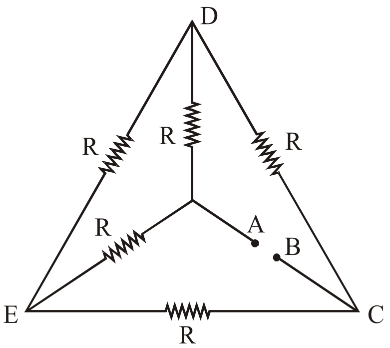
CURRENT ELECTRICITY

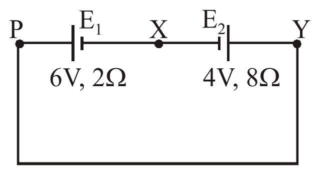
1. Five equal resistances are connected in a network as shown in figure. The net resistance between the points A and B is :



(1) 2R (2) $\frac{R}{2}$ (3) $\frac{3R}{2}$ (4) R

2. In an electrical circuit, a battery is connected to pass 20 C of charge through it in a certain given time. The potential difference between two plates of the battery is maintained at 15 V. The work done by the battery is _______J.

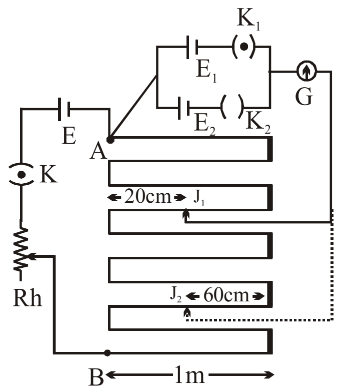
3. A cell E_1 of emf 6V and internal resistance 2Ω is connected with another cell E_2 of emf 4V and internal resistance 8Ω (as shown in the figure). The potential difference across points X and Y is :



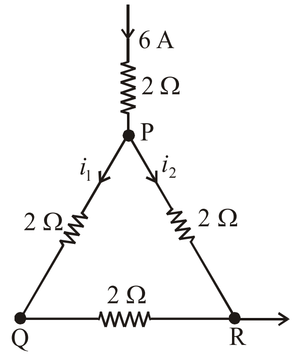
(1) 10.0 V (2) 3.6 V
(3) 5.6V (4) 2.0 V

4. A cylindrical wire of radius 0.5 mm and conductivity 5×10^7 S/m is subjected to an electric field of 10 mV/m. The expected value of current in the wire will be $x^3\pi$ mA. The value of x is ____.

5. In the given circuit of potentiometer, the potential difference E across AB (10m length) is larger than E_1 and E_2 as well. For key K_1 (closed), the jockey is adjusted to touch the wire at point J_1 so that there is no deflection in the galvanometer. Now the first battery (E_1) is replaced by second battery (E_2) for working by making K_1 open and K_2 closed. The galvanometer gives then null deflection at J_2. The value of $\frac{E_1}{E_2}$ is $\frac{a}{b}$, where a = ___.



6. A current of 6 A enters one corner P of an equilateral triangle PQR having 3 wires of resistance 2Ω each and leaves by the corner R. The currents i_1 in ampere is __________.



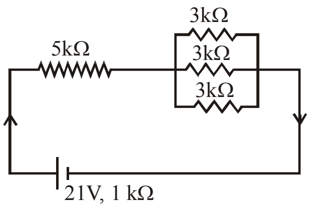
7. A wire of 1Ω has a length of 1m. It is stetched till its length increases by 25%. The percentage change in resistance to the neartest integer is :-
(1) 56% (2) 25% (3) 12.5% (4) 76%

8. A conducting wire of length 'l', area of cross-section A and electric resistivity ρ is connected between the terminals of a battery. A potential difference V is developed between its ends, causing an electric current.
If the length of the wire of the same material is doubled and the area of cross-section is halved, the resultant current would be :

(1) $\frac{1}{4}\frac{VA}{\rho l}$ (2) $\frac{3}{4}\frac{VA}{\rho l}$

(3) $\frac{1}{4}\frac{\rho l}{VA}$ (4) $4\frac{VA}{\rho l}$

9. In the figure given, the electric current flowing through the 5 kΩ resistor is 'x' mA.



The value of x to the nearest integer is _______.

10. A resistor develops 500 J of thermal energy in 20s when a current of 1.5 A is passed through it. If the current is increased from 1.5 A to 3A, what will be the energy developed in 20 s.

(1) 1500 J (2) 1000 J

(3) 500 J (4) 2000 J

11. The energy dissipated by a resistor is 10 mJ in 1s when an electric current of 2 mA flows through it. The resistance is _______ Ω. (Round off to the Nearest Integer)

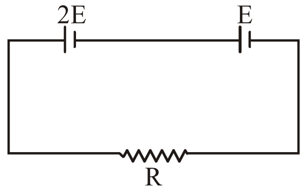
12. A current of 10A exists in a wire of crosssectional area of 5 mm^2 with a drift velocity of 2×10^{-3} ms^{-1}. The number of free electrons in each cubic meter of the wire is ___.

(1) 2×10^6 (2) 625×10^{25}

(3) 2×10^{25} (4) 1×10^{23}

13. The equivalent resistance of series combination of two resistors is 's'. When they are connected in parallel, the equivalent resistance is 'p'. If s = np, then the minimum value for n is ___. (Round off to the Nearest Integer)

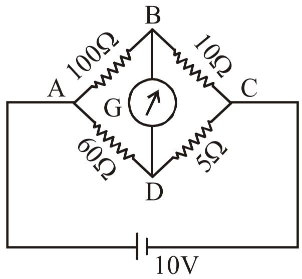
14. Two cells of emf 2E and E with internal resistance r_1 and r_2 respectively are connected in series to an external resistor R (see figure). The value of R, at which the potential difference across the terminals of the first cell becomes zero is :



(1) $r_1 + r_2$ (2) $\frac{r_1}{2} - r_2$

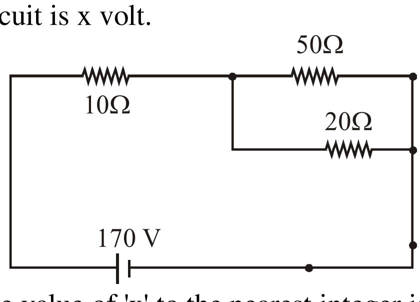
(3) $\frac{r_1}{2} + r_2$ (4) $r_1 - r_2$

15. The four arms of a Wheatstone bridge have resistances as shown in the figure. A galvanometer of 15 Ω resistance is connected across BD. Calculate the current through the galvanometer when a potential difference of 10V is maintained across AC.



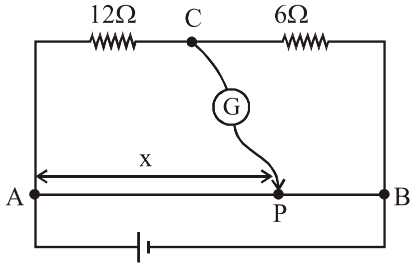
(1) 2.44 μA (2) 2.44 mA
(3) 4.87 mA (4) 4.87 μA

16. The voltage across the 10Ω resistor in the given circuit is x volt.



The value of 'x' to the nearest integer is ______.

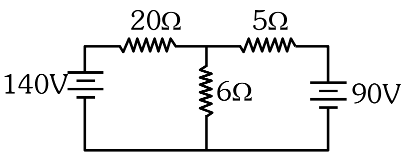
17. Consider a 72 cm long wire AB as shown in the figure. The galvanometer jockey is placed at P on AB at a distance x cm from A. The galvanometer shows zero deflection.



The value of x, to the nearest integer, is

18. Two wires of same length and thickness having specific resistances 6Ω cm and 3Ω cm respectively are connected in parallel. The effective resistivity is ρ Ω cm. The value of ρ, to the nearest integer, is_____.

19.



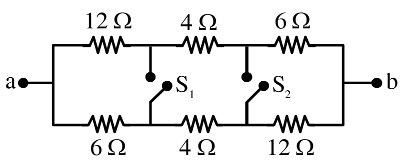
The value of current in the 6Ω resistance is :

(1) 4A (2) 8A
(3) 10A (4) 6A

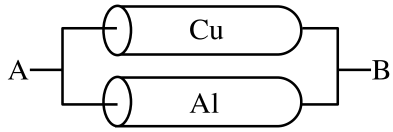
20. A current of 5 A is passing through a non-linear magnesium wire of cross-section 0.04 m^2. At every point the direction of current density is at an angle of 60° with the unit vector of area of cross-section. The magnitude of electric field at every point of the conductor is : (Resistivity of magnesium $\rho = 44 \times 10^{-8}$ Ωm)

(1) 11×10^{-2} V/m (2) 11×10^{-7} V/m
(3) 11×10^{-5} V/m (4) 11×10^{-3} V/m

21. In the given figure switches S_1 and S_2 are in open condition. The resistance across ab when the switches S_1 and S_2 are closed is _________Ω.



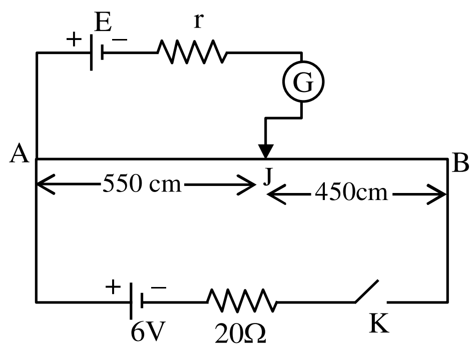
22. A Copper (Cu) rod of length 25 cm and cross-sectional area 3 mm^2 is joined with a similar Aluminium (Al) rod as shown in figure. Find the resistance of the combination between the ends A and B. (Take Resistivity of Copper = 1.7×10^{-8} Ωm Resistivity of Aluminium = 2.6×10^{-8} Ωm)



(1) 2.170 mΩ (2) 1.420 mΩ
(3) 0.0858 mΩ (4) 0.858 mΩ

23. In an electric circuit, a call of certain emf provides a potential difference of 1.25 V across a load resistance of 5 Ω. However, it provides a potential difference of 1 V across a load resistance of 2Ω. The emf of the cell is given by $\frac{x}{10}$ V. Then the value of x is ________.

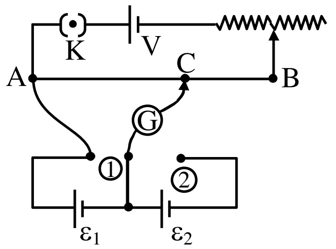
24. In the given figure, there is a circuit of potentiometer of length AB = 10 m. The resistance per unit length is 0.1 Ω per cm. Across AB, a battery of emf E and internal resistance 'r' is connected. The maximum value of emf measured by this potentiometer is :



(1) 5 V (2) 2.25 V (3) 6 V (4) 2.75 V

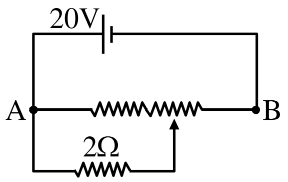
25. An electric bulb rated as 200 W at 100 V is used in a circuit having 200 V supply. The resistance 'R' that must be put in series with the bulb so that the bulb delivers the same power is _____ Ω.

26. In the given potentiometer circuit arrangement, the balancing length AC is measured to be 250 cm. When the galvanometer connection is shifted from point (1) to point (2) in the given diagram, the balancing length becomes 400 cm. The ratio of the emf of two cells, $\frac{\varepsilon_1}{\varepsilon_2}$ is :



(1) $\frac{5}{3}$ (2) $\frac{8}{5}$ (3) $\frac{4}{3}$ (4) $\frac{3}{2}$

27. The given potentiometer has its wire of resistance 10Ω. When the sliding contact is in the middle of the potentiometer wire, the potential drop across 2Ω resistor is :

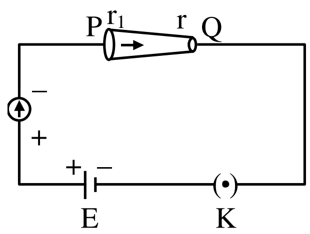


(1) 10 V (2) 5 V

(3) $\frac{40}{9}$ V (4) $\frac{40}{11}$ V

28. A 16 Ω wire is bend to form a square loop. A 9V supply having internal resistance of 1 Ω is connected across one of its sides. The potential drop across the diagonals of the square loop is _________ × 10^{-1} V

29. In the given figure, a battery of emf E is connected across a conductor PQ of length 'l' and different area of cross-sections having radii r_1 and r_2 ($r_2 < r_1$).



Choose the correct option as one moves from P to Q :

(1) Drift velocity of electron increases.

(2) Electric field decreases.

(3) Electron current decreases.

(4) All of these

30. The resistance of a conductor at 15°C is 16 Ω and at 100°C is 20Ω. What will be the temperature coefficient of resistance of the conductor?

(1) 0.010°C^{-1} (2) 0.033°C^{-1}

(3) 0.003°C^{-1} (4) 0.042°C^{-1}

31. For the circuit shown, the value of current at time t = 3.2 s will be ______ A.

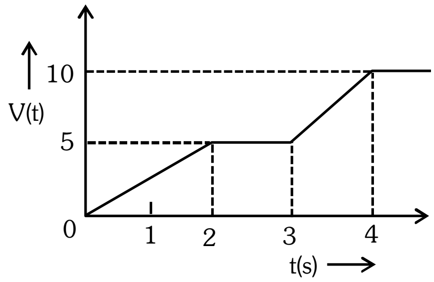


Figure 1

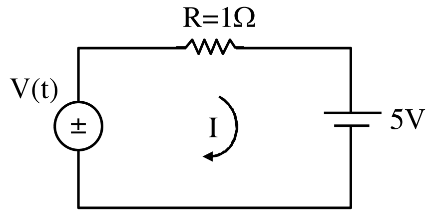
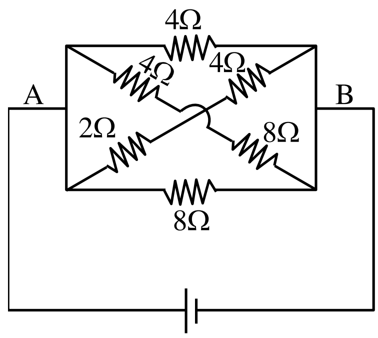


Figure-2

[Voltage distribution V(t) is shown by Fig. (1) and the circuit is shown in Fig. (2)]

32. In the given figure, the emf of the cell is 2.2 V and if internal resistance is 0.6Ω. Calculate the power dissipated in the whole circuit :



2.2 V, r=0.6Ω

(1) 1.32 W (2) 0.65 W

(3) 2.2 W (4) 4.4 W

33. What equal length of an iron wire and a copper-nickel alloy wire, each of 2 mm diameter connected parallel to give an equivalent resistance of 3Ω?
(Given resistivities of iron and copper-nickel alloy wire are 12 μΩ cm and 51 μΩ cm respectively)
(1) 82 m (2) 97 m
(3) 110 m (4) 90 m

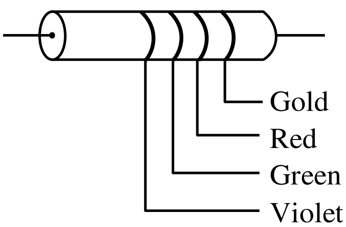
34. If you are provided a set of resistances 2Ω, 4Ω, 6Ω and 8Ω. Connect these resistances so as to obtain an equivalent resistance of $\frac{46}{3}\Omega$.
(1) 4Ω and 6Ω are in parallel with 2Ω and 8 Ω in series
(2) 6Ω and 8Ω are in parallel with 2Ω and 4Ω in series
(3) 2Ω and 6Ω are in parallel with 4Ω and 8 Ω in series
(4) 2Ω and 4Ω are in parallel with 6Ω and 8Ω in series

35. An electric bulb of 500 watt at 100 volt is used in a circuit having a 200 V supply. Calculate the resistance R to be connected in series with the bulb so that the power delivered by the bulb is 500 W.
(1) 20 Ω (2) 30 Ω
(3) 5 Ω (4) 10 Ω

36. Five identical cells each of internal resistance 1Ω and emf 5V are connected in series and in parallel with an external resistance 'R'. For what value of 'R', current in series and parallel combination will remain the same ?
(1) 1 Ω (2) 25 Ω
(3) 5 Ω (4) 10 Ω

37. First, a set of n equal resistors of 10 Ω each are connected in series to a battery of emf 20V and internal resistance 10 Ω. A current I is observed to flow. Then, the n resistors are connected in parallel to the same battery. It is observed that the current is increased 20 times, then the value of n is ....

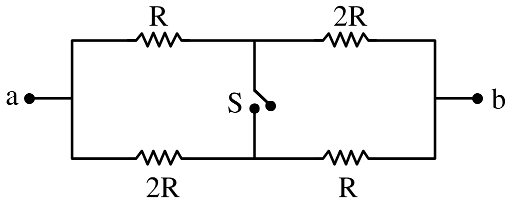
38. The colour coding on a carbon resistor is shown in the given figure. The resistance value of the given resistor is :



(1) (5700 ± 285) Ω (2) (7500 ± 750) Ω
(3) (5700 ± 375) Ω (4) (7500 ± 375) Ω

39. For full scale deflection of total 50 divisions, 50 mV voltage is required in galvanometer. The resistance of galvanometer if its current sensitivity is 2 div/mA will be :
(1) 1 Ω (2) 5 Ω
(3) 4 Ω (4) 2 Ω

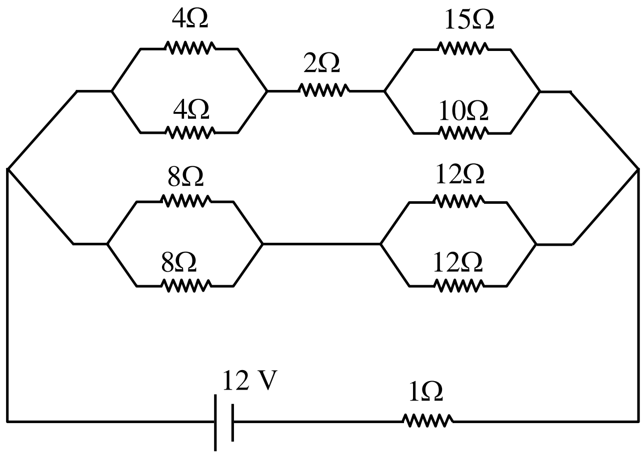
40. The ratio of the equivalent resistance of the network (shown in figure) between the points a and b when switch is open and switch is closed is x : 8. The value of x is _______.



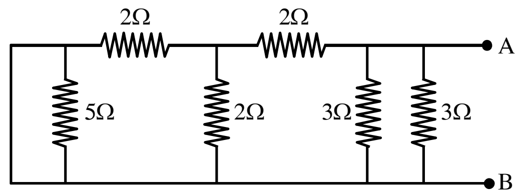
41. Consider a galvanometer shunted with 5Ω resistance and 2% of current passes through it. What is the resistance of the given galvanometer ?
(1) 300 Ω (2) 344 Ω
(3) 245 Ω (4) 226 Ω

42. A square shaped wire with resistance of each side 3Ω is bent to form a complete circle. The resistance between two diametrically opposite points of the circle in unit of Ω will be ______.

43. The voltage drop across 15Ω resistance in the given figure will be______V.



44. The equivalent resistance of the given circuit between the terminals A and B is :



(1) 0 Ω (2) 3Ω
(3) $\frac{9}{2}\Omega$ (4) 1Ω

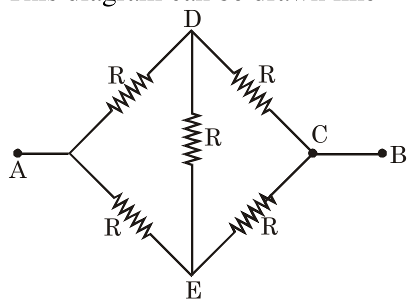
45. A resistor dissipates 192 J of energy in 1 s when a current of 4A is passed through it. Now, when the current is doubled, the amount of thermal energy dissipated in 5 s in______J.

46. A uniform heating wire of resistance 36 Ω is connected across a potential difference of 240 V. The wire is then cut into half and potential difference of 240 V is applied across each half separately. The ratio of power dissipation in first case to the total power dissipation in the second case would be 1 : x, where x is...........

SOLUTION

1. Official Ans. by NTA (4)

Sol. This diagram can be drawn like



It is a wheat stone bridge

$\therefore R_{eq} = \frac{2R \times 2R}{2R + 2R} \Rightarrow R$

2. Official Ans. by NTA (300)

Sol. Work done by battery = Q (ΔV)

$\Rightarrow 20 \times 15 = 300$ J

$\therefore$ Ans. 300

3. Official Ans. by NTA (3)

Sol. $I = \frac{6-4}{10} = \frac{1}{5}$ A

$V_x + 4 + 8 \times \frac{1}{5} - V_y = 0$

$V_x - V_y = -5.6 \Rightarrow |Vx - Vy| = 5.6$ V

4. Official Ans. by NTA (5)

Sol. Conductivity $\sigma = 5 \times 10^7$ S/m

Radius r = 0.5 mm = 5×10^{-4} m

$E = 10 \times 10^{-3} \frac{V}{m}$

$J = \sigma E = 10 \times 10^{-3} \times 5 \times 10^7$

$J = 5 \times 10^5$

$\frac{i}{A} = 5 \times 10^5$

$i = 5 \times 10^5 \times \pi r^2$

$= 5 \times 10^5 \times \pi \times (5 \times 10^{-4})^2$

$= 125\pi \times 10^{-3}$ Amp

$i = 125\ \pi$ mA

$\boxed{x = 5}$ $\boxed{\text{Ans. 5}}$

5. Official Ans. by NTA (1)

Sol. Length of AB = 10 m

For battery E_1, balancing length is l_1

$l_1 = 380$ cm [from end A]

For battery E_2, balancing length is l_2

$l_2 = 760$ cm [from end A]

Now, we know that $\frac{E_1}{E_2} = \frac{l_1}{l_2}$

$\Rightarrow \frac{E_1}{E_2} = \frac{380}{760} = \frac{1}{2} = \frac{a}{b}$

$\therefore$ a = 1 & b = 2 a = 1

6. Official Ans. by NTA (2)

Sol. For parallel combination current devides in the inverse ratio of resistance.

$i_{PQ} = \frac{2}{6} \times 6$ A

7. Official Ans. by NTA (1)

Sol. $R_0 = 1\Omega$ $R_1 = ?$

$\ell_0 = 1$m $\ell_1 = 1.25$m

$A_0 = A$

As volume of wire remains constant so

$A_0\ell_0 = A_1\ell_1 \Rightarrow A_1 = \frac{\ell_0 A_0}{\ell_1}$

Now

Resistance (R) = $\frac{\rho\ell}{A}$

$\frac{R_0}{R_1} = \frac{\ell_0 / A_0}{\rho\ell_1 / A_1}$

$\frac{1}{R_1} = \frac{\ell_0}{A_0}\left(\frac{\ell_0 A_0}{\ell_1 \times \ell_1}\right)$ $R_1 = \frac{\ell_1^2}{\ell_0^2} = 1.5625\Omega$

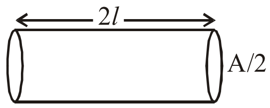
So % change in resistance

$= \frac{R_1 - R_0}{R_0} \times 100\% = \frac{1.5625 - 1}{1} \times 100\%$

= 56.25%

8. Official Ans. by NTA (1)

Sol. As per the question

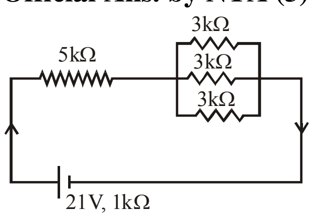


Resistance = $\frac{\rho(2l)}{(A/2)} = \frac{4\rho l}{A}$

$\Rightarrow$ Current = $\frac{V}{R} = \frac{VA}{4\rho l}$

9. Official Ans. by NTA (3)

Sol.



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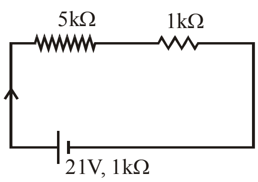


$I = \frac{21}{5+1+1} = 3$ mA

10. Official Ans. by NTA (4)

Sol. $500 = (1.5)^2 \times R \times 20$

$E = (3)^2 \times R \times 20$

$E = 2000$ J

11. Official Ans. by NTA (2500)

Sol. Ans. (2500)

$Q = i^2 RT$

$$R = \frac{Q}{i^2 t} = \frac{10\times10^{-3}}{4\times10^{-6}\times1} = 2500\ \Omega$$

12. Official Ans. by NTA (2)

Sol. $i = 10A$, $A = 5\ mm^2 = 5 \times 10^{-6}\ m^2$

and $v_d = 2 \times 10^{-3}$ m/s

We know, $i = neAvd$

$\therefore\ 10 = n \times 1.6 \times 10^{-19} \times 5 \times 10^{-6} \times 2 \times 10^{-3}$

$\Rightarrow n = 0.625 \times 10^{28} = 625 \times 10^{25}$

13. Official Ans. by NTA (4)

Sol. $R_1 + R_2 = s$ ... (1)

$$\frac{R_1R_2}{R_1+R_2} = p \ ...\ (2)$$

$R_1R_2 = sp$

$R_1R_2 = np^2$

$$R_1 + R_2 = \frac{nR_1R_2}{(R_1+R_2)}$$

$$\frac{(R_1+R_2)^2}{R_1R_2} = n$$

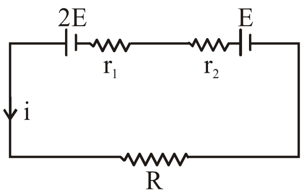
for minimum value of n

$R_1 = R_2 = R$

$$\therefore\ n = \frac{(2R)^2}{R^2} = 4$$

14. Official Ans. by NTA (2)

Sol. (2)



$$i = \frac{3E}{R + r_1 + r_2}$$

$TPD = 2E - ir_1 = 0$

$2E = ir_1$

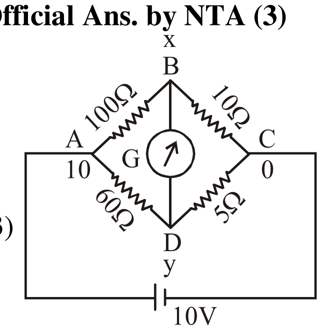
$$2E = \frac{3E\times r_1}{R + r_1 + r_2}$$

$2R + 2r_1 + 2r_2 = 3r_1$

$$R = \frac{r_1}{2} - r_2$$

15. Official Ans. by NTA (3)

Sol. (3)



$$\frac{x-10}{100} + \frac{x-y}{15} + \frac{x-0}{10} = 0$$

$53x - 20y = 30$ .....(1)

$$\frac{y-10}{60} + \frac{y-x}{15} + \frac{y-0}{5} = 0$$

$17y - 4x = 10$ ......(2)

on solving (1) & (2)

$x = 0.865$

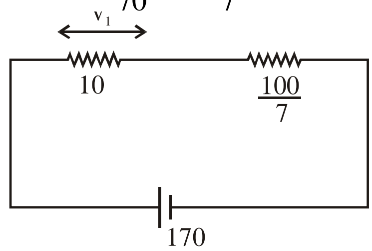
$y = 0.792$

$\Delta V = 0.073\ R = 15\Omega$

$i = 4.87$ mA

16. Official Ans. by NTA (70)

Sol. $$R_{eq_1} = \frac{50\times20}{70} = \frac{100}{7}$$



$$R_{eq} = \frac{170}{7}$$

$$v_1 = \left[\frac{170}{\frac{170}{7}}\right]\times10 = 70v$$

Ans. = 70.00

17. Official Ans. by NTA (48)

Sol. In Balanced conditions

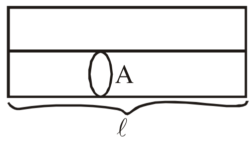
$$\frac{12}{6} = \frac{x}{72-x}$$

$x = 48$ cm

18. Official Ans. by NTA (4)

Sol. $\because$ in parallel

$$R_{net} = \frac{R_1R_2}{R_1+R_2}$$



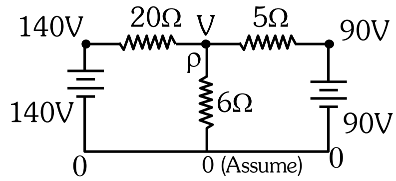
$$\frac{\rho\ell}{2A} = \frac{\rho_1\frac{\ell}{A}\times\rho_2\frac{\ell}{A}}{\rho_1\frac{\ell}{A}+\rho_2\frac{\ell}{A}}$$

$$\frac{\rho}{2} = \frac{6\times3}{6+3} = 2$$

$\rho = 4$

19. Official Ans. by NTA (3)

Sol.



Applying KCL at point P,

$$\frac{V-0}{6}+\frac{V-90}{5}+\frac{V-140}{20}=0$$

$\Rightarrow$ 10 V + 12 V – 1080 + 3V – 420 = 0

$\Rightarrow$ V = 60

$\therefore$ current in 6Ω = $\frac{V-0}{6}=10A$

Hence option 3.

20. Official Ans. by NTA (3)

Sol. $I=\vec{J}\cdot\vec{A}=JA\cos(\theta)$

$$5=J\left(\frac{4}{100}\right)\times\cos(60)$$

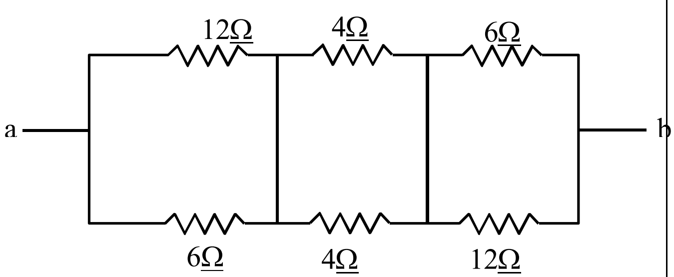
J = 5 × 50 = 250 A/m^2

Now, $\vec{E}=\rho\cdot\vec{J}$

= 44 × 10^{-8} × 250 = 11 × 10^{-5} V/m

21. Official Ans. by NTA (10)

Sol. when switch S_1 and S_2 are closed



$$\frac{12\times6}{12+6}+2+\frac{6\times12}{6+12}$$

$$\frac{72}{18}+2+\frac{72}{18}=4+2+4=10\Omega$$

22. Official Ans. by NTA (4)

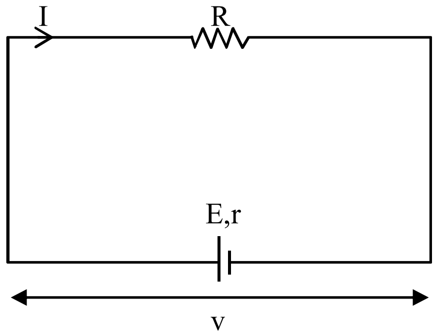
Sol. $R=\frac{R_1R_2}{R_1+R_2}=\frac{\ell}{A}\cdot\frac{\rho_1\rho_2}{\rho_1+\rho_2}$

$$R=\frac{25\times10^{-2}}{3\times10^{-6}}\times\frac{1.7\times2.6\times10^{-16}}{4.3\times10^{-8}}$$

R = 0.858 mΩ

23. Official Ans. by NTA (15)

Sol.



Terminal voltage v = iR = $\frac{ER}{R+r}$

1st $\rightarrow$ 1.25 = $\frac{E(5)}{5+r}$ ..(i)

2nd $\rightarrow$ 1 = $\frac{E(2)}{2+r}$ ...(ii)

By (i) and (ii)

$r=1\Omega, E=\frac{3}{2}V=\frac{15}{10}\text{volt}\ \Rightarrow x=15$

24. Official Ans. by NTA (1)

Sol. Max. voltage that can be measured by this potentiometer will be equal to potential drop across AB

R_{AB} = 10 × 0.1 × 100 = 100 ohm.

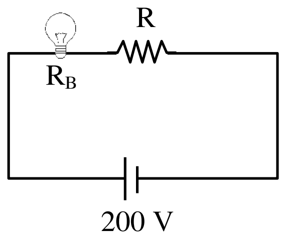
$$\therefore V_{AB}=\frac{6}{20+100}\times100=6\times\frac{100}{120}=5V$$

25. Official Ans. by NTA (50)

Sol. Power, P = $\frac{V^2}{R_B}$

$$R_B=\frac{V^2}{P}=\frac{100\times100}{200}$$

R_B = 50Ω



To produce same power, same voltage (i.e. 100 V) should be across the bulb

Hence, R = R_B

R = 50 Ω

26. Official Ans. by NTA (1)

Sol. $E_1 = k\ell_1$ … (i)

$E_1 + E_2 = k\ell_2$ … (ii)

$$\frac{E_1}{E_1+E_2} = \frac{\ell_1}{\ell_2} = \frac{250}{400} = \frac{5}{8}$$

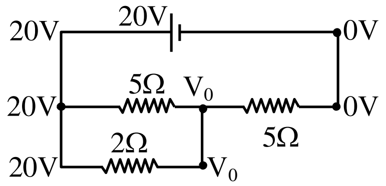
$8E_1 = 5E_1 + 5E_2$

$3E_1 = 5E_2$

$$\frac{E_1}{E_2} = \frac{5}{3}$$

27. Official Ans. by NTA (3)

Sol.



$$\frac{20-V_0}{5} + \frac{0-V_0}{5} + \frac{20-V_0}{2} = 0$$

$$4 + 10 = \frac{2V_0}{5} + \frac{V_0}{2}$$

$$14 = \frac{4V_0 + 5V_0}{10}$$

$$V_0 = \frac{140}{9}\text{Volt}$$

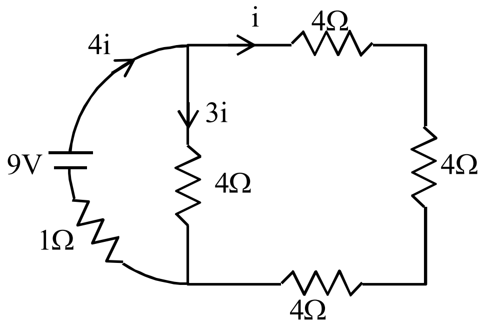
Potential difference across 2Ω resistor is $20 - V_0$

That is $\left(20 - \frac{140}{9}\right)$Volt

Hence answer is $\left(\frac{40}{9}\right)$Volt

28. Official Ans. by NTA (45)

Sol. here assume current as



By KVL in outer loop

$9 - 12i - 4\,i = 0$

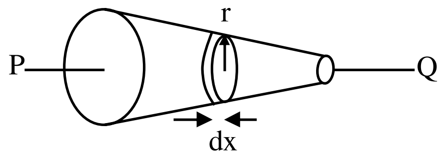
$16i = 9$

$$8i = \frac{9}{2} = 4.5$$

$= 45 \times 10^{-1}$

29. Official Ans. by NTA (1)

Sol.



Current is constant in conductor

i = constant

Resistance of element $dR = \frac{\rho dx}{\pi r^2}$

$$dV = idR = \frac{i\rho dx}{\pi r^2}$$

$$E = \frac{dV}{dx} = \frac{i\rho}{\pi r^2} \ \& \ V_d = \frac{eE\tau}{m}$$

$$\therefore V_d \propto E \to E \propto \frac{1}{r^2}$$

if r decreases , E will increase $\therefore$ V_d will increase

30. Official Ans. by NTA (3)

Sol. $16 = R_o\,[1 + \alpha\,(15 - T_o)\,]$

$20 = R_o\,[1 + \alpha\,(100 - T_o)\,]$

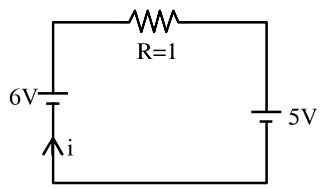
Assuming $T_o = 0°C$, as a general convention.

$$\Rightarrow \frac{16}{20} = \frac{1+\alpha\times15}{1+\alpha\times100}$$

$\Rightarrow \alpha = 0.003\ °C^{-1}$

31. Official Ans. by NTA (1)

Sol. From graph voltage at t = 3.2 sec is 6 volt.

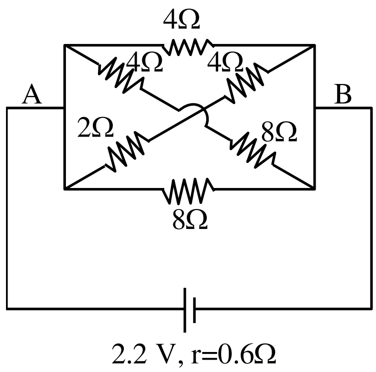


$$i = \frac{6-5}{1}$$

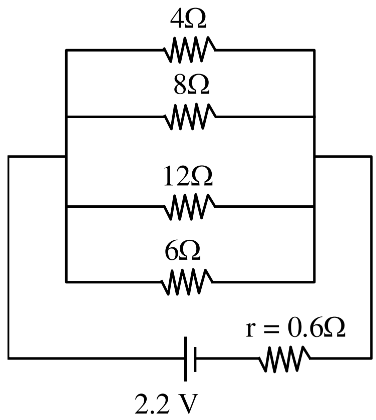
i = 1 A

32. Official Ans. by NTA (3)

Sol.



⇒



$$\frac{1}{R_{eq}}=\frac{1}{4}+\frac{1}{8}+\frac{1}{12}+\frac{1}{6}=\frac{6+3+2+4}{24}=\frac{15}{24}$$

$$R_{eq}=\frac{24}{15}=1.6\Rightarrow R_T=1.6+0.6=2.2\Omega$$

$$P=\frac{V^2}{R_T}=\frac{(2.2)^2}{2.2}=2.2W$$

Option (3)

33. Official Ans. by NTA (2)

Sol. $\frac{R_1R_2}{R_1+R_2}=3$

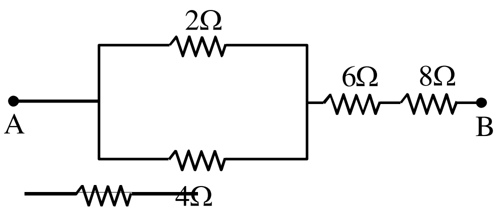
$$\frac{\frac{(12\times10^{-6}\times10^{-2})\ell\times4}{\pi(2)^2\times10^{-6}}\times\frac{(51\times10^{-6}\times10^{-2})\ell\times4}{\pi(2)^2\times10^{-6}}}{\frac{63\times10^{-6}\times10^{-2}\times\ell\times4}{\pi(2)^2\times10^{-6}}}$$

$\Rightarrow \ell=97m$

Option (2)

34. Official Ans. by NTA (4)

Sol.

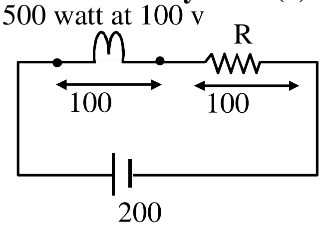


$\frac{46}{3}\Omega$

Ans 4

35. Official Ans. by NTA (1)

500 watt at 100 v



Sol.

P = Vi

500 = Vi

i = 5 Amp

V = i × R

R = 20 Ans. 1

36. Official Ans. by NTA (1)

Sol. $i_1=\frac{25}{5+R}$

$i_2=\frac{5}{R+\frac{1}{5}}$

$i_1=i_2\Rightarrow 5\left(R+\frac{1}{5}\right)=5+R$

4R = 4 R = 1Ω

37. Official Ans. by NTA (20)

Sol. In series

$R_{eq}=nR=10\,n$

$i_s=\frac{20}{10+10n}=\frac{2}{1+n}$

in parallel

$R_{eq}=\frac{10}{n}$

$i_p=\frac{20}{\frac{10}{n}+10}=\frac{2n}{1+n}$

$\frac{i_p}{i_s}=20;\ \frac{\left(\frac{2n}{1+n}\right)}{\left(\frac{2}{1+n}\right)}=20$

n = 20

38. Official Ans. by NTA (4)

Sol. R = 75 × 10^2 ± 5% of 7500

R = (7500 ± 375)Ω

39. Official Ans. by NTA (4)

Sol. $I_{max}=\frac{50}{2}=25mA$

R $=\frac{V}{I}=\frac{50mV}{25mA}=2\Omega$

40. Official Ans. by NTA (9)

Sol. $R_{eq\ open}=\frac{3R}{2}$

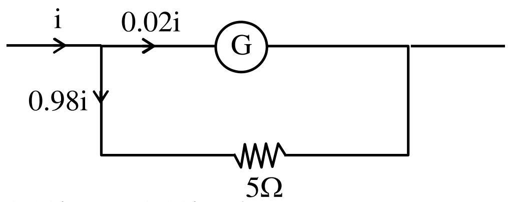
$R_{eq\ closed}=2\times\frac{R\times2R}{3R}=\frac{4R}{3}$

$\frac{R_{eq\ open}}{R_{eq\ closed}}=\frac{3R}{2}\times\frac{3}{4R}=\frac{9}{8}$

∴ x = 9

41. Official Ans. by NTA (3)

Sol.



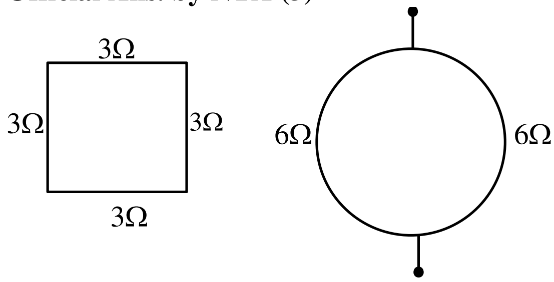
0.02i Rg = 0.98i × 5

Rg = 245 Ω

Option (3)

42. Official Ans. by NTA (3)

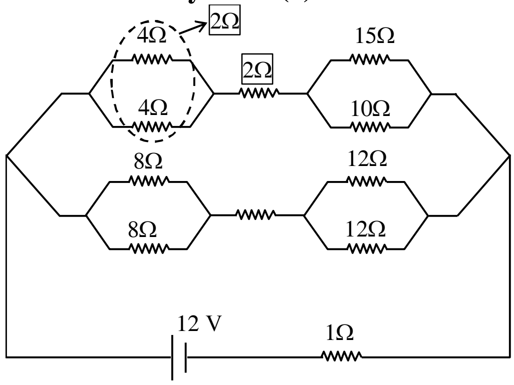
Sol.



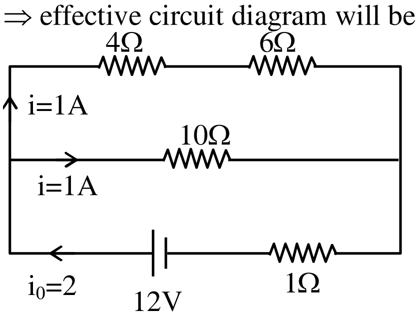
$R_{eq} = 3\Omega$

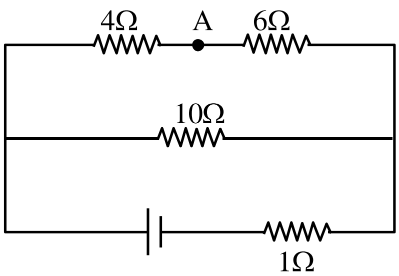
43. Official Ans. by NTA (6)

Sol.

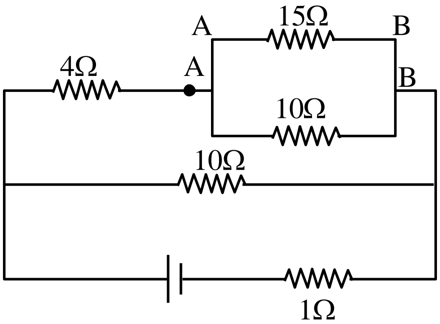


⇒ effective circuit diagram will be





⇒

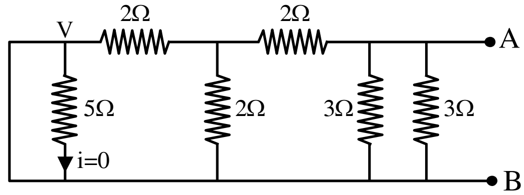


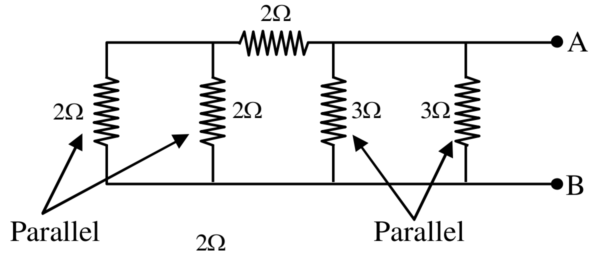
Point drop across $6\Omega = 1 \times 6 = 6 = V_{AB}$

⇒ Hence point drop across $15\Omega = 6$ volt $= V_{AB}$

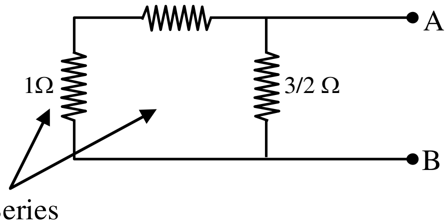
44. Official Ans. by NTA (4)

Sol.





⇒



$$R_{eq} = \frac{3 \times 3/2}{3 + 3/2} = \frac{9/2}{9/2} = 1\Omega$$

45. Official Ans. by NTA (3840)

Sol. $E = i^2Rt$

$192 = 16\,(R)\,(1)$

$R = 12\ \Omega$

$E^1 = (8)^2\,(12)\,(5) = 3840$ J

46. Official Ans. by NTA (4)

Sol. First case $P_1 = \frac{V^2}{R} = \frac{(240)^2}{36}$

Second case Resistance of each half = 18 Ω

$$P_2 = \frac{(240)^2}{18} + \frac{(240)^2}{18} = \frac{(240)^2}{9}$$

$$\frac{P_1}{P_2} = \frac{1}{4}$$

x = 4.00