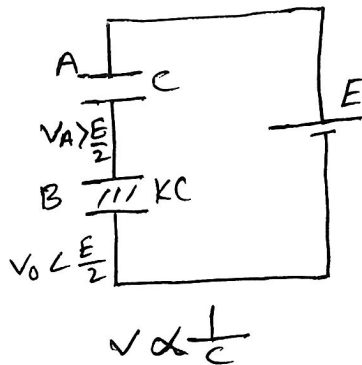
Ans - A

Sol-47Ans - BSol-48Ans - BSol-49

$$\frac{E_2}{E_1} = \frac{l_1 + l_2}{l_1 - l_2}$$

$$\frac{E_2}{E_1} = \frac{105 \phi}{60 \phi} = \frac{7}{4}$$

$$\frac{E_1}{E_2} = \frac{4}{7}$$

Ans - BSol-50 $a \rightarrow P, S$ $b \rightarrow P, S$ $c \rightarrow P, S$ $d \rightarrow Q, S$ Ans - B