PHYSICS

AAKASH INSTITUTE ENGLISH

CURRENT ELECTRICITY

EXAMPLE

1. 10^6 positrons are flowing normally through an area in forward direction and same amount of electrons are flowing in backward direction in the interval of 10 ms.Find the current through the area.

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2. Charge through a cross-section of a conductor is given by $Q = (2t^2 + 5t)C$. Find the current through the conductor at the instant

$t = 2s.$

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3. What do you mean by thermal motion of free electrons in conductors ?

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4. Can electrons produce current due to their thermal speed . Explain.

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5. Resistance of a conductor of length l and area of cross-section A is R. If its length is doubled and area of cross-section is halved, then find its new resistance.

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6. If $\overrightarrow{j}$ and $\overrightarrow{E}$ are current and electric field inside a current carrying conductor at an instant then $\overrightarrow{j}.Vec(E)$ is

(1) Positive (2) Negative

(3) Zero (4) May be positive or negative

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7. Find the average drift speed of free electrons in a copper wire of area of cross-section $10^{-7}m^2$ carrying current of 1.5 A and having free electron density $8.5 \times 10^{28}m^{-3}$

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8. What are the possible paths of free electrons inside the conductor ?

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9. Find the resistance of following carbon resistor .

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10. Resistance of platinum wire in a platinum resistance thermometer at melting ice, boiling water and at a hot bath are $5\Omega, 5.5\Omega$ and 5.2Ω respectively . Find temperature of hot bath.

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11. Current 2 A is flowing through a conductor fo resistance 4 Ω . Find the electrical energy consumedin 10 s.

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12. Two resistance 12 Ω and 4Ω are supplied to you . Find the maximum and minimum resistance that can be achieved by using form .

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13.

Find the resistance across AB.

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14. A cell of emf 10V and internal resistance 5Ω is connected across a resistance 15Ω. Find potential difference across AB.

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15.

In the network shown in the above figure, find the current through 3Ω and 10Ω resistances.

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16. When a dry a cell is connected acrossa bulb and the circuit is switched on , then the brightness of bulb goes on decreasing . Explain.

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17. What is the relationship between potential difference across the terminalsof a cell and emf of the cell?

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18. A cell of emf ε and internal resistance r is connected across a load resistance R

(i) Find the maximum power delivered at the load ?

.

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19. A cell develops the same power across two resistances R_1 and R_2 separately. The internal resistance of the cell is

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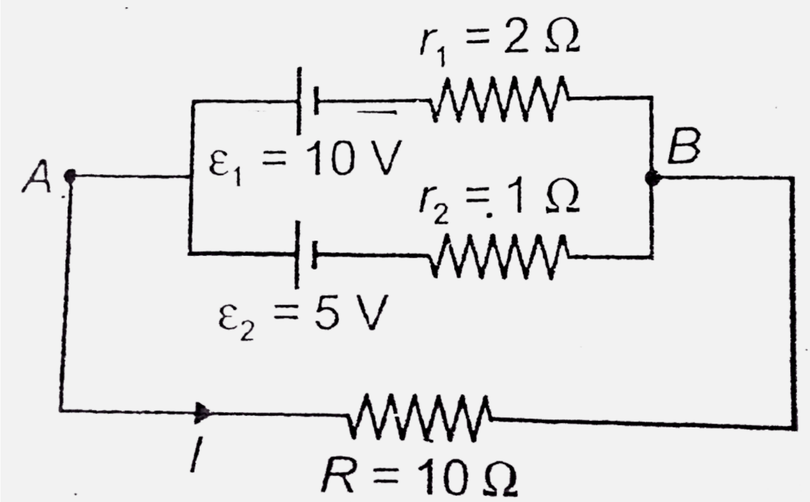
20. Find the current I through then 10Ω resistance in the network shown in figure.



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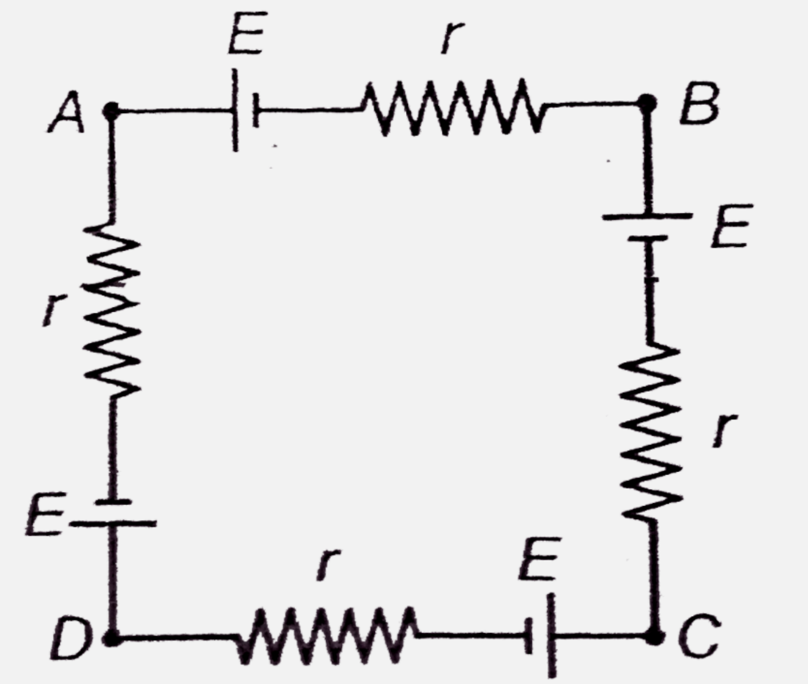
21. Four cells each of emf E and internal resistance r are connected in series to form a loop ABCD. Find potential difference across (1) AB, (2) AC



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22. Two cells of emf E each and internal resistance r_1 and r_2 are connected in series across a load resistance R. If potential difference across the first cell is zero, then find the relation between R, r_1 and r_2

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23. In the network in given find l_1, l_2 and I.

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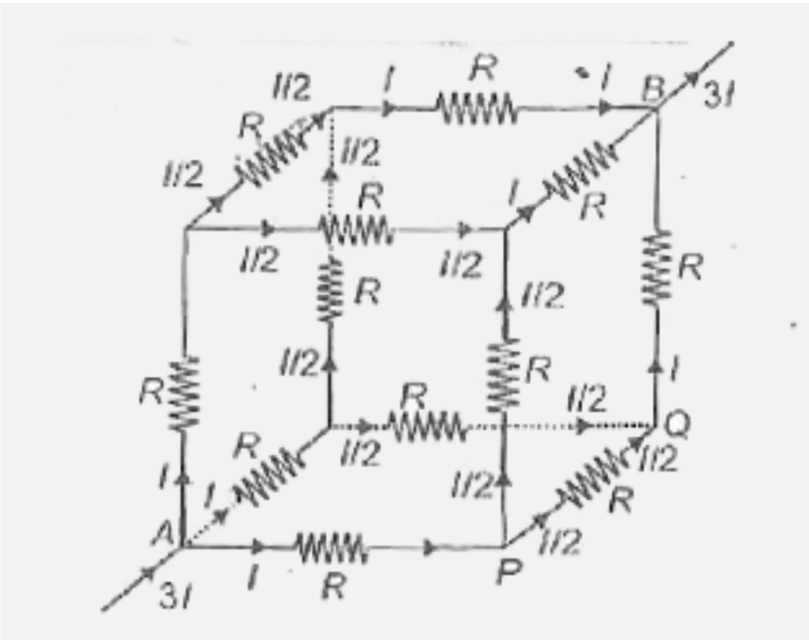
24. 

Twelve indentical resistance each of resistance R are joined to form a cube as shown in figure. Find resistance of the combination across AB.

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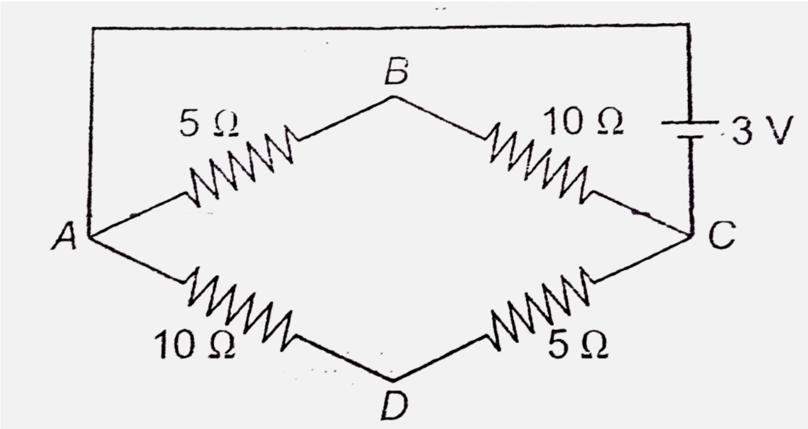
25. In the network shown in given figure, find the potential difference across BD



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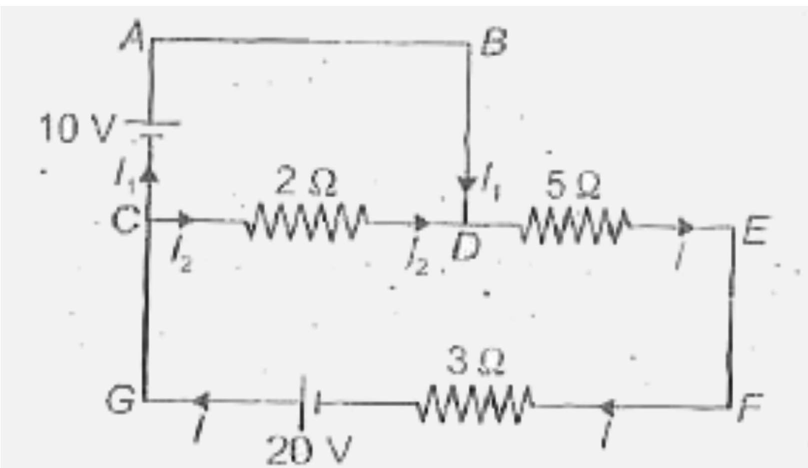
26. In the network shown in given figure the current I_1 through the 10 V battery .



A. 2V

B. 3V

C. 4V

D. $\frac{0.101}{\sqrt{}}$V

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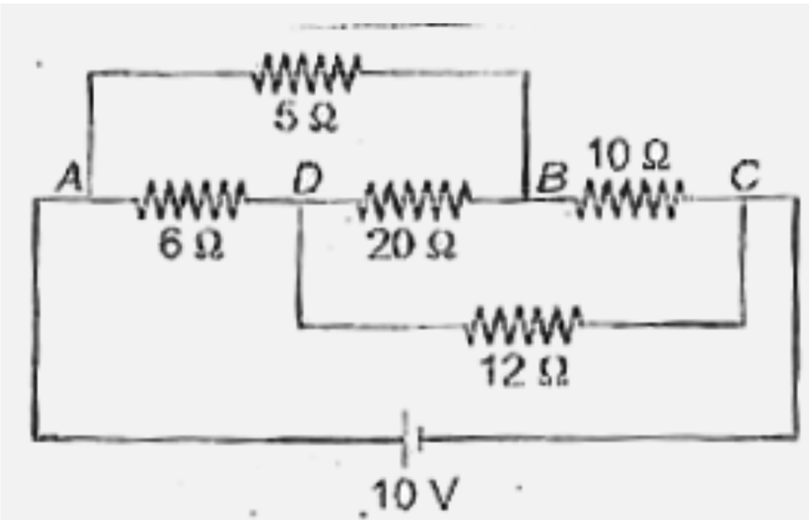
27. 

In the above network , find the current through the 20Ω resistance and current through the battery .

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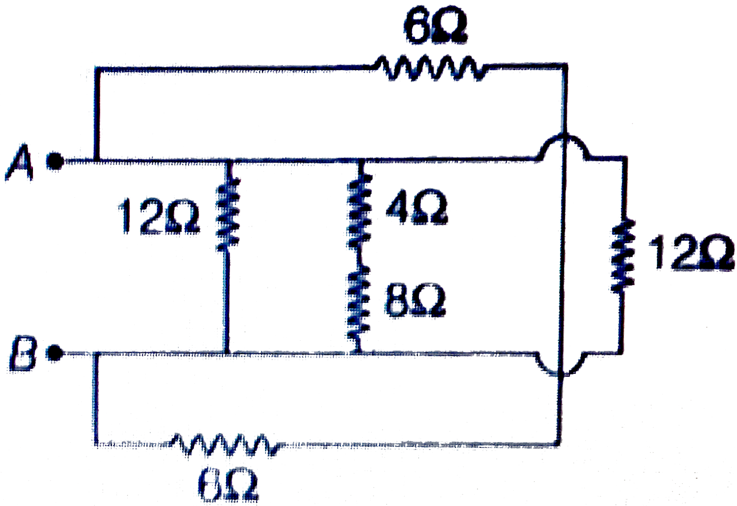
28. The equivalent resistance across AB in the given network is



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29.

In ther meter bridge circuit shown in figure. Find the length AB for null deflection in galvanometer.

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30. In a potentiometer arrangement a cell of emf 1.5 V gives a balance point at 30 cm length of wire. Now, when the cell is replaced by another celle , the balance point shifts to 50 cm. What is the emf of second cell ?

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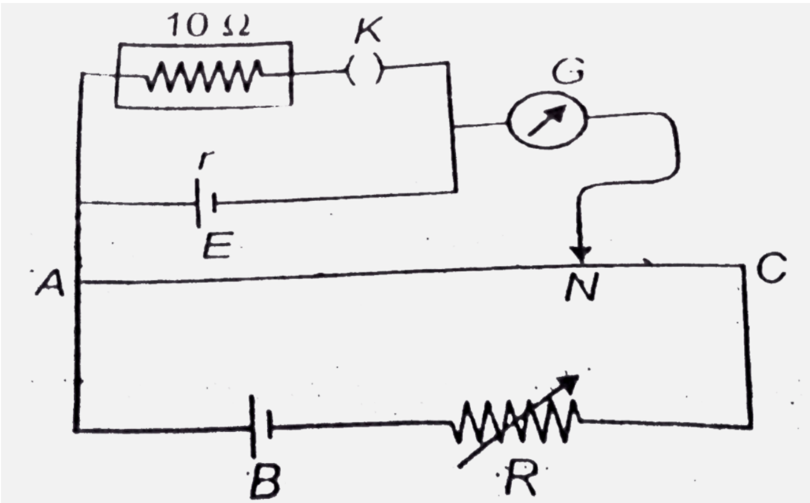
31.



In the given potentiometer circuit internal resistance r of the cell of emf ε is to be determined when K is open balance point is obtained at $N_1, AN_1 = 60cm$. When K is close balance point is obtained at $N_2, AN_2 = 50cm$, what is the value of r ?

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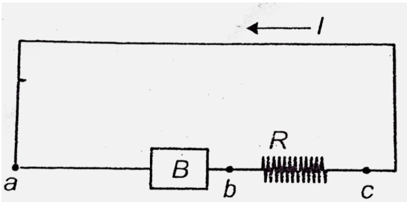
32. Figure shows a battery B having emf resistor having resistance R in a closed circuit.

(1) Show arrow for emf E of the battery B.

(2) Arrange points a,b,c in decreasing order of magnitude of current

(3) Arrange points a,b,c in decreasing order of electric potential .

(4) Arrane points a,b. In increasing order of electric potential energy of charge carriers.



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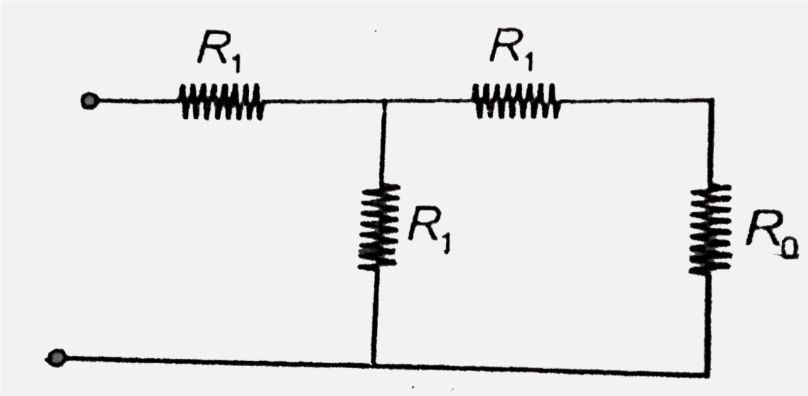
33. Consider the circuit shown in figure . For a given resistance R_0 what must be the value of R_1 so that the equivalent resistance between the terminals is equal to R_0 ?



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34. The figure shows an infinite circuit formed by the repetiton of the same link , consisting of resistance $R_1 = 4.0\Omega$ and $R_2 = 3.0\Omega$. Find the resisance of this circuit between points A and B.

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35. Figure (A) and (B) show two resistors with resistances R_1 and R_2 connected in parallel and in series. The battery has a terminal voltage of e.

Suppose R_1 and R_2 are connected in parallel .

(a) Find the power delivered to each resistor.

(b) Show that the power used by each resistor is equal to the power supplied by the battery .

Suppose R_1 and R_2 are now connected in series

(c) Find teh power delivered to each resistor.

(d) Show that the sum of the power by each resistor is equal to the power supplied by the battery.

(e) Which configuration , parallelor series, uses more power ?

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36. An electric kettle used for heating water has two heating elements. One raises the temperature of water by $\Delta\theta$ in time t_1 and another in time t_2. Assuming no loss of heat , find the time taken to raise the temperature by $\Delta\theta$.

(i) When heating elements are connected in series.

(ii) When heating elements are connected in parallel.

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37. In an experiment to measure the membrane potential of a living plant cell micro-electrodes are placed inside and outside the cell. The membrane potential is measured to be 120 mV and a current of 1.5 nA flows through the membrane .Assume that the current density in the cell is uniform.

The total area of the cell membrane is $2.0mm^2$ and its thickness is 12 μm.

(a) What is the current density in the membrane?

(b) What is the resistivity of the membrane ?

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38. The following table gives the current I (in amperes) through two devies for several values of potential differences V(in volt) . From these data which does not obey ohm's law ?

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39. Two 100W bulbs one having the tungsten filament and the other carbon filament are joined in series with a power supply. How will their brightness change as time passes on .

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40. Resistance thermometer . The variation in electrical resistance with temperature can be used to make precise temperature measurements. Platinum is commonly used since it is relatively free from corrosive effects and has a high melting point. Suppose at $20.0^{\circ} C$ the resistance of a platnum resistance thermometer is 164.2Ω When praised in a particular solution, the resistance is187.4Ω . What is the temperature of this solution ?

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41. A current is flowing through a cylinderical conductor of radius R, such that current density at any cross-section is given by $J = J_0\left(1 - \frac{r}{R}\right)$, where r is radial distance from axis of the cylinder .Calculate the total current through the cross-section of the conductor.

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42. A chrged spherical conductor a radius and charge q, is surrounded another charged concentric spehere of $b(b > a)$. The potential difference between conductors is V. When, the spherical conductor of radius b is discharged completely then the potential between conductor will be

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43. Two metal balls of the same radius a are located in a homongenous poorly conducting medium with resistivity ρ. Find the resistance of the medium between the balls provided that the separation between them is mush greater than the radius of the ball.

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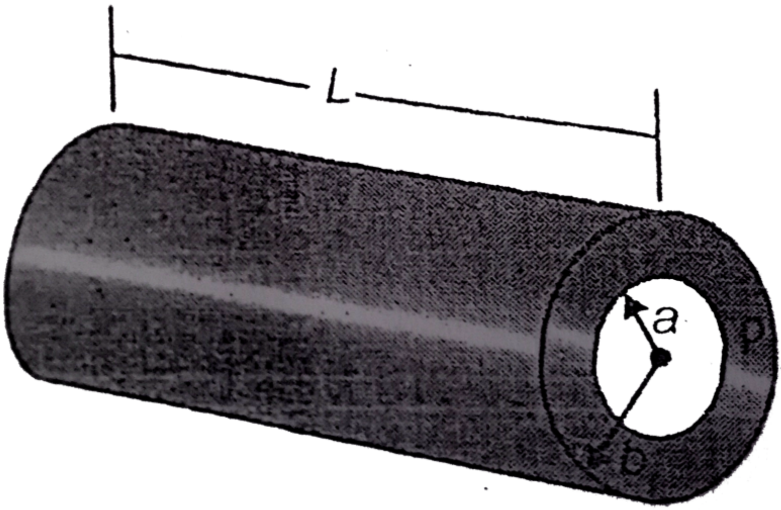
44. Consider a hollow cylinder of length L and inner radius a and outer radius b, as shown in figure. The material has resistivity ρ.



A hollow cylinder

(a) Suppose a potential difference is applied between te ends of the cylinder and produces a current parallel to the axis. What is the resistance measure ?

(b) If instead the potential difference is applied between the inner outer surfaces so that current flows radially outward, what is the resistance measure ?

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45. When a celll is connected to an external resistance R_1, current through it is i_1. When the same cell is connected to an external resistance R_2, current through it is i_2. Calculate the emf and internal resisance of the cell.

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46. In the circuit shown, find the terminal potential difference across each cell. Also,if $\varepsilon_1 = \varepsilon_2$, find the condition that terminal potential difference across the cell of emf ε_1 is zero .

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47. Figure shows 3n cells connected in series to form a circuit r is the internal resistance of each cell and e is th eemf of each cell. If polarity of n cells are reversed , find the terminal voltage across cell A.

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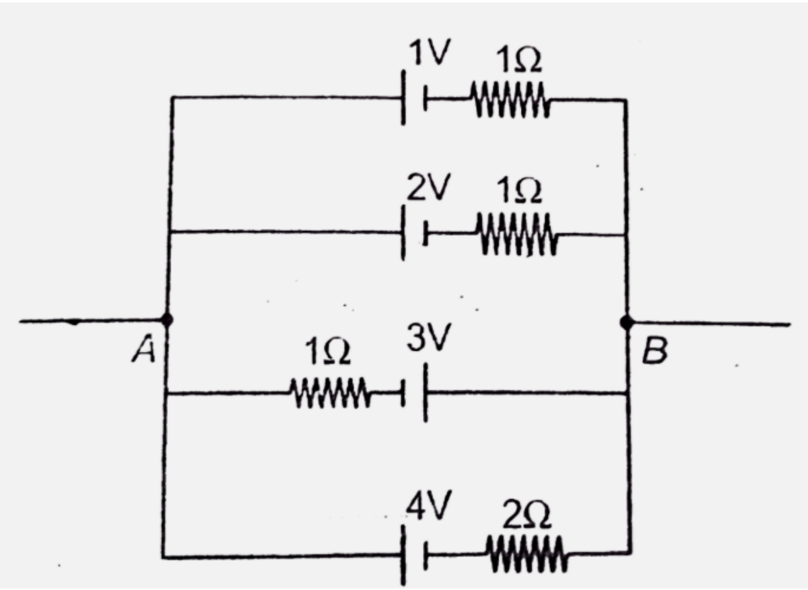
48. Find equivalent emf of four different cells which are connected in parallel. Their emf's and internal resistance are 1 volt, 1Ω, 2 volt, 1Ω, 3 volt, 1Ω, 4 volt, 2Ω and their connection is given below .



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49. In the circuit shown , find the current through the battery when switch S is (i) open (ii) closed.

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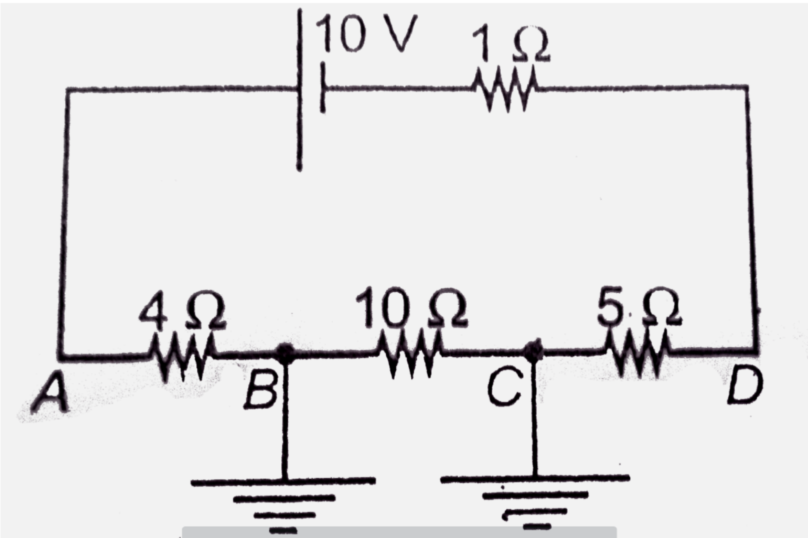
50. In the electrical circuit shown, points B and C are earthed . Find the potentials of points A and D .



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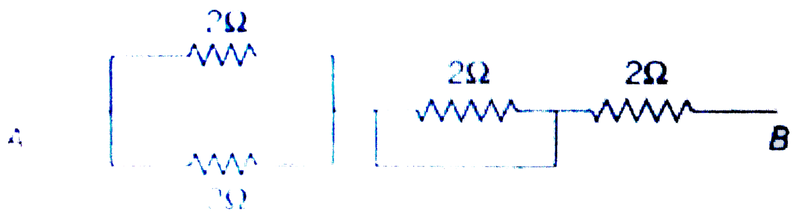
51. Find equivalent resistance between A and B



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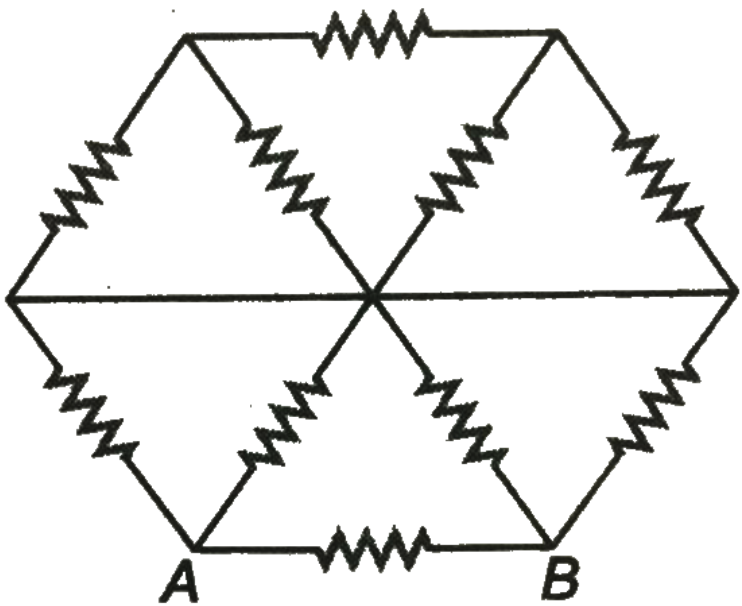
52. In the network shown, each resistance is R. Calculate the equivalent resistance between A and B.



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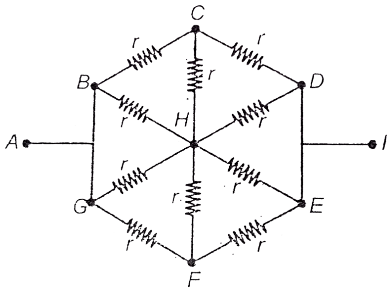
53. Find the effective resistance between A and I if $r = 2\Omega$



Strategy : (1) Remove CH and HF since they are at the same potential of symmetric network.

(2) Find the equivalent resistance between A and I.

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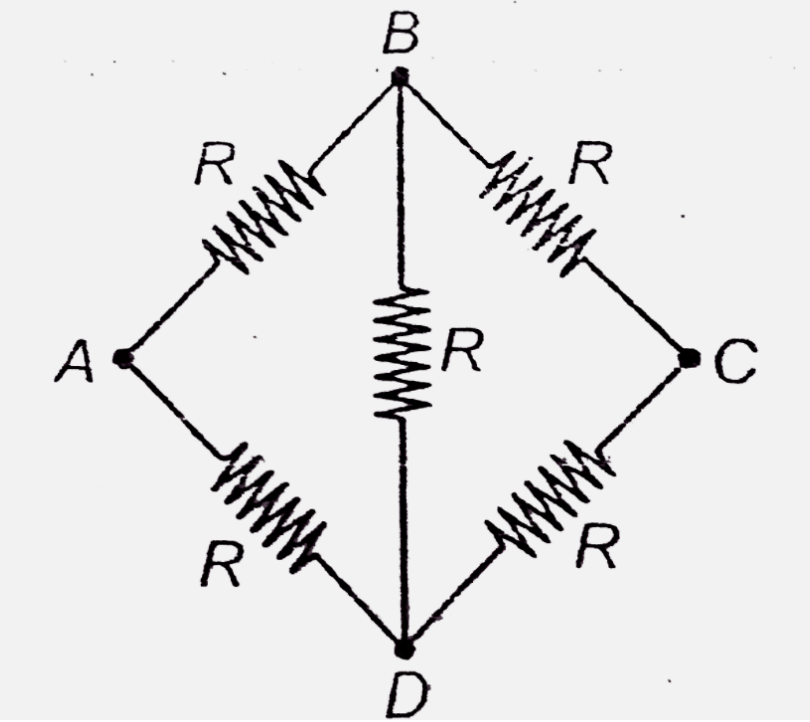
54. Five equal resistance each of value R are connected in a circuit . Find equivalent resistance of the network between points A and C



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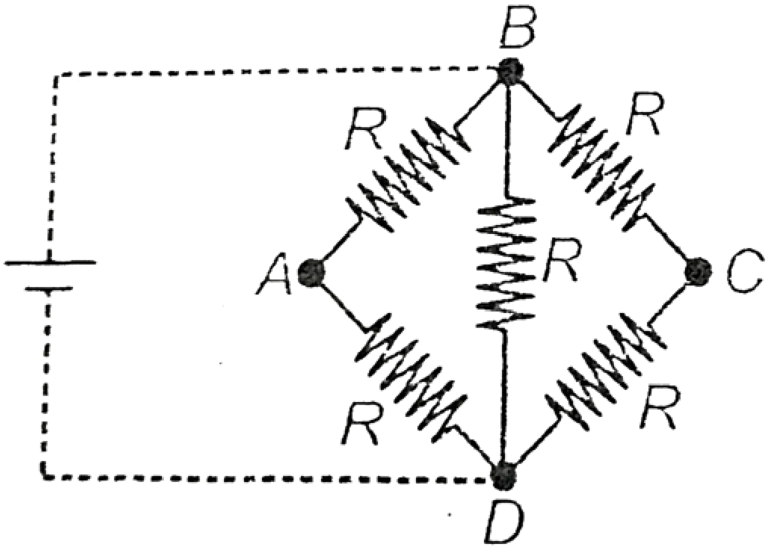
55. Refer to the figure , find equivalent resistance between points B and D.



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56. Find the equivalent resistance between A and B

Strategy : Step- 1 : Convert the triangles of resistance between the points AC,CB,BD,DA

Step -2 : Simplify the circuit in the form of a bridge of four arms.

Step-3 : Check whether bridge is balanced or not.

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57. In the given square each side is of 1m and resistance of wire is $1\Omega/m$ and resistance between AE is 1Ω. A constant potential difference is applied across A and C. If potentials of B and E are same, then

(a) $\frac{CE}{ED}=\frac{1}{\sqrt{2}}$ (b) $\frac{CE}{ED}=1$

(c) $\frac{CE}{ED}=2$ (d) $\frac{CE}{ED}=\sqrt{2}$

Strategy : The potential of points B and E will be same , when this is a balanced bridge circuit.

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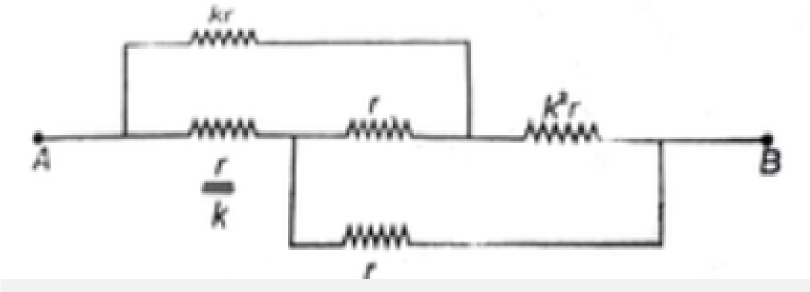
58. Find the equivalent resistance of the network shown in figure between points A and B.



where k is a positive constant.

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59. Find the equivalent resistance between P and Q of the given network.

Strategy : (1) Remove the resistance between 1,2 and 2,3 since it is symmetrical network.

(2) Find R_{PQ}.

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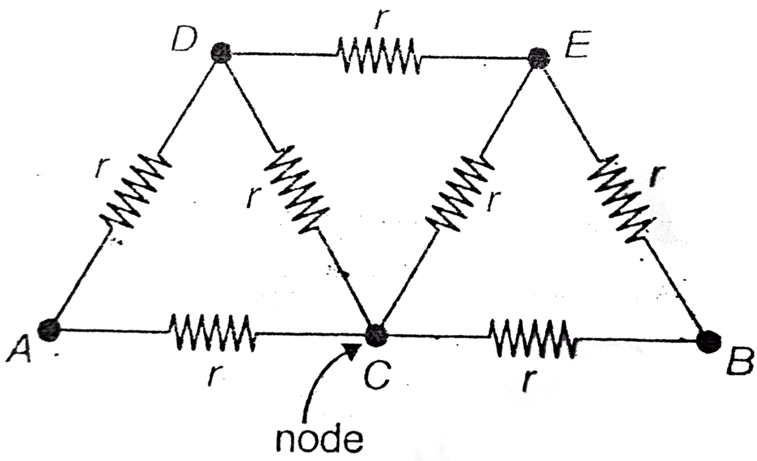
60. In the following circuit , find the value of R_{AB}



Strategy : (1) The symmetry suggests that current flowing from D to C will be equal to current flowing from C to E.

(2) Remove the node C and change the circuit as follows and find R_{AB}.

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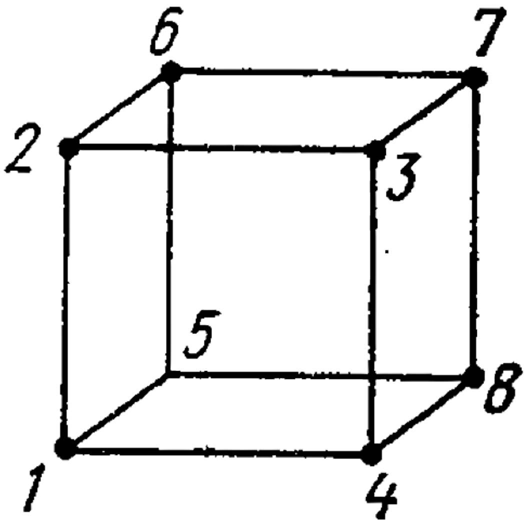
61. Find the resistance of a wire frame shaped as cube (Fig) when measured between points (a) 1.7, (b) 1.2, (c) 1.3.

The resitance of each edge of the frame is R



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62. In the given each of the segments has resistance R, EMF of battery is E and internal resistance is negligible. Find ratio of power generated in AE to that in HO.

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63. A galvanometer having 30 divisions has current sensitivity of $20\mu A / \text{division}$. Find the maximum current it can measure.

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64. Tha scale of a galvanometer is divided into 150 equal divisions.The galvanometer has a current sensitivity of 10 divisions per mA and a voltage sensitivity of 2 divisions per mV . The galvanometer be designed to read (i) 6 A per division and (ii) $1V$ per division?

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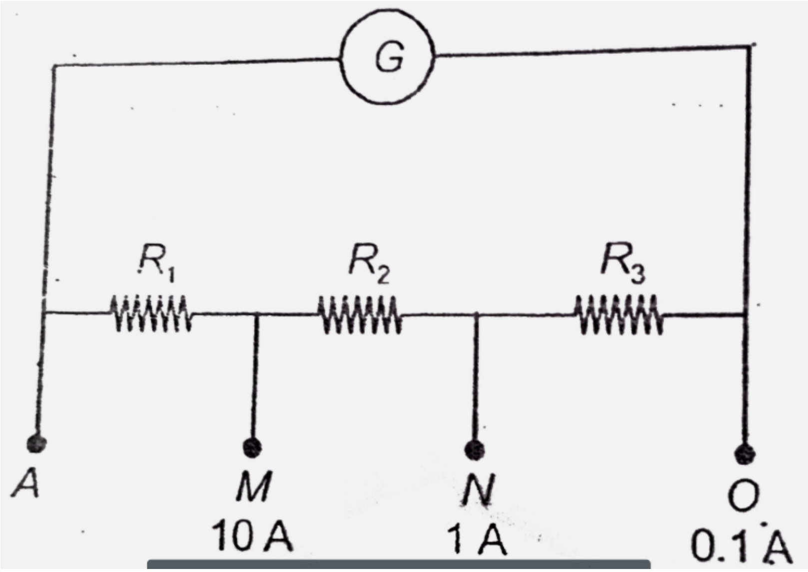
65. The galvanometer shown in figure has resistance 50 Ω and current required for full scale deflection is 1mA. Find the resistance R_1, R_2 and required to convert to convert it into ammeter having ranges as indicated.



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66. In the electrical circuits shown in figure (a) and figure (b) , the instruments are ideal in figure (a) while their resistance are marked in figure (b). Determine their readings.

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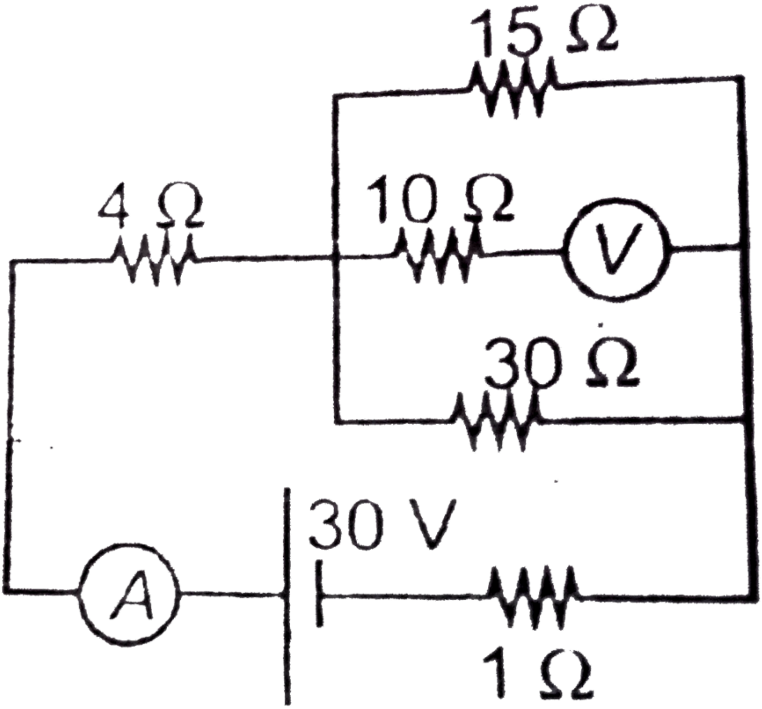
67. In the electrical circuit shown, the instrumets are ideal . Determine their readins.



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68. In a potentiometer circuit, the emf of driver cell is 2V and internal resistance is 0.5Ω. The potentiometer wire is 1m long . It is found that a cell of emf 1V and internal resistance 0.5Ω is balanced against 60 cm length of the wire. Calculate the resistance of potentiometer wire.

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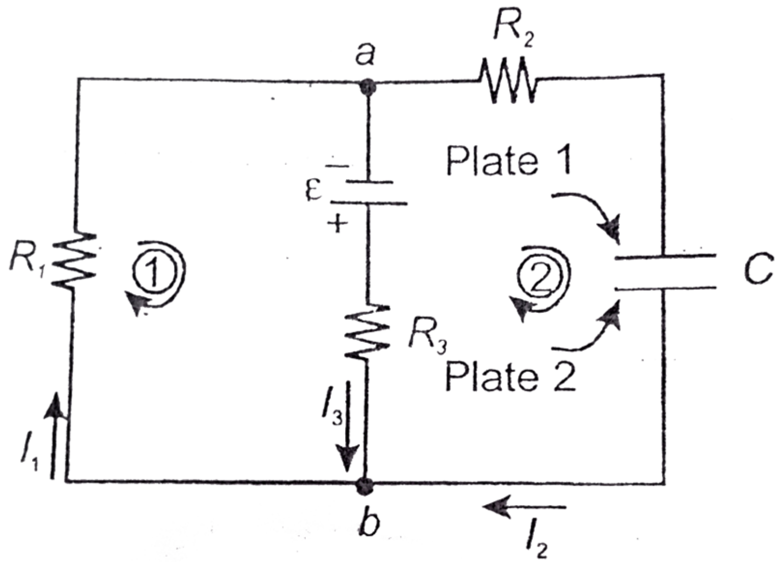
69. Find the steady-state current l_1 and l_2 in the circuit drawn in figure. Also find the resistance of resistor R_3 , that will give a steady -state current $l_3 = 50mA$. Finally , determine the potential drop across the capacior. The values of the known elements are $\varepsilon = 6V, R_1 = 100\Omega, R_2 = 80\Omega,$ and $C = 2\mu F$



Strategy : A capacity acts as an open switch for steady-state current flow. Nevertheless, there is a voltage drop across the capacitor , because charge can build up on the capacitor plates under the impetus of the battery as the steady state is achieved . (Once steady state is reached, there is no further build up of charge.) We must accordingly include he capacitor in application of the loop rule, and we cannot simply ignore, for example , the loop (a-capacitor -b-a). There will therefore be two loop equations and one junction equation -with two junctions, there is always only one independent equation. With three equations, we will be able to solve for the three unknown l_1, R_2 and the potential drop across the capacitor.

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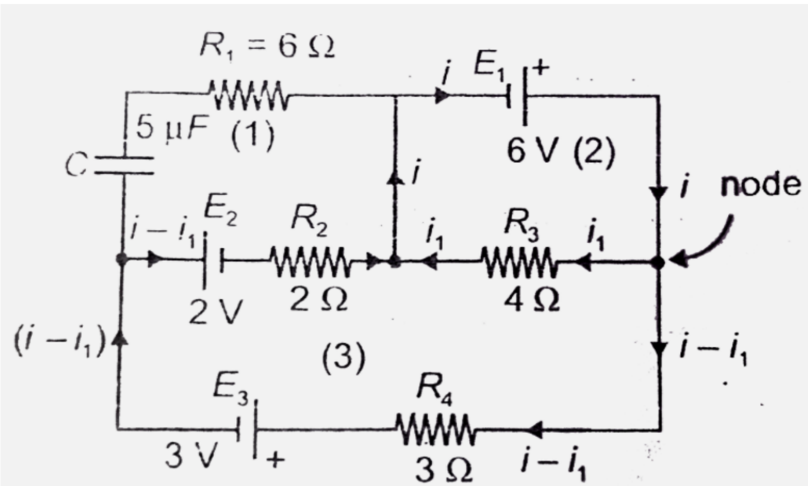
70. Find the energy stored in the capacitor using Kirchhoff's Laws.



Strategy : Step-1 : Take the current from the batter of highest EMF

Step -2 : Divide the total current into branch currents, keeping in mind that no current flows through capacitor.

Step-3 : Apply KVL to 3 loops shown in the figure.

Step -4 : Find the voltage across the capacitor using KVL

Step -5 : Apply the formula $E = \frac{1}{2}CV^2$ to find energy

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71. In the electrical circuit shown, find the reading of ammeter (ideal) just after closing the switch and long time after closing the switch.

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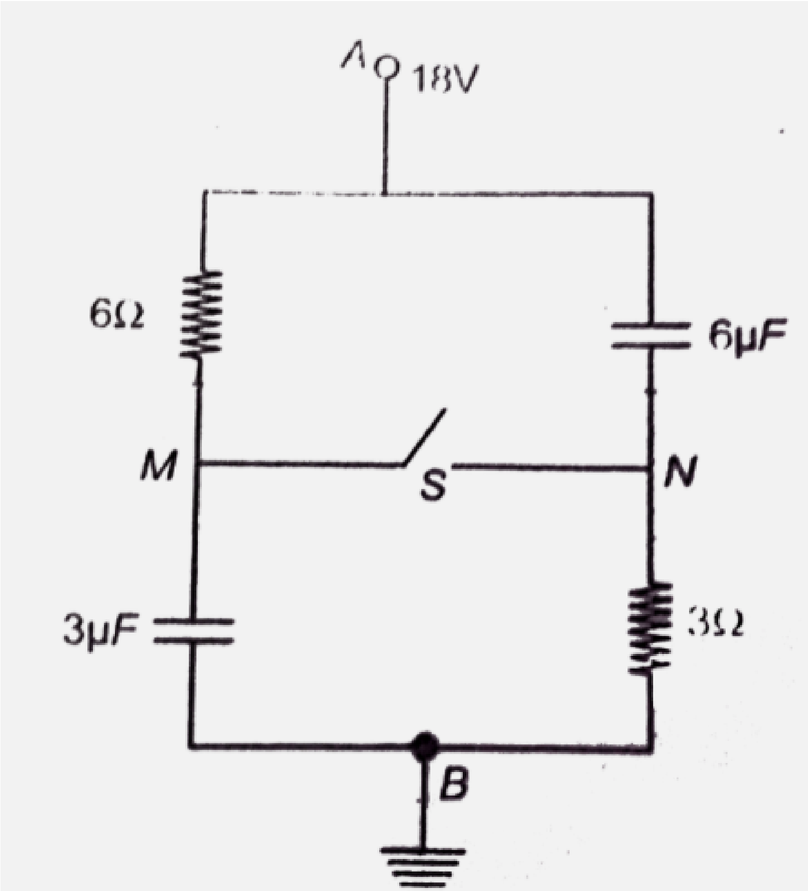
72. Find :

(i) Potential differnece between points M and N when switch 'S' is open.

(ii) Potential of point N after long time when switch is closed.

(iii) How much does the charge after long time when S is closed ?



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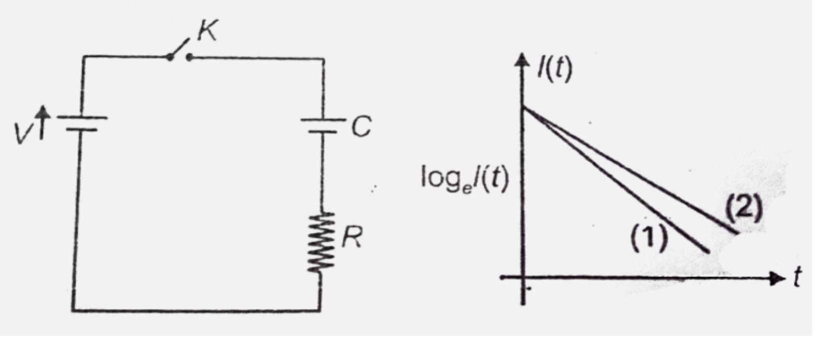
73. A capacitor of capacitance C, which is initially uncharged , is connected with a battery of emf ε. Find the heat dissipated in the circuit during the process of charging .

74. Consider the circuit at t=0s, the kety K is closed . At t=1 s, the current is I(t), Graph (1) is the variation of $\log_e l(t)$ with time 't'. To obtain graph (2) , one of the parameters that is V, R or C is charged keeping the other two constant , What should be the change, to obtain graph (2) from graph (1) ?



75. Find the time constant of the following RC circuit

76. Find time constants of the following RC circuits.

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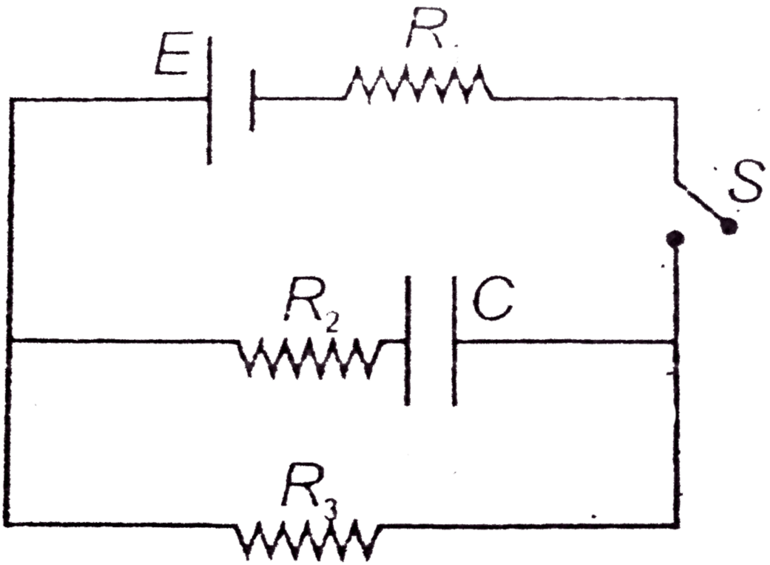
77. Find time constant of the circuit when (a) S is closed . (b) S is open.



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78. 10^6 positrons are flowing normally through an area in forward direction and same amount of electrons are flowing in backward direction in the interval of 10 ms. Find the current through the area.

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79. Charge through a cross-section of a conductor is given by $Q = (2t^2 + 5t)C$. Find the current through the conductor at the instant $t = 2s$.

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80. In a neon discharge tube $2.9 \times 10^{18} Ne^+$ ions move to the right each second while 1.2×10^{18} eletrons move to the left per second. Electron charge is $1.6 \times 10^{-19} C$. The current in the discharge tube

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81. In the Bohr model of hydrogen atom, the electron is pictured to rotate in a circular orbit of radius $5 \times 10^{-11} m$, at a speed 2.2×10^6 m/ s. What is the current associated with electron motion?

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82. The current in a wire varies with time according to the relation i = $2.0A + (0.6t^2) A / s^2$. How many coulomb of charge pass a cross-section of the wire in the time interval between t = 0 and t = 10s?

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83. What do you mean by thermal motion of free electrons in conductors ?

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84. Can electrons produce current due to their thermal speed . Explain.

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85. Resistance of a conductor of length l and area of cross-section A is R. If its length is doubled and area of cross-section is halved, then find its new resistance.

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86. If $\vec{j}$ and $\vec{E}$ are current density and electric field inside a current carrying conductor at an instant then $\vec{j} \cdot \vec{E}$ is

(1) Positive (2) Negative

(3) Zero (4) May be positive or negative

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87. If the value of drift speed of electrons inside a conduct is very low , can we measure it with the help of a microscope ?

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88. Though the drift velocity of electron responsible for current in a conductor under ordinary circumstances is very small, light in a room turn on immediately after the switch is closed. Explain why and how?

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89. What is the drift velocity of electrons in a silver wire of length $1m$ having cross-section area $3.14 \times 10^{-6} m^2$ and carriying a current of $10A$. Given atoms weight of weight of silver $= 108$ density of silver $10.5 \times 10^3 kg/m^3$, charge of electron $1.6 \times 10^{-19} C$, Avogadro's number 6.023×10^{26} per kg.atom

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90. A potential difference V is applied to a conductor of length L, diameter D. How are electric field E, the drift velocity v_d and the resistance

R affected when (i) V is doubled (ii)L is doubled (iii) D is doubled ?

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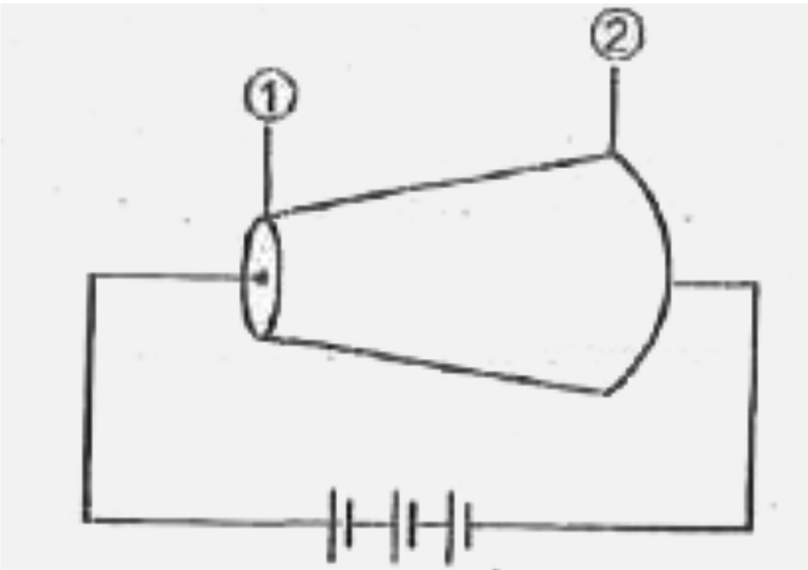
91. The value of drift speeds at cross section (1) and (2) are V_1 and V_2 respectively in the conductor shown below in the shape of a truncated cone .



Which of the following is correct ?

A. V1=V2

B. V1 $<$ V2

C. V1 $>$ V2

D. Data insufficient

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92. Find the average drift speed of free electrons in a copper wire of area of cross-section $10^{-7}m^2$ carrying current of 1.5 A and having free electron density $8.5 \times 10^{28}m^{-3}$

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93. What are the possible paths of free electrons inside the conductor ?

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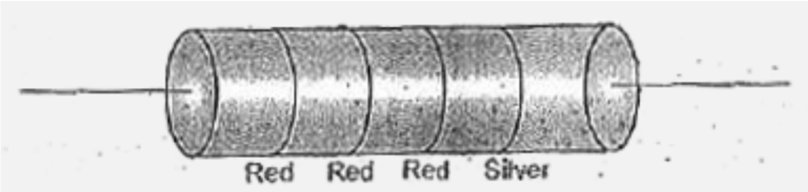
94. Find the resistance of following carbon resistor.



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95. Current 2 A is flowing through a conductor of resistance 4Ω . Find the electrical energy consumed is 10 s.

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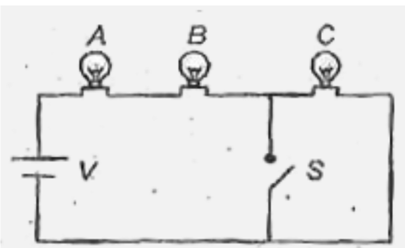
96. Figure shows three idenetical bulbs A,B and C connected to a battery of supply voltage V. When the switch S is closed, discuss the change is .



(a) The illumination of the three bulbs

(b) The power dissipated in the circuit .

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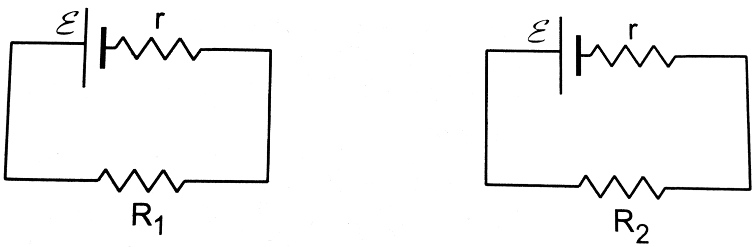
97. Two unequal resistances R_1 and R_2 ae connected across two identical batteries of $emf\varepsilon$ and internal resistance $r(figure)$. Can the thermal energies developed in R_1 and R_2 be equal in a given time. If yes, what will be the condition? (Figure Question)



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98. Two electric lamps are rated as 220V. 40 W and 220V,60W. Find the heat generated per second in lamp when they are connected in series across 220V mains. Given 1 cal=4.2J.

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99. Two bulbs ar marked (a) 100 W, 220 V(b) 40 W, 220 V.Which has higher resistance ? Also calculate the maximum current that can flow through each bulb.

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100. Two resistance 12Ω and 4Ω are supplied to you . Find the maximum and minimum resistance that can be achieved by using them.

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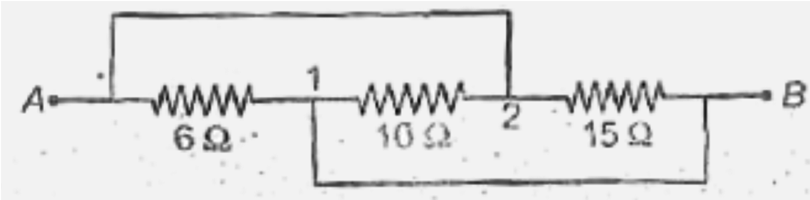
101. 

Find the resistance across AB.

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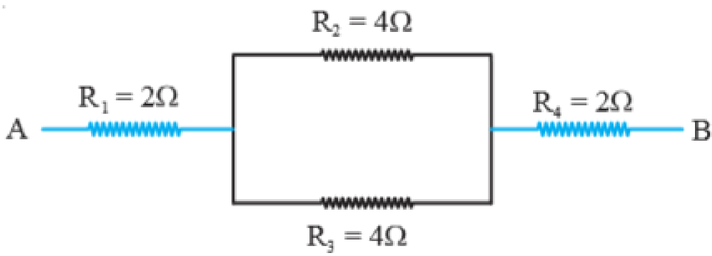
102. In the given figure what is the equivalent resistance between two points A and B?



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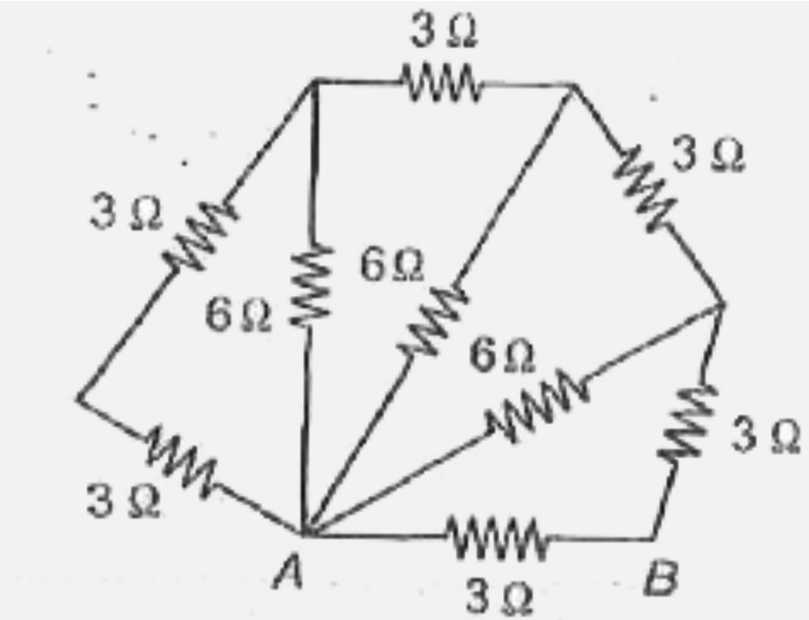
103. Find the equivalent resistance between A and B in the give figure .



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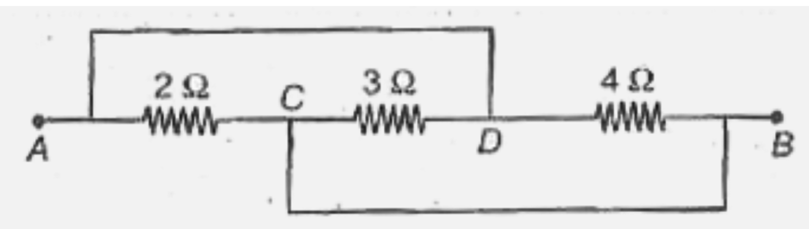
104. What will be the equivalent resistance between points A and B form gives figure ?



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105. A cell of emf 10 V and internal resistance 5Ω is connected across a resistance 15Ω . Find potential difference across AB.

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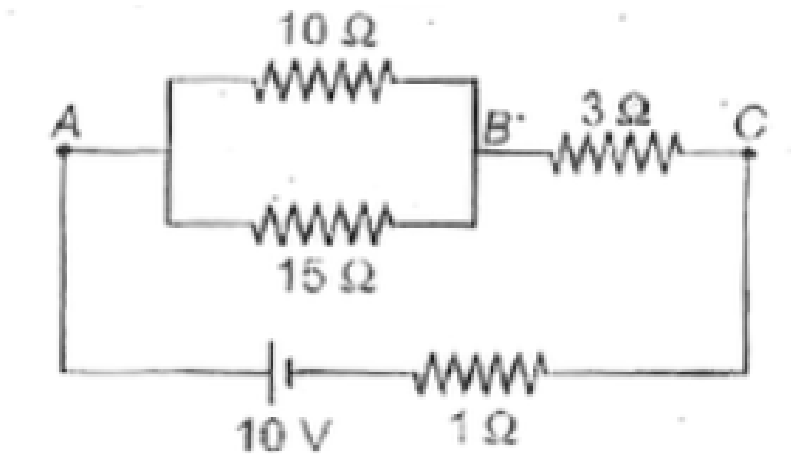

106.

In the network shown in the above figure find the current through 3Ω and 10Ω resistances.

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107. When a dry a cell is connected acrossa bulb and the circuit is switched on , then the brightness of bulb goes on decreasing . Explain.

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108. What is the relationship between potential difference across the terminals of a cell and emf of the cell ?

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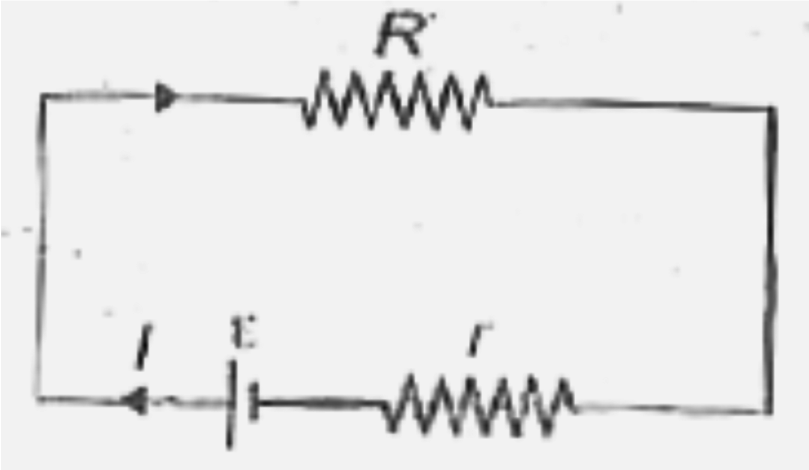
109. A cell of emf ε and internal resistance r is connected across a load resistance R .

(i) Find the maximum power delivered at the load ?

(ii) Draw the power (P) vs load resistance (R) graph .



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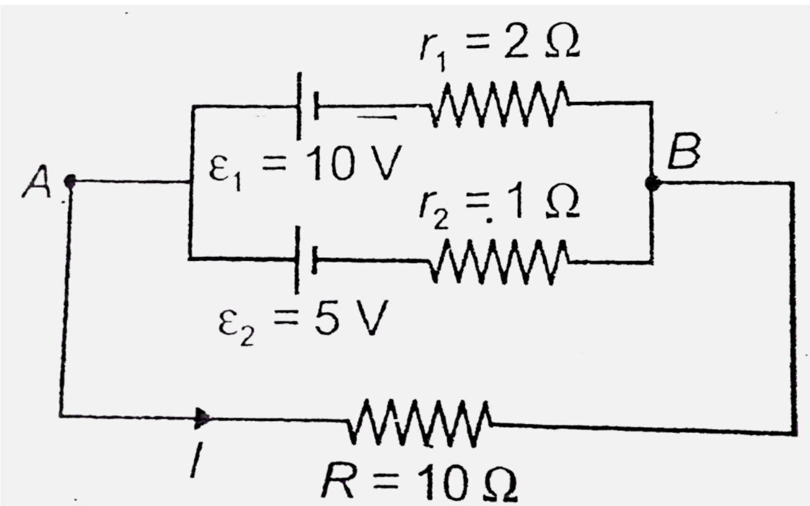
110. Find the current I through then 10Ω resistance in the network shown in figure.



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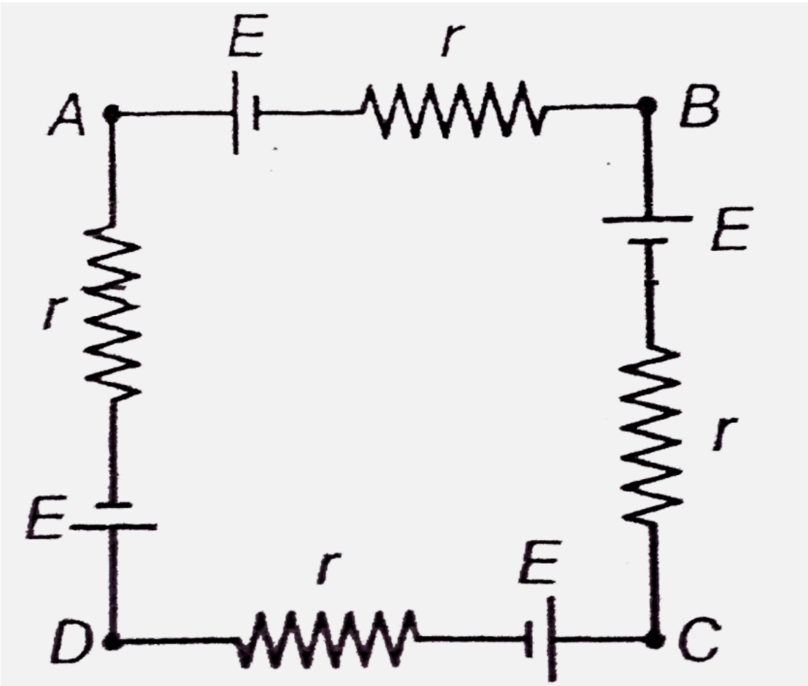
111. Four cells each of emf E and internal resistance r are connected in series to form a loop ABCD. Find potential difference across (1) AB, (2) AC



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112. Two cells of emf E each and internal resistance r_1 and r_2 are connected in series across a load resistance R. If potential difference across the first cell is zero, then find the relation between R, r_1 and r_2

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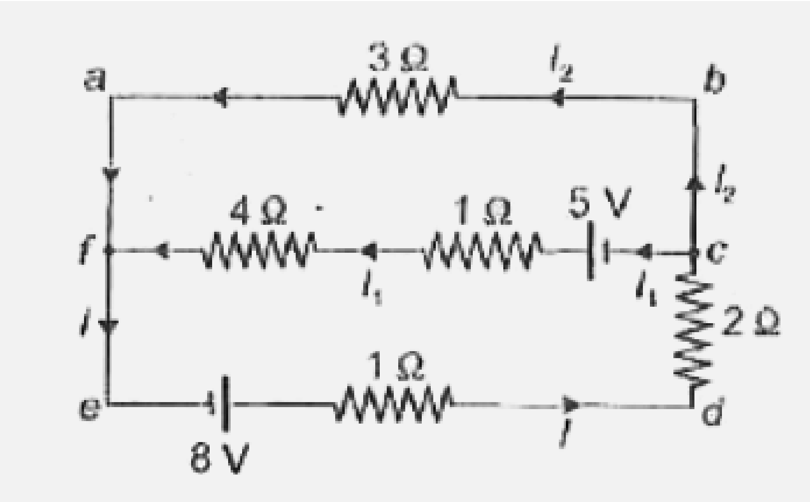
113. In the network in given figure find I_1, I_2 and i.



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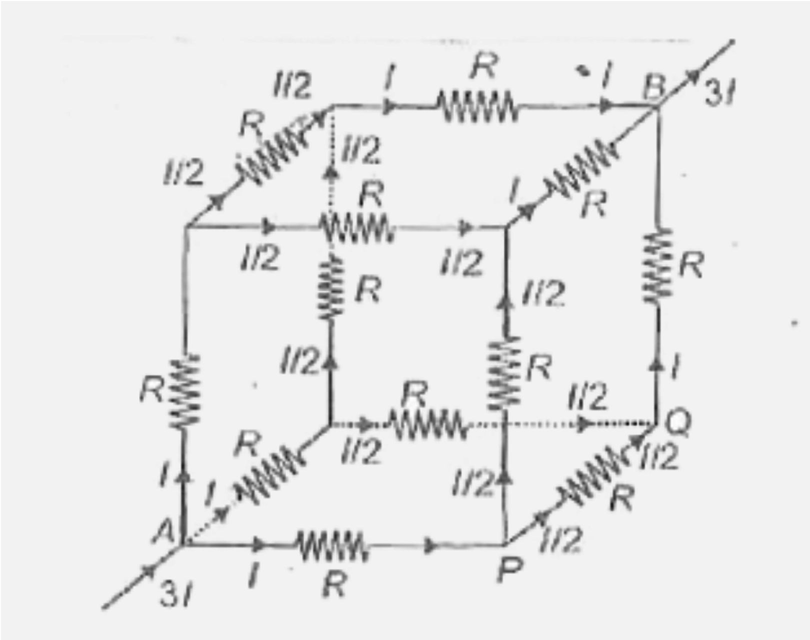
114. 

Twelve indentical resistance each of resistance R are joined to form a cube as shown in figure. Find resistance of the combination across AB.

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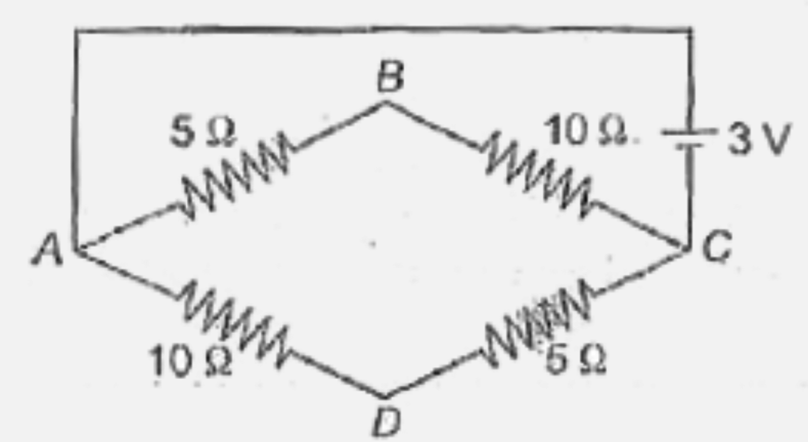
115. In the network shown in given figure , find the potential differene across BD.



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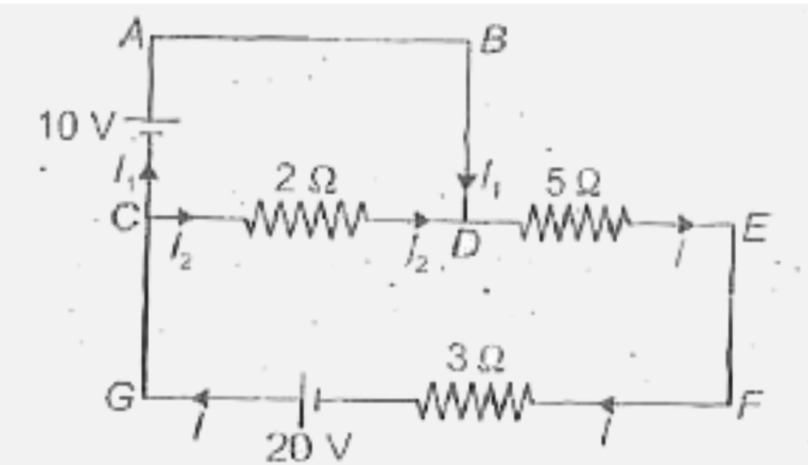
116. In the network shown in given figure the current l_1 through the 10 V battery .



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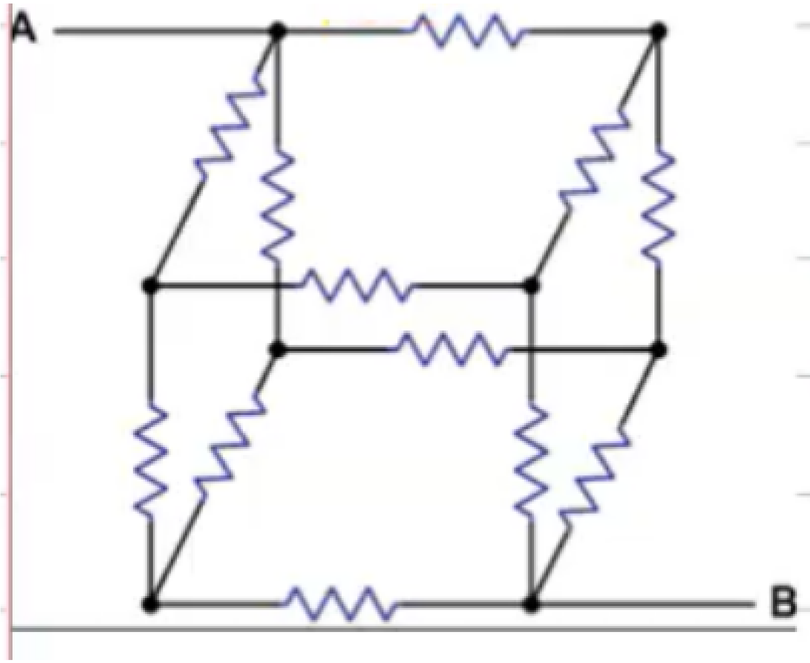
117. Figure (a) shows a cube made of 12 resistors each of resistance R. Find the equivalent resistance it the terminals A and B are connected to an emf source.



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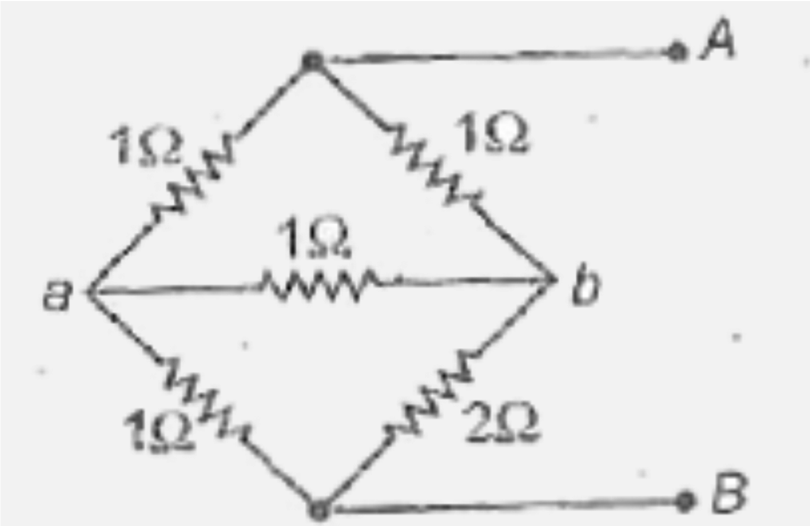
118. Find the equivalent resistance of the network between the point A and B shown in the figure . If A and B are connected to a 13 V battery so that $V_A > V_B$. Find (a) the current in each resistor (b) the potential difference $V_{ab} = V_a - V_b$.



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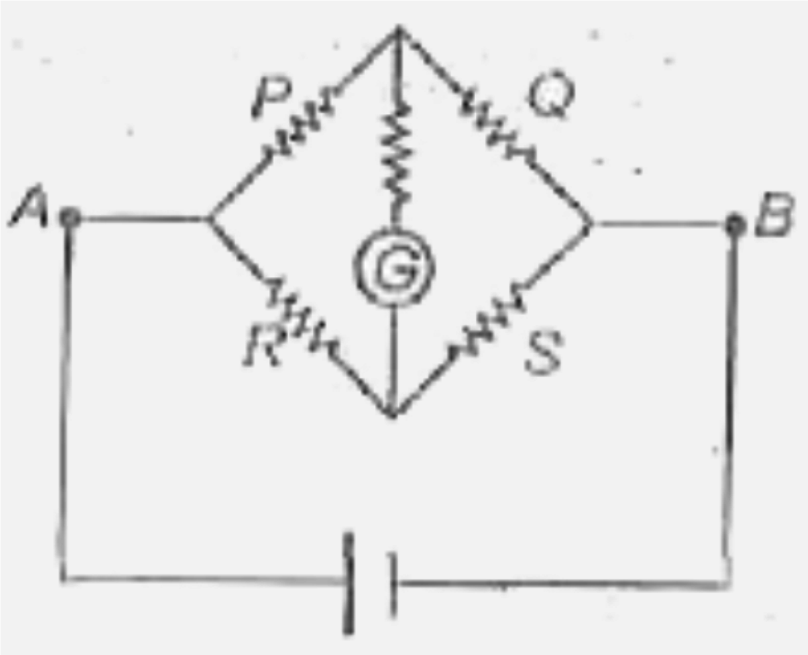
119. The network shown in the figure consists of five resistance of resistances P , Q, R, S and G such that $\frac{P}{Q} = \frac{R}{S}$. Find the equivalent resistance between A and B. Use this technique to find the equivalent resistance when .

(a) P = Q = R = S = G = r

(b) P = Q = R = S = r $\neq G$

(c) P = Q = r, R = S = r_1 and $G \neq 0$

(d) $P = 1\Omega$, $Q = 2\Omega$, $R = 2\Omega$, $S = 4\Omega$ and $\neq G = 5\Omega$



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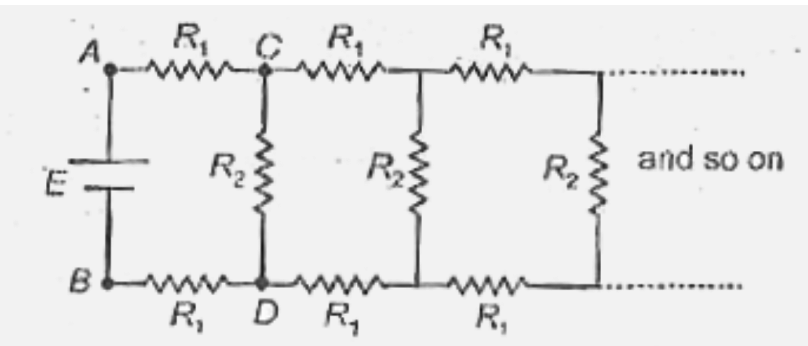
120. (a) Find the equivalent resistance between A and B of the network extending off to the infinity shown in the figure .



(b) If $E = 12V$, $R_1 = 1\Omega$ and $R_2 = 4\Omega$. Find the current in R_2 nearest of the battery .

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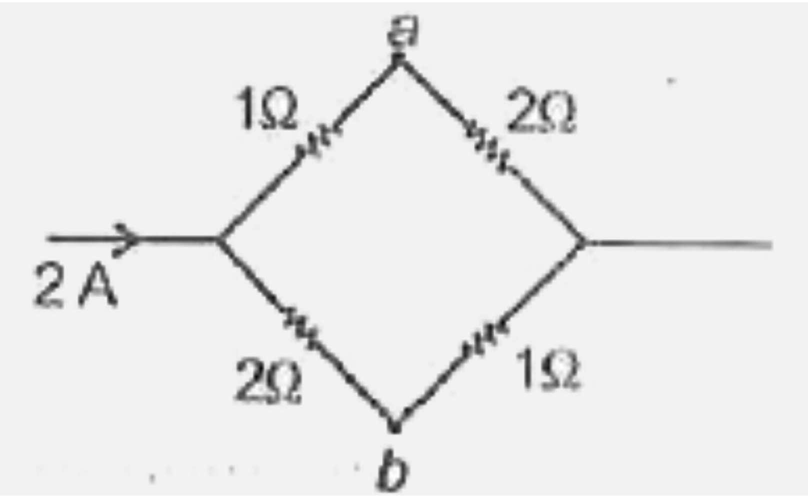
121. Find theh potential difference between points a and b.



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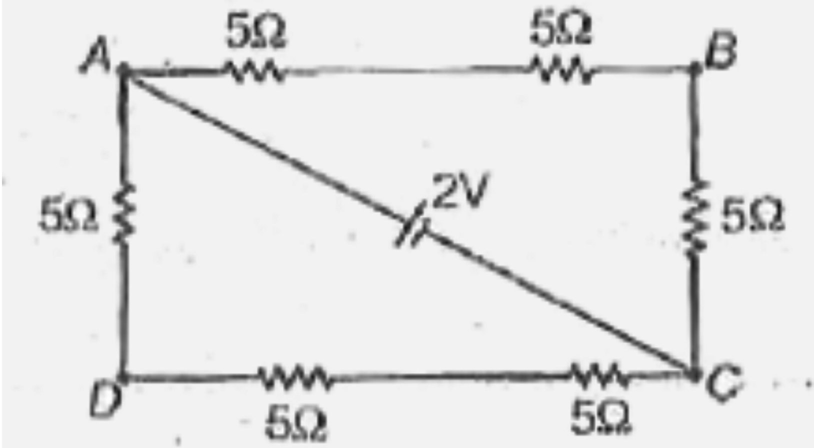
122. Find the potential difference between points B and D in the figure below.



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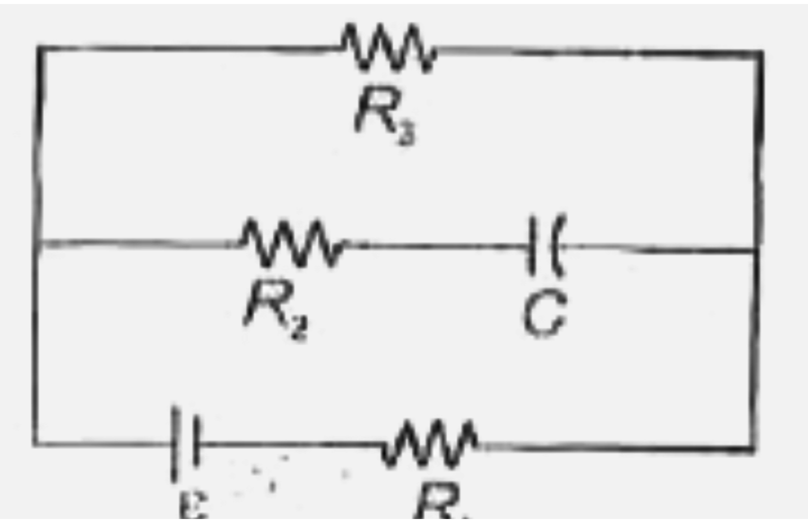
123. Find the charge and energy stored on the capactor C in the electrical network shonw below .



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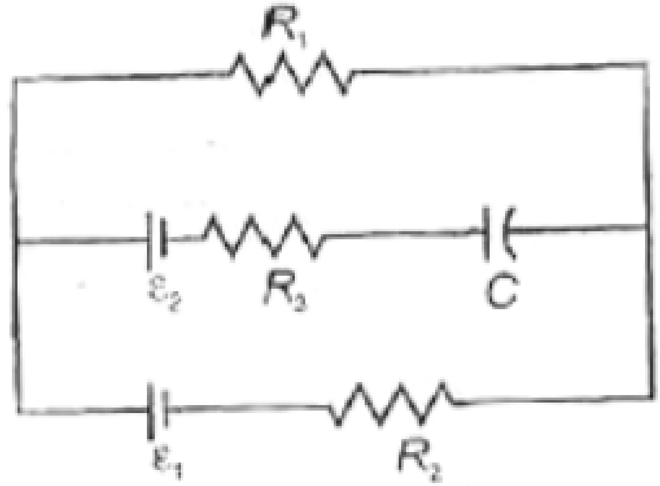
124. Find the charge and energy stored on the capacitor C in the following circuit.



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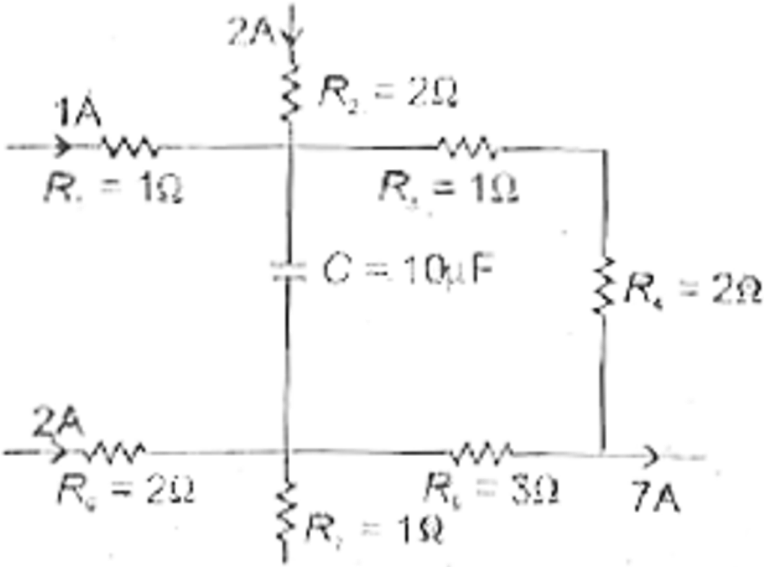
125. Given below is a part of network various values shown. Find the charge and energy stored in the capacitor .



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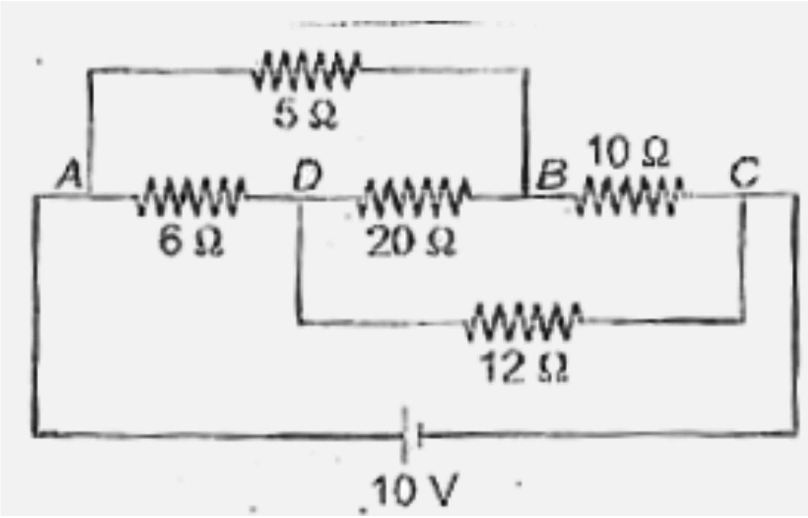
126. 

In the above network , find the current through the 20Ω resistance and current through the battery .

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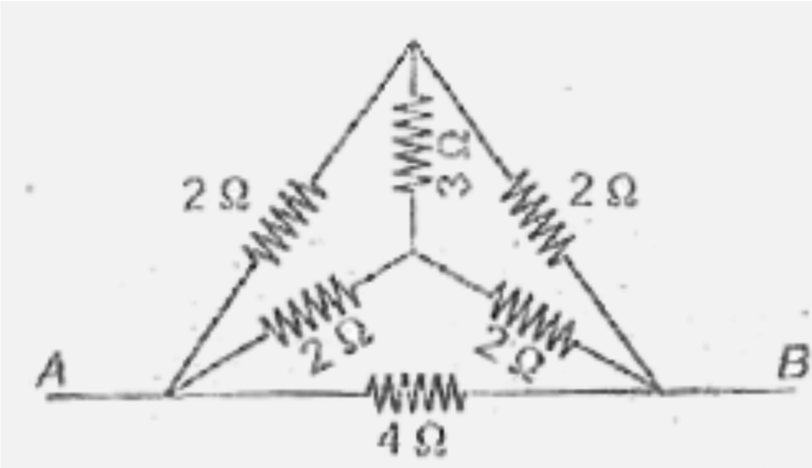
127. Find the resistance across AB in the network shown .



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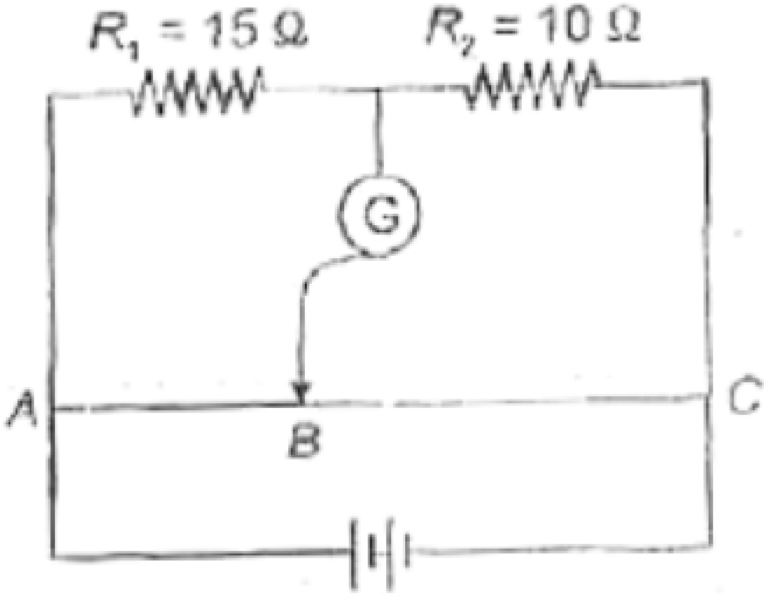
128. In the metor bridge circuit shown in figure . Find the length AB for null deflection in galvaometer .



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129. In a potentiometer arrangement a cell of emf 1.5 V gives a balance point at 30 cm length of wire. Now, when the cell is replaced by another celle , the balance point shifts to 50 cm. What is the emf of second cell ?

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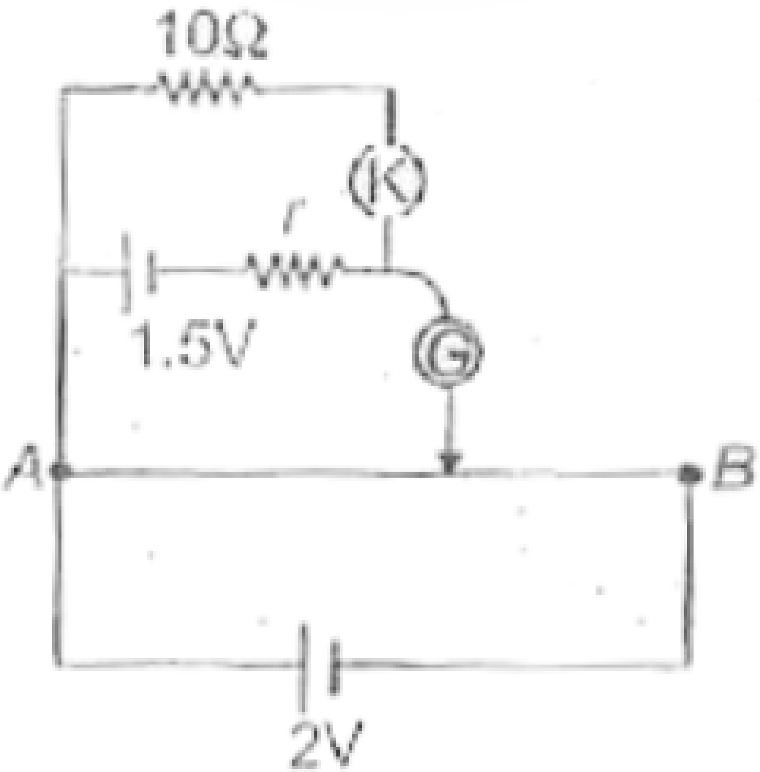
130. Figure shows a 2.0V potentiometer used for the determination of intermal resistance of a 1.5V cell , When the key is not inserted in the pulg , the balance point is at 60 cm and in the closed circuit the balance point is at 50 cm. Find the intermal reistance of the cell .



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131. In the given potentiometer circuit internal resistance rof the cell of emf ε is to be determined when k is open balance point is obtained at N_1 , AN_1 =60 C. When K isclose balance point is obatined at N_2 , $AN_2 = 50$ cm , what is the value of r ?

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132. The slide wire bridge AB is 100 cm long . Where should be the free end of the galvanometer be connected on AB so that the galvanometer may show zero deflection ?

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133. In a potentiometer arrangement a cell of emf 1.5 V gives a balance point at 30 cm length of wire. Now, when the cell is replaced by another celle , the balance point shifts to 50 cm. What is the emf of second cell ?

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134. A potentiometer , with a wire of length 10 m, is connected to an acculator of steady voltage. A lenchlanche cell gives a null point at 7.5 m If the length of the potentiometer wire is increaseed by 1 m, find the new posistion of the balance point.

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135. A standerd cell emf $1.08V$is balance by the potential difference across $91cm$ of a meter long wire applied by a cell of emf $2V$ through a series resistor of resistance 2Ω. The internal resistance of the cell is zero. Find the resistance per unit length of the potentiometer wire.

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136. A potentiometer wire of length 100cm has a resistance of 10Ω. It is connected in series with a resistance and a cell of emf 2V and of negligible

interal resistance. A source of emf 10mV is balanced against a length of 40cm of the potentiometer wire. What is the value of external resistance?

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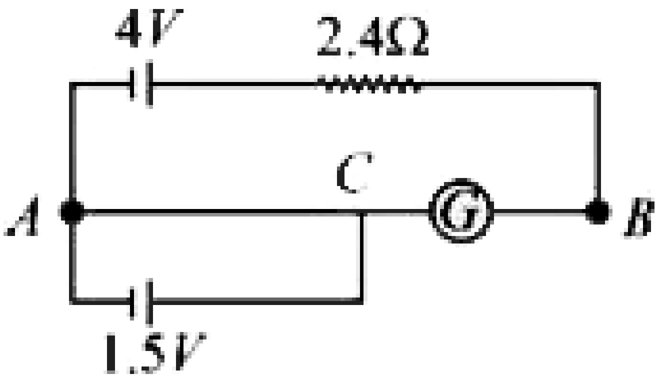
137. A simple potentiometer circuit is shown in the figure. The internal resistance of the 4V battery is negligible. AB is a uniform wire of length 100 cm and resistance 2Ω. What would be the length AC for zero galvanometer deflection (in mm)?



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Try Yourself

1. Charge through a cross-section of a conductor is given by $Q = 5t^2 - 2t$ coulomb . Find the average current through the conductor in the interval $t_1 = 2s$ to $t_2 = 4s$

(1) 14s (2) 28 A

(3) 56A (4) 7A

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2. If l_1, l_2 and l_3 are the orders of the currents through our nerves, domestic appliances and average lightening, then the correct order of currents is

(1) $l_1 > l_2 > l_3$ (2) $l_1 > l_3 > l_2$

(3) $l_1 < l_2 < l_3$ (4) $l_1 = l_2 = l_3$

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3. A conductor is at T kelvin. Find the thermal speed of free electrons of the conductor .

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4. How does electric current flow along a conductor , when electric field is applied along the length of conductor ?

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5. Resistance of a conductor of length l and area of cross-section A is R. If its length is doubled and area of cross-section is halved, then find its new resistance.

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6. When a $40Vm^{-1}$ electric field produced inside a conductor then $2 \times 10^{4} Am^{-2}$ curren density is established in it. Resistivity of the conducot is

(1) $2 \times 10^{-3} \Omega m$ (2) $4 \times 10^{-3} \Omega m$ (3) $2 \times 10^{3} \Omega m$ (4) $4 \times 10^{3} \Omega m$

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7. Drift speed of electrons is of the order of $10^{-3} m/s$, but current is established in the circuit with the speed of light . Explain.

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8. Mobility of free electrons in a current carrying conductor is proportional to

(1) Relaxation time (2) Electric field

(3) Potential difference (4) All of these

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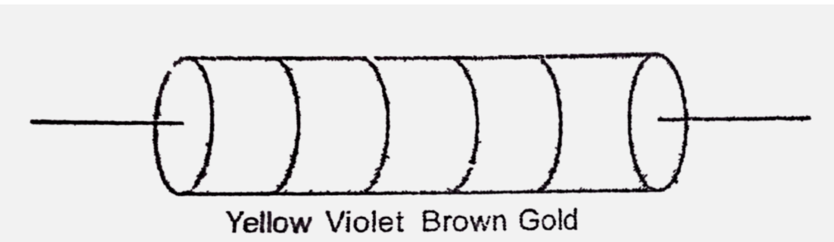
9. Find the resistance of the following carbon resistor.



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10. The alloys constantan and manganin are used to make standard resistance due to they have

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11. The instant at which a bulb is switched on, its power is maximum , then it decreases to a steady value . Explain.

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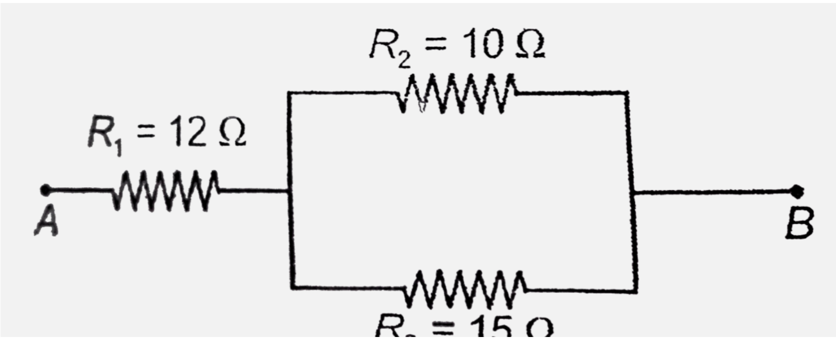
12. 

Find the resistance across AB.

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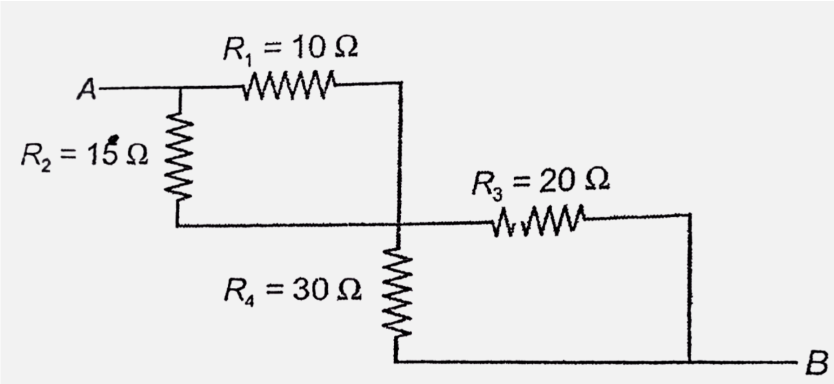
13.



Find the resistance across AB.

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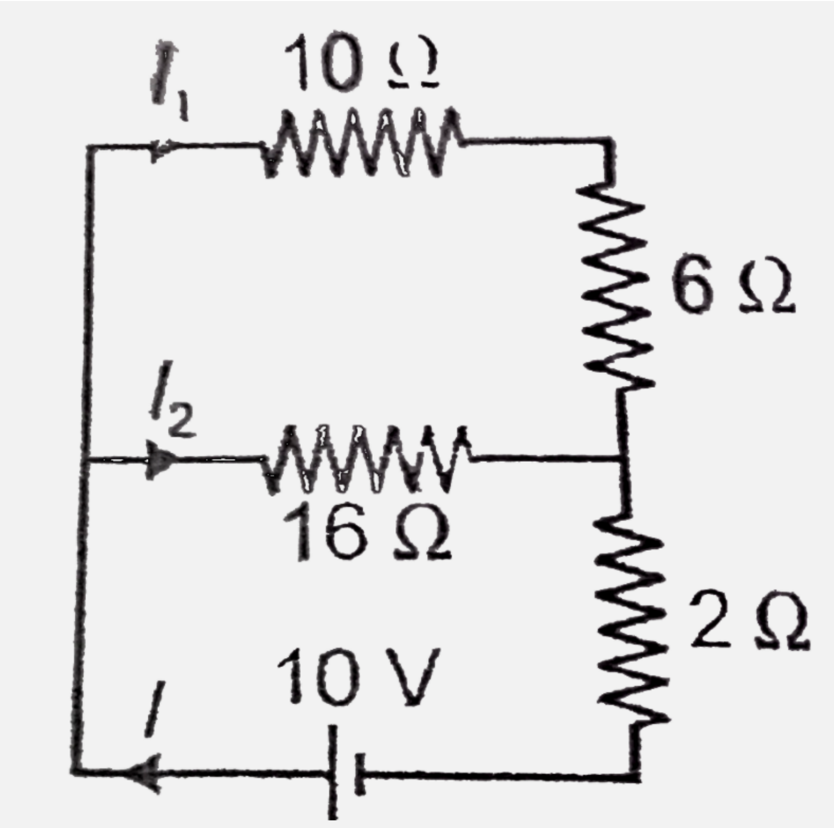
14. Current I in the network shwon in figure is



A. 1A

B. $0.5A$

C. $2A$

D. 5A

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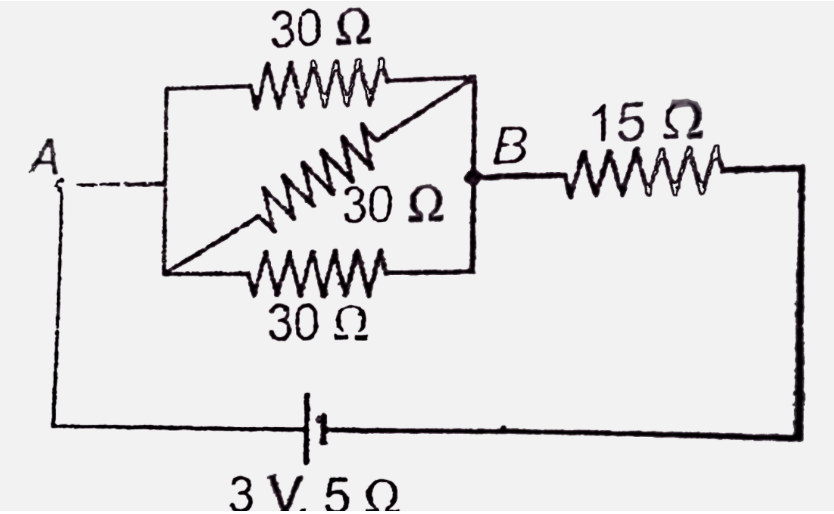
15. Potential difference across AB in the network shown in figure.



A. 2V

B. 3V

C. 1V

D. 1.5V

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16. Maximum current produced by a cell of emf 10 V and internal resistance 2Ω is

A. 10A

B. 2A

C. 5A

D. 0.1666666666667

Answer: C

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17. When the positive and negative electrodes of a cell are denoted as P and N inside the cell.

A. A) Current is from N to P

B. B) Current is from P to N

C. C) Ions move from P to N

D. D) Electrons move from N to P

Answer: B

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18. About internal resistance of a cell , the correct statements that it is

A. Constant for a given time

B. Inifinity

C. Finite and its value decreases with increase of time of use

D. Finite and its value increases with increase of time of use

Answer: 4

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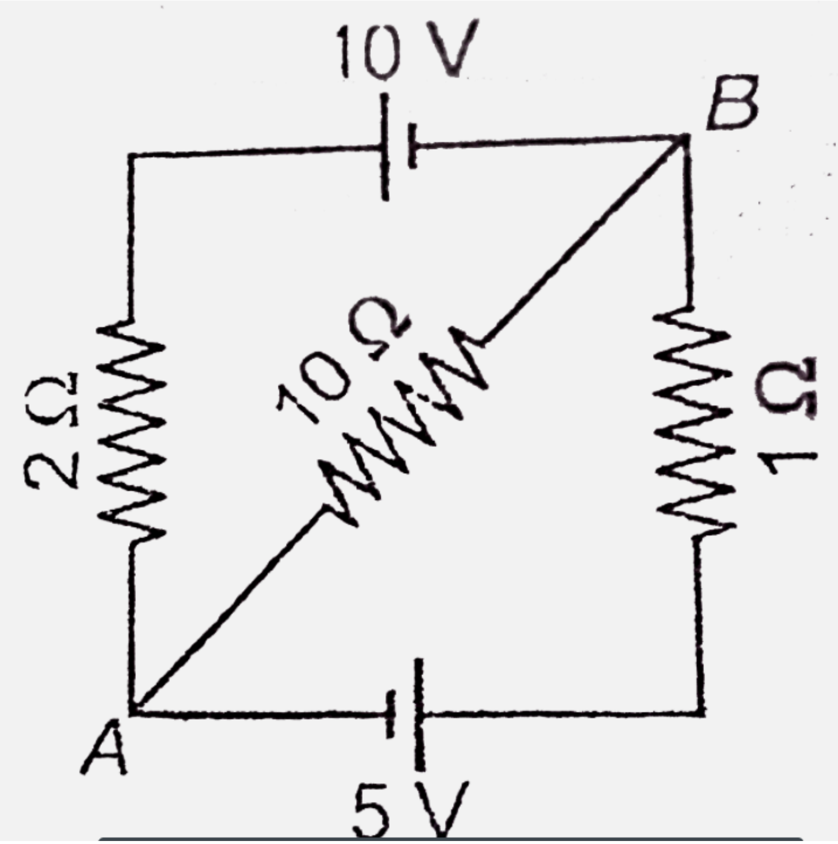
19. Find the current through the 10Ω resistance connected across AB



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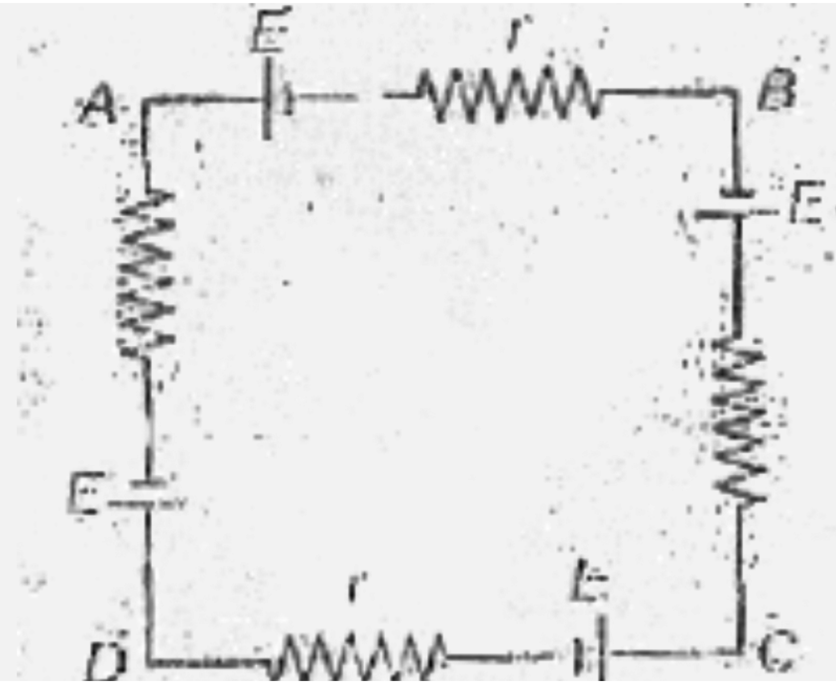
20. Four identical cells each having emf E and internal resistance r are connected in series to form a loop ABCD as shown in figure . Find potential difference across AB and AC .



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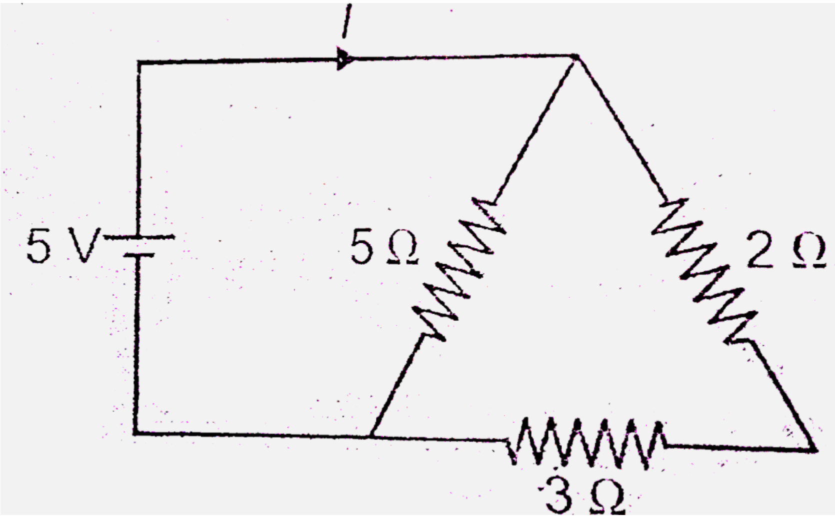
21. The current I through the cell in the network shown is



A. 3A

B. 2A

C. 1A

D. 4A

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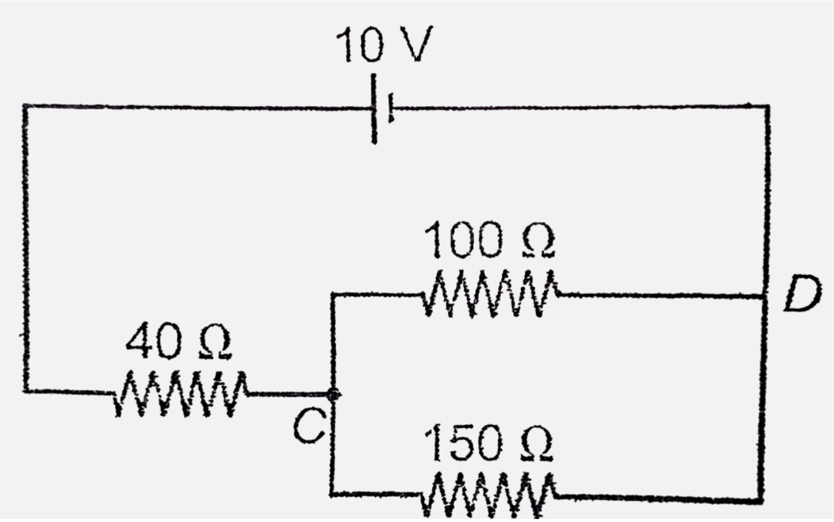
22. In the network shown below , potential difference across CD is



A. 4V

B. 6V

C. 10V

D. 5V

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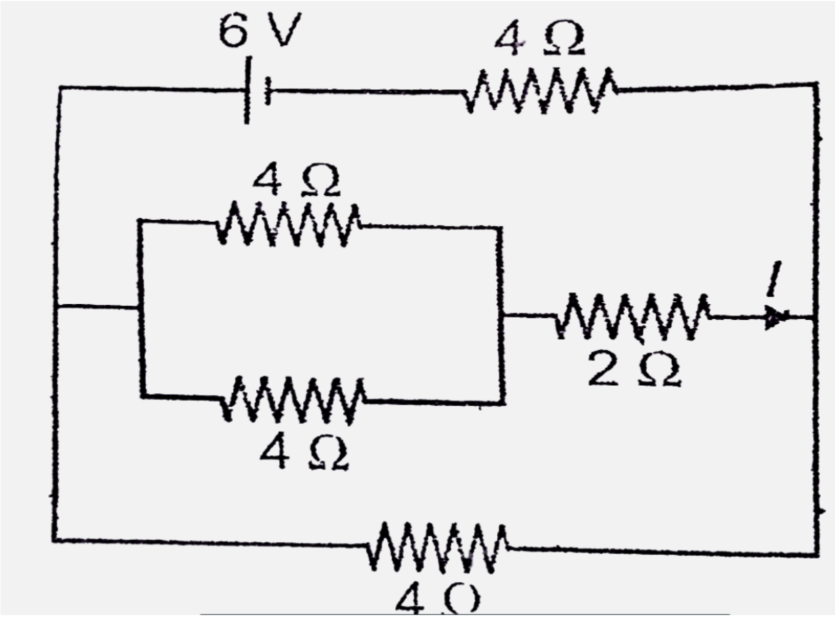
23. The current I in the circuit shown below is



A. 1A

B. 2 A

C. $0.5A$

D. Zero

Answer: C

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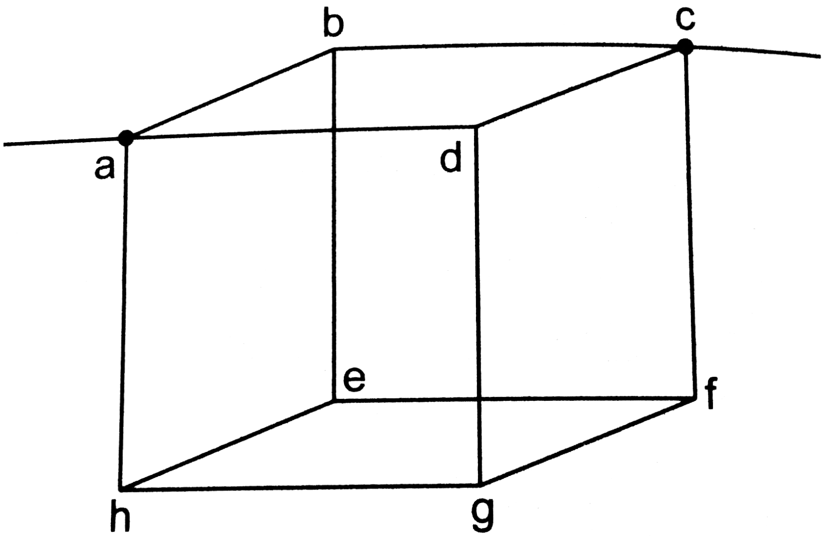
24. Twelve identical resistance R each form a cube as shown in figure. Resistance across its face diagonal AC corners is



A. $\frac{5}{6}R$

B. $\frac{6}{5}R$

C. $\frac{4}{3}R$

D. $\frac{3}{4}R$

Answer: 4

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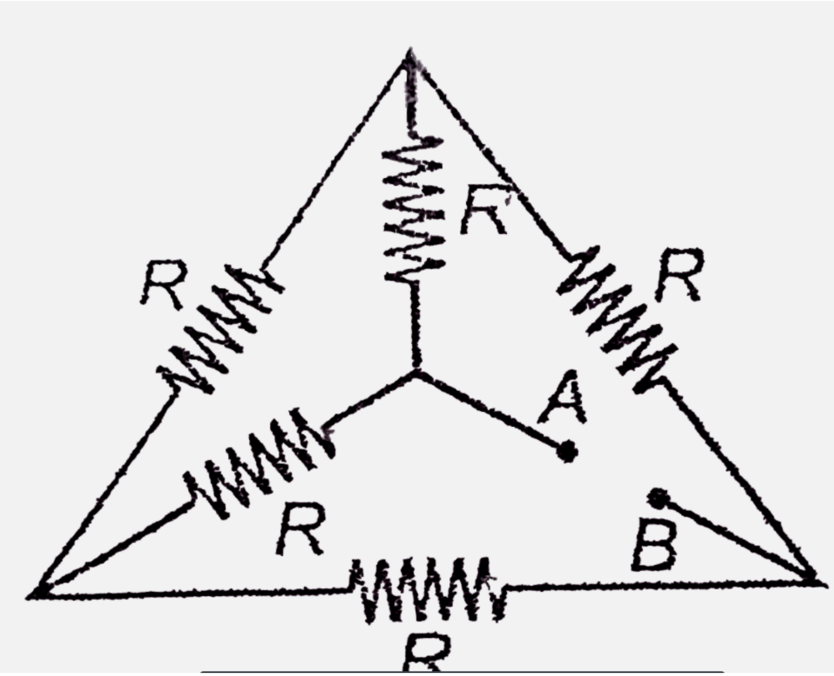
25. In the network shown , find the resistance across AB.



A. R

B. 2R

C. $\frac{R}{2}$

D. 4R

Answer: A

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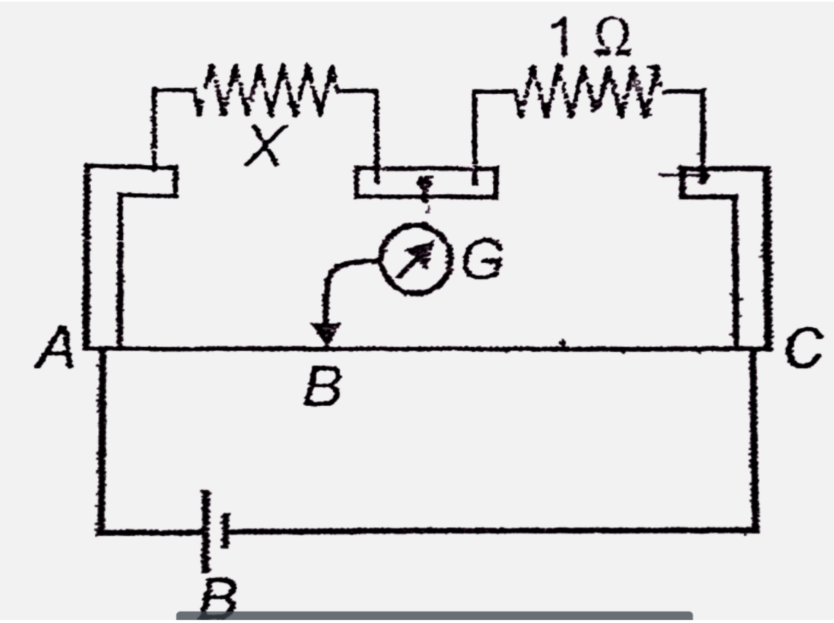
26. In the metre bridge, the balancing length AB =l=20 cm. The unknown resistance X is equal to



A. 0.25Ω

B. 0.8Ω

C. 0.2Ω

D. 0.16Ω

Answer: A

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27. An unknown resistance R_1 is connected is series with a resistance of 10Ω. This combination is connected to one gap of a meter bridge, while other gap is connected to another resistance R_2. The balance point is at $50cm$ Now , when the 10Ω resistance is removed, the balanced point shifts to $40cm$ Then the value of R_1 is.

A. 20Ω

B. 10Ω

C. 60Ω

D. 40Ω

Answer: 1

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28. Two cells of emf E_1 and E_2 are to be compared in a potentiometer $(E_1 > E_2)$. When the cells are used in series correctly , the balancing length obtained is 400 cm. When they are used in series but E_2 is connected with reverse polarities, the balancing obtaiend is 200cm. Ratio of emf of cells is

A. A) $3:2$

B. B) $3:1$

C. C) $4:1$

D. D) $4:3$

Answer: 2

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29. A simple potentiometer circuit is shown in figure. The internal resistance of 4V battery is negligible. AC is he uniform wire of length 100 cm and resistance 2Ω .What would be the length of AB for which galvanometer shows zero deflection.

A. 82.5 cm

B. $41.50 cm$

C. 165 cm

D. 50 cm

Answer: 1

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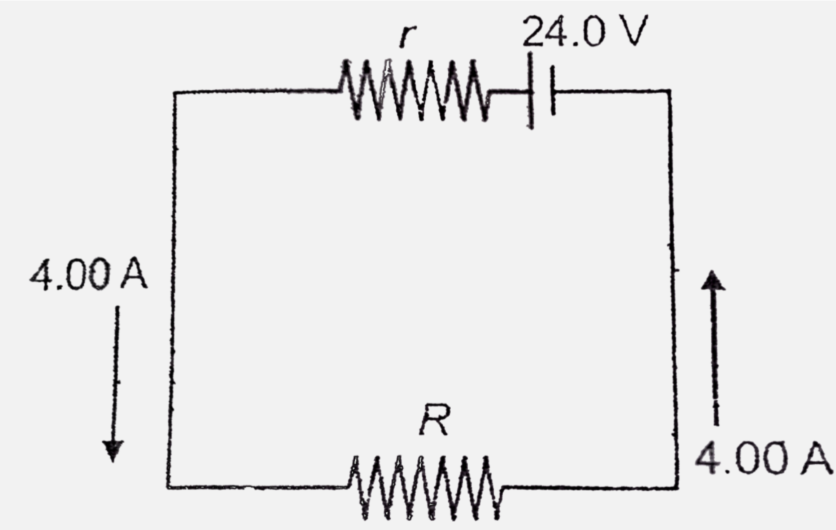
30. Consider the circuit shown in Figure . Ther terminal voltage of the 24.0 V battery is 21.2V. What are

(a) The internal resistance r of the battery and

(b) The resistance R of the circuit resistor ?



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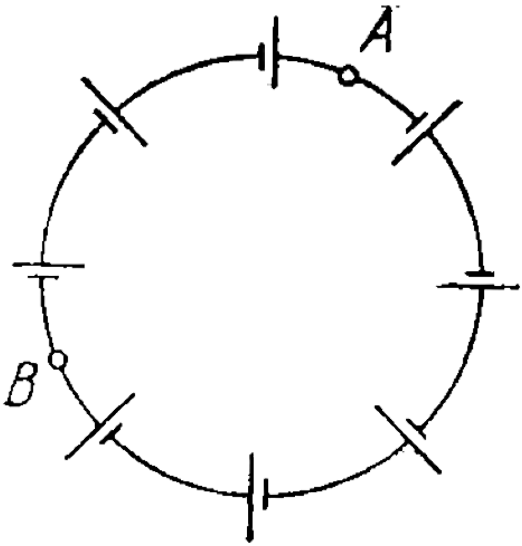
31. N sources of current with different emf's are connected as shown in Fig. The emf of the sources are proportional to their internal resistancs, i.e., $E = \alpha R$, where α is an assigned constatant. The lead wire resistance is neglible. Find:

(a) the current in the circuit ,

(b) the potential differences between points A and B dividing the circuit in

n and $N - n$ links.



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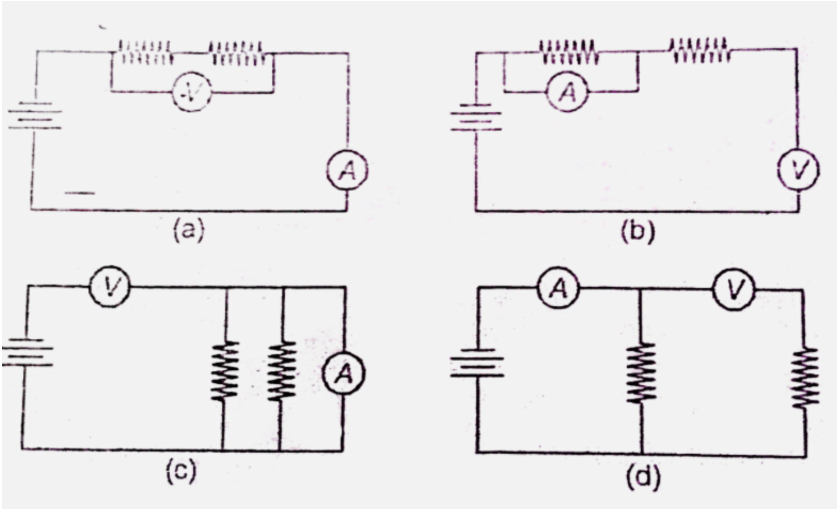
32. Voltmeter V and Ammeter A are used to measure the total potential difference of the circuit and the current through each resistor. Which is the correct circuit ?



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33. Could the equation for R_3 lead to a negative valuefor this resistance under certain circumstances?

Watch Video Solution

34. Which of the two capacitor plates is at the higher potential ?

Watch Video Solution

35. Charge through a cross section of a conductor is give by $Q = 5t^2 - 2t$ coulomb .Find the average current through the conduction the interval $t_1 = 2s$ to $t_2 = 4s$.

A. 14A

B. 28A

C. 56A

D. 7A

Answer: B

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36. If l_1, l_2 and l_3 are the orders of the currents through our nerves, domestic appliances and average lightening, then the correct order of currents is

(1) $l_1 > l_2 > l_3$ (2) $l_1 > l_3 > l_2$

(3) $l_1 < l_2 < l_3$ (4) $l_1 = l_2 = l_3$

A. $l_1 > l_2 > l_3$

B. $l_1 > l_3 > l_2$

C. $l_1 < l_2 < l_3$

D. $l_1 = l_2 = l_3$

Answer: C

Watch Video Solution

37. For driving current of 2 A for 6 minute in a circuit 1000 J of work is to be done . The emf of the source of the circuit is

A. 1.38V

B. 1.68V

C. 2.03 V

D. 3.10V

Answer: A

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38. The potential difference applied to an X-ray tube is 5 kV and the current through it is 3.2 mA. Then the number of electros striking the target par second is

A. 2×10^{16}

B. 5×10^{16}

C. 1×10^{17}

D. 4×10^{15}

Answer: A

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39. A conductors is a T Kelvin. Find the thermal speed of free electrons of the conductor.

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40. How does electric current flow along a conductor , when electric field is applied along the length of conductor ?

Watch Video Solution

41. Resistivity of a conductor of length l and cross - section A is ρ . If its length is doubled and area of cross-section is halved, then its new resistivity will be .

A. $\frac{\rho}{2}$

B. 4ρ

C. $\frac{\rho}{4}$

D. ρ

Answer: D

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42. When a $40Vm^{-1}$ electric field produced inside a conductor then $2 \times 10^{4} Am^{-2}$ curren density is established in it. Resistivity of the conducot is

(1) $2 \times 10^{-3} \Omega m$ (2) $4 \times 10^{-3} \Omega m$ (3) $2 \times 10^{3} \Omega m$ (4) $4 \times 10^{3} \Omega m$

A. $2 \times 10^{-3} \Omega$

B. $4 \times 10^{-3} \Omega m$

C. $2 \times 10^{3} \Omega m$

D. $4 \times 10^{3} \Omega m$

Answer: A

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43. A wire of lenth L is drawn such that its diameter is reduced to half of its original diamter. If the initial resistance of the wire were 10Ω, its new resistance would be

A. 40Ω

B. 80Ω

C. 120Ω

D. 160Ω

Answer: D

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44. The masses of the three wires of copper are in the ratio of $1:3:5$ and their lengths are in the ratio of $5:3:1$. The ratio of their electrical resistance is

A. $125:15:1$

B. $1:15:125$

C. $5:3:1$

D. $1:3:5$

Answer: A

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45. There is a current of 40 ampere in a wire of $10^{-6} m^2$ are of cross-section. If the number of free electron per m^3 is 10^{29} then the drift velocity will be

A. 1.25×10^3 m/s

B. 2.5×10^{-3} m/s

C. 25×10^{-3} m/s

D. 25×10^3 m/s

Answer: B

Watch Video Solution

46. A wire of 50 cm long, $1 mm^2$ in cross-section carries a current of 4 A, when connected to a 2 V battery, the resistivity of wire is

A. $2 \times 10^{-7} \Omega m$

B. $5 \times 10^{-7} \Omega m$

C. $4 \times 10^{-6} \Omega$ m

D. $1 \times 10^{-6} \Omega m$

Answer: D

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47. The electric resistance of a certain wire of iron is R . If its length and radius are both doubled, then

A. Will be doubled and the specific resistance will be halved

B. Will be halved and the specific resistance will remain unchanged

C. Will be halved and the specific resistance will be doubled

D. And the specific resistance both will remain unchanged

Answer: B

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48. The drift velocity of free electrons in a conductor is v, when a current i is flowing in it, Ifboth the radius and current are doubled, then the drift velocity will be :

A. $\frac{v_d}{8}$

B. $\frac{v_d}{4}$

C. $\frac{v_d}{2}$

D. v_d

Answer: C

Watch Video Solution

49. Two wires of the same dimensions but resistivities ρ_1 and ρ_2 are connected in series. The equivalent resistivity of the combination is

A. $\frac{\rho_1+\rho_2}{2}$

B. $\rho_1+\rho_2$

C. $2(\rho_1+\rho_2)$

D. $\sqrt{\rho_1\rho_2}$

Answer: A

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50. The specific resistance and area of cross section of the potentiometer wire are ρ' and A respectively. If a current i passes through the wire, its potential gradient will be

A. $\frac{I\rho}{A}$

B. $\frac{I}{A\rho}$

C. $\frac{IA}{\rho}$

D. $IA\rho$

Answer: A

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51. Two copper wire of length l and 2l have radii, r and 2r respectively. What si the ratio of their specific resistance.?

A. $1:2$

B. $2:1$

C. $1:1$

D. $1:3$

Answer: C

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52. The electron drift speed in metals is small $\left(\text{~}ms^{-1}\right)$ and the charge of the electron is also very small $\left(\text{~}10^{-19}C\right)$, but we can still obtain a large amount of current in a metal. Why?

A. Conducting property of the conductor

B. Resistance of the conductor is small

C. Electron number density of the conductor is small

D. Electron number density of the conductor is enomous

Answer: D

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53. Drift speed of electrons is of the order of 10^{-3} m/s , but current is established in the circuit with the speed of light . Explain .

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54. Mobility of free electrons in a conductor is

A. Relaxation time

B. Electric field

C. Potential difference

D. All of these

Answer: A

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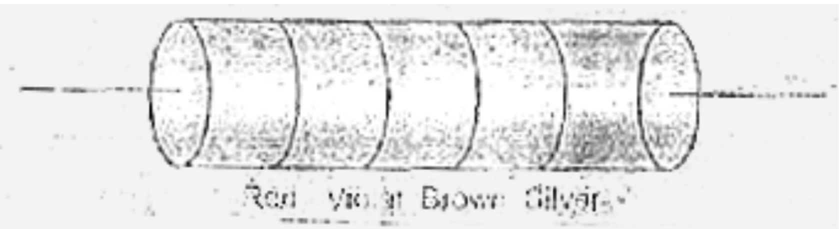
55. Find the resistance of the following carbon resistor



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56. The instant at which a bulb is switched on, its power is maximum , then it decreases to a steady value . Explain.

Watch Video Solution

57. For driving a current of 2 A for 6 minutes in a circuit, 1000 J of work is to be done. The e.m.f. of the source in the circuit is

A. $1.38V$

B. $1.68V$

C. $2.03V$

D. $3.40V$

Watch Video Solution

58. An electric bulb, marked $40W$ and $200V$, is used in a circuit of supply voltage $100V$. Now its power is

A. $10W$

B. $20W$

C. $40W$

D. $100W$

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59. Three bulbs of 40 W , 60 W , 100 W are arranged in series with 220 volt supply which bulb has minimum resistance

A. $100W$

B. $4W$

C. $60W$

D. Equal in all bulb

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60. The current flowing through a lamp marked as 50 W and 250 V is

A. 0.1 A

B. 0.2A

C. 0.4A

D. 0.3A

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61. Three equal resistors connected in series across a source of emf together dissipate 10W of power. What would be the power dissipated if te same resistors are connected in parallel across the same source of emf?

A. 25 W

B. 80 W

C. 45W

D. 90 W

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62. Two electric bulbs A and B are rated 60 and $100W$, respectively. If they are connected in parallel to the same source , then

A. B draws more current than A

B. Current draws are in the ratio of their resistaces

C. Both draw the same current

D. A draws more current than B.

Watch Video Solution

63. An electric immersion heator of 1.08 k W is immersed in water. After the water has reached a temperature of $100^{\circ}C$, how much time will be required to produce 100 g of steam?

A. $210s$

B. $105s$

C. $420s$

D. $50s$

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64. If two identical heaters each rated as (1000 W, 220V) are connected are connected in parallel to 220 V, then the total power consumed is .

A. 500 W

B. 2500W

C. 250W

D. 2000 W

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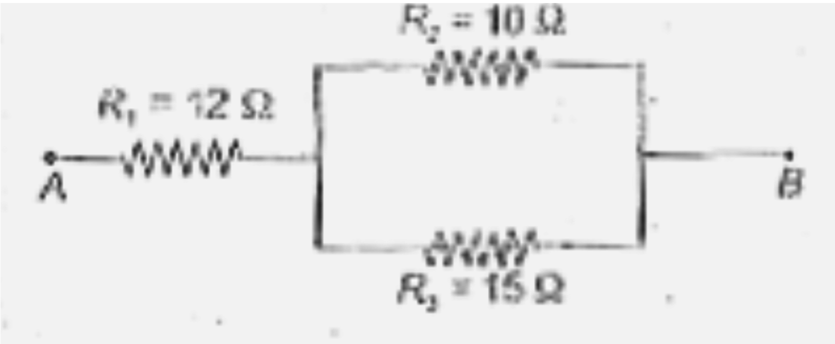
65. 

Find the resistance across AB .

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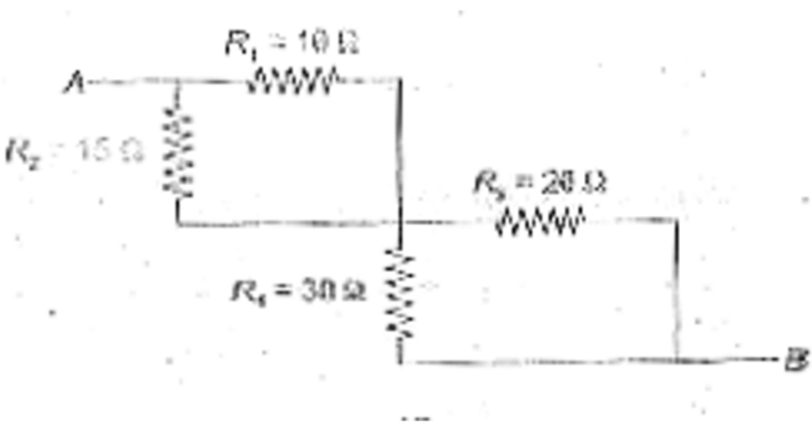

66.

Find the resistance across AB .

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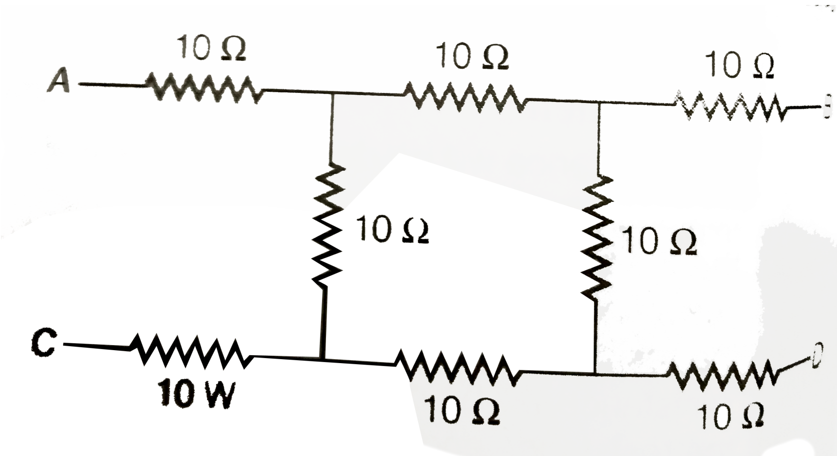
67. What will be the equivalent resistance fo circuit shown in figure between two points A and D?



A. 10Ω

B. 20Ω

C. 30Ω

D. 40Ω

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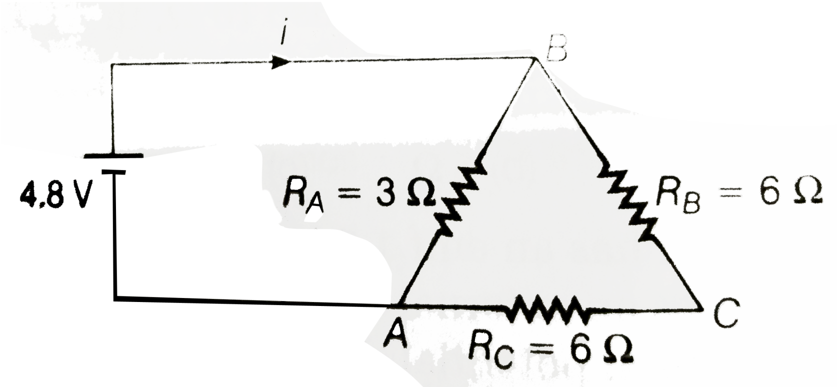
68. The current (i) in the given circuit is



A. $1.6A$

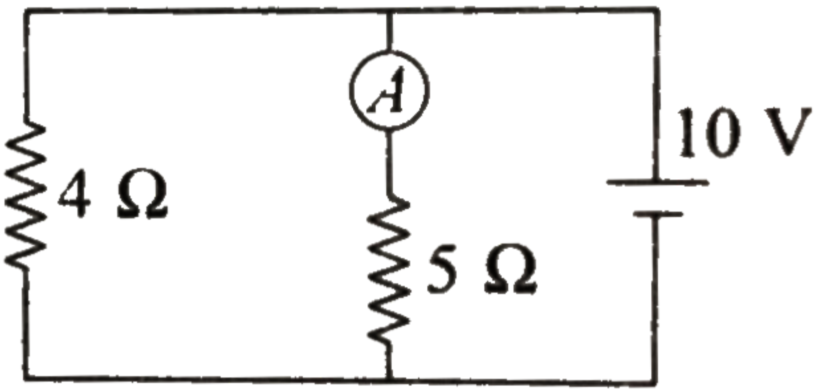
B. $2A$

C. $0.32A$

D. $3.2A$

Watch Video Solution

69. In the circuit shows in Fig. 6.41, the reading of the ammeter is (assume internal resistance of the battery be to zero)



A. $40/29A$

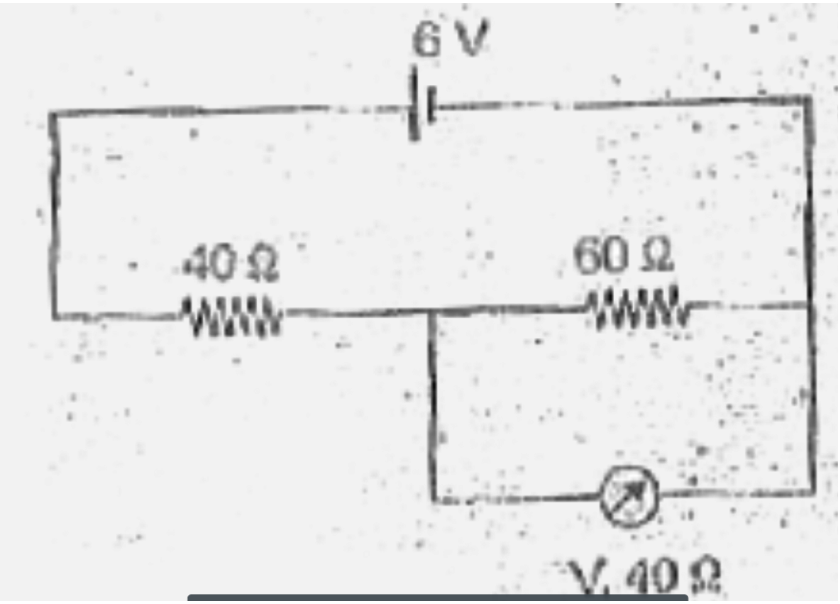
B. $10/9A$

C. $5/3A$

D. $2A$

Watch Video Solution

70. The reading of voltmeter in the circuit shown is :



A. $2.25V$

B. $3.25V$

C. $4.25V$

D. 6.25 V

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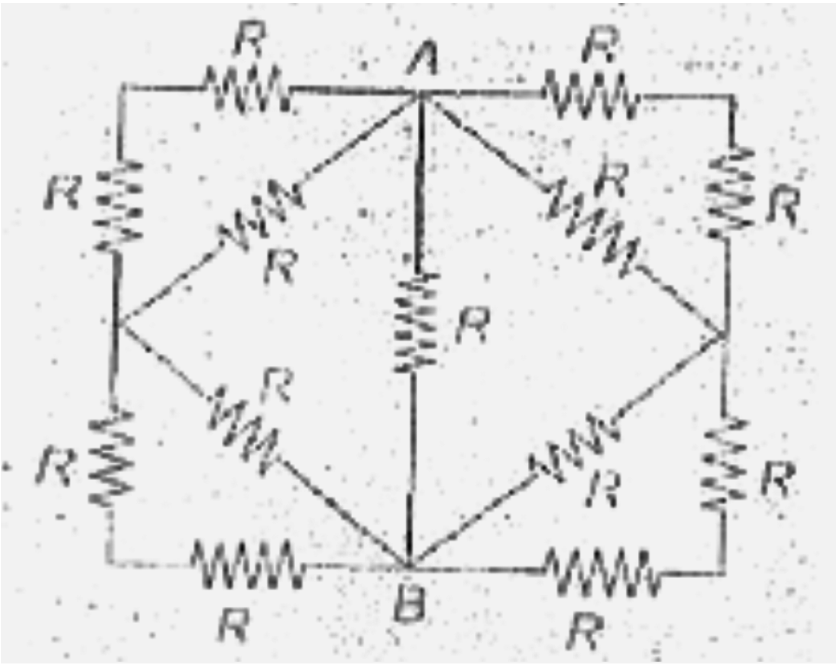
71. Thirteen resistors each of resistance R are connected in the circuit as shown . The effective resistance between A and B is



A. $\frac{4R}{3}$

B. 2 R

C. R

D. $\frac{2R}{5}$

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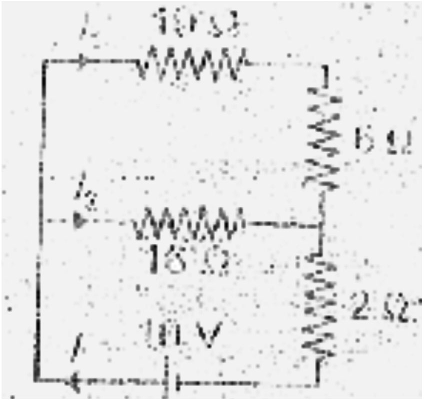
72. Current I in the network shown in figure



A. $1A$

B. $0.5A$

C. $2A$

D. $5A$

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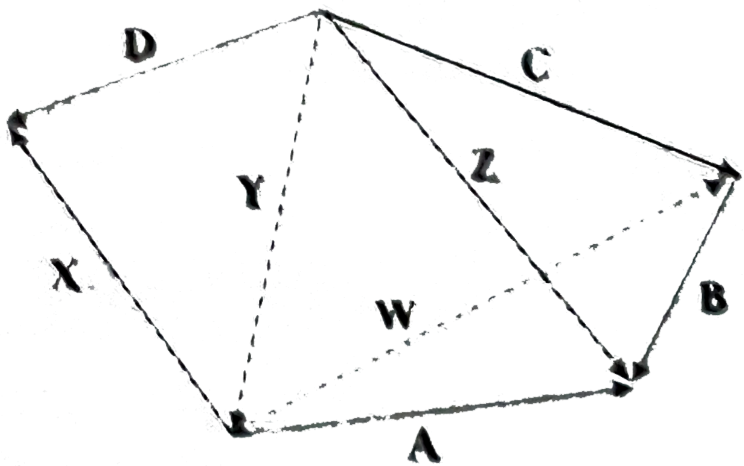
73. In the digram shown in figure



A. $2V$

B. $3V$

C. $1V$

D. $1.5V$

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74. Maximum current produced by a cell of emf 10 V and internal resistance 2Ω is

A. $10A$

B. $2A$

C. $5A$

D. $4A$

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75. When the positive and negative electrodes of a cell are denoted as P and N inside the cell.

A. Current is from N to P

B. Current is from P to N

C. Ions move from P to N

D. Electron move from N to P

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76. About internal resistance of a cell, the correct statement is that it is

A. Constant for a given cell

B. Infinite

C. Finite and its value decreases with increase of time of use

D. Finite and its value increases with increase of time of use

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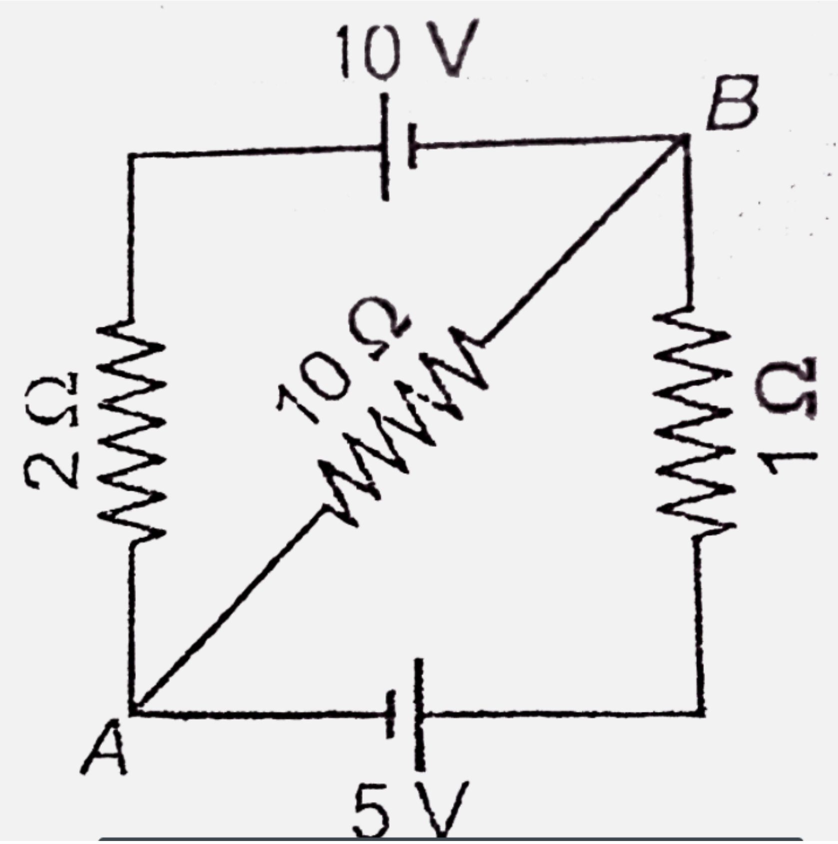
77. Find the current through the 10Ω resistance connected across AB



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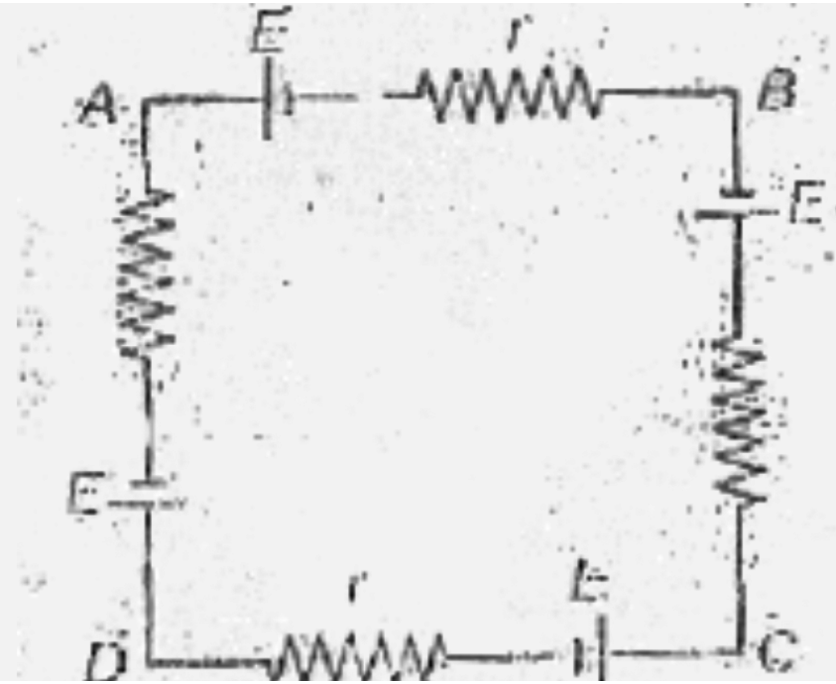
78. Four identical cells each having emf E and internal resistance r are connected in series to form a loop ABCD as shown in figure . Find potential difference across AB and AC .



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79. The cell has an emf of $2V$ and the internal resistance of this cell is 0.1Ω, it is connected to resistance of 3.9Ω, the voltage across the cell will be

A. $1.\ 95V$

B. $1.5V$

C. $2V$

D. $1.8V$

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80. A battery of 20 cells is charged by 220 V with a charging current of 15 A . If the emf of each cell is 2 V and internal resistance is 0.1Ω , then the series resistance required to be placed in the circuit will be

A. 16Ω

B. 10Ω

C. 12Ω

D. 14Ω

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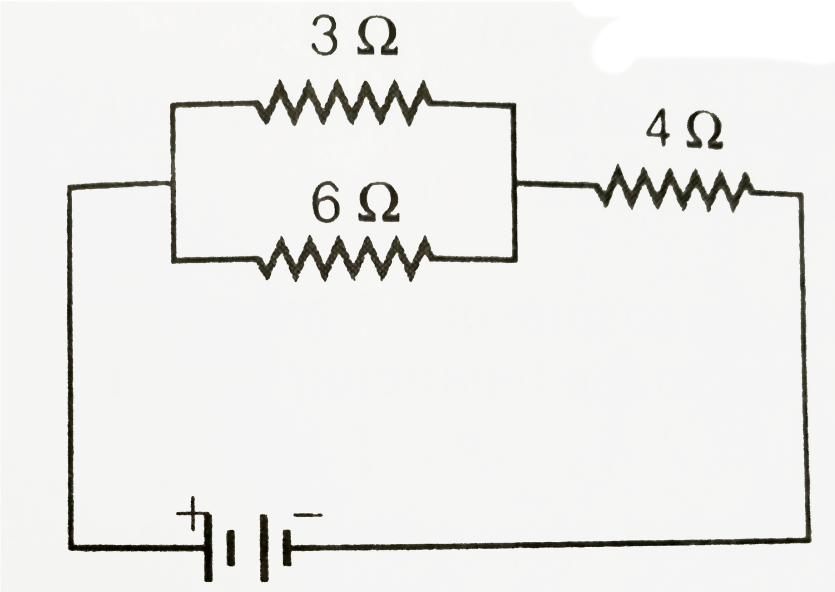
81. Current through 3Ω resistor is 0.8A, then potential drop through 4Ω resistor is



A. $1.2V$

B. $2.\ 6V$

C. $4.\ 8V$

D. $9.\ 6\Omega$

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82. A 6 V battery is connected to the terminals of a 3m long wire of uniform thickness and resistance fo 100Ω .The difference of potential between two points on the wire seperated by a distance of 50cm well be

A. $2V$

B. $3V$

C. $1V$

D. $0.5V$

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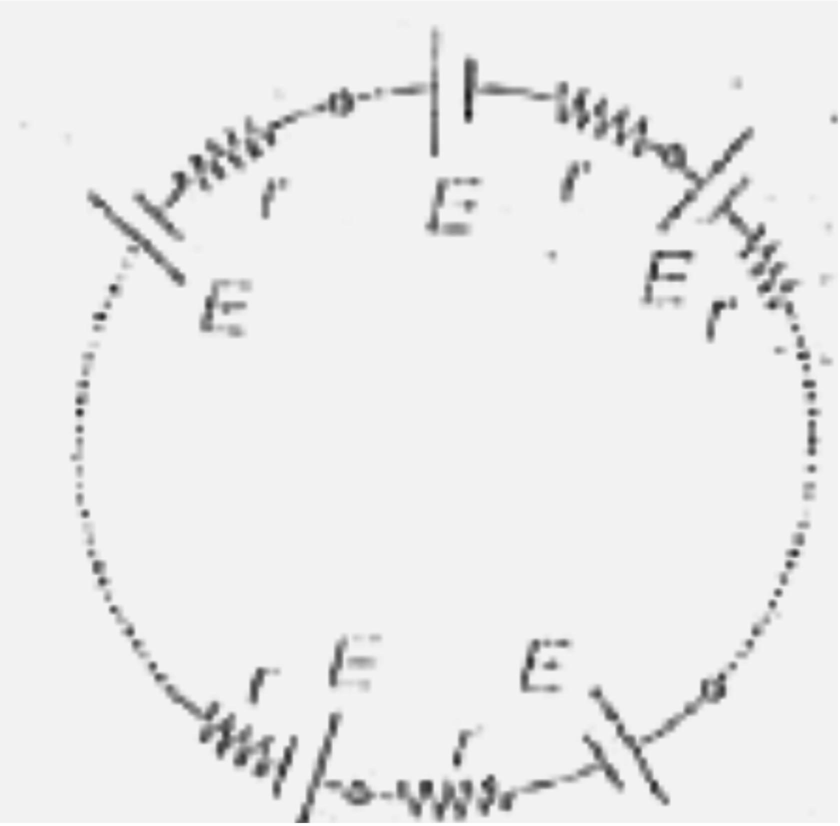
83. A group of n identical cells each of EMF E and internal resistance r are joined in series to form a loop as shown . The terminal voltage across each cell is



A. Zero

B. E

C. nE

D. $\frac{E}{n}$

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84. v31

A. $\dfrac{2(E-V)V}{r}$

B. $\dfrac{2(E-V)r}{E}$

C. $\dfrac{(E-V)r}{V}$

D. $(E-V)r$

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85. To draw the maximum current from a combination of cells, how should be the cells be grounded ?

A. Series

B. Parallel

C. Mixed

D. Depends upon the relative values of external and internal resistance .

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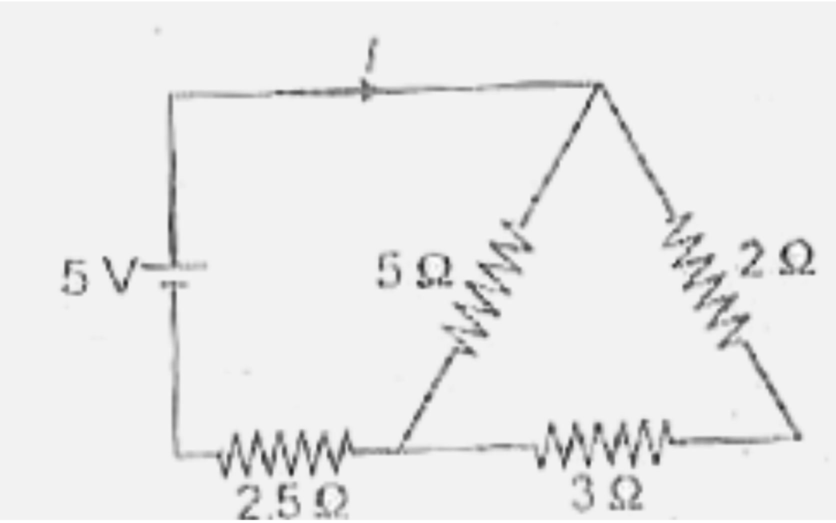
86. The current I through the cell in the network shown is



A. $3A$

B. $2A$

C. $1A$

D. $4A$

Answer: C

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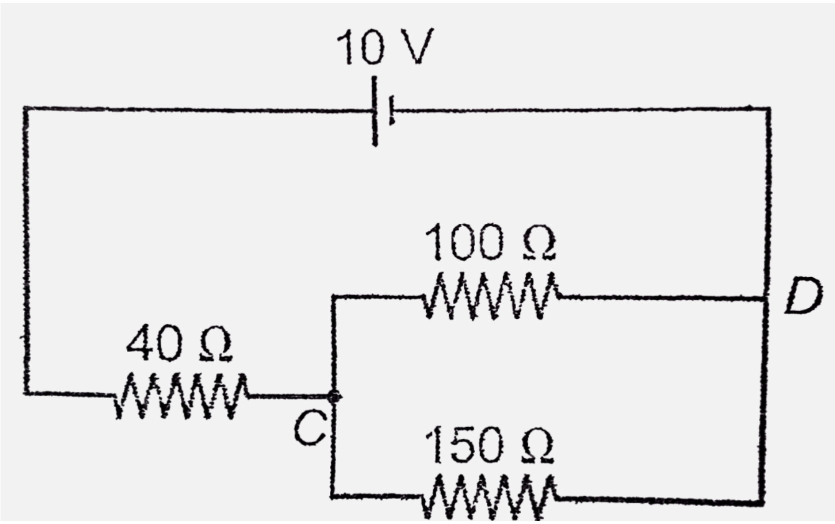
87. In the network shown below , potential difference across CD is



A. $4V$

B. $6V$

C. $10V$

D. $5V$

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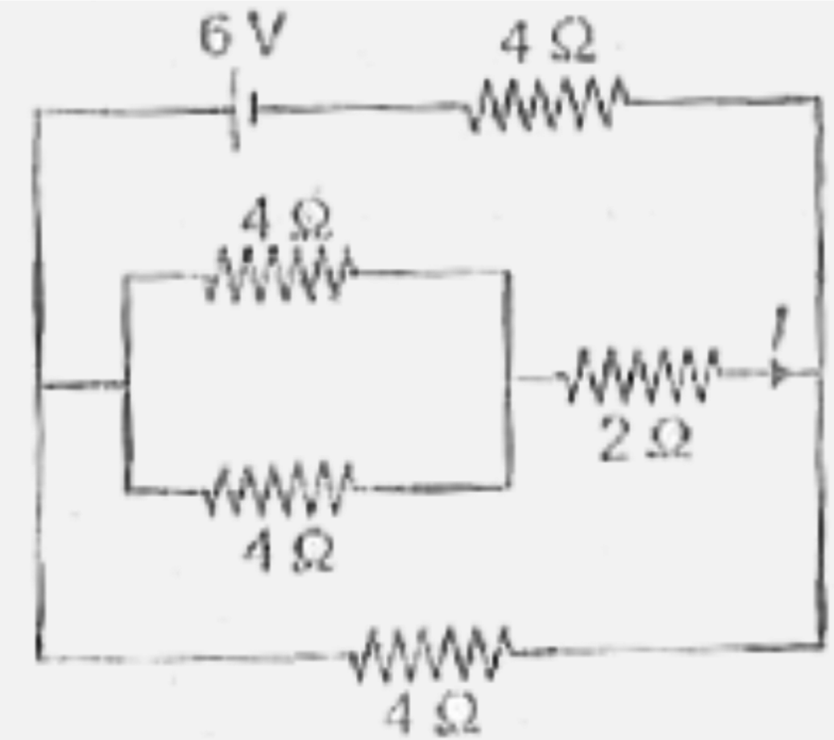
88. The current I in the circuit shown below is



A. A. $1A$

B. B. $2A$

C. C. $0.5A$

D. D. Zero

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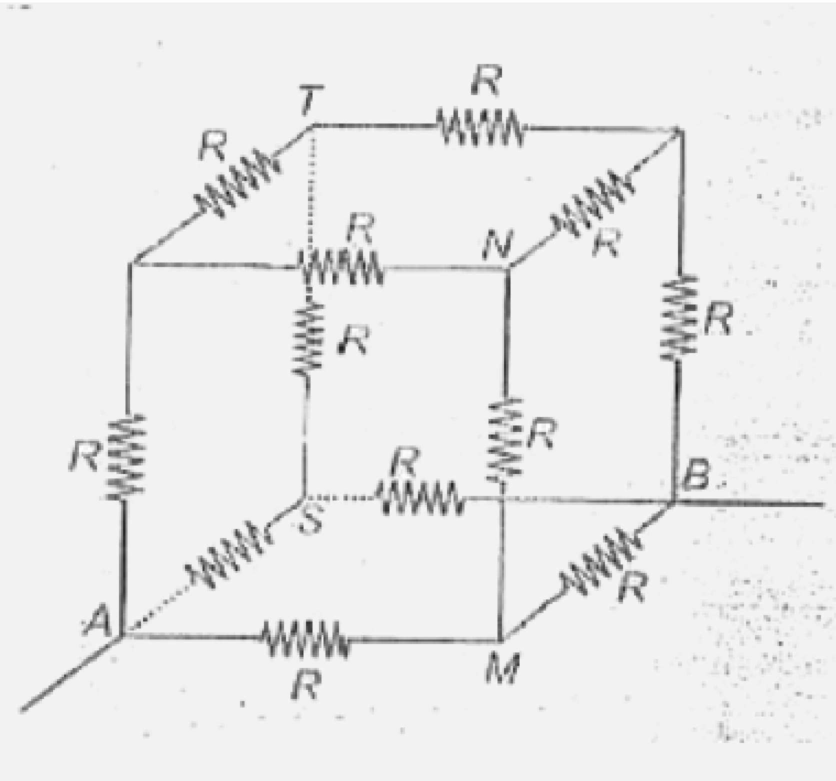
89. Twelve identical resistance R each form a cube as shown in figure . Resistance across its face diagonal AB corners is



A. $\frac{5}{6}$ R

B. $\frac{6}{5}R$

C. $\frac{4}{3}R$

D. $\frac{3}{4}R$

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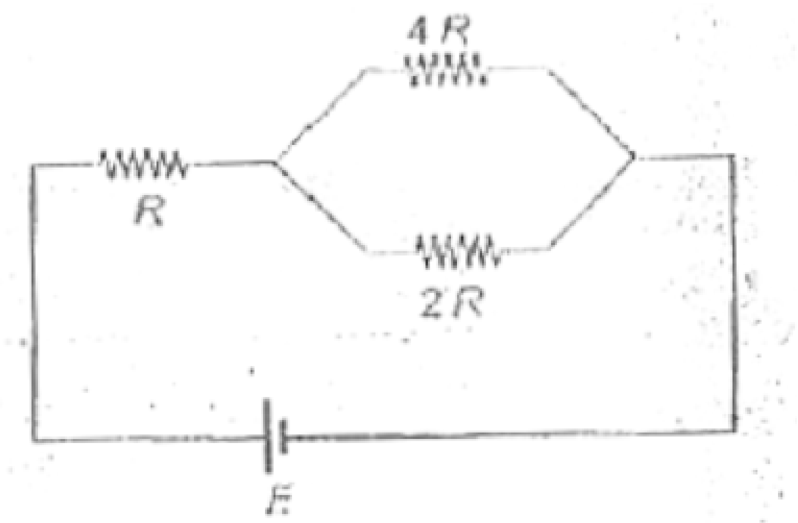
90. In a network as shown in the figure , the potential difference across the resistance 2 R is (the cell has emf E - volt and no internal resistance)



A. $2E$

B. $\frac{4E}{7}$

C. $\frac{E}{7}$

D. E

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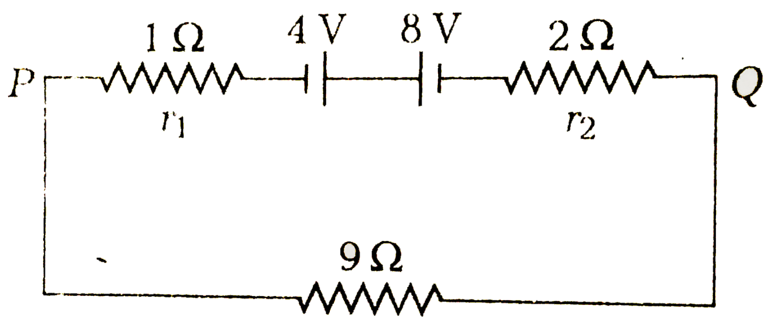
91. Two batteries of emf 4 V and 8 V with internal resistances 1Ω and 2Ω are connected in a circuit with a resistance of 9Ω as shown in figure. The current and potential difference between the points P and Q are



A. $\frac{1}{12}$ A and $12V$

B. $\frac{1}{g}A$ and 9 V

C. $\frac{1}{6}$ A and 4 V

D. $\frac{1}{3}A$ and 3 V

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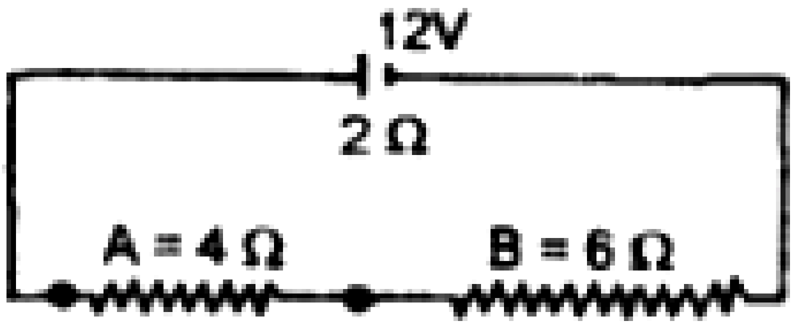
92. A battery of emf 12V and internal resistance 2Ω is connected with two resistors A and B of resistance 4Ω and 6Ω respectively joined in series. . The current i in the circuit is



A. $1A$

B. $4.0A$

C. $2.\ 0A$

D. $1.33A$

Answer: A

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93. A part of circuit is shown in figure . The wire A is a very thick copper and wire B and C are identical wires of manganin . The currents in wire A , B , C will be respectively

A. $1A, 1A, 2A$

B. $0, 2A, 2A$

C. $2A, 0, 2A$

D. $2A, 2A, 2A$

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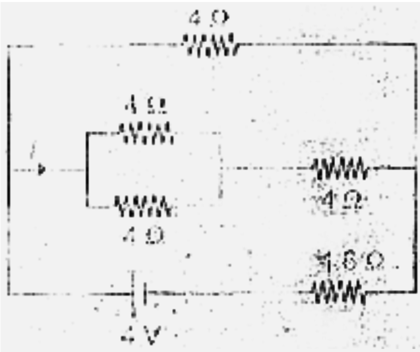
94. In the circuit shown the value of in amper is



A. 1

B. 0.6

C. 0.4

D. 1.5

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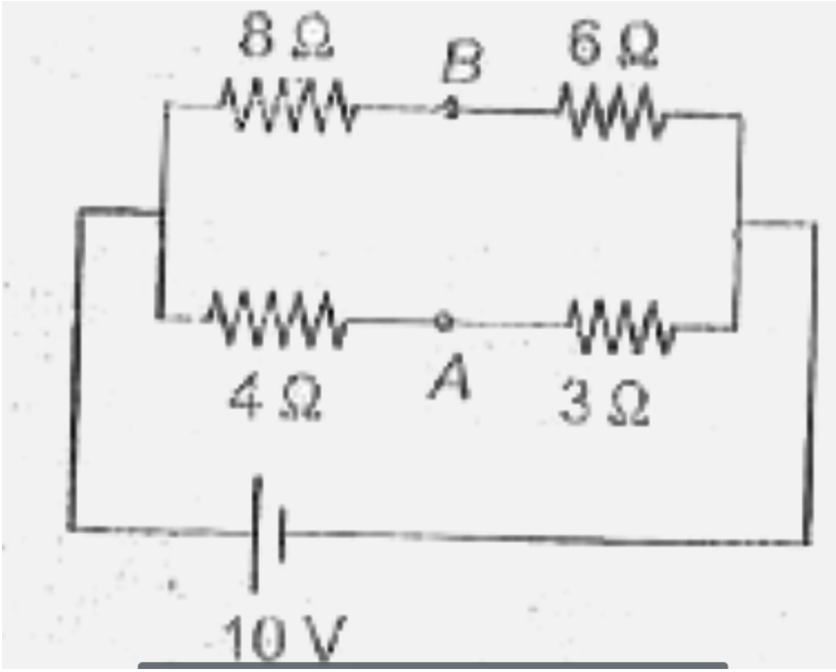
95. The potential difference between points A and B is



A. $\frac{20}{7}V$

B. $\frac{40}{7}V$

C. $\frac{10}{7}V$

D. Zero

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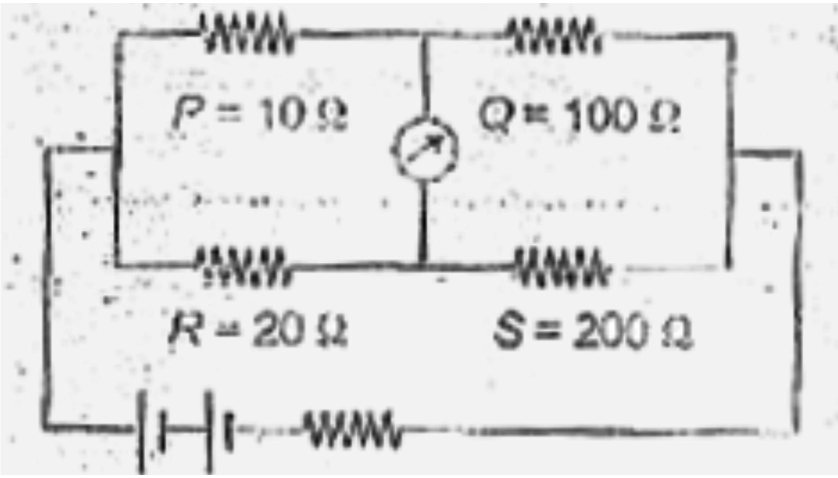
96. In the gives figure , a balanced Wheastone bridge is shown . Now it is distrubed by changing P to 15Ω. Which of the following steps will not bring the bridge to balance again ?



A. Increasing Q by 50Ω

B. Increasing R by 10Ω

C. Increasing S by 20Ω

D. All of these

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97. In a balanced wheatstone's network, the resistances in the arms Q and S are interchanged. As result of this:

A. A. Galvanometer and the cell must to be interchanged to balance

B. B. Galvanometer shows zero deflection

C. C. Netwrok is not balanced

D. D. Network is still balanced

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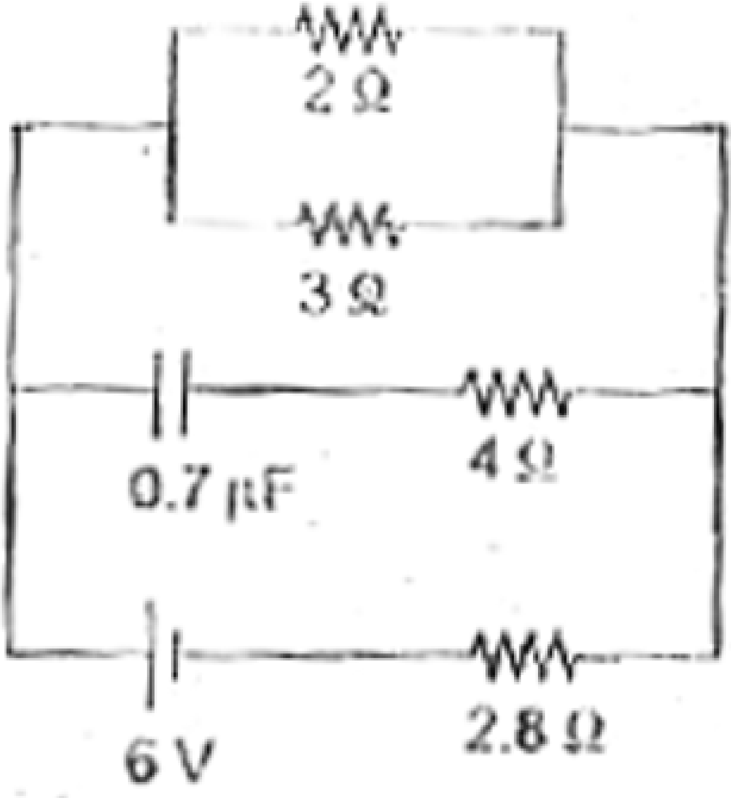
98. In the circuit shown , the internal resistance of the cell is negligible . The steady stale current in the 2Ω resistor is



A. $0.6A$

B. $1.2A$

C. $0.9A$

D. $1.5A$

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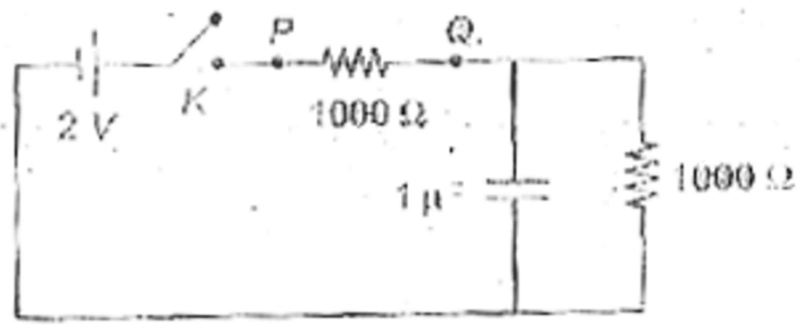
99. When the key K is presend at time t = 0 , then which of the following statements about the current I in the resistor PQ of given circuit is true ?



A. at t = 0 , I =2 mA and with time it goes to 1 mA

B. I oscillates between (1 mA and 2mA)

C. i=2 mA at all t

D. i=1 mA at all t

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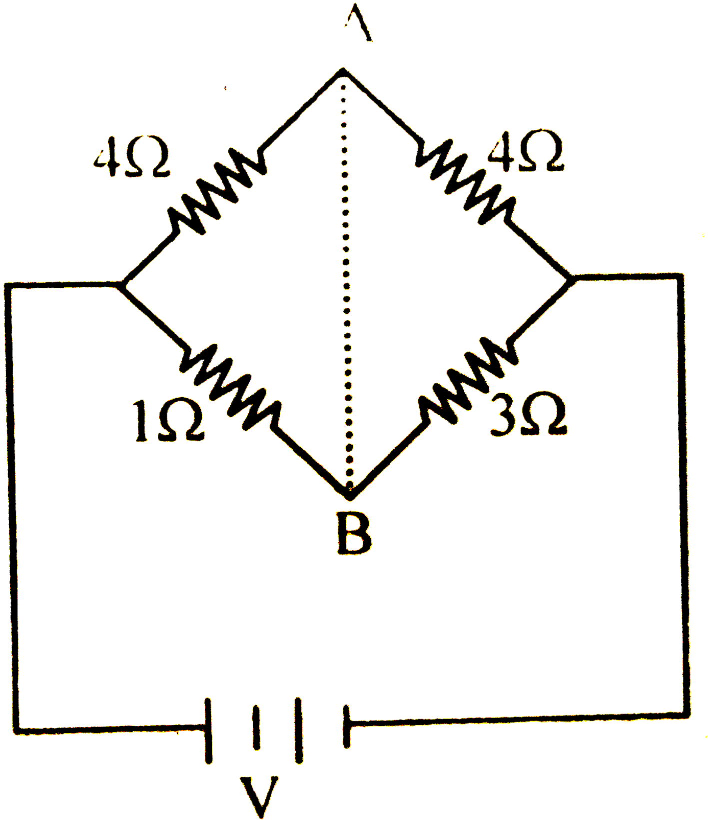
100. In the circuit shown,if a conduction wire is connected between point A and B current in this wire will-



A. Flow from A to B

B. Flow in the direction which will be decided by the value of V .

C. Be zero

D. Flow from B to A

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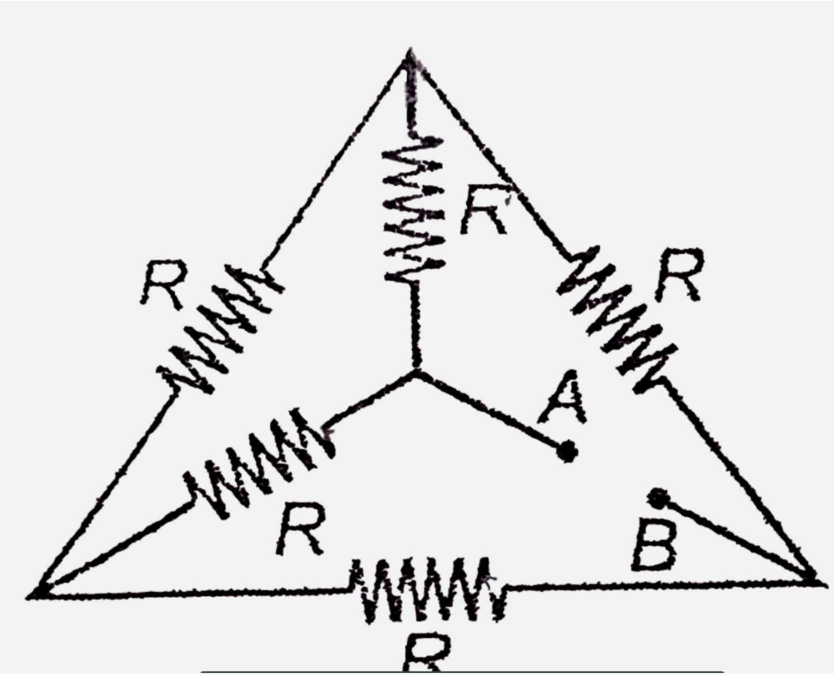
101. In the network shown , find the resistance across AB.



A. R

B. 2R

C. $\frac{R}{2}$

D. $4R$

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102. In the metre brige , the balancing length $AB = l = 20cm$. The unknow resistance X is equal to

A. 0.25Ω

B. 0.8Ω

C. 0.2Ω

D. 0.16Ω

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103. An unknown resistance R_1 is connected is series with a resistance of 10Ω. This combination is connected to one gap of a meter bridge, while other gap is connected to another resistance R_2. The balance point is at $50cm$ Now , when the 10Ω resistance is removed, the balanced point shifts to $40cm$ Then the value of R_1 is.

A. 20Ω

B. 10Ω

C. 60Ω

D. 40Ω

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104. Two cells of emf E_1 and E_2 are to be compared in a potentiometer $(E_1 > E_2)$. When the cells are used in series correctly, the balancing length obtained is 400 cm. When they are used in series but E_2 is connected with reverse polarities, the balancing obtaiend is 200cm. Ratio of emf of cells is

A. $3:2$

B. $3:1$

C. $4:1$

D. $4:3$

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105. A simple potentiometer circuit is shown in figure . The internal resistance of 4 V battery is negligble AC is the uniform wire of length 100 cm , and resistance 2Ω . What would be the length of AB for which galivanometer shows zero deflection .

A. $82.5cm$

B. $41.50cm$

C. $165cm$

D. 50 cm

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106. In meter bridge , the balancing length from left is found to be 20 cm when standard connected of 1Ω is in right gap . The value of unknown resistance is

A. 0.25Ω

B. 0.8Ω

C. 0.2Ω

D. 0.16Ω

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ASSIGNMENT(SECTION-A(OBJECTIVE TYPE QUESTIONS))

1. 10^{23} electrons passed from left to rigth normally through a cross section in 1s. Average current through the cross section is

A. $1.6 \times 10^{4} A$

B. $1.6 \times 10^{3} A$

C. $1.6 \times 10^{2} A$

D. $10^{23} A$

Answer: A

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2. Charge Q passing through a cross-section of conductor at an instant is given by $Q = (0.5t^{2} + t)C$ where t is in second . Current through the conductor at $t = 1$ is

A. Zero

B. 1A

C. 2A

D. $-1A$

Answer: 3

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3. S.I. unit of current is :-

A. ampere

B. coulomb per second (Cs^{-1})

C. biot

D. All of these

Answer: D

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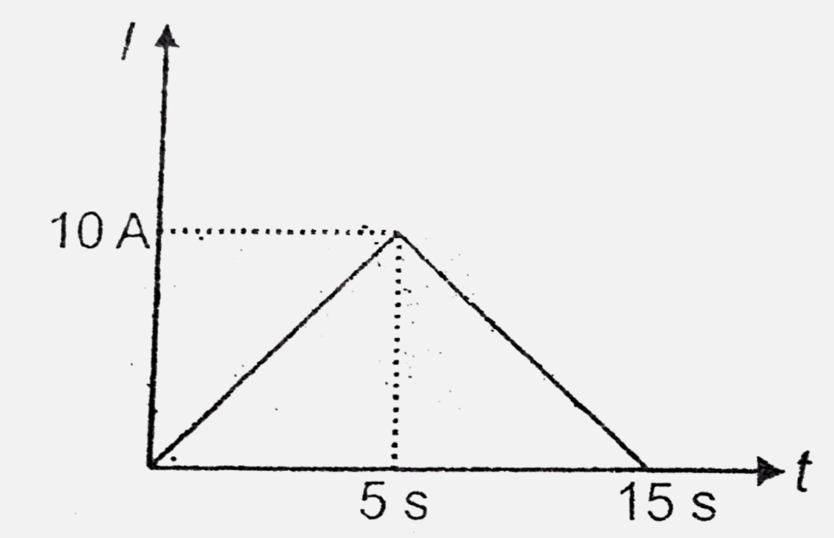
4. Current I versus time t graph through a conductor is shown in the figure.

Average current through the conductor in the interval 0 to 15 s is



A. 1A

B. 10A

C. 7.5A

D. $5A$

Answer: 4

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5. Which of the following is $/$ are correct about electric current ?

A. A) Current is a scalar quantity

B. B) Conventional current is along the direction of flow of positive charges

C. C) Conventional current is along the direction opposite to flow of free electrons

D. D) All of these

Answer: 4

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6. The average velocity of electrons in a conductor in the absence of electric field is

A. A) $10^{-3} m / s$

B. B) $3 \times 10^{8} m / s$

C. C) $10^{5} m / s$

D. D) Zero

Answer: 4

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7. Thermal speed v of free electrons in a conductor at absolute temperaure T is proportional to

A. T

B. $\sqrt{T}$

C. $\frac{1}{\sqrt{T}}$

D. $\frac{1}{T}$

Answer: 2

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8. When a circuit is switched on, current flows through the circuit with the speed of light because

A. Electrons travel with speed of light

B. Ions travel with speed of light

C. Electric field sets up in the conductor with speed of light

D. All of these

Answer: 3

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9. The conducting medium in which flow of positive ions and negative ions develop currnt through the medium is known as

A. Metal

B. Semiconductor

C. Electrolyte solution

D. Insulators

Answer: 3

Watch Video Solution

10. If V is the potential difference between the ends of conductor and I is the current through it, then ohm's law states that

A. $V \propto l$

B. $V \propto \frac{1}{l}$

C. $V \propto l^2$

D. $V \propto l^0$

Answer: 1

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11. The resistance of a conductor depends on its

A. Material of conductor

B. Length of conductor

C. Area of cross-section of conductor

D. All of these

Answer: 4

Watch Video Solution

12. If the length of a conductor is increased by 100% keeping its area of cross-section constant, the percentage increase in its resistance is

A. 100%

B. 50%

C. 200%

D. 25%

Answer: 1

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13. If the radius of cross-section of the conductor is increased by 0.1% keeping volume constant, then percentage change in the resistance of the conductor is

A. -0.2%

B. -0.1%

C. -0.3%

D. -0.4%

Answer: 4

Watch Video Solution

14. Which of the following is a non metallic conductor

A. Diode

B. Transistor

C. Solar cell

D. All of these

Answer: 4

Watch Video Solution

15. If $\vec{j}$ and $\vec{E}$ are current density and electric field respectively inside a current carrying conductor , then correct relation is

A. $\vec{j} = \sigma \vec{E}$

B. $\vec{j} \times \vec{E} = 0$

C. $\vec{j} . \vec{E} > 0$

D. All of these

Answer: 4

Watch Video Solution

16. Current density $\overrightarrow{j}$ at an area $\overrightarrow{A}=\left(2\hat{i}+3\hat{j}\right)mm^2$ is $\overrightarrow{j}=\left(3\hat{j}+4\hat{k}\right)\times10^3A/m^2$. Current through the area is

A. 9 mA

B. Zero

C. 18 mA

D. 12 mA

Answer: 1

Watch Video Solution

17. Which of the following represents the ohm's law ?

A. $V=\dfrac{l}{R}$

B. $\overrightarrow{j}=\dfrac{1}{simga}\overrightarrow{E}$

C. $\vec{j} = \frac{1}{\rho}\vec{E}$

D. $\vec{j} = \vec{E}$

Answer: 3

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18. The ratio of magnitude of current density and magnitude of electric field inside the conductor is

A. Independent of temperature

B. Independent of dimension of conductor

C. Independent of material of conductor

D. All of these

Answer: 2

Watch Video Solution

19. Conductivity of a conductor of length L and radius of cross-section r at temperature $t^\circ C$ is σ . If its length is doubled and radius is halved at same temperature, then new conductivity of the conductor will be

A. σ

B. 4σ

C. $\frac{\sigma}{2}$

D. $\frac{\sigma}{4}$

Answer: 1

Watch Video Solution

20. Resistance of the conductor of length 5m and area of cross -section $4mm^2$ s 0.02Ω. Its resistivity is

A. $1.6 \times 10^{-6}\Omega$ m

B. $1.6 \times 10^{-5}\Omega m$

C. $1.6 \times 10^{-8} \Omega m$

D. $10^{-8} \Omega m$

Answer: 3

Watch Video Solution

21. When electric field is applied inside a conductor then free electron are accelerated. Their average velocity in time interval t is proportional to

A. t^1

B. t^2

C. $\sqrt{t}$

D. t^0

Answer: 4

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22. If n,e,A and v_d are free electron density inside conductor , charge of electron , area of cross-section of conductor and drift velocity of free electrons inside conductor, then current I through the conductor is

A. $neAv_d$

B. ne^2Av_d

C. nev_d

D. $n^2eA\bar{v}_d$

Answer: 1

Watch Video Solution

23. If n ,e,m and τ are free electron density in conductor , charge of electron, mass of electron and relaxation time of free electrons , then resistivity ρ of the conductor can be expressed as

A. $\rho = \dfrac{m}{ne^2\tau}$

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

C. $\rho = \frac{ne\tau}{m}$

D. $\rho = \frac{m}{ne\tau}$

Answer: 1

Watch Video Solution

24. A current of 10 A is maintained in a conductor of cross-section $1cm^2$. If the free electron density in the conductor is $9 \times 10^{28}m^{-3}$, then drift velocity of free electrons is

A. $6.94 \times 10^{-6}m/s$

B. $5.94 \times 10^{-2}m/s$

C. $1.94 \times 10^{-3}m/s$

D. $2.94 \times 10^{-4}m/s$

Answer: 1

Watch Video Solution

25. Two wires A and B of the same material having radii in the ratio 1:2 carry currents in the ratio 4 :1 , The ratio of drift speed of electrons in A and B is .

A. $16 : 1$

B. $1 : 16$

C. $1 : 4$

D. $4 : 1$

Answer: 1

Watch Video Solution

26. If μ is the mobility of free electrons inside a conductor , then μ is independent of

A. Area of cross-section of conductor

B. Length of conductor

C. Volume of conductor

D. All of these

Answer: 4

Watch Video Solution

27. A potential difference of 5V is applied across a conductor of length 10 cm. IF drift of electron is $2.5 \times 10^{-4} m/s$, then electron mobility in SI unit is

A. 5×10^{-4}

B. 5×10^{-6}

C. 5×10^{-2}

D. Zero

Answer: 2

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28. The SI unit of electron mobility is :

A. $m^2V^{-1}s^{-1}$

B. m^2Vs^{-1}

C. $m^{-2}V^{-1}s^{-1}$

D. $m^{-1}V^{-1}s^{-1}$

Answer: 1

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29. When electric field inside a conductor is E, mobility of free electrons inside the conductor is μ. When the electric field is doubled mobility will be

A. μ

B. 2μ

C. $\frac{\mu}{2}$

D. $\frac{\mu}{4}$

Answer: 1

Watch Video Solution

30. What is the range of resistivity of metallic conductors?

A. $10^{-8}\Omega m$ to $10^{-6}\Omega m$

B. $10^{10}\Omega m$ to $10^{12}\Omega m$

C. $10^{-3}\Omega m$ to $10\Omega m$

D. $10^{3}\Omega m$ to $10^{6}\Omega m$

Answer: 1

Watch Video Solution

31. Wire wound resistances used in resistance boxes are made up of

A. Iron

B. Copper

C. Silver

D. Manganin

Answer: 4

Watch Video Solution

32. A good moderator should

A. Low resistivity

B. High metling point

C. Low sensitiveness to temperature

D. All of these

Answer: 3

Watch Video Solution

33. In a carbon resistor the last band colour is missing. Its tolerance is

A. 5%

B. 10%

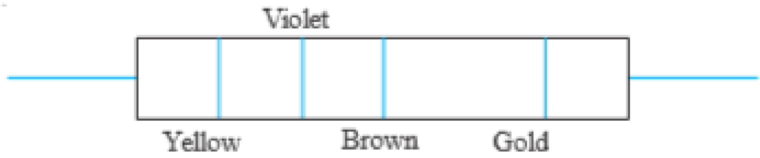
C. 20%

D. 0%

Answer: 3

Watch Video Solution

34. A carbon resistor has coloured strips as shown in figure. Its resistance is



A. $410\Omega \pm 5\%$

B. $470\Omega \pm 5\%$

C. $470\Omega \pm 10\%$

D. $470\Omega \pm 20\%$

Answer: 2

Watch Video Solution

35. Temperature coefficient of resistance of a wire at $0^{\circ}C$ is $0.00125^{\circ}C^{-1}$.

At $25^{\circ}C$ its resistance is 1Ω. The resitance of the wire will be 1.2Ω at

A. 225 K

B. $190^\circ C$

C. $260^\circ C$

D. $185K$

Answer: 2

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36. In a platinum resistance thermometer resitance of the platinum wire at $0^\circ C, 100^\circ C$ and in hot bath are $8\Omega, 12\Omega$ and 11Ω respectively. Temperature of hot bath is

A. $15^\circ C$

B. $175^\circ C$

C. $60^\circ C$

D. $75^\circ C$

Answer: 4

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37. Coefficient of linear expnsion of material of resistor is α . Its temperature coefficient of resistivity and resistance are α_p and α_R respectively , the correct relation is .

A. $\alpha_R = \alpha_p - \alpha$

B. $\alpha_R = \alpha_p + \alpha$

C. $\alpha_R = \alpha_p + 3\alpha$

D. $\alpha_R = \alpha_p - 3\alpha$

Answer: 1

Watch Video Solution

38. Which of the following has negative temperature coefficient of resistance?

A. Iron

B. Coppoer

C. Gas

D. Gold

Answer: 3

Watch Video Solution

39. Two bulbs B_1 and B_2 are used in a household circuit. B_1 glows brighter and B_2 glows dim. Mark the correct statement.

A. B_1 has higher resistance than B_2

B. B_2 has higher resistance than B_1

C. B_1 and B_2 have same resistance

D. B_1 and B_2have same current.

Answer: 2

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40. Two electric bulbs whose resistances are in the ratio of $1:2$ are connected inparallel to a constant voltage source. The powers dissipated in them have the ratio

A. $1:2$

B. $1:1$

C. $1:4$

D. $2:1$

Answer: 4

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41. If two bulbs of power 60 W and 100 W respectively each rated 110 V are connected in series with the supply of 220 V, then

A. 60 W bulb will fuse

B. 100 W bulb will fuse

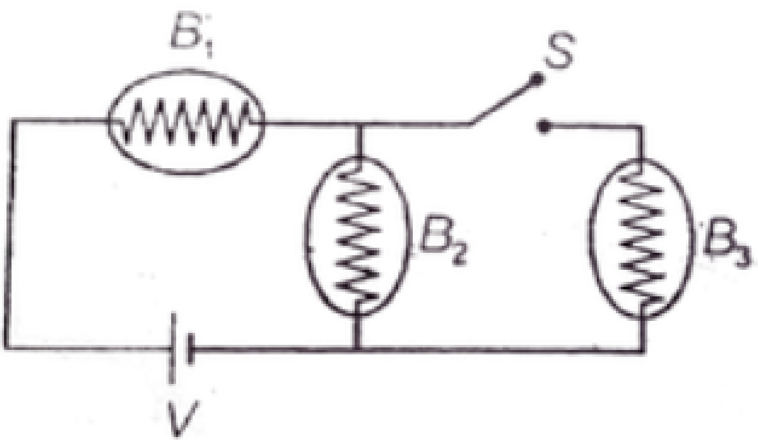
C. Both bulbs will fuse

D. Bulbs will not fuse

Answer: 1

Watch Video Solution

42. Three bults $B_{1,B} \_ (2)$ and B_3 of equal resistance are connected as shown in figure with S open.When S is closed then intentsity of B_1 will



A. Increase

B. Decrease

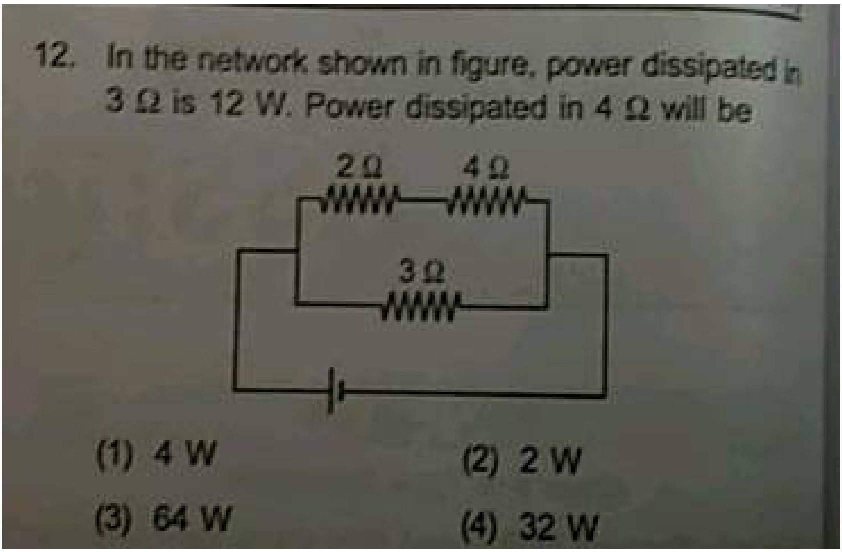
C. Remain constant

D. First increase then decrease

Answer: 1

Watch Video Solution

43. In the network shown in the figure, power dissipated in 3Ω and 12 W. Power dissipated in 4Ω will be



12. In the network shown in figure, power dissipated in $3\ \Omega$ is 12 W. Power dissipated in $4\ \Omega$ will be

(1) 4 W (2) 2 W

(3) 64 W (4) 32 W

A. 4W

B. 2W

C. 64W

D. 32W

Answer: 1

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44. In a house, individual power of two elements are 100W and 150 W . Effective power of their series combination will be

A. 120W

B. 75W

C. 50W

D. 60W

Answer: D

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45. How many 60 W bulbs may be safely run on 220 v using a 5 A fuse?

A. 18

B. 16

C. 14

D. 12

Answer: A

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46. A cell of emf 16V and internal resistant 4Ω can deliver maximum power to a load of resistance R where R is equal to

A. 2Ω

B. 16Ω

C. 4Ω

D. 8Ω

Answer: 3

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47. A battery delivers equal power individually across 4Ω and 16Ω . Internal resistance of the cell is

A. 8Ω

B. 6Ω

C. 12Ω

D. 20Ω

Answer: 1

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48. A heater boils certain amount of water in 15 minutes. Another heater boils same amount of water in 10 minutes. Time taken to boil same amount of water when both are used in parallel is

A. 25 minute

B. 6 minute

C. 12 minute

D. 12.5 minute

Answer: 2

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49. Minimum resistance obtained from two resistors 3Ω and 2Ω is

A. 1Ω

B. 1.2Ω

C. 5Ω

D. 2Ω

Answer: 2

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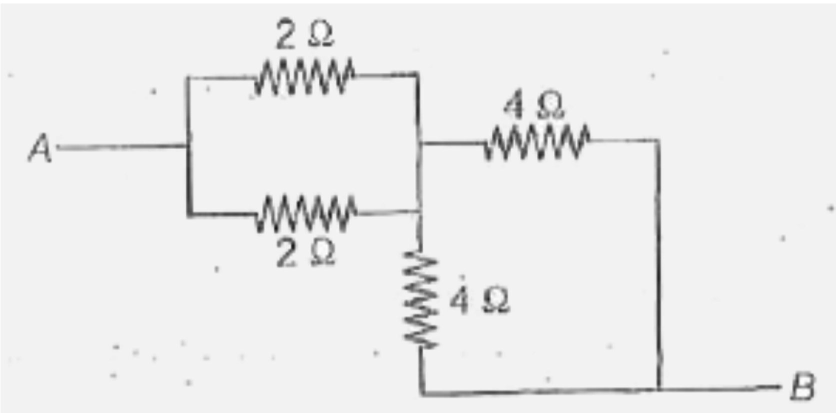
50. Effective resistance across AB in the network shown in



A. 6Ω

B. 3Ω

C. 5Ω

D. 8Ω

Answer: 2

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51. A uniform wire os resistance 12Ω is bent to form a circle. Effective resistance across two diametrically opposite points is

A. 12Ω

B. 24Ω

C. 3Ω

D. 6Ω

Answer: 3

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52. A wire of resistance R is cut into ' n ' equal parts. These parts are then connected in parallel. The equivalent resistance of the combination will be

A. $\frac{r}{n}$

B. $\frac{r}{n^2}$

C. rn

D. n^2r

Answer: 2

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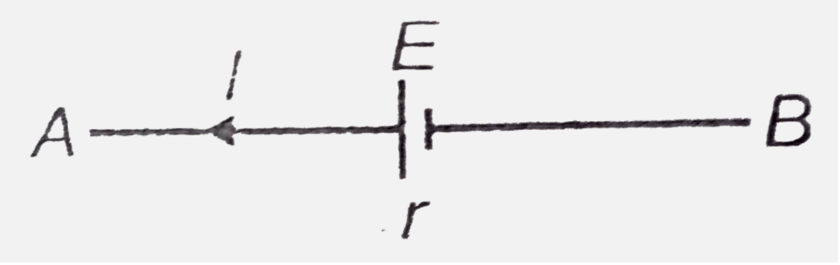
53. Potential difference across AB in the circuit as shown in figure.



A. E $E - lr$

B. $E + lr$

C. Zero

D.

Answer: 2

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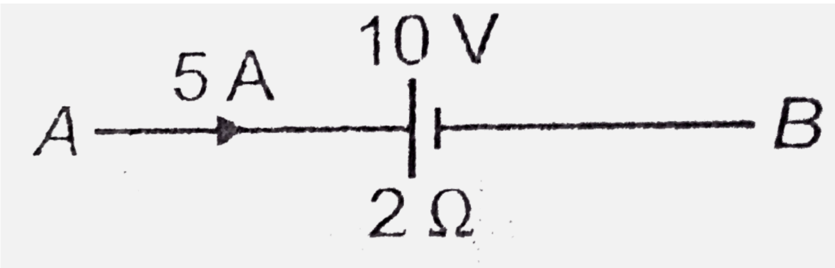
54. Potential difference across AB in the network shown is



A. 5V

B. 10V

C. Zero

D. 20V

Answer: 4

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55. emf of a chemical cell depends on

A. Distance between electrodes

B. Area of electrods

C. Nature of electrolyte

D. Chemical potential of electrons

Answer: 4

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56. When current supplied by a cell to a circuit is $0.3A$, its terminal potential difference is 0.9 A. When the current supplied becomes 0.2 A, its terminal potential difference becomes 1.0 V . The internal resistance of the cell is

A. 0.5Ω

B. 2Ω

C. 1.2Ω

D. 1Ω

Answer: 2

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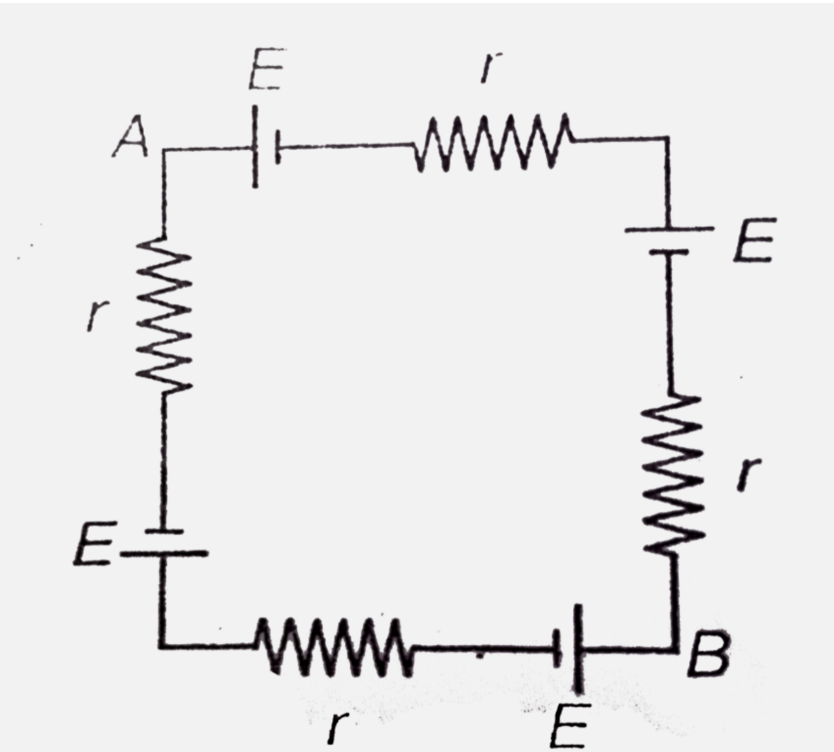
57. Potential difference across AB in the networ shown is



A. Zero

B. E

C. $E - \frac{lr}{2}$

D. $E - 2r$

Answer: 1

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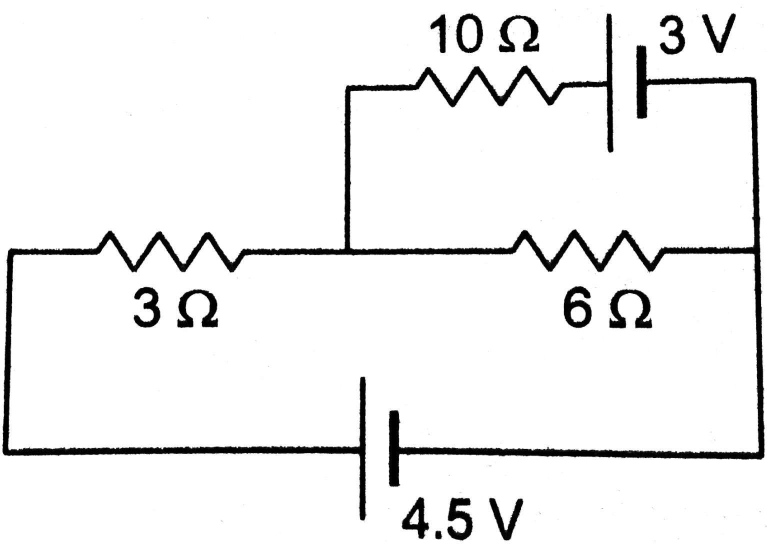
58. Find the current through the $10(\Omega)$resistor shown in figure.



A. Zero

B. 1A

C. $1.5A$

D. 2A

Answer: 1

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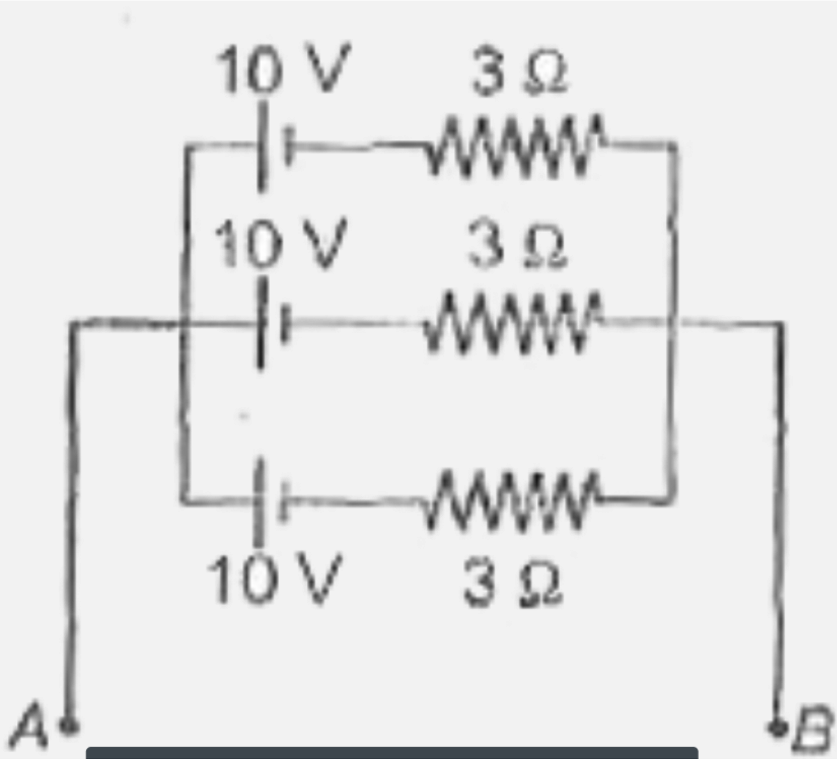
59. Three identical cells are connected in parallel across AB. Net across AB is



A. 10V

B. 30V

C. 15V

D. 12V

Answer: A

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60. Five cells each of emf E and internal resistance r are connecte in series. Due to oversight one cell is connected wrongly . The equivalent emf and internal resistance of the combination is

A. $3E, 3r$

B. 5E , 3r

C. 3E, 5r

D. 5E,5r

Answer: 3

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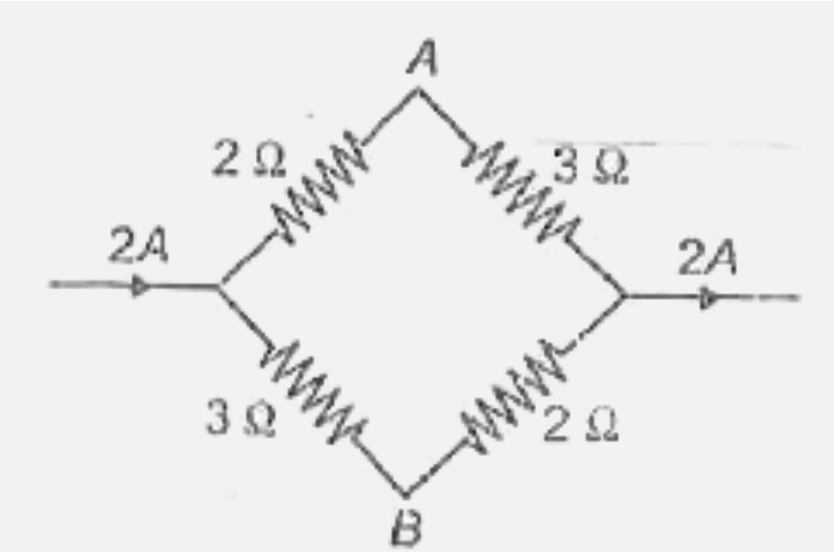
61. Potentail difference $V_A - V_B$ in the network shown in



A. 1V

B. $-1V$

C. $2V$

D. $-2V$

Answer: 1

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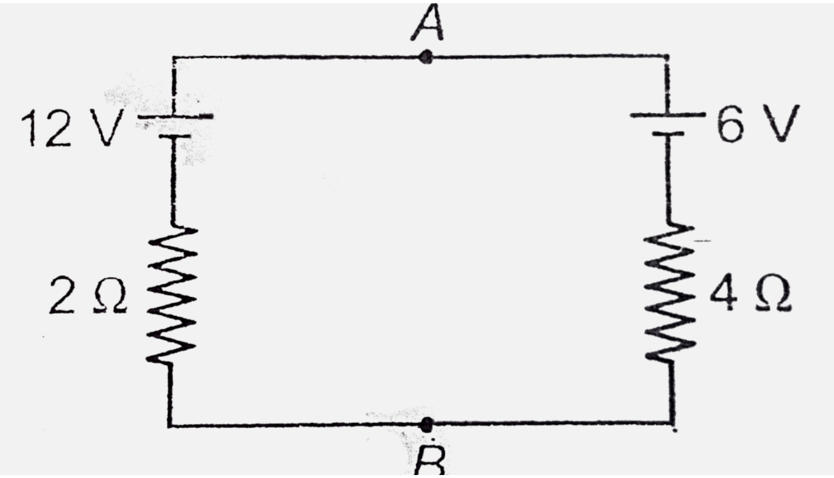
62. Potential difference across AB , i.e., $V_A - V_B$ is



A. 10V

B. 8V

C. 6V

D. Zero

Answer: 1

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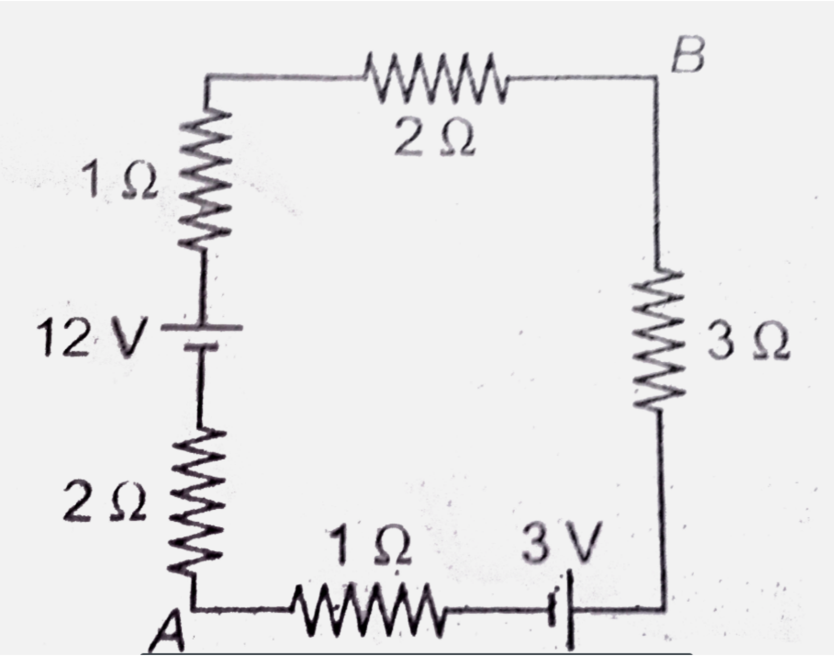
63. Potential difference $V_B - V_A$ in the network shown is



A. 7V

B. 6V

C. 5V

D. 8V

Answer: 1

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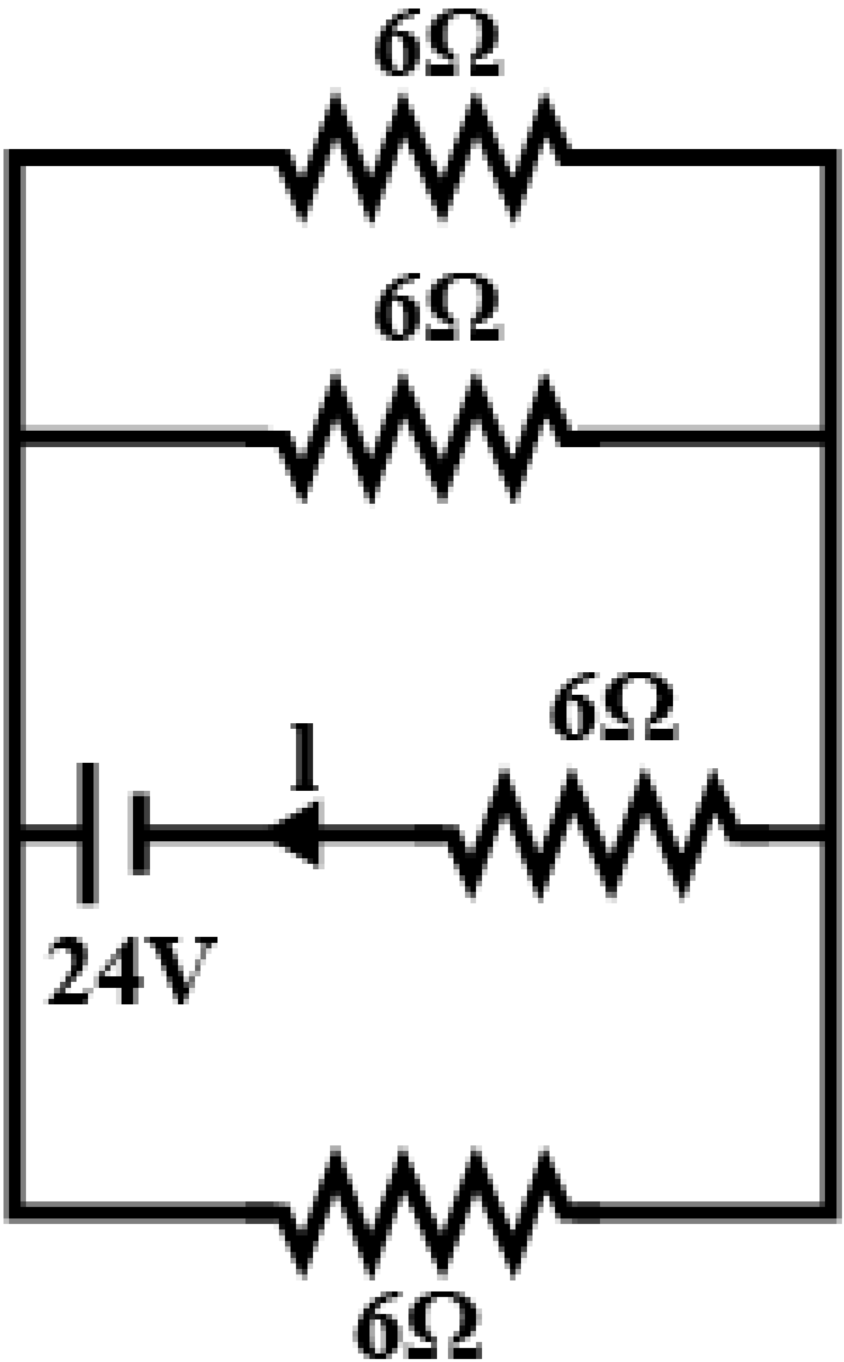
64. Current I in the network shown in figure is



A. 16A

B. 3A

C. 4A

D. 12A

Answer: B

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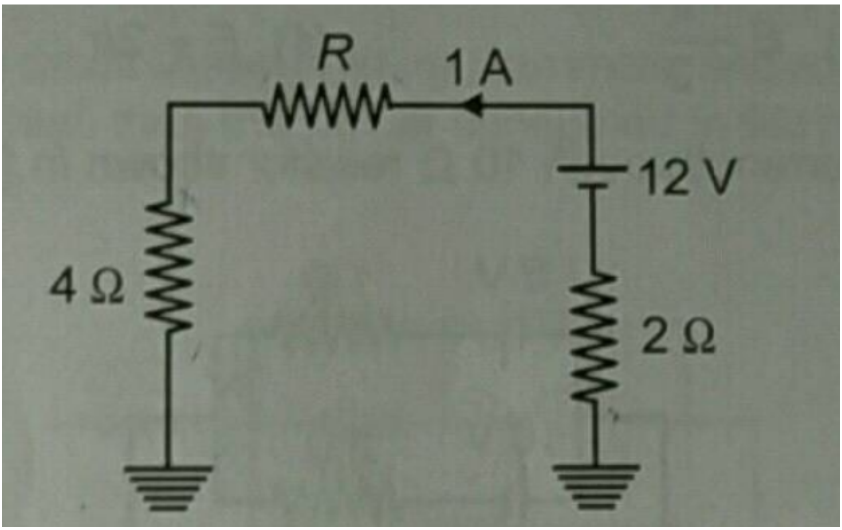
65. Value of the resistance R in the figure is



A. 6Ω

B. 8Ω

C. 10Ω

D. 12Ω

Answer: A

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66. Current through resistor $R3$ as shown in figure is _____. Given that $R1 = 10\Omega$ $R2 = 5\Omega$ $R4 = 20\Omega$ and $R5 = 10\Omega$

A. 1A

B. 2A

C. 2.5A

D. Zero

Answer: 4

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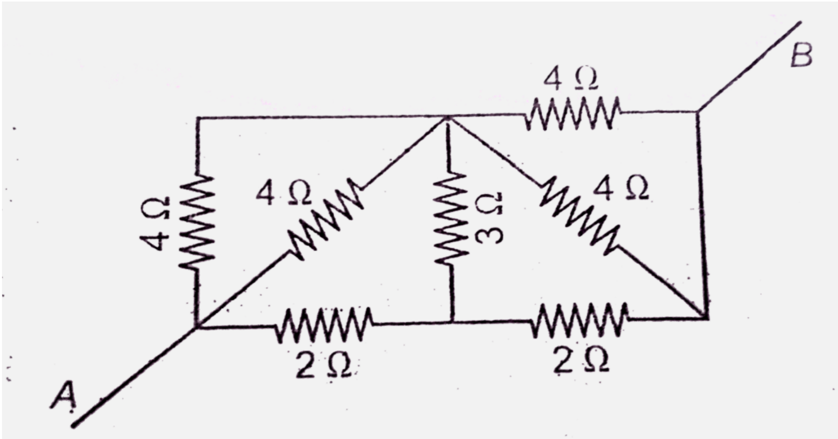
67. Resistance across AB as shown in figure is



A. 2Ω

B. 4Ω

C. 6Ω

D. 12Ω

Answer: 1

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68. Determination of unknonw resistance in metre bridge is most accurate , when the balancing length is

A. 50 cm

B. 10 cm

C. 20 cm

D. 40 cm

Answer: 1

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69. Two cells of emf E_1 and $E_2(E_1 > E_2)$ are connected in series to potentiometer for balancing length 625 cm . When polarity of E_2 is reversed then balancing length becomes 125 cm. Then the ratio $\frac{E_1}{E_2}$ is

A. $3:2$

B. $3:1$

C. $5:1$

D. $2:1$

Answer: 1

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ASSIGNMENT SECTION-B(OBJECTIVE TYPE QUESTION))

1. Which of the following is different from others

A. $volt^2 ohm^{-1}$

B. $ampere^2 ohm$

C. volt ampere

D. joule $second^2$

Answer: D

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2. The current I through a given cross -section varies with time t as $I = 3 + 2t$, where I is in ampere and t is in second. The charge passed through this cross-section dring $t = 0$ to $t = 2$ s is

A. 7C

B. 10C

C. 14C

D. 20C

Answer: 2

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3. Electric current is passing through a solid conductor PQ from P to Q. The electric current densities at p and Q are in the ratio.

A. $1:2$

B. $2:1$

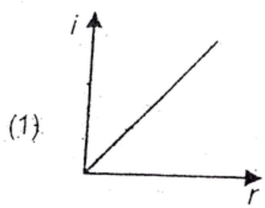
C. $1:4$

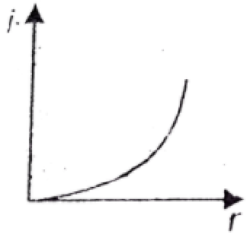
D. $4:1$

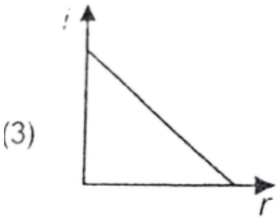
Answer: C

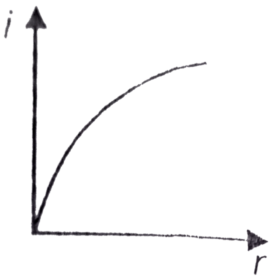
Watch Video Solution

4. Electric current is passing unfiormly through a solid cylinderical wire of radius R. The current I passing through circular cross-section of radius r measured from the axis of the cylinder $(r < R)$ varies as shown in

A. 

B. 

C. 

D. 

Answer: B

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5. When a steady current flows through a metal conductor of non-uniform cross-section , then drift velocity is

A. Independent of area of cross-section

B. Directly proportional to the area of cross-section

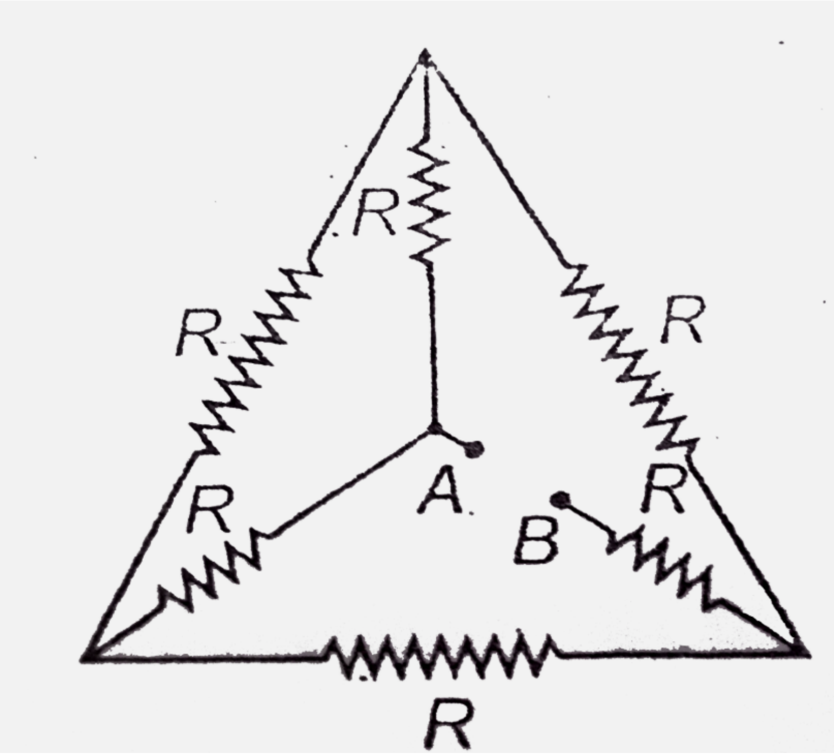
C. Inversely proportional to the area of cross-section

D. Inversely proportional to the square of area of cross-section.

Answer: 3

Watch Video Solution

6. The equivalent resistance between A and B in the situation shown is



A. $\frac{6R}{5}$

B. $\frac{8R}{3}$

C. Remain constant

D. 2R

Answer: 4

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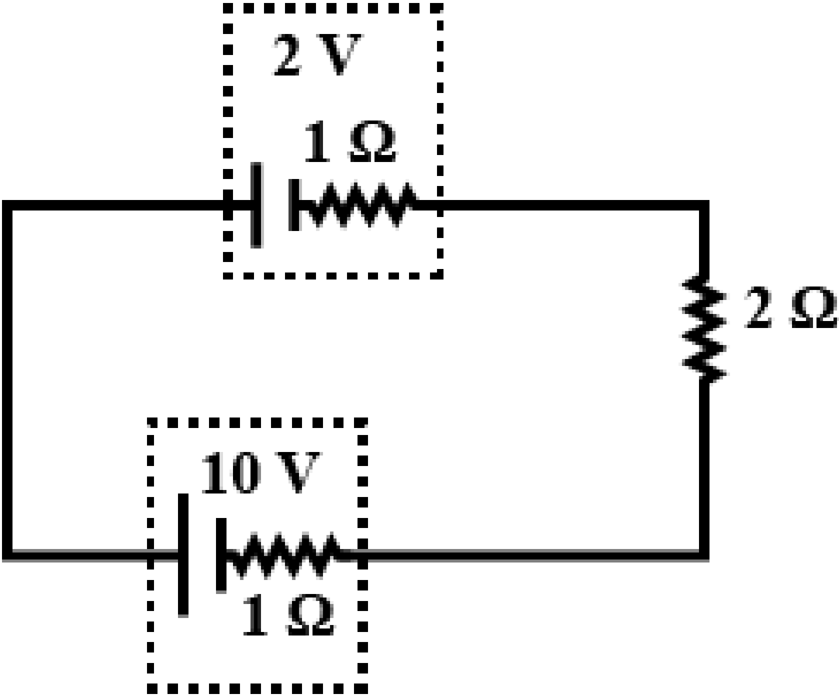
7. In the situation shown , The potential difference across the cell of smaller e.m.f. is



A. 2V

B. 4V

C. Zero

D. 6V

Answer: 2

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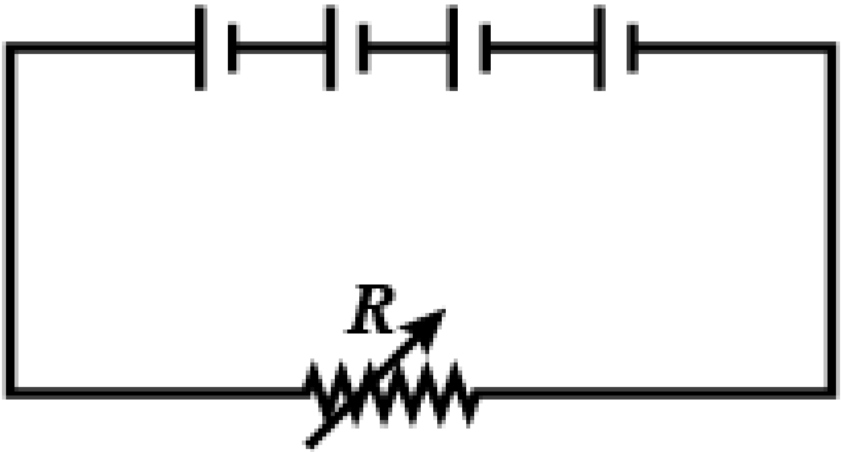
8. In the situation shown each cell has e.m.f. 4V and internal resistance 1Ω.

The maximum power that can be delivered to the variable load resistance R is



A. 64W

B. 32W

C. 128W

D. 16W

Answer: 4

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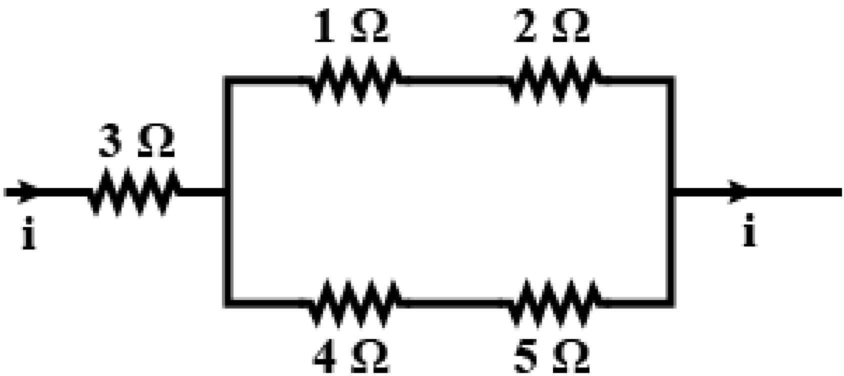
9. In the situation shown, the currents through 3Ω and 2Ωresistances are in the ratio.



A. $3:2$

B. $7:4$

C. $4:3$

D. $3:1$

Answer: C

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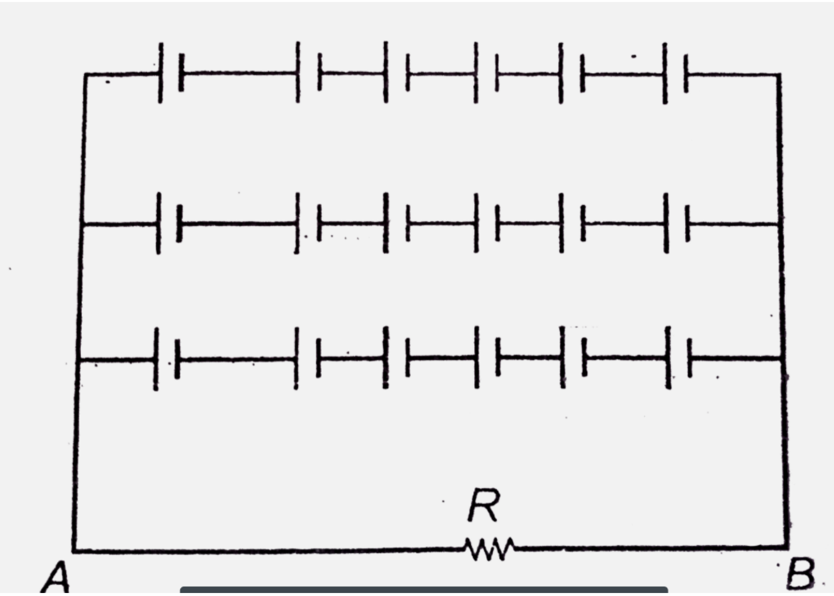
10. Figures shows mixed grouping of identical cells each of e.m.f. 4V and internal resistance 1Ω . This combination can be replaced by an equivalent cell between A and B having e.m.f. E and internal resistance r, where



A. $E = 72V, r = 18\Omega$

B. $E = 24V, r = 18\Omega$

C. $E = 72V, r = \quad = 2\Omega$

D. $E = 24V, r = 2\Omega$

Answer: D

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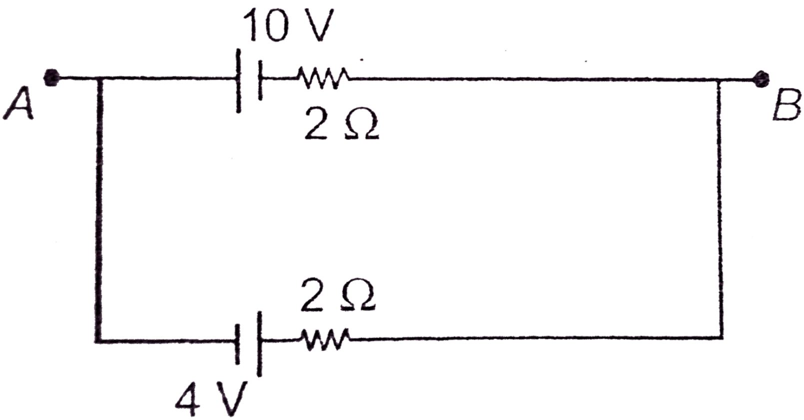
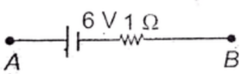
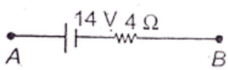
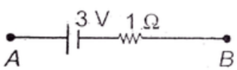
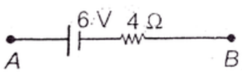
11. The situation shown in figure is equivalent to



A. (1) 

B. (2) 

C. (3) 

D. (4) 

Answer: 3

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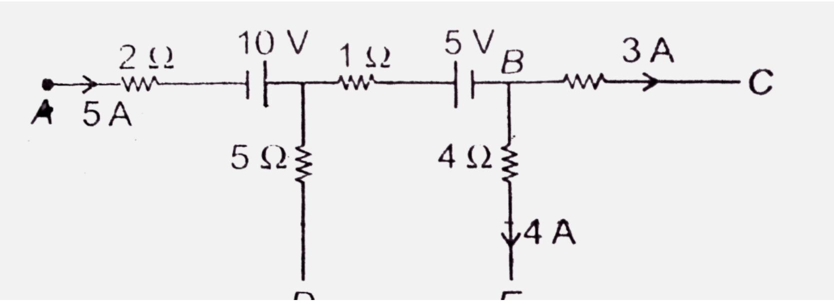
12. The potential difference between A and B int eh following situation is



A. 12V

B. 7V

C. 20V

D. 14V

Answer: 1

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13. An ammeter and a milliammeter are converted from identical galvanometers. Which one has smaller resistance ?

A. Ammeter

B. Milliammeter

C. Both have equal resistances

D. The resistance of ammeter may be more than or equal to that of milliammeter depending upon its range.

Answer: A

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14. A voltmeter has resistance 2000Ω and range 5 V. For increasing its range upto 20V, a resistance of

A. 8000Ω should be connected in series.

B. 6000Ω should be connected in series.

C. 8000Ω should be connected in parallel

D. 6000Ω should be connected in parallel.

Answer: 2

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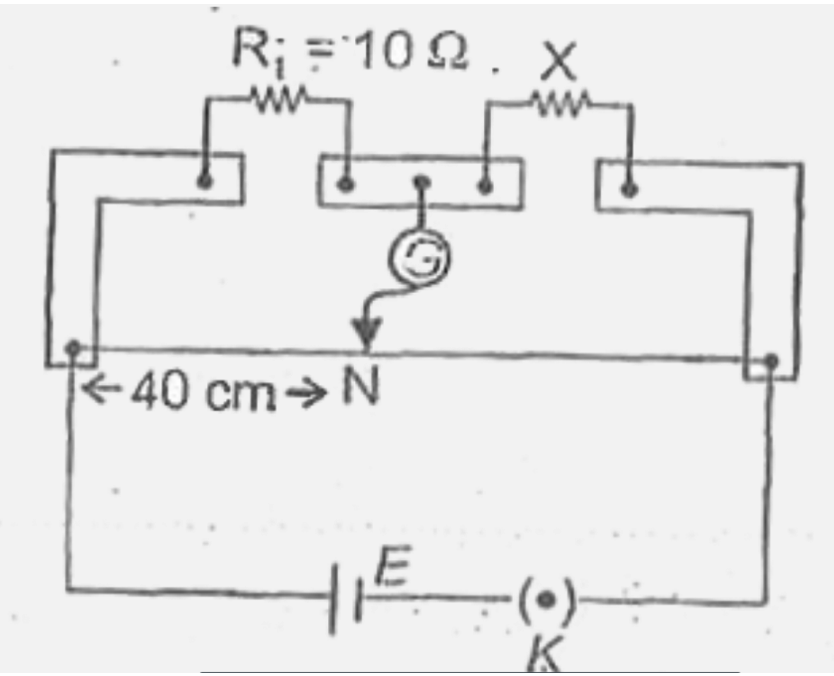
15. In the metrebridge experiment , the null point is obtained at N. The value of unkonw resistance X will be .



A. 60Ω

B. 40Ω

C. 6Ω

D. 15Ω

Answer: 4

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16. A battery of unknown emf connected to a potentiometer has balancing length 560 cm. If a resistor of resistance 10 ohm, is connected in parallel with the cell the balancing length change by 60 cm. If the internal resistance of the cell is $\frac{n}{10}$ ohm, the value of 'n' is

A. 2Ω

B. 5Ω

C. 1.5Ω

D. 15Ω

Answer: 2

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17. The drift velocity of free electron in a metal wire of a given potential gradient along it is V_d . If this potential gradient is doubled the new drift velocity will be

A. V_d

B. $2V_d$

C. $\frac{V_d}{2}$

D. $4V_d$

Answer: 2

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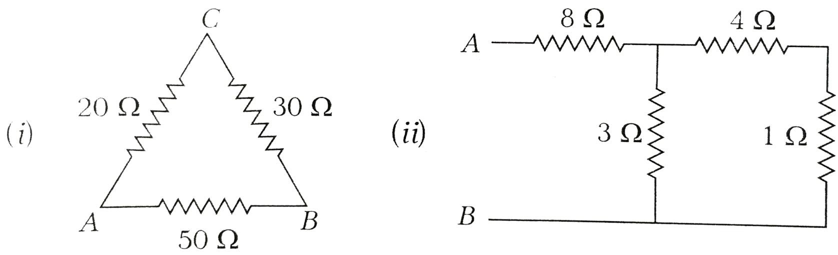
18. Find the equivalent resistance between A and B in the following cases



A. 120Ω

B. 40Ω

C. 30Ω

D. 22.5Ω

Answer: 3

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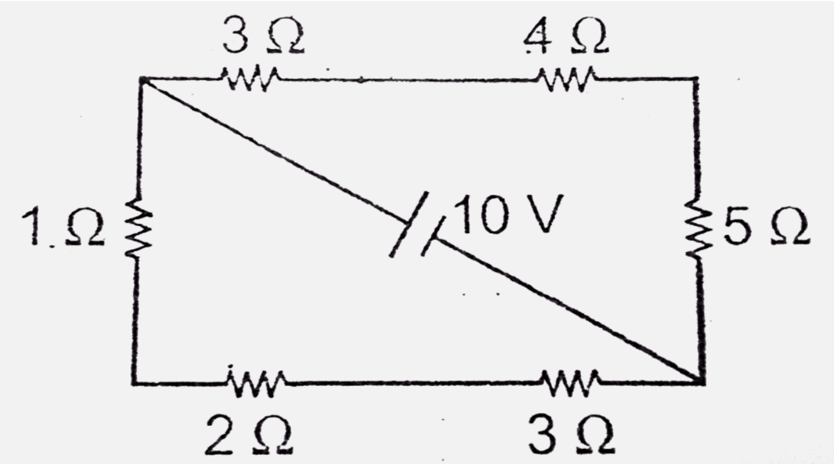
19. In the circuit shown, the current drawn by the cell is



A. $1.2A$

B. 2.5 A

C. $0.6A$

D. $3.8A$

Answer: 2

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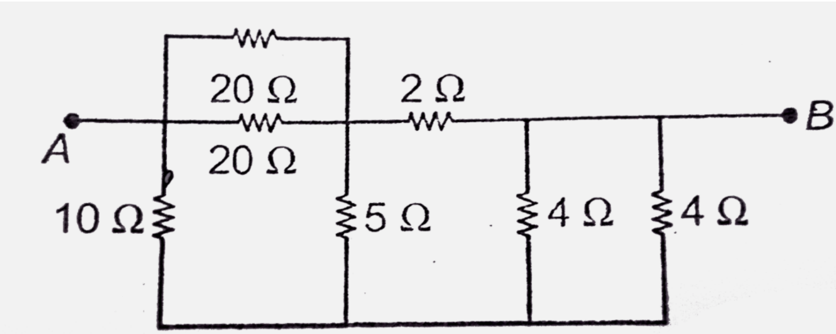
20. The equivalen resistance between A and B in the network shown in figure is



A. 6Ω

B. 7.8Ω

C. 12Ω

D. 24Ω

Answer: A

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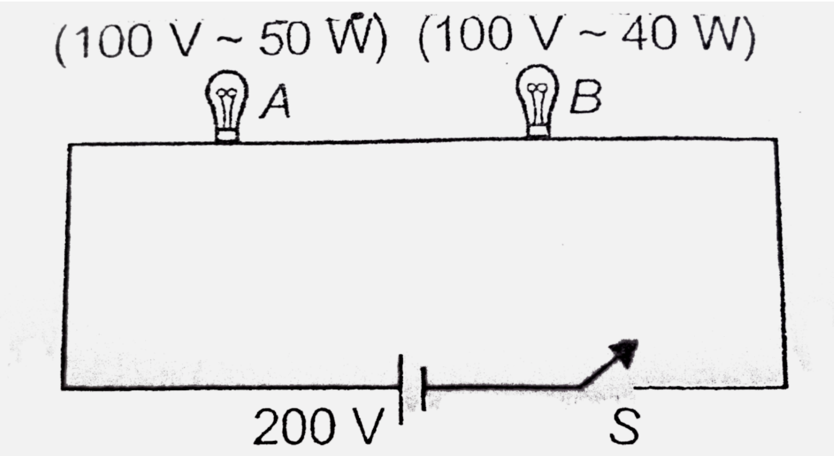
21. Two bulbs A and B are connected as shown . When switch 'S' is closed then which of them will fuse?



A. Bulb A

B. BulbA

C. Both A and B will fuse

D. Neither A nore B will fuse

Answer: 2

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22. A current i passes through a wire of length l , radius of cross-section r and resistivity ρ . The rate of heat generation is

A. $\dfrac{i^2 l}{\sigma \pi r^2}$

B. $i^2\left(\dfrac{l}{\sigma \pi r^2}\right)^2$

C. $\dfrac{i^2 \sigma l}{\pi r^2}$

D. $\dfrac{i l^2}{\sigma \pi r^2}$

Answer: 1

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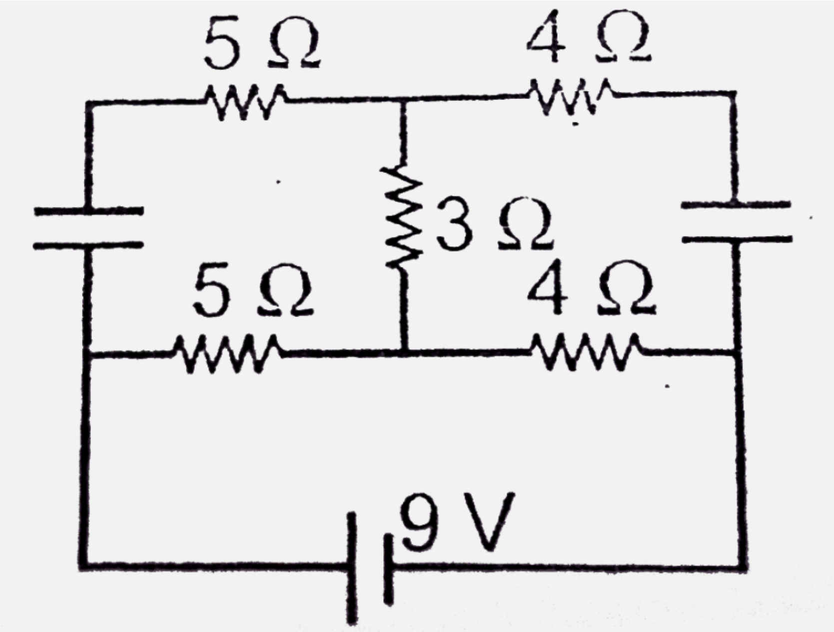
23. The power consumption by the circuit shown in figure at steady state is



A. 18W

B. 4.5 W

C. 36 W

D. 9W

Answer: 4

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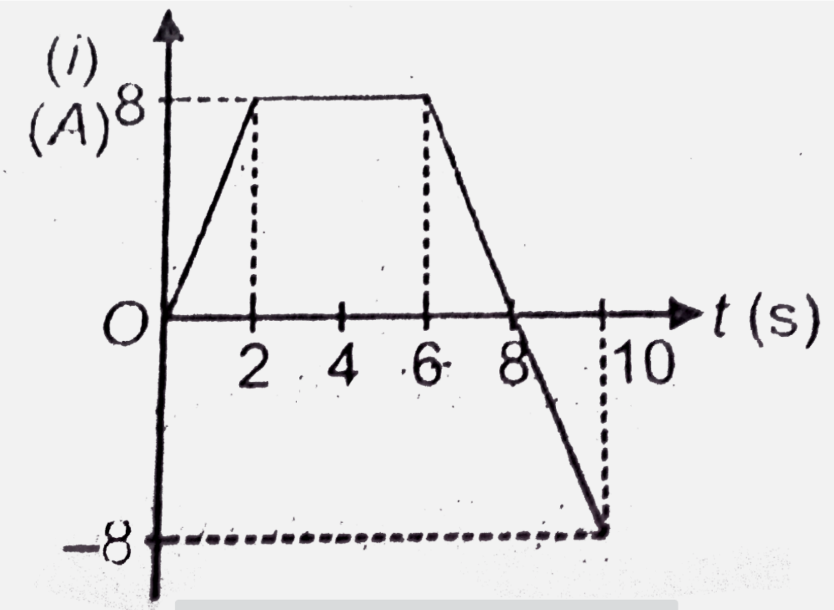
24. The current I through a conductor varies with time t as shown in figure.

The average electric current during t=0 to t=10 s will be



A. 5.6 A

B. 4A

C. 4.8 A

D. 8A

Answer: 2

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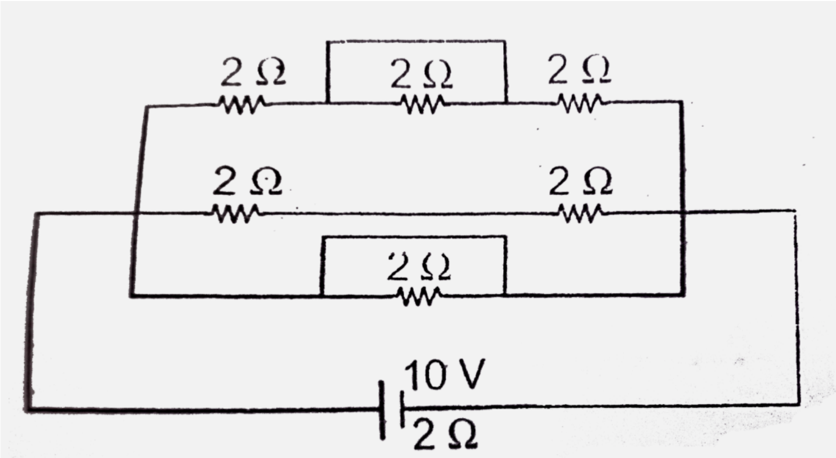
25. The current drawn by the battery in the situation shown in figure is



A. 2.5A

B. 5A

C. 7.5A

D. 1A

Answer: 2

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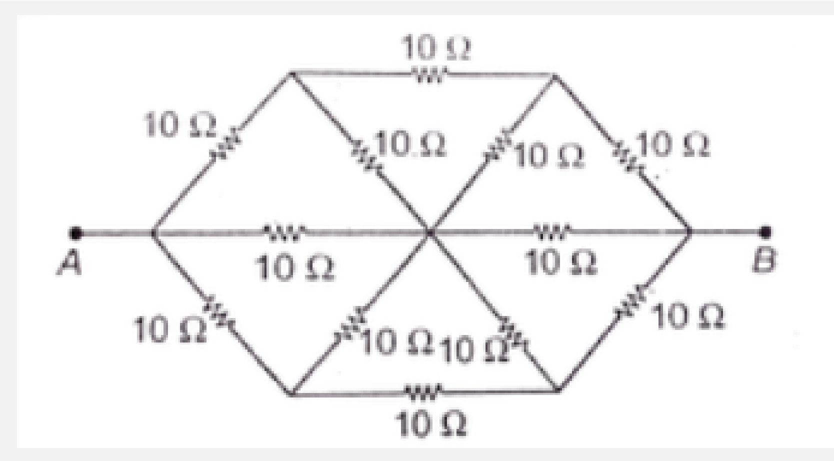
26. The equivalnent resistance between A and B n the situdation shown is



A. 8Ω

B. 16Ω

C. 28Ω

D. 32Ω

Answer: 1

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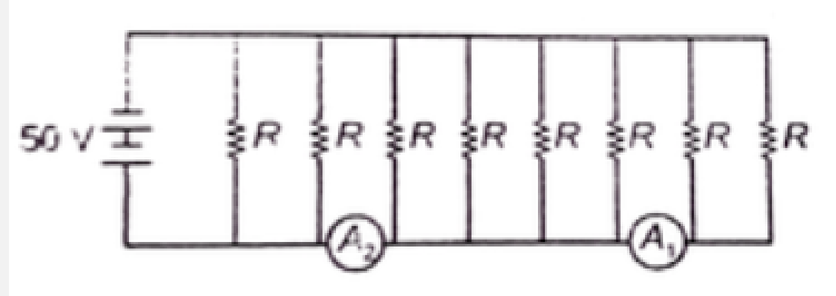
27. In the situation shown , the readings of ideal ammeters A_1 and A_2 are in the ratio.



A. $1:1$

B. $1:3$

C. $3:1$

D. $1:2$

Answer: 2

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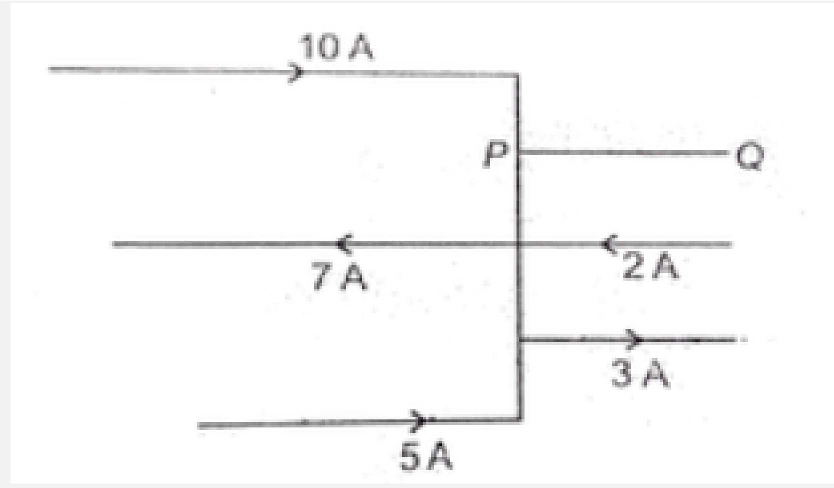
28. In the situation shown, the current in arm PQ will be



A. 1A from P to Q

B. 5A from P to Q

C. 7A from P to Q

D. 2A from Q to P

Answer: 3

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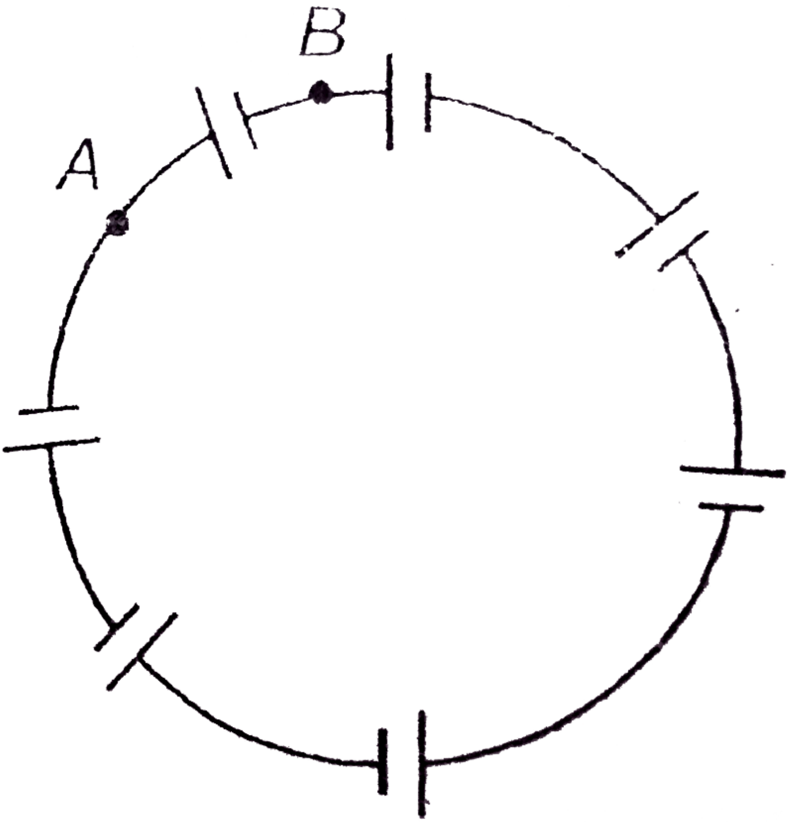
29. Seven identical cells each of e.m.f. E and internal resistance r are connected as shown . The potential difference between A and B is



A. 7E

B. E

C. 6E

D. Zero

Answer: 4

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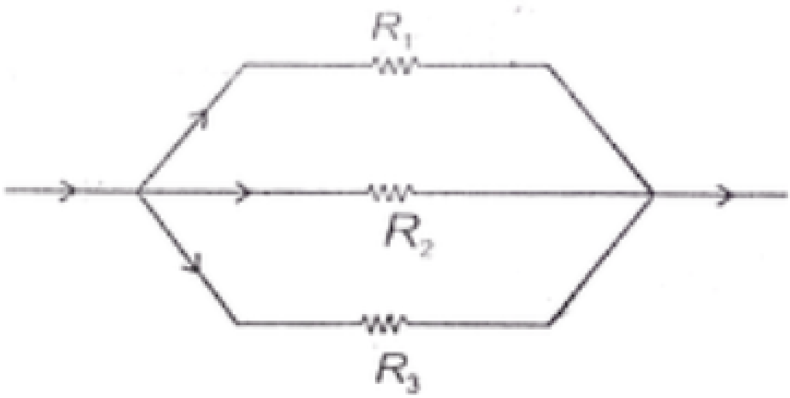
30. In the situation shown, resistance R_1, R_2 and R_3 are in the ratio $3:2:1$, then



A. The currents through R_1, R_2 and R_3 are in the ratio $1:2:3$

B. The rate of heat production in R_1, R_2 and R_3 are in the ratio $1:2:3$

C. The potential differences across R_1, $R_2$and R_3 are in the ratio $3:2:1$

D. The rate of power consumption in R_1, R_2 are R_3 in the ratio $2:3:6$

Answer: 4

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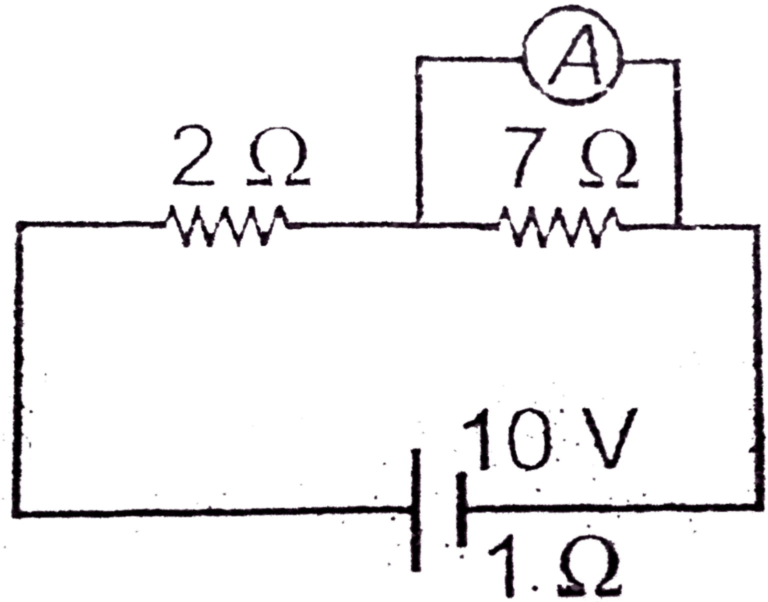
31. In the situation shown in figure , an ideal ammeter is connected across 7Ωresistors. Select the correct statement from the following



A. The current drawn by the battery is 1A

B. The currents through 2Ω and 7Ω are equal

C. The rate of heat production in 7Ω is less than that in 2Ω

D. Both (1) & (2)

Answer: 3

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32. Two cells when connected in series are balanced on 6 m on a potentiometer. If the polarity one of these cell is reversed, they balance on 2m. The ratio of e.m.f of the two cells.

A. $3:1$

B. $2:3$

C. $4:3$

D. $2:1$

Answer: 4

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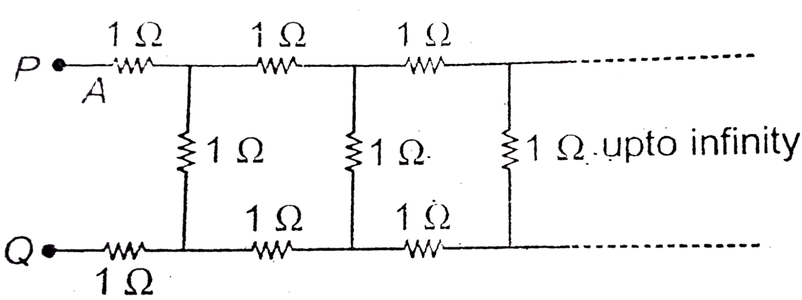
33. The resistance between the terminal point P and Q of the given infinitely long circuit will be (in `Omega')



A. $1+\sqrt{3}$

B. $1-\sqrt{3}$

C. $\sqrt{3}-1$

D. $3+\sqrt{3}$

Answer: 1

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34. Half part of a wire of resistance R is stretched to make it 1% longer and remaining half is stretched to make it 2% longer. The new resistance of the wire is nearly.

A. $1.04R$

B. 1.03 R

C. 1.06 R

D. R

Answer: 2

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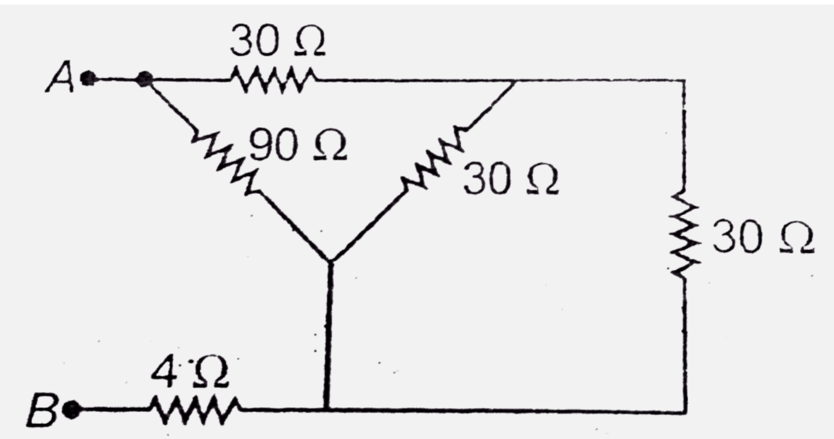
35. The effective resistance between A and B in the network shown is



A. 34Ω

B. 30Ω

C. 17Ω

D. 10Ω

Answer: 1

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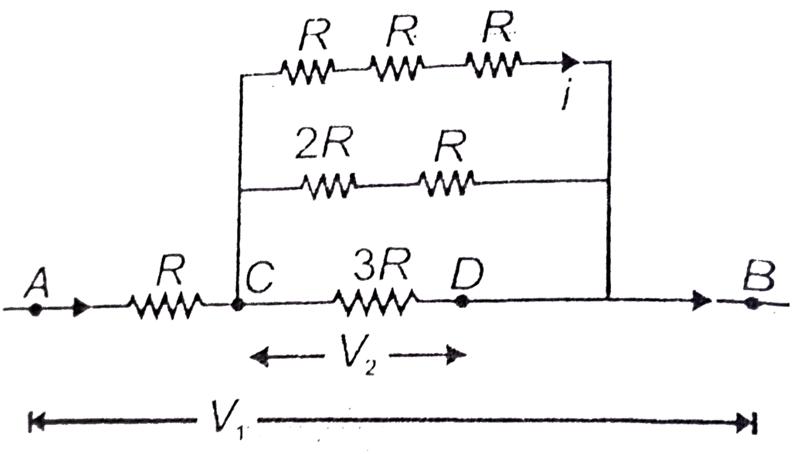
36. In the circuit shown, the potential differences, V_1 (between A and B) and V_2 (between C and D), are



A. 6 I R, 3iR

B. 3iR,3iR

C. 3iR,iR

D. 6iR,6iR

Answer: 1

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37. A wire of length l and area A is connected to an ideal battery . The drift speed of electrons is v. If the wire is twisted to half its length, what will be the new drift speed ?

A. v

B. 2v

C. $\frac{v}{2}$

D. $\frac{v}{4}$

Answer: B

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38. A resistor R_1 dissipates the power P when connected to a certain generator. If the resistor R_2 is put in series with R_1, the power dissipated by R_1

A. P

B. $\frac{PR_2}{(R_1 + R_2)}$

C. $\frac{PR_2^2}{(R_1 + R_2)^2}$

D. $\frac{PR_1^2}{(R_1 + R_2)^2}$

Answer: 4

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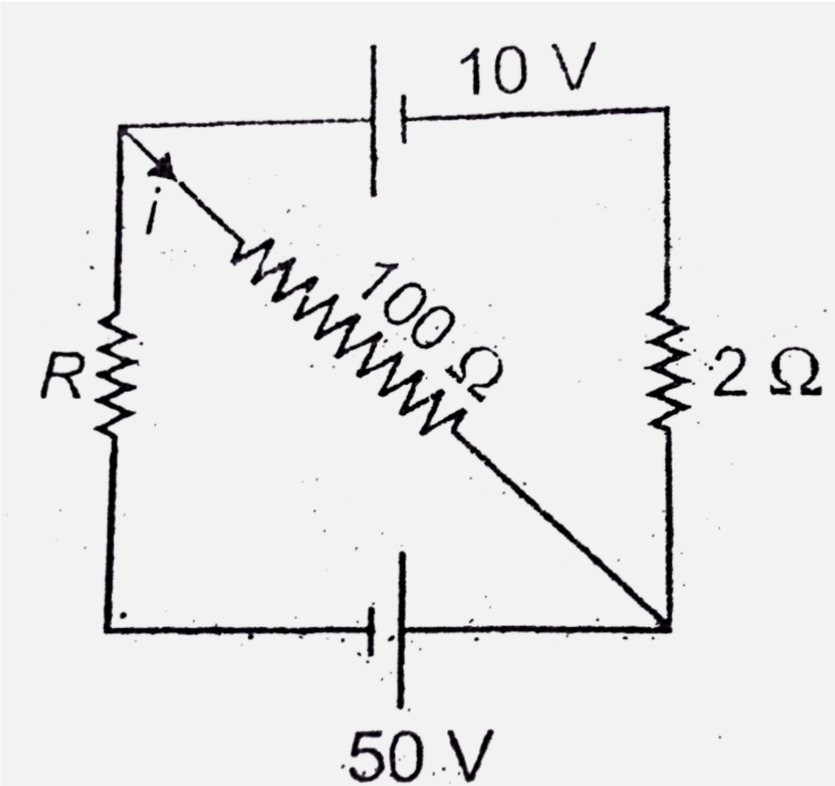
39. In the circuit shown, the current I will be zero when R is



A. 10Ω

B. 100Ω

C. 2Ω

D. Zero

Answer: A

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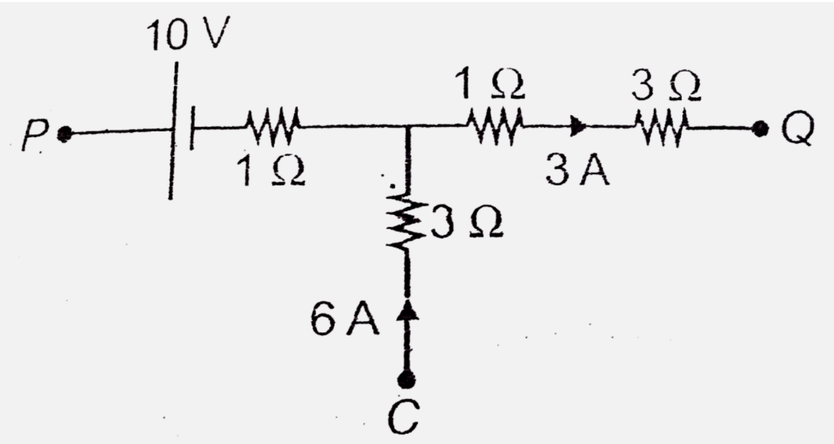
40. The given circuit is the part of a certain circuit. The current through resistors are shown . The potential difference $V_P - V_Q$ is



A. $-2V$

B. $19V$

C. 22V

D. $-19V$

Answer: 2

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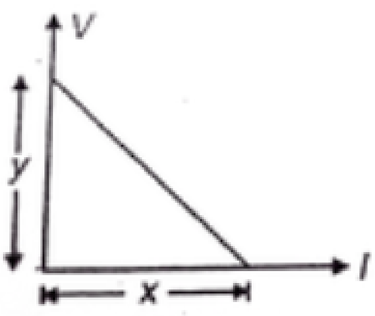
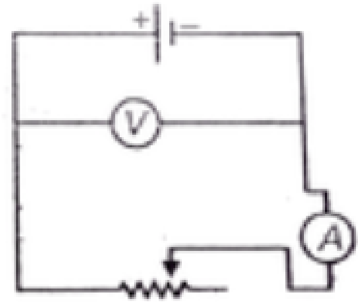
41. For the determination of emf E and internal resistance 'r' of a cell , the graph is obtained between potential difference V between the terminal of the cell against the current I, which was changed by adjusting the rheostat, is as shown . The internal resistance of the cell is





A. x

B. y

C. $\frac{y}{x}$

D. $\frac{x}{y}$

Answer: C

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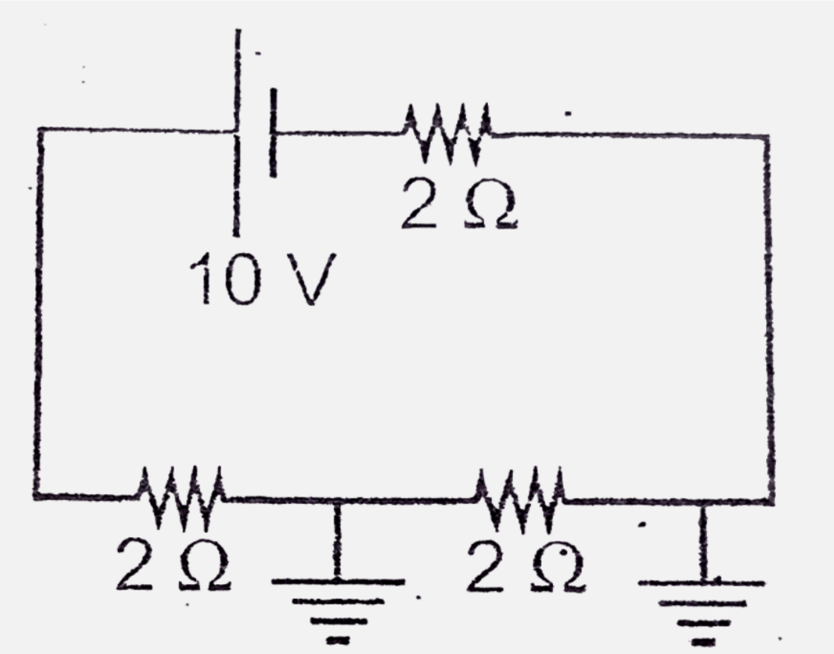
42. The current flowing through the cell in the circuit shown is



A. $\frac{5}{3}A$

B. 5A

C. $\frac{5}{4}A$

D. $\frac{5}{2}A$

Answer: 4

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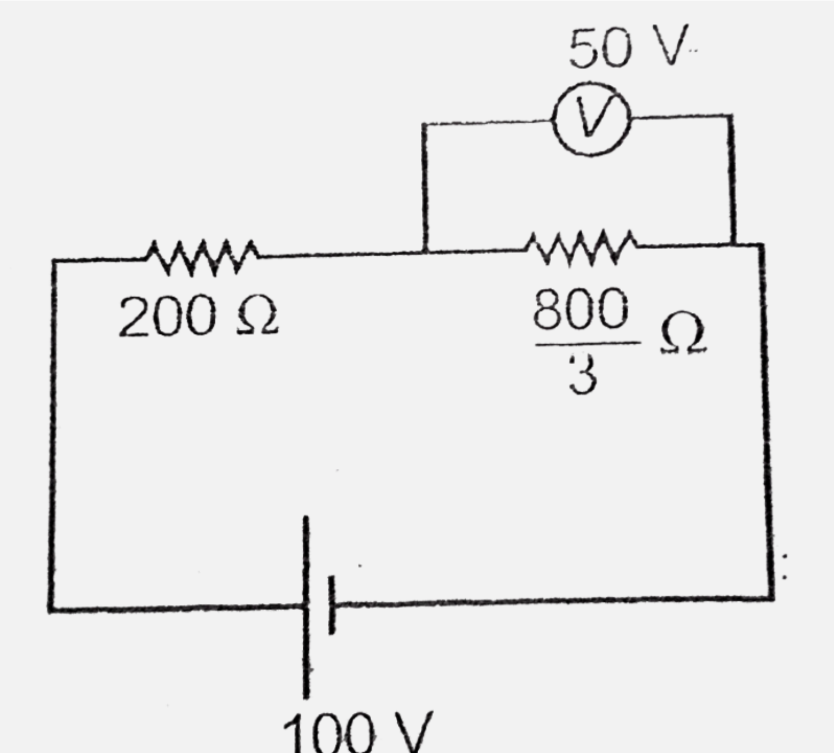
43. What is the resistance of voltmeter shown in the circuit ?



A. $\frac{800}{3}\Omega$

B. 800Ω

C. 1000Ω

D. 200Ω

Answer: 2

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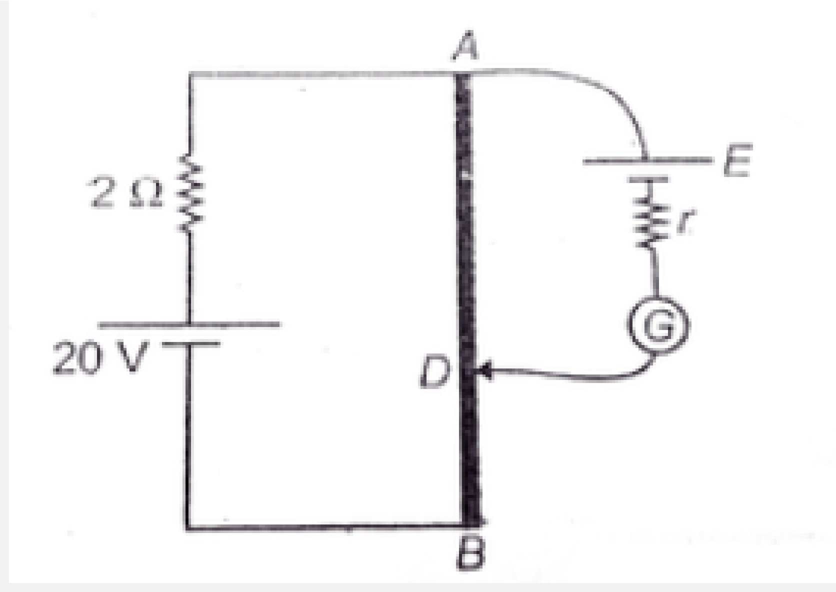
44. In the potentiometer circuit shown the galvanometer shows no deflection for AD = 35 cm. The resistance of wire AB is 18 Ω and its length is 50 cm . Calculate the emf E of the cell



A. 10V

B. 14V

C. 12.6V

D. 12V

Answer: 3

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ASSIGNMENT SECTION-C(OBJECTIVE TYPE QUESTION))

1. Consider the following arrangement of resistors . The currents in various branches are shown .Select the correct alternative(s).

A. $i_1 = 3A$

B. $i_1 = \frac{63}{47}A$

C. $i_2 = -1A$

D. $V_A - V_B = 10V$

Answer: A::C::D

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2. A cell supplies a current of 2A to an exertnal resistance of 2Ω and a current of 1 ampere to another external resistance of 4.5Ω connected across the cell separately . Select the correct alternative (s).

A. Emf of the cell is 5 V

B. Emf of the cell is 4.25 V

C. Internal resistance of the cell is 0.5 Ω

D. Internal resistace of the cell is 3.25Ω

Answer: (1, 3)

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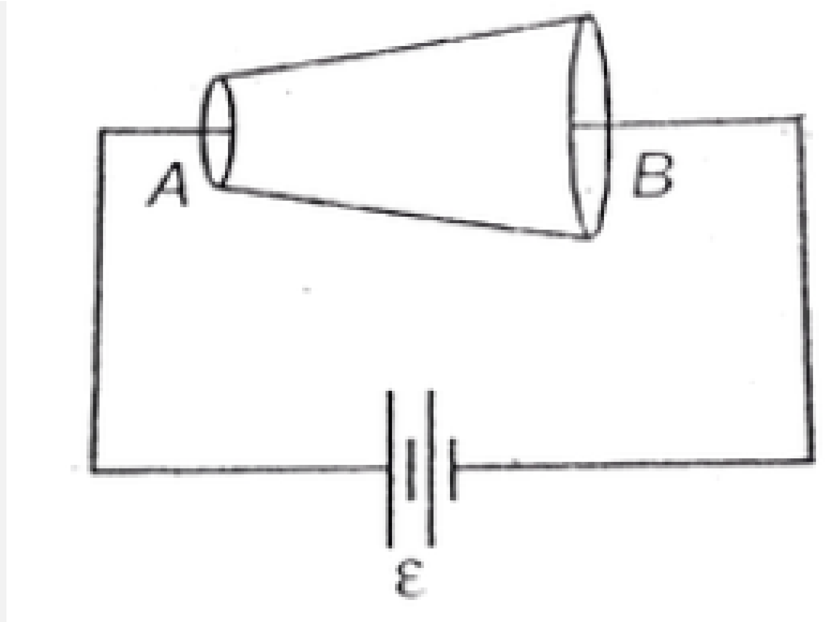
3. Figure shows a conical conducting wire connected to a source of emf. Let E, v_d, I represent the electric field, drift velocity and current at a cross-section of the wire. As one moves from end A to B of the wire



A. E increases

B. E decreases

C. v_d decreases

D. I remains same

Answer: (2, 3, 4)

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4. A resistance R_1 is connected to a source of constant voltage . On connecting a resistance R_2 in series with R_1

A. The total thermal power dissipated increases

B. Thermal power dissipated by R_1 decreases

C. Thermal power dissipated by R_1 increases

D. Total power dissipiated decreases

Answer: (2, 4)

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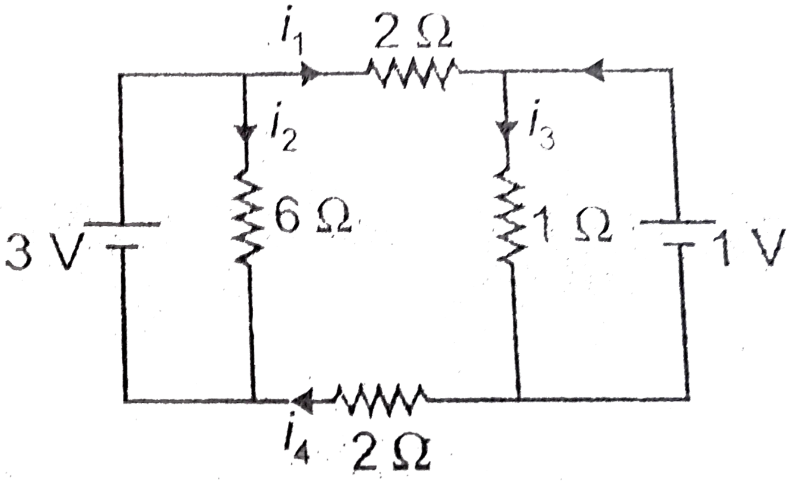
5. In the circuit shown, current in different branches are marked. Select the correct alternative(s)



A. $i_1 = \frac{1}{2}A$

B. $i_4 = \frac{1}{2}A$

C. $i_1 = \frac{1}{2}A$

D. $i_3 = 1A$

Answer: (1, 2, 3, 4)

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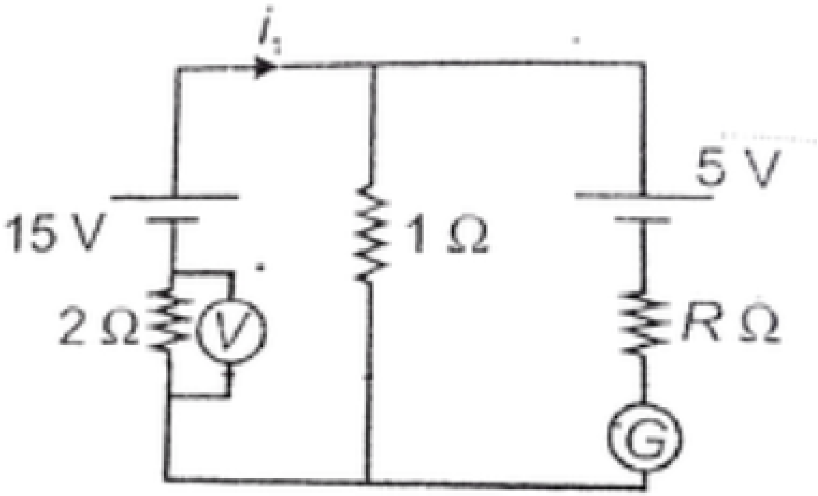
6. In the circuit shown, readint of galvanometer is zero. Select the correct alternative(s)



A. Reading of ideal voltmeter is 10V

B. $i_1 = 5A$

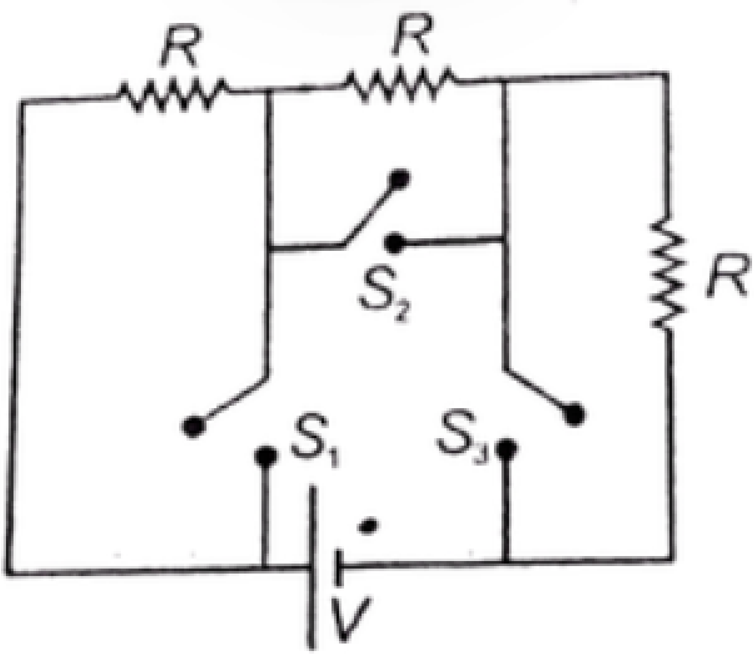
C. R must be zero

D. R can have any value

Answer: (1, 2, 4)

Watch Video Solution

7. If all the resistors are identical , select the correct alternative (s).



A. Any one of the switch may be closed, the power consumed by the circuit remains same in all three cases

B. Power consumed remains same, when any two switched are closed

C. Total power consucmed becomes zero when only S_1 is closed

D. Power consumed becomes zero when any two switcheds are closed.

Answer: (1, 2)

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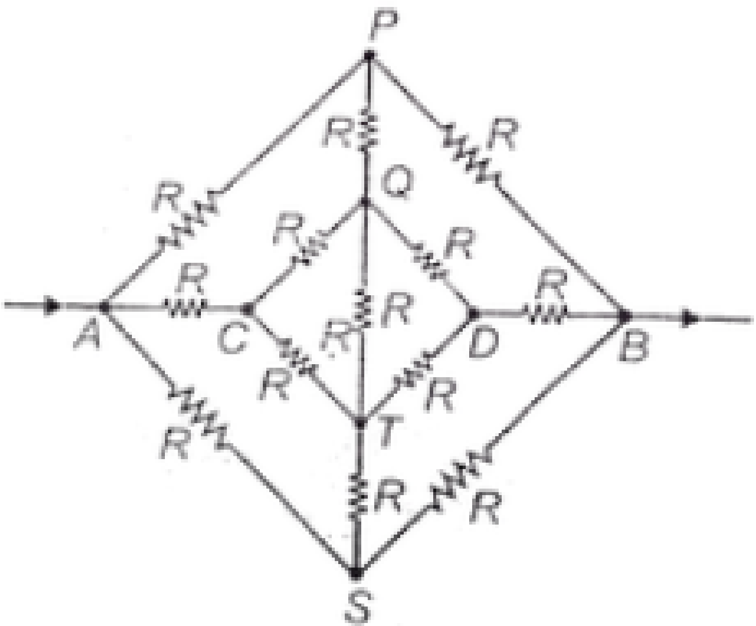
8. A current enters from A and leaves at B through the network shown. Select the correct alternative(s).



A. $R_{AB} = \frac{3R}{4}$

B. $R_{AB} = \frac{5R}{6}$

C. Point P,Q,T and S are at same potential

D. Points C and D are at same potential

Answer: (1, 3)

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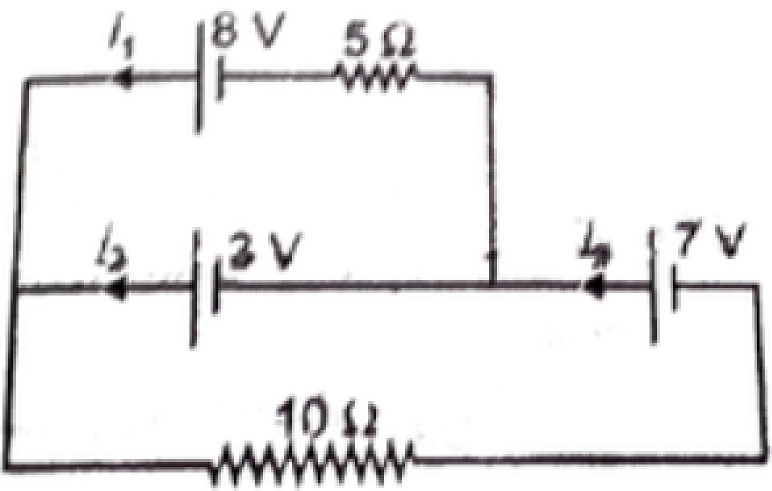
9. Consider the circuit shown. Which of the following values is / are correct ?



A. $i_3 = 1A$

B. $i_1 = 1A$

C. $i_2 = 0$

D. $i_3 = 2A$

Answer: (1, 2, 3)

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10. A capacitor is charged to a potential difference of 100 V and is then connected across a resistor. The potential difference across the capacitor decays exponentially with respect to time. After 1 sec, the P.D. between the plates of the capacitor is 80 V. what will be the potential difference between the plates after 2 sec ?

A. After 2ms from start, the potential difference across the resistor is 64 V

B. After 2ms from start, the potential difference across the capacitor is 64 V

C. After 2ms from start , the potential difference across the resistor is 60V

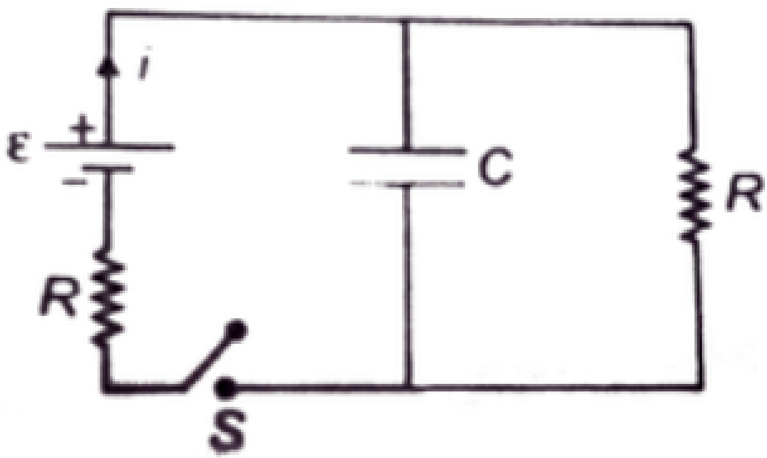
D. After 2ms from start , the potential difference across the capacitor is

60 V

Answer: (1, 2)

Watch Video Solution

11. In the circuit shown, the switch is closed at t=0. Select the correct alternative(s)



A. At t=0, $i = \frac{\varepsilon}{R}$

B. At t=0 , $I = \frac{\varepsilon}{2R}$

C. At steady state, charge on the capacitor is $\frac{\varepsilon C}{2}$

D. The current at any instant is given by $I = \frac{\varepsilon}{2R}\left(1 + e^{-2t/RC}\right)$

Answer: (1, 3, 4)

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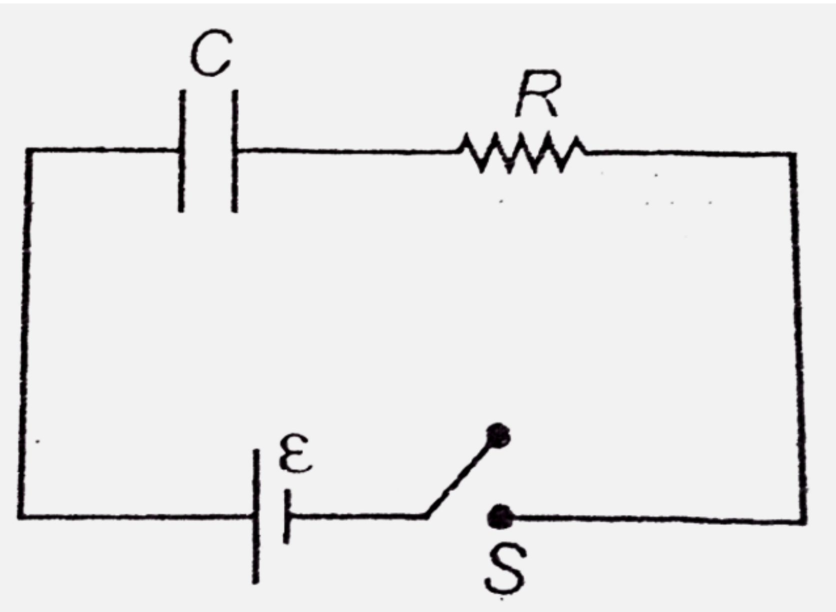
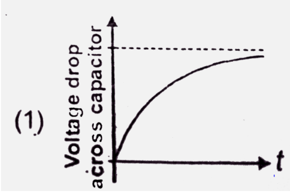
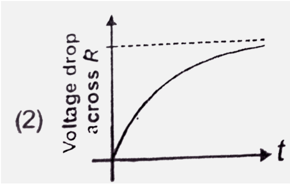
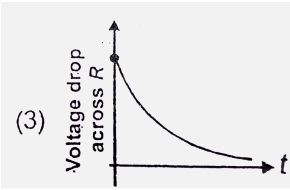
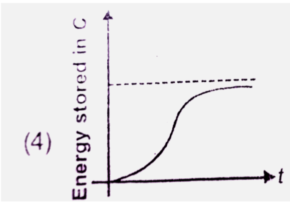
12. An uncharged capacitor is connected to an ideal battery through a resistance R and a switch S. Initially the switch is open . At an instant, the switch is closed . Taking this instant as t=0, which of the following graphs represent correct variation of the quantity taken along y -axis with time ?



A. 

B. 

C. 

D. 

Answer: (1, 3, 4)

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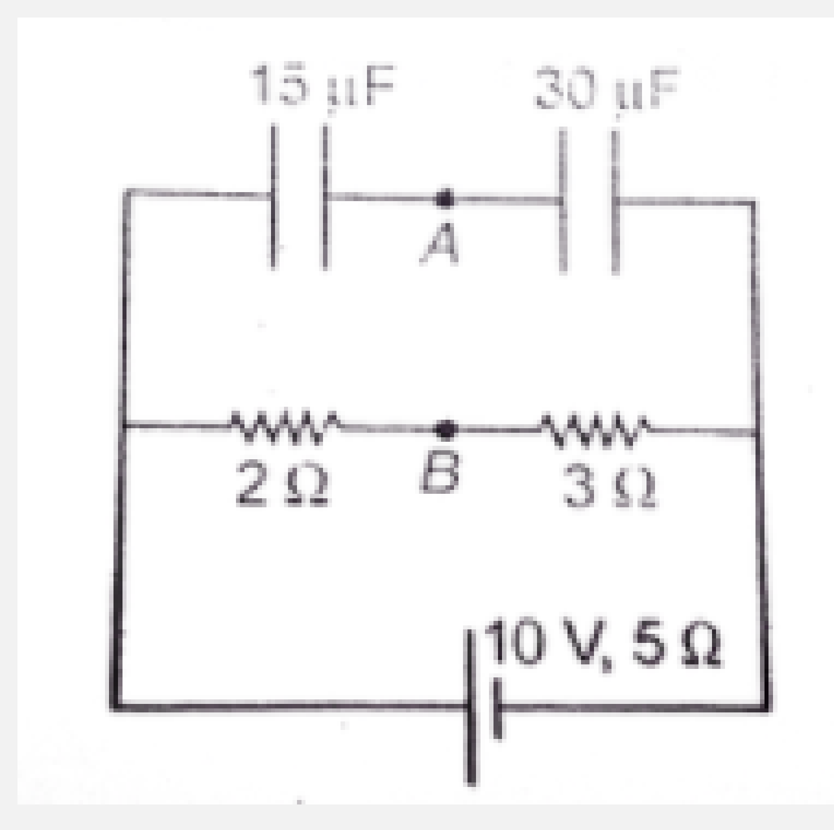
13. The figure shows two capacitors connected in parallel with two resistance and a battery of emf 10V , internal resistance 5Ω. At steady state.



A. $V_A - V_B = -\frac{4}{3}V$

B. $V_A - V_B = +\frac{4}{3}$

C. Energy stored in $15\mu F$ capacitor is $\frac{15}{18} \times 10^{-4} J$

D. Energy stored in $30\mu F$ capacitor is $\frac{75}{18} \times 10^{-5} J$

Answer: (1, 3, 4)

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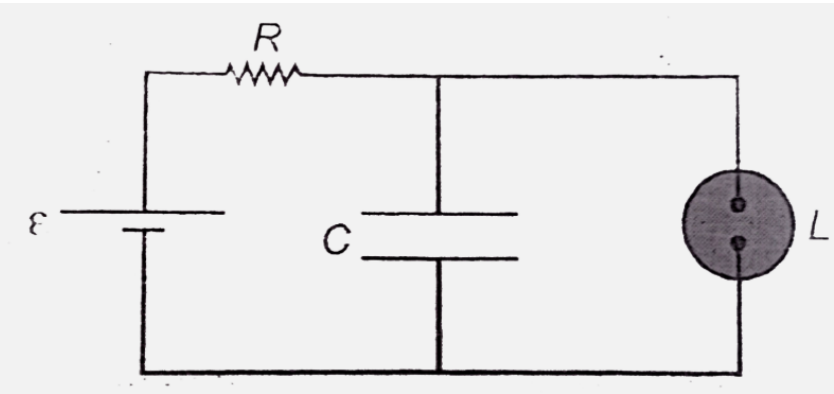
ASSIGNMENT SECTION-D(LINKED COMPREHENSION TYPE QUESTIONS)

1. Figure shows the circuit of a flashing lamp, used at construction sites. The fluorescent lamp L, having negligible capacitance, is connected in parallel across the capacitor C of an RC circuit . There is a current through the lamp only when the potential difference across it reaches the breakdown voltage V_L). In this event, the capacitor discharges completley through the lamp and lamp flashes momentarily.



Consider an instant, when the capacitor has just discharged through the flash light. Taking this instant as t=0, the time after which the lamp flashes momentarily is given by

A. $T_0 = RC \ln\left(\frac{\varepsilon}{\varepsilon - V_L}\right)$

B. $T_0 = RC\left[1 - \ln\left(\frac{\varepsilon}{V_L}\right)\right]$

C. $T_0 = RC\ln\left(\frac{\varepsilon}{V_L}\right)$

D. $T_0 = RC\ln\left(\frac{\varepsilon - V_L}{\varepsilon}\right)$

Answer: A

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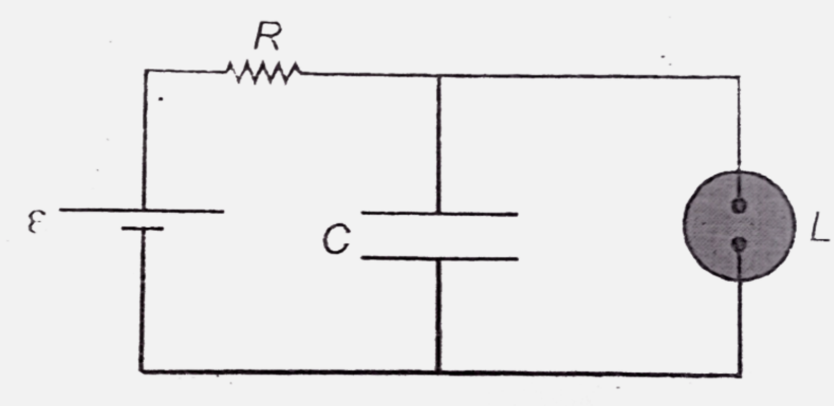
2. Figure shows the circuit of a flashing lamp, used at construction sites. The fluorescent lamp L, having negligible capacitance, is connected in parallel across the capacitor C of an RC circuit . There is a current through the lamp only when the potential difference across it reaches the breakdown voltage V_1). In this event, the capacitor discharges completley through the lamp and lamp flashes momentarily.



The number of flashes per second produced by the arrangement is (neglecting th etime of flashing or discharging of capacitor)

A. $\dfrac{1}{RC\ln\left(\frac{\varepsilon}{\varepsilon - V_L}\right)}$

B. $\dfrac{1}{RC\ln\left(\frac{\varepsilon}{V_L}\right)}$

C. $\dfrac{1}{RC\ln\left(\frac{\varepsilon - V_L}{\varepsilon}\right)}$

D. $\dfrac{1}{RC\left[1 - \ln\left(\frac{\varepsilon}{V_L}\right)\right]}$

Answer: 1

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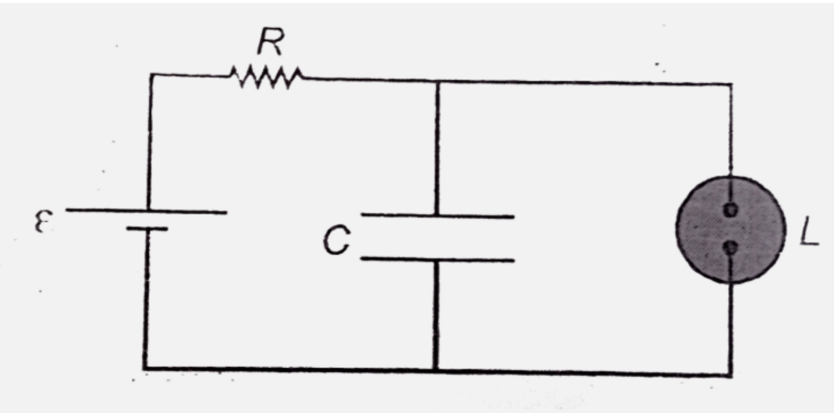
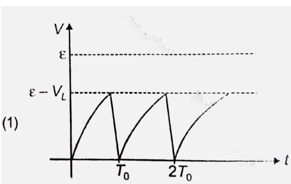
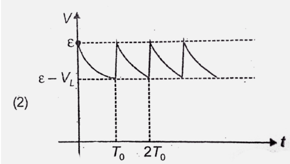
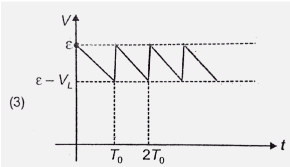
3. Figure shows the circuit of a flashing lamp, used at construction sites. The fluorescent lamp L, having negligible capacitance, is connected in parallel across the capacitor C of an RC circuit . There is a current through the lamp only when the potential difference across it reaches the breakdown voltage V_1). In this event, the capacitor discharges completley through the lamp and lamp flashes momentarily.

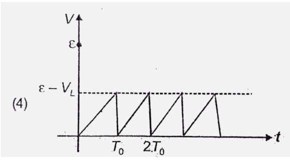


Which of the following graphs represents the variation fo potential drop across the resistor ?

A. 

B. 

C. 

D. 

Answer: 2

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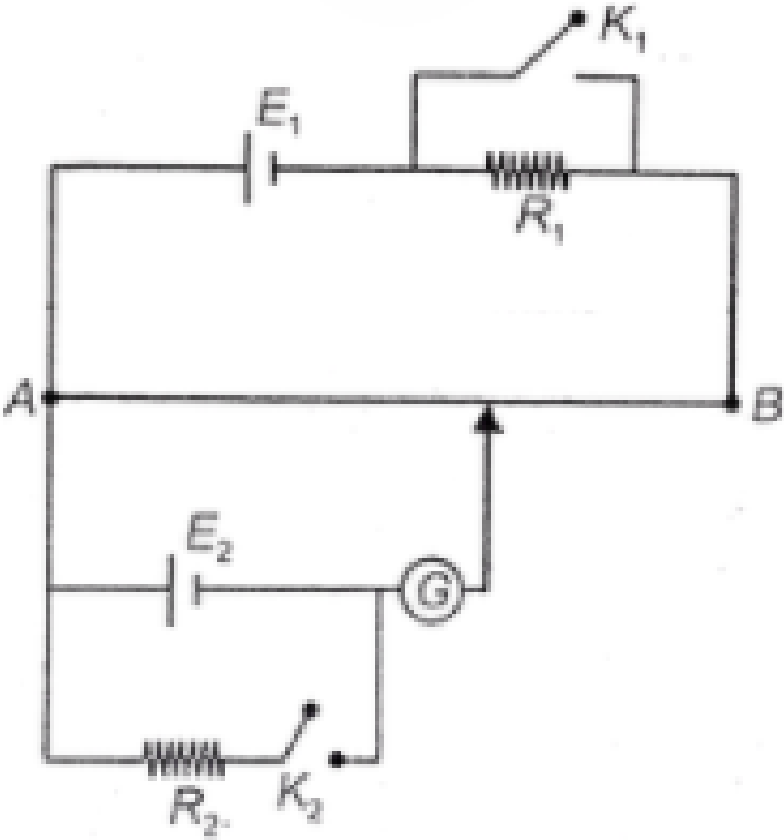
ASSIGNMENT SECTION-D(LINKED COMPREHENSION TYPE QUESTIONS) Comprehension - II

1. Figure shows the circuit of a potentiometer. The length of the potentiometer wire AB is 50 cm. The emf of the battery E, is 4 volt having negligible internal resistance. Values of resistances R_1 and R_2 are 15 ohm and 5 ohm respectively. When both the keys are open, he null point is obtained at a distance of 31.25 cm from end A but when both the keys are closed, the balance length reduces to 5 cm only $R_{AB} = 10\Omega$



The emf of the cell E_2 is

A. 1 volt

B. 2 volt

C. 3 volt

D. 4 volt

Answer: A

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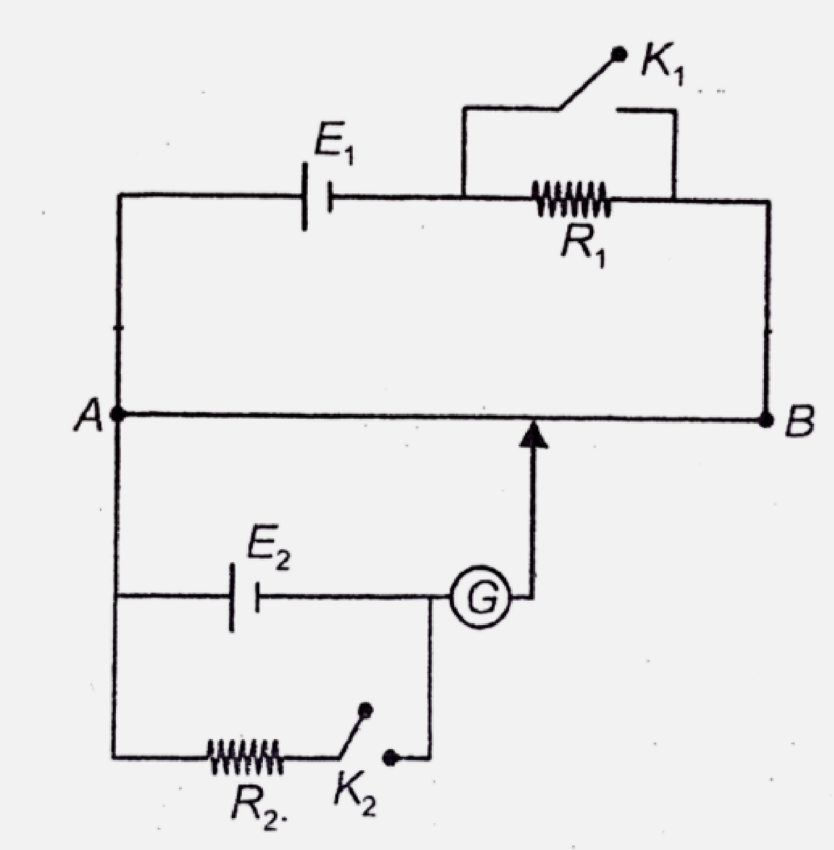
2. Figure shows the circuit of a potentiometer. The length of the potentiometer wire AB is 50 cm. The emf of the battery E, is 4 volt having negligible internal resistance. Values of resistances R_1 and R_2 are 15 ohm and 5 ohm respectively. When both the keys are open, he null point is obtained at a distance of 31.25 cm from end A but when both the keys are closed, the balance length reduces to 5 cm only $R_{AB} = 10\Omega$



The internal resistance of cell E_2 is

A. 4.5Ω

B. 5.5Ω

C. 6.5Ω

D. 7.5Ω

Answer: 4

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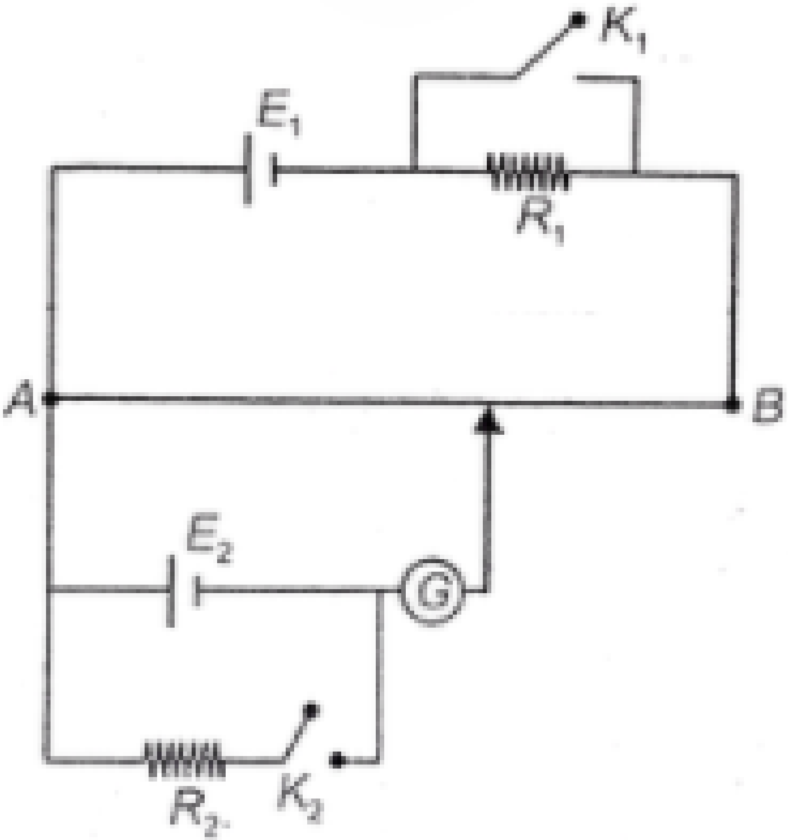
3. Figure shows the circuit of a potentiometer. The length of the potentiometer wire AB is 50 cm. The emf of the battery E, is 4 volt having negligible internal resistance. Values of resistances R_1 and R_2 are 15 ohm and 5 ohm respectively. When both the keys are open, he null point is obtained at a distance of 31.25 cm from end A but when both the keys are closed, the balance length reduces to 5 cm only $R_{AB} = 10\Omega$



The emf of the cell E_2 is

A. 10.5 cm

B. 11.5 cm

C. 12.5 cm

D. 13.5 cm

Answer: 3

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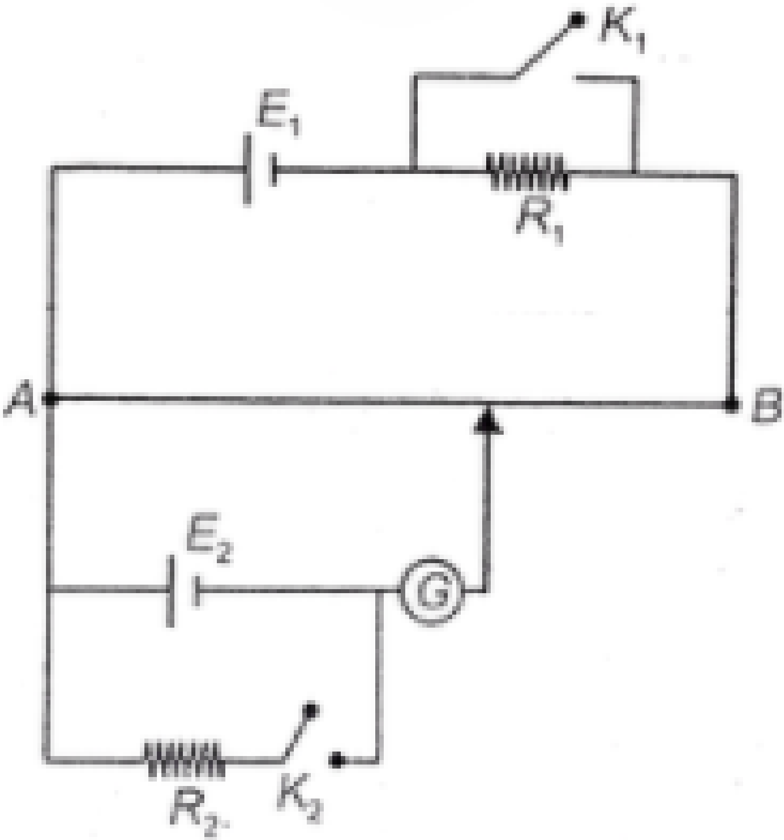
4. Figure shows the circuit of a potentiometer. The length of the potentiometer wire AB is 50 cm. The emf of the battery E, is 4 volt having negligible internal resistance. Values of resistances R_1 and R_2 are 15 ohm and 5 ohm respectively. When both the keys are open, he null point is obtained at a distance of 31.25 cm from end A but when both the keys are closed, the balance length reduces to 5 cm only $R_{AB} = 10\Omega$



The emf of the cell E_2 is

A. 10.5 cm

B. 11.5 cm

C. 12.5 cm

D. 13.5 cm

Answer: 3

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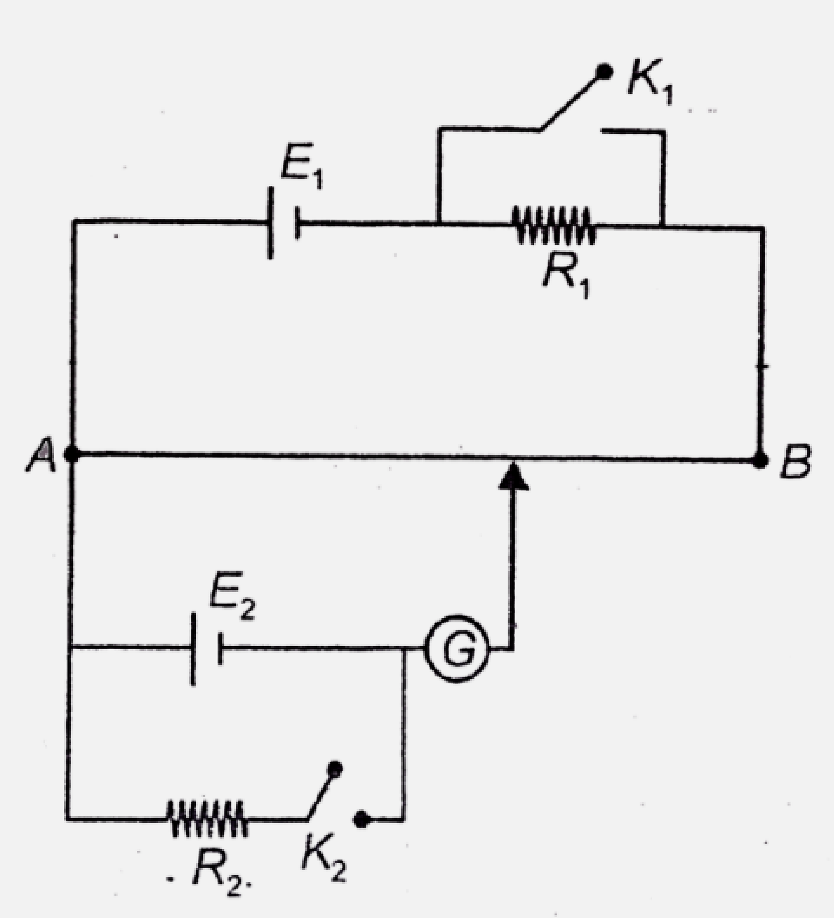
5. Figure shows the circuit of a potentiometer. The length of the potentiometer wire AB is 50 cm. The emf of the battery E, is 4 volt having negligible internal resistance. Values of resistances R_1 and R_2 are 15 ohm and 5 ohm respectively. When both the keys are open, he null point is obtained at a distance of 31.25 cm from end A but when both the keys are closed, the balance length reduces to 5 cm only $R_{AB} = 10\Omega$



Which of the following can be possible way to connect the batteries in the potentiometer setup above ?

A. Positive terminal of E_1 and positive terminal of E_2 connected to point A.

B. Negative terminal o fE_1 and negative terminal of E_2 connected to A

C. Positive terminal of E_1 and negative terminal of E_2 connected to A

D. Positive terminal of E_2 and negative terminal of E_1 connected to A

Answer: 1, 2

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ASSIGNMENT SECTION-E (ASSERTION-REASON TYPE QUESTION)

1. STATEMENT-1 : As we move across a resistor in the direction of current, current decreases,

and

STATEMENT-2 : As we move across a resistor in the direction of current , potential decreases.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: D

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2. Two cells of same emf but different internal resistance are connected in parallel so as to send current in same direction.

STATEMENT-1 : The equivalent emf of the combination is equal to individual emf of each cell.

and

STATEMENT-2 : The equivalent emf is the arithmetic mean of the individual emfs.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 3

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3. STATEMENT-1 : When the plates of a charged capacitor are connected to a resistor, a current starts flowing in the resistor.

and

STATEMENT-2 : A charged capacitor acts as a battery of steady emf.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 3

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4. STATEMENT-1 : In the absence of current in a counducting wire, the random motionof electrons is zig-zag with electrons moving in a straight line between two successive collisions.

and

STATEMENT-2 : When a c urrent is set up, the path of electrons between two successive collisions becomes curved.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 is True

Answer: 2

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5. Two ammeters are made from exactly similar galvanometers.

STATEMENT-1 : The ammeter with higher range will be the one with lower resistance.

and

STATEMENT-2 : The shunt resistance to be connected in parallel is inversely proportional to maximum current to be measured.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 3

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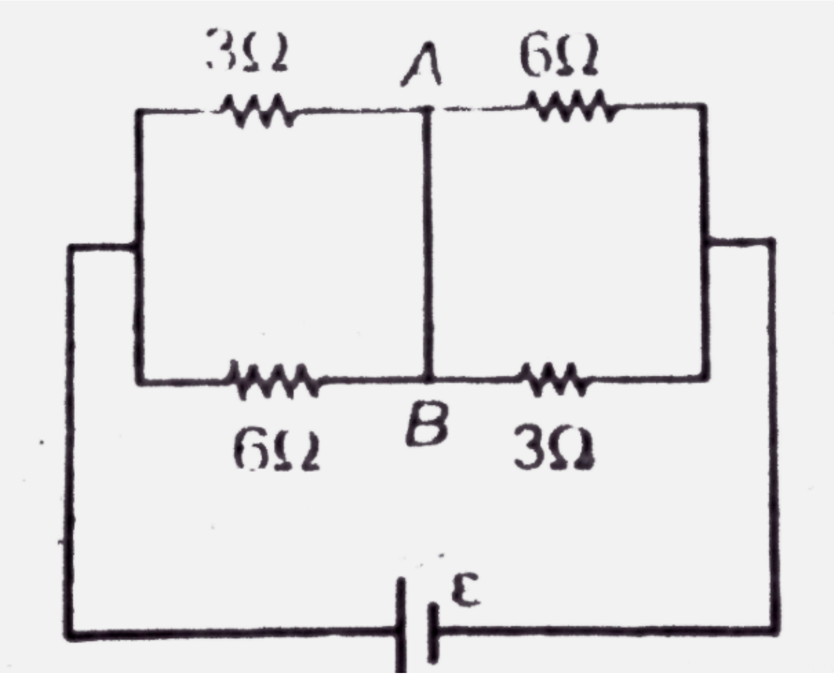
6. Consider the circuit diagram . The connecting wires are assumed to be perfect conducting.

STATEMENT-1 : The current in branch AB is zero.

and

STATEMENT -2 : The potential difference between A & B is zero



A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 4

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7. STATEMENT-1 : As temperature of a conducting wire increases, the slope of V-I graph (V on y - axis and I on x-axis) increases.

and

STATEMENT-2 : For a conductor, the resistance increases with increase in temperature.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 1

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8. STATEMENT-1 : As the drift velocity increases, the current flowing through the conductor decreases,

and

STATEMENT-2 : The current flowing through a conductor is directly proportional to drift velocity.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 4

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9. STATEMENT-1 : The drift velocity of electrons in a metallic wire will decrease, if the temperature of the wire is increased.

and

STATEMENT-2 : On increasing the temperature of the wire , conductivity of metallic wire decreases.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 2

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10. Assertion : An electric bulb is first connected to a dc source and then to a ac source having the same brightness in both the cases.

Reason : The peak value of voltage for an A.C. source is $\sqrt{2}$ times the root mean square voltage.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 2

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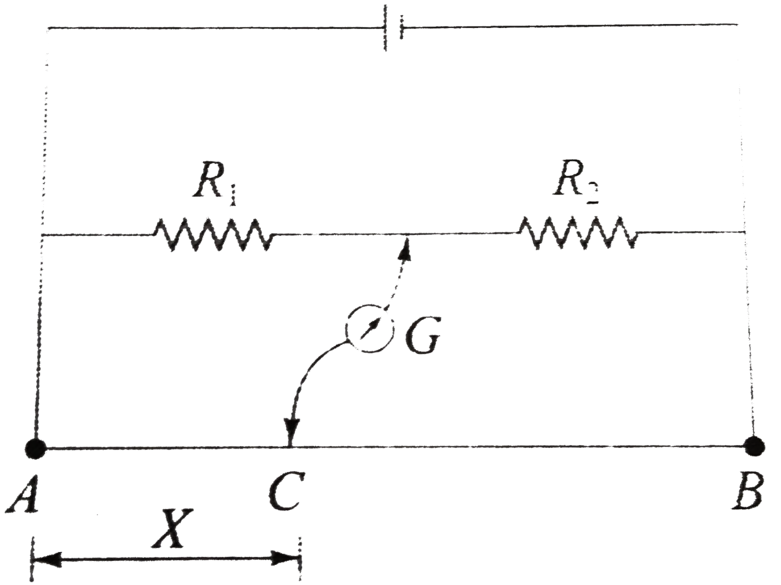
11. STATEMENT-1 : In the meter bridge experimeter shown in figure the balance length AC corresponding to null deflection of the galvanometer is x. If the radius of the wire AB is doubled, the balance length becomes 4x.



and

STATEMENT-2 : The resistance of a wire a inversely proportional to the square of its radius.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 4

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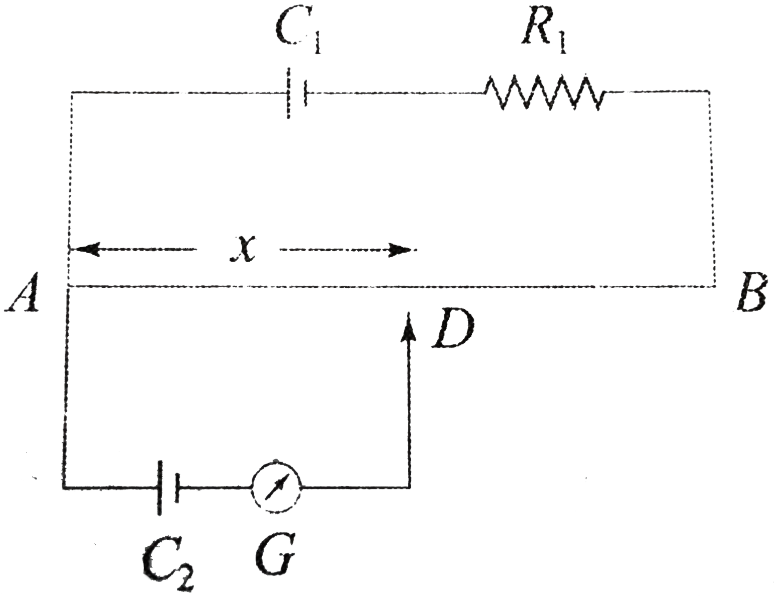
12. Statement I: In the potentiometer circuit shown in figure. E_1 and E_2 are the emf of cells C_1 and C_2, repsectively, with $E_1 > E_2$. Cell C_1 has negligible internal resistance. For a given resistor R, the balance length is x. If the diameter of the potentiometer wire AB is increased, the balance length x will decrease.



Statement II: At the balance point, the potential difference between AD due to cell $C_1 is E_2$, the emf of cell C_2.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 4

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13. STATEMENT-1 : In a meter bridge, if its wire is replaced by another wire having same length, same material but twice the cross sectional area, then the accuracy of measurement decreases.

and

STATEMENT-2 : Accuracy of meter bridge depends on the length of wire.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 4

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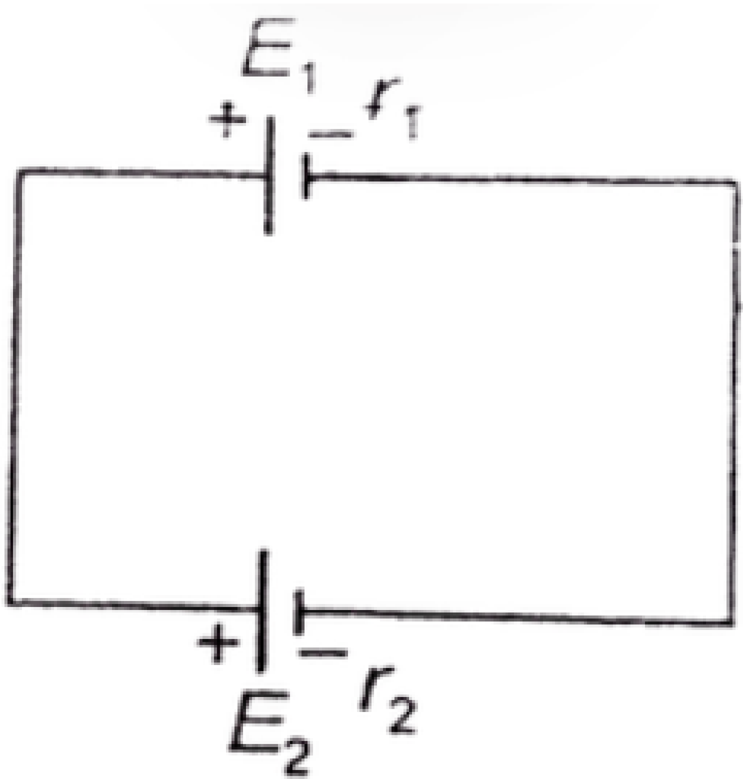
14. STATEMENT-1 : If two cells of emf E_1 and $E_2 (E_1 \neq E_2)$ and internal resistace r_1 and r_2 are joined together as shown, then one cell will continuously supply energy to the other.



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and

STATEMENT-2 : The potential drop across one cell will be larger than other

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 3

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15. STATEMENT-1 : In a chain of 50 bulbs connected in series, one bulb is taken out remaining 49 bulbs are again connected in series across the same supply then light gets decreased in the room.

and

STATEMENT-2 : More resistance in the circuit means lesser current drawn source.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is True

D. Statement-1 is False , Statement-2 is True

Answer: 4

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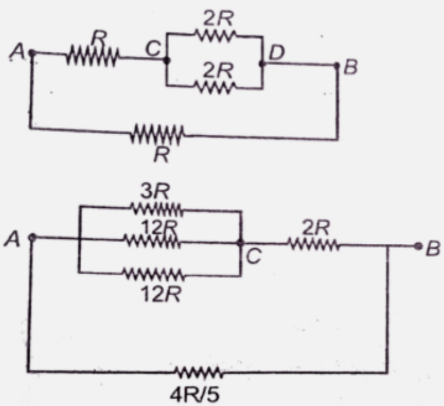
ASSIGNMENT SECTION-J(MATRIX-MATCH TYPE QUESTIONS)

1. Match the following :

Column-I

(A)

(B)



Column-II

(p) $R_{AB} = \frac{2R}{3}$

(q) $R_{AC} = \frac{2R}{3}$

(r) $R_{BC} = \frac{2R}{3}$

(s) $R_{BC} = \frac{7R}{6}$

(t) $R_{AC} = \frac{7R}{6}$

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2. ColumnI lists physical quantities for a uniform current carrying conductor . These quantities depend on quantities given in column II. Match entries in column I to all the quantities in column II on which it depends.

Column I

(A) Resistivity

(B) Current through the conductor for a given potential difference across t

(C) Current density in condcutor for a given potential difference across th

(D) Thermal power generated per unit volume for given value of potential

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ASSIGNMENT SECTION-H(INTEGER ANSWER TYPE QUESTIONS)

1. A potential difference of 22V is maintained across a 1200Ω rheostat PR. The voltmeter has a resistance of 600Ω and PQ is one fourth of distance from P to R. What is the reading (in V) of the voltmeter ?

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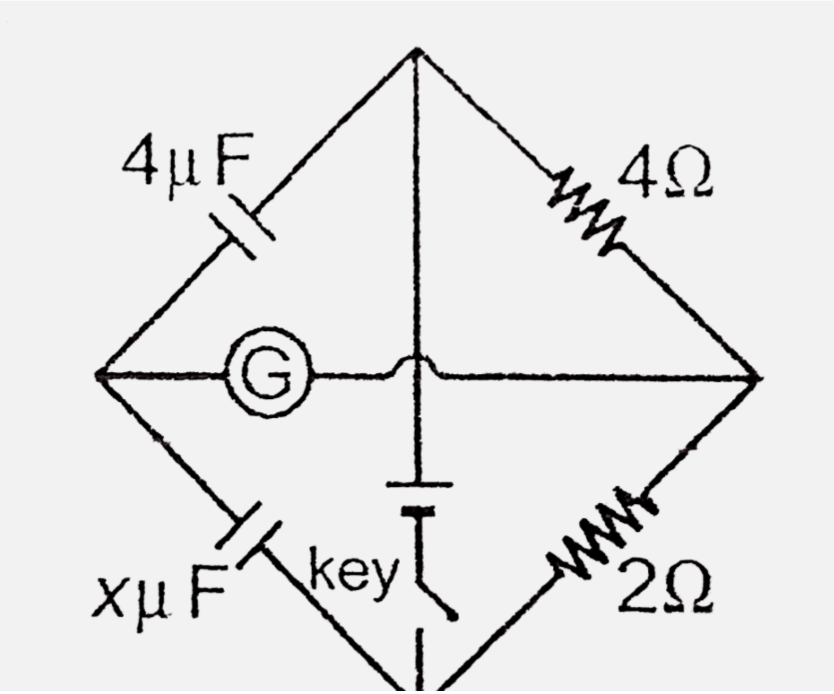
2. Consider the circuit shown with key opened . The key is closed at t=0 . Capacitance of one of the shown capacitors is x μF. For what svalue of x the galvanometer does not shown any deflection ?



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3. Consider a wire of length l , area of cross-section A and resistivity ρ and resistance $\frac{1}{5}\Omega$. Its length is increased by applying a force on l and its length increases by four times of its original length. Find the new resistance in ohms of the wire.

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4. A current , 32 A, is made to pass through a conductor where the free electrons density is $4 \times 10^{28} m^{-3}$ and its area of cross section is $10^{-6} m^2$. Find out the value of the drift velocity (in mm / s) of free electrons.

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5. The deflection in a moving coil galvanometer falls from 50 divisions when a shunt of 2Ω is applied. What is the resistance (in ohms) of the galvanometer ?

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ASSIGNMENT SECTION-H (MULTIPLE TRUE-FALE TYPE QUESTIONS)

1. Consider the follwing three statmenet for a current carrying conductor of non-uniform cross-section.

STATEMENT-1 : Current density at any cross -section of the conductor is proportional to electric field at the cross-section.

STATEMENT-2 : If temperature of the conductor is increased, relaxation time of drifting electron decreases.

STATEMENT-3 : Electrons in the conductor flow from low potential to high potential.

A. F F F

B. F T F

C. F F T

D. T T T

Answer: D

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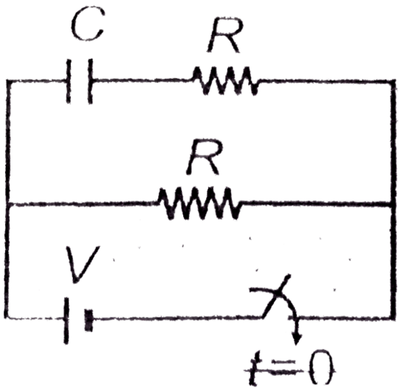
2. Consider the following three statement for the circuit shown here. The key is closed at t=0



STATEMENT-1 : Time constant of the circuit is $RC / 2$.

STATEMENT-2 : Final charge on the capacitor is CV.

STATMENT-3 : Final current drawn from the cell is $2V / R$.

A. F F F

B. T T T

C. F T T

D. F T F

Answer: D

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3. STATEMENT-1 : Resistance of a conductor increases on increasing temperature.

STATEMENT-2 : Drift speed decreasees on increasing temperature.

STATEMENT-3 : Relaxation time decreases on increasing temperature.

A. F F F

B. T T T

C. T F T

D. F T T

Answer: 2

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4. STATEMENT-1 : Galvanometer can be converted into voltmeter by connecting a large shunt in its series.

STATEMENT-2 : Galvanometer can be converted into an ammeter by connecting a small shunt in its parallel.

STATEMENT-3 : Galvanometer cannot be converted into voltmeter or ammeter.

A. F T F

B. T T F

C. T F F

D. F F T

Answer: B

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5. STATEMENT-1 : For d.c. circuits capacitors behaves as short circuit at t=0.

STATEMENT-2 : For d.c. circuit capacitor behaves as open circuit at $t \to \infty$

STATEMENT -3 : Capacitor always behaves as open circuit as there is a gas between the plates of capacitor and thus it doesn't allow any current to pass through it.

A. F T F

B. T T F

C. T F F

D. T T T

Answer: A

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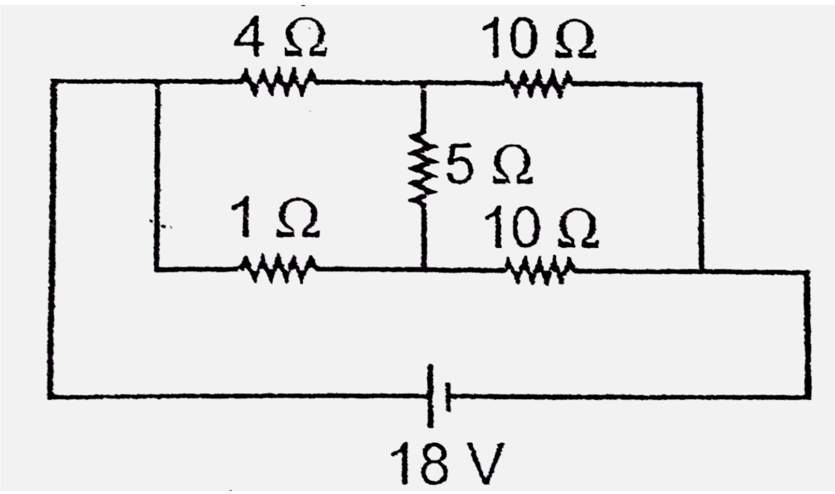
ASSIGNMENT SECTION-I(SUBJECTIVE TYPE QUESTIONS)

1. Determine the current drawn from the battery in the circuit shown.



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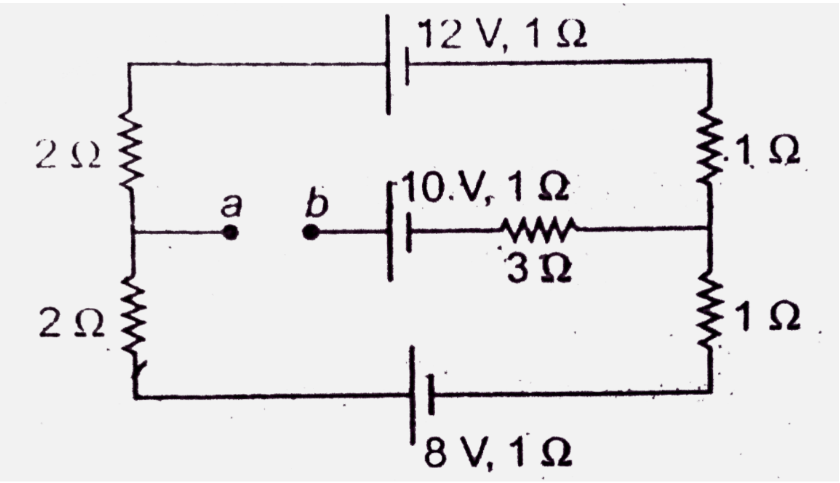
2. Find the potential difference between the points a and b. If the points a and b are joined by a resistance of 5Ω, calculate the current through this resistance.



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3. A cylindrical tube of length l has inner radius a while outer radius b. What is the resistance of the tube between (a) its ends (b) inner and outer surfaces ? (The resistivitiy of its material is p)

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4. Consider the potentiometer circuit arranged as in figure. The potentiometer wire is 600 cm long . If the jockey toches the wire at a distance 560 cm from A, calculate the current through the galvanometer.

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5. A battery of emf $1.4V$ and internal resistance 2Ω is connected to a resistor of 100ω resistance through an ammeter. This resistance of the ammeter is $4/3\Omega$. A voltmeter has also been connected to find the potential difference across the resistor.

a. Draw the circuit diagram.

b. The ammeter reads $0.02A$. What is the resistance of the voltmeter?

c. The voltmeter reads $1.1V$. What is the error in the reading?

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6. A capacitor of capacitance C, charged to a potential difference V, is discharged through a series combination of two resistors R_1 and R_2. Find the heat generated in resistor R_1 during discharging.

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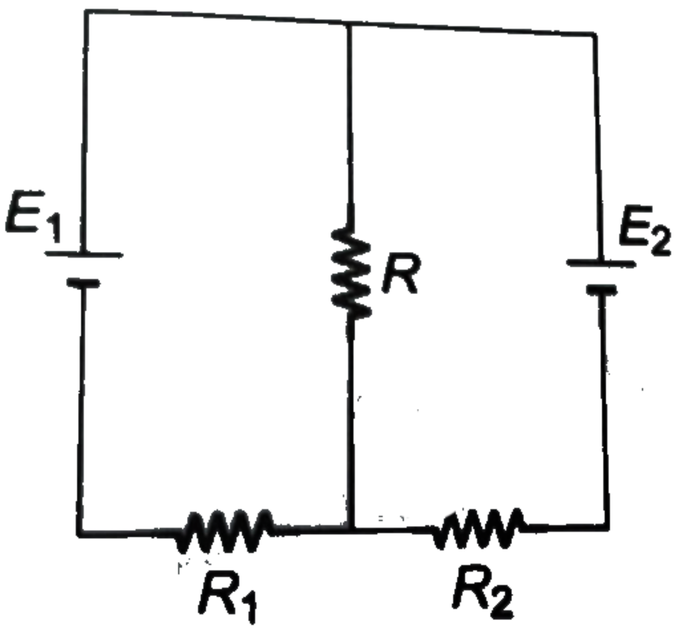
7. In the circuit shown in figure, the emfs of batteries are E_1, and E_2 which have internal resistances R_1, and R_2. At what value of the resistance R will the thermal power generated in it be the highest? What it is?



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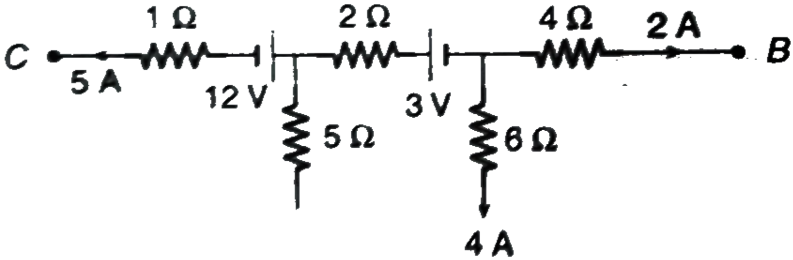
8. The figure shows part of certain circuit, find,



a. power dissipated in 5Ω resistance,

b.Potential difference $V_C - V_B$

c.Which battery is being charged?

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9. Calculate the drif velocity of electrons in an aluminium wire of radius 2mm when a current of 5A passes through it. (Atomic weight of aluminium = 27, Avogardo number = 6×10^{23} and density of aluminium = 2700 kg m^{-3}

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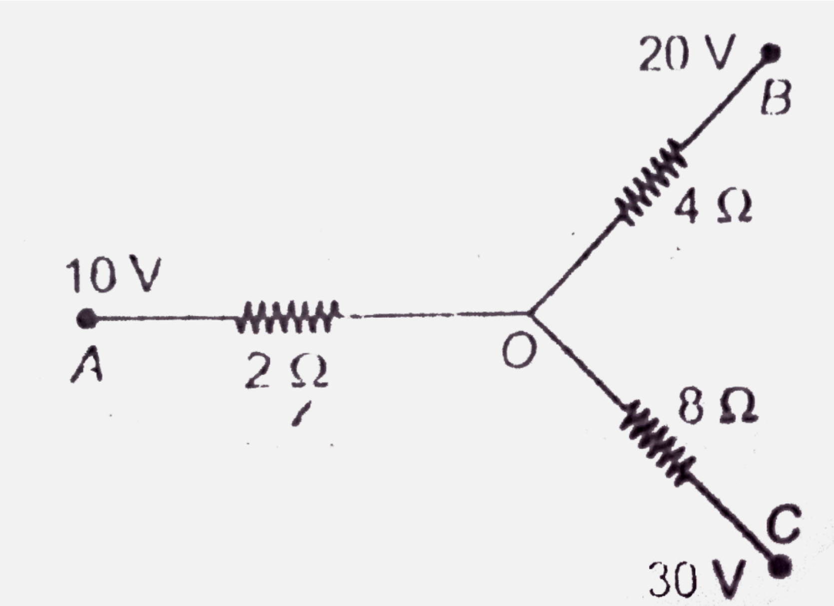
10. Consider the circuit shown in the figure. Find the current in branch AO and OC . Potential of point A = 10 V of point B = 20 V and of C = 30 V.



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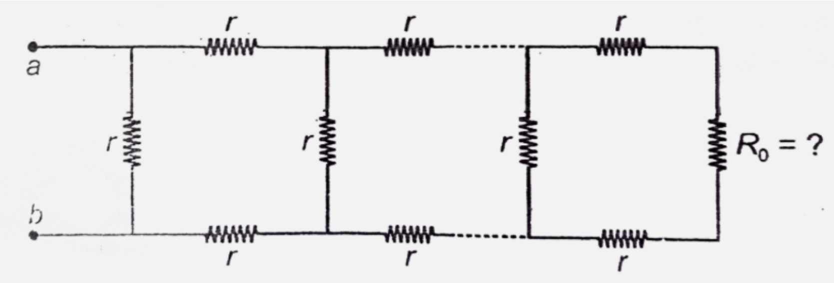
11. In the circuit shown there are n repetitions of the same loop. What resistance R_0 should be connected across the end points , so that the equivalent resistance between a and b may be independent of n ? What is this equal to ?



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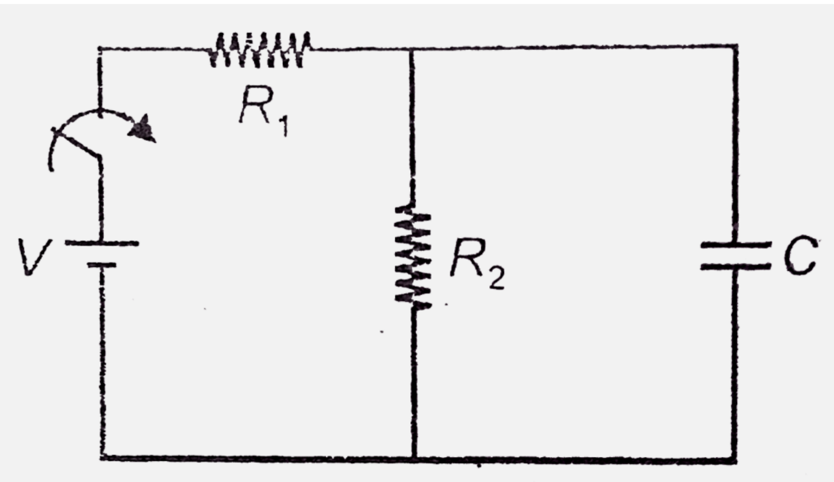
12. Consider the circuit shown. Switch is closed at t=0. Find the current through the battery as a function of time. Initially capacitor was uncharged.



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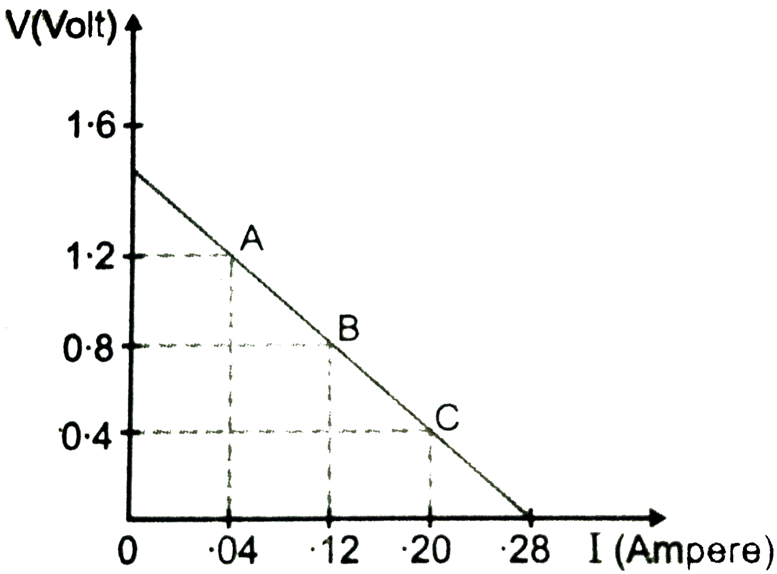
13. Potential difference across terminal sof a cell were measured (in volts) against different currents (in ampere) flowing through cell. A graph ABC is drawn as shown. Determine

(a) The emf.

(b) Internal resistance of cell



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14. Consider the potentiometer shown in the diagram resistance of uniform wire $AB = 10\Omega$, length of wire $AB = 1m$. Find

(a) Potential gradient along AB.

(b) Length 'AO' where galvanometer shows zero deflection.

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ASSIGNMENT SECTION-J

1. You have a microammeter which reads $50\mu A$ at full scale deflection and the coild in the meter movement has a resistance of 20 ohms. By adding two resistors , R_1 and R_2 and a 1.5 volt battery you can convert this into an ohmeter. When the two outcoming leads of this ohmeter are connected together , the meter is to register ohms by giving exactly full-scale deflectio. When the leads are connected across an unknown resisance R, the deflection will indicate the resistance value,if the scalse is appropriately marked . In particular , we wan half scale deflection to indicate 15 ohms. What values of R_1 and R_2 are required , how should the connections be made ?

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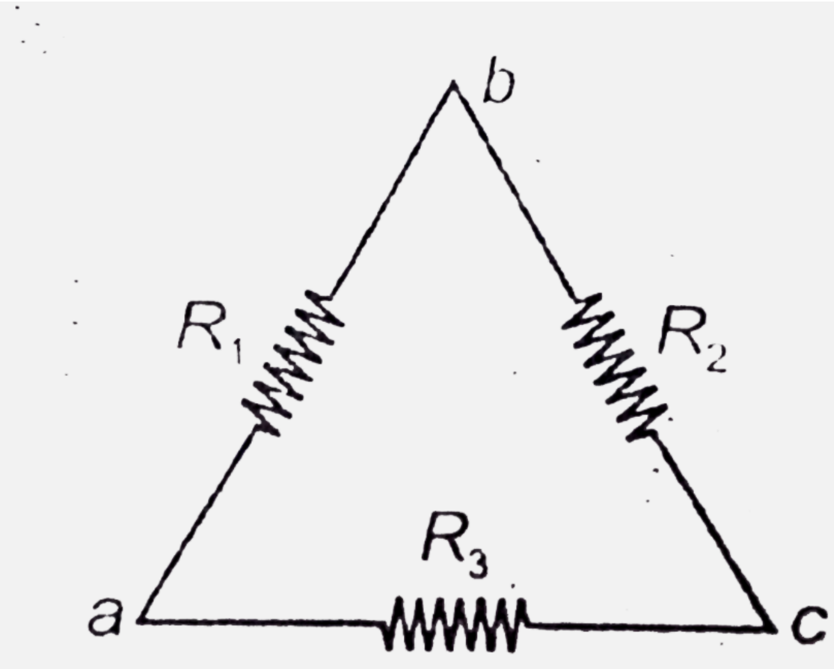
2. Consider the circuit shown in the figure. Equivalent resistance between terminals ab,ac,c equals $30\Omega, 60\Omega$ and 70Ω respectively. Find the respectively . Find the resistance R_1, $R_2$and R_3



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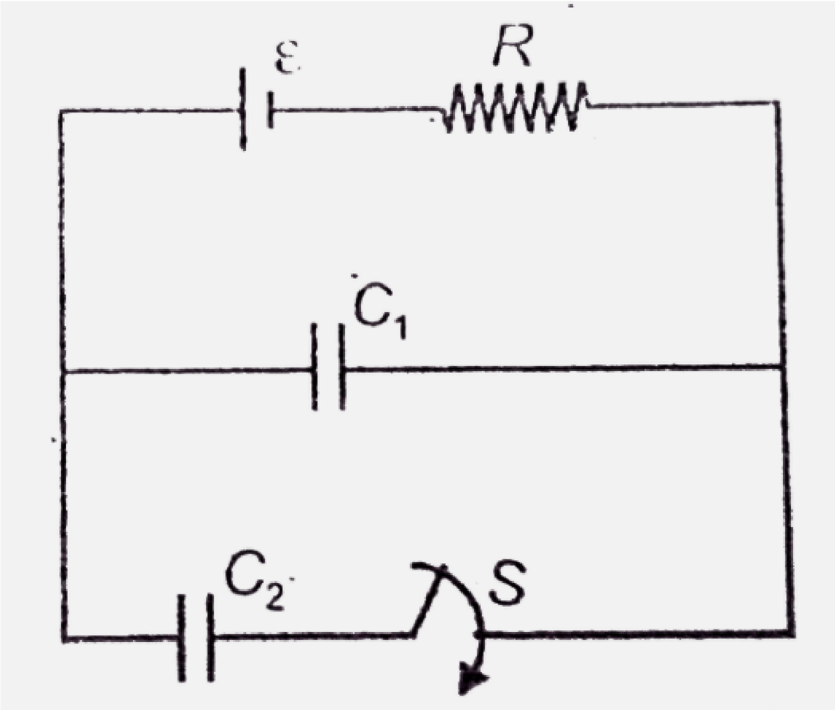
3. Initially switch 'S' was open and the circuit has achieved its steady state at t=0. Then , switch 'S' is sddenly closed. Find the current through resistance R as a function of time.



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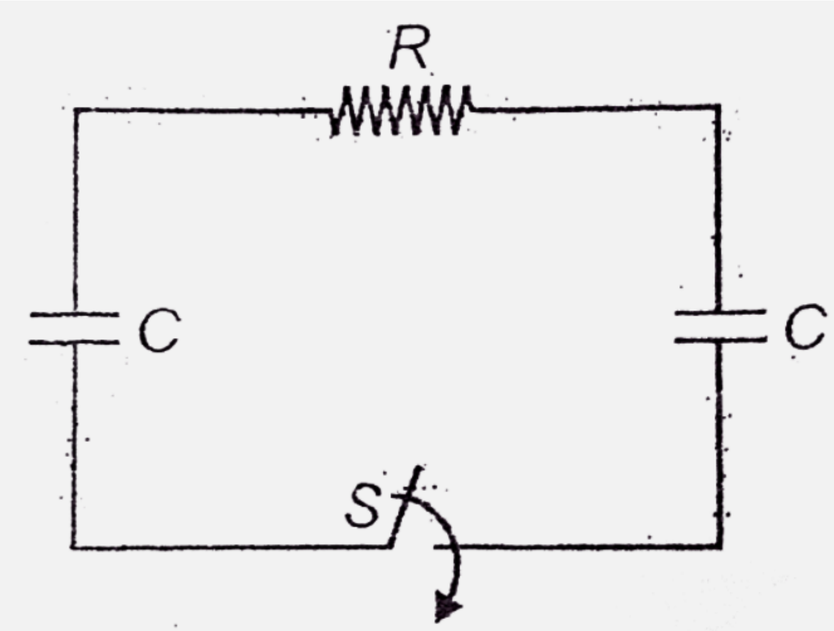
4. In the circuit shown the capacitance of each capacitance is equal to C and the resistance in R. One of the capacitance was connected to a voltage V_0 and then at the moment t=0 was shorted by means of the switch S. Find

(i) Current in the circuit as a function of time.

(ii) The amount of generated heat provided a dependece I(t) is known



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5. Two metal balls of the same radius a are located in a homogeneous poorly conducting meium with resistivity ρ. Find the resistance of the medium between the balls provided that the separated between them is much greater than the radius of the ball.

Strategy : Let us mentally impart the charge $+q$ and $= q$ to the balls respectively. The electric field strength at the surface of a ball will be determined only by its own charge and the cahrge can be considered to be uniformly distributed over the surface, because the other ball is at infinite distance.

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6. A rod of length L and cross-section area A lies along the x-axis between $x = 0$ and $x = L$. The material obeys Ohm's law and its resistivity varies along the rod according to $\rho(x) = \rho_0 \varepsilon^{-x/L}$. The end of the rod $x = 0$ is at a potential V_0 and it is zero at $x = L$.

(a) Find the total resistance of the rod and the current in the wire.

(b) Find the electric potential in the rod as a function of x.

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7. If all the energy lost from joule heating stays in a wire , and the temperature increases as a result the resistivity also increase. The current will therefore change as a function of time of time, the joule heating will change and so forth. If the wire material has constant heat capacity , the rate of energy loss in wire will be proportional to rate of change of temperature . Assuming that potential stays constant set up a differential equation that describes the rate of change of temperature .If this equation is solved, how can the current he found as a function of time ?

(Given m is the mass of the wire , V is the potential difference across the wire, C is the specfic heat capacity of wire , α is the thermal coefficient of resistance, R_0 is the resistance of wire at initial temperature T_0).

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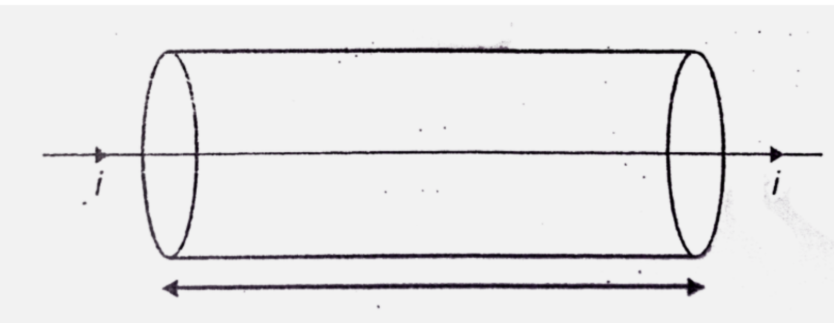
8. In a uniform solid cylinder of radius R conductivity increases linearly with the distance as we move from the axis to the surface of cylinder from σ_1 to σ_2. Current I enters the cylinder from one end and leaves from the other end. Find the current density as a function of distance from axis of the cylinder at any cross-section.



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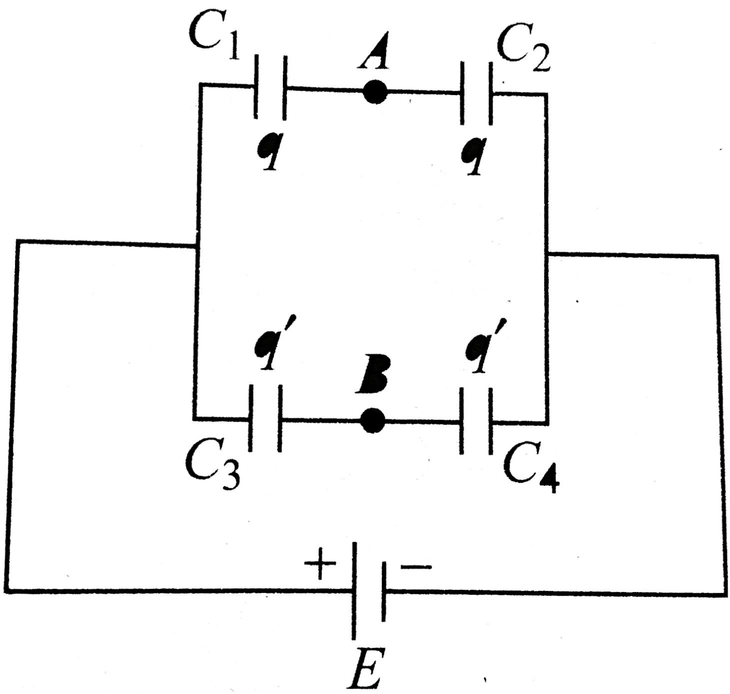
9. Consider



The charge appearing is C_2 is.

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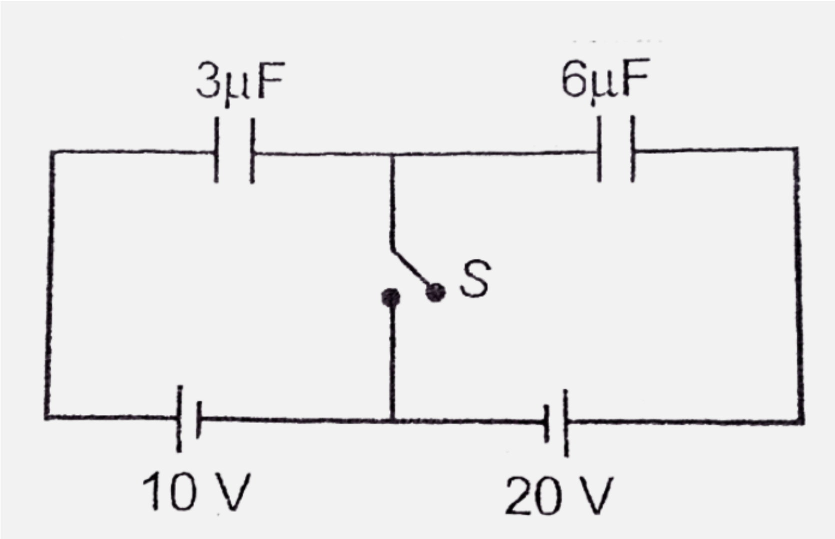
10. 

At t=0 switch S is closed . Find

(i) Charge flown through switch

(ii) Charges flown through both cells.

(iii) Work done by both cells

(iv) Heat dissipated in circuit.

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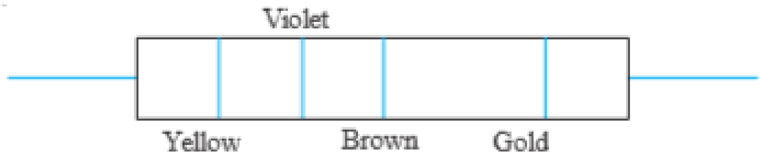
EXERCISE

1. A carbon resistor has coloured strips as shown in figure. Its resistance is



A. $410\Omega \pm 5\,\%$

B. $470\Omega \pm 5\,\%$

C. $470\Omega \pm 10\,\%$

D. $470\Omega \pm 20\,\%$

Answer: B

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2. Derive an expression for the resistivity of a good conductor, in terms of the relaxation time of electrons.

A. $\rho = \dfrac{m}{\mathrm{ne}^2\tau}$

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

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

D. $\rho = \frac{m}{ne\tau}$

Answer: A

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3. Electric current is passing through a solid conductor PQ from P to Q. The electric current densities at p and Q are in the ratio.

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: C

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4. Through a give cross section n_1 electrons per second are passing from left to right and n_2 protons per second are passing from right to left simultaneously. The electric current throught that cross section is (θ = electronic charge).

A. $(n_1 + n_2)$e towards left

B. $(n_2 - n_1)$ e toward right

C. $\left(n_1^2 + n_2^2\right)$ e toward left

D. $\left(n_2^2 - n_1^2\right)$ e toward right

Answer: A

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5. The dimensional formula of mobility is ______ .

A. $\left[M^{-1}L^2T^{-2}A^{-1}\right]$

B. $\left[M^{-1}LT^{2}A\right]$

C. $\left[MLT^{-1}A^{0}\right]$

D. $\left[M^{-1}L^{0}T^{2}A\right]$

Answer: D

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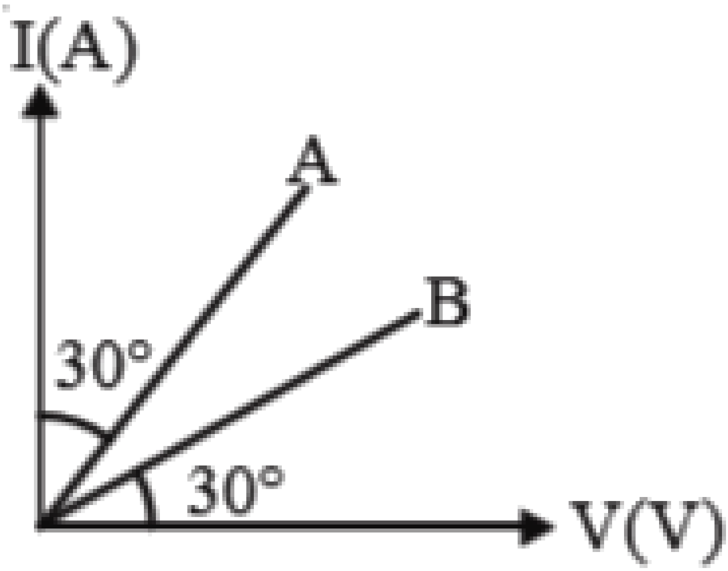
6. Figure shows graph between I and V for two conductors A and B. Their respective resistances are in the ratio.



A. $1:1$

B. $1:3$

C. $3:1$

D. $1:2$

Answer: B

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7. A heater boils certain amount of water in 15 minutes. Another heater boils same amount of water in 10 minutes. Time taken to boil same amount of water when both are used in parallel is

A. 25 minute

B. 6 minute

C. 12 minute

D. 12.5 minute

Answer: B

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8. In a house, individual power of two elements are 10OW and 150 W . Effective power of their series combination will be

A. 120 W

B. 75 W

C. 50 W

D. 60 W

Answer: D

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9. If two bulbs of power 60 W and 100W respectively each rated 110V are connected in series with the supply of 220 V, then

A. 60 W bulb will fuse

B. 100 W bulb will fuse

C. Both bulbs will fuse

D. Bubls will not fuse

Answer: A

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10. Two electric bulbs whose resistance are in the ratio $1:2$ are connected in series to a constant voltage source . The power dissipated in them are in the ratio.

A. $1:2$

B. $1:1$

C. $1:4$

D. $2:1$

Answer: A

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11. What is a fuse ? Name the material of fuse. State one characteristic of the material used for fuse.

A. High melting point and high resistivity

B. Low melting points and low resistivity

C. High melting point and low resistivity

D. Low melting point and high resistivity

Answer: B

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12. Kilowathour is the unit of

A. A. Energy

B. B. Power

C. C. Charge

D. D. Time

Answer: A

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13. Two electric bulbs one, if 200 V-40 W and other 200 V-100 W are connected in series to a 200 V line, then the potential drop across

A. Each bulb is 200 V

B. 100 W bulb is greater than that across 60 W bulb

C. 100 W bulb is smaller than that across 60W bulb

D. Each bulb is 100 V

Answer: A

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14. A heater coil c onnected across a give potential difference has power P . Now , the coil is cut into two equal halves and joined in parallel . Across the same potential difference, this combination has power

A. A. P

B. B. 4P

C. C. P/4

D. D. 2P

Answer: A

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15. An electric bulb marked 25 W and 100 V is connected across 50 V supply . Now its power is .

A. 25 W

B. 12.5 W

C. 6.25 W

D. 50 W

Answer: C

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16. The equivalent resistance between A and B in the situation shown is .

A. $\frac{6R}{5}$

B. $\frac{8R}{3}$

C. R

D. 2R

Answer: C

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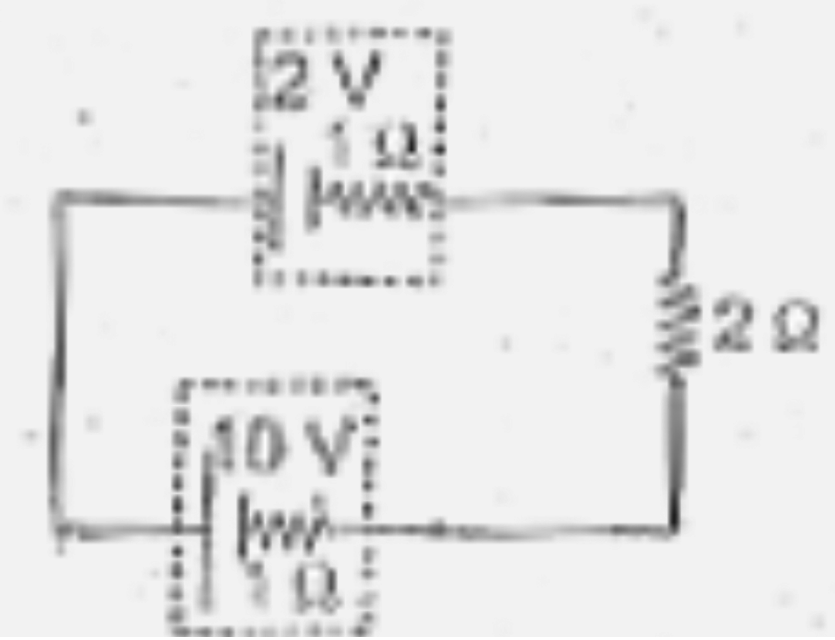
17. In the situation shown , the potential difference across the cell of smaller e.m.f is .



A. 2V

B. 4V

C. Zero

D. 6V

Answer: B

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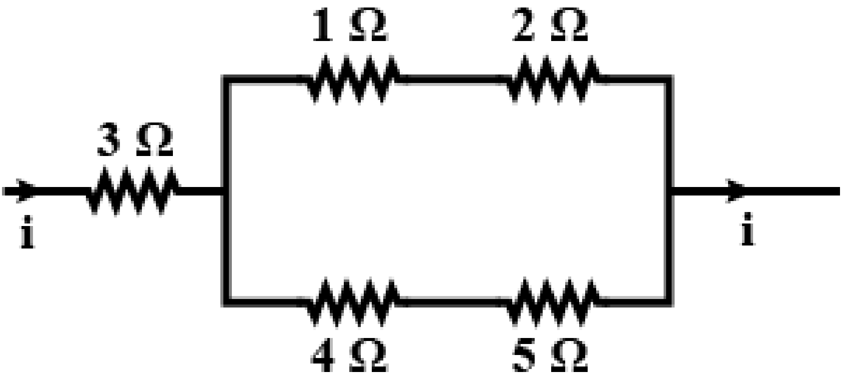
18. In the situation shown, the currents through 3Ω and 2Ωresistances are in the ratio.



A. $3:2$

B. $7:4$

C. $4:3$

D. $3:1$

Answer: C

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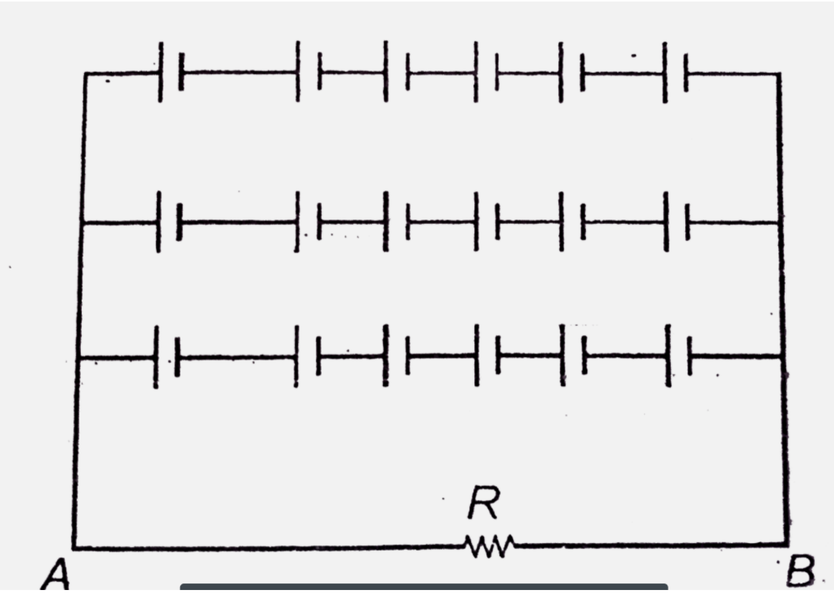
19. Figures shows mixed grouping of identical cells each of e.m.f. 4V and internal resistance 1Ω . This combination can be replaced by an equivalent cell between A and B having e.m.f. E and internal resistance r, where



A. $E = 72V r = 18\Omega$

B. $E = 24V r = 18\Omega$

C. $E = 72V r = 2\Omega$

D. $E = 24V r = 2\Omega$

Answer: D

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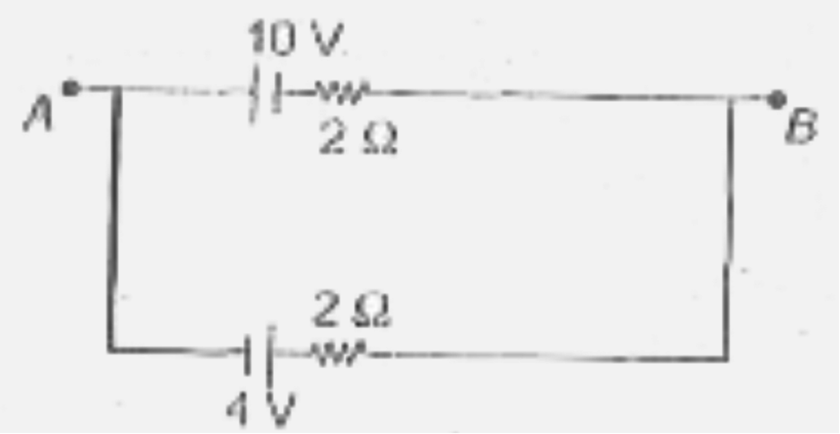
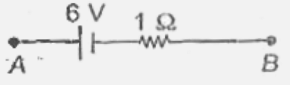
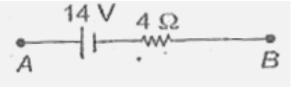
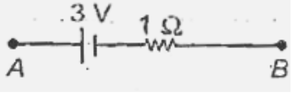
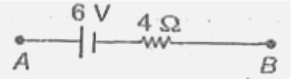
20. The situation shown in figure is equivalent to



A. 

B. 

C. 

D. 

Answer: C

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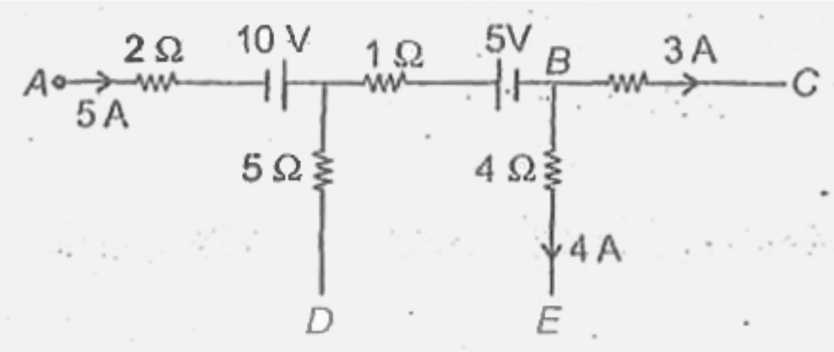
21. The potential difference between A and B in the following situation is .



A. 12V

B. 7V

C. 20V

D. 14V

Answer: A

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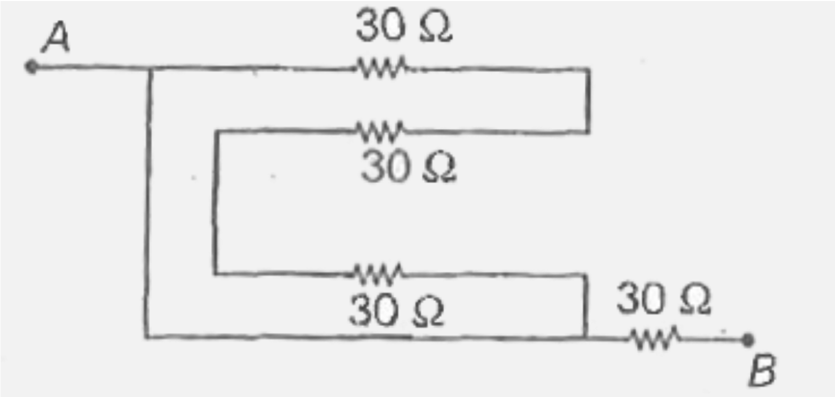
22. The equivalent resistance between A and B in the following figure is .



A. 120Ω

B. 40Ω

C. 30Ω

D. 22.5Ω

Answer: C

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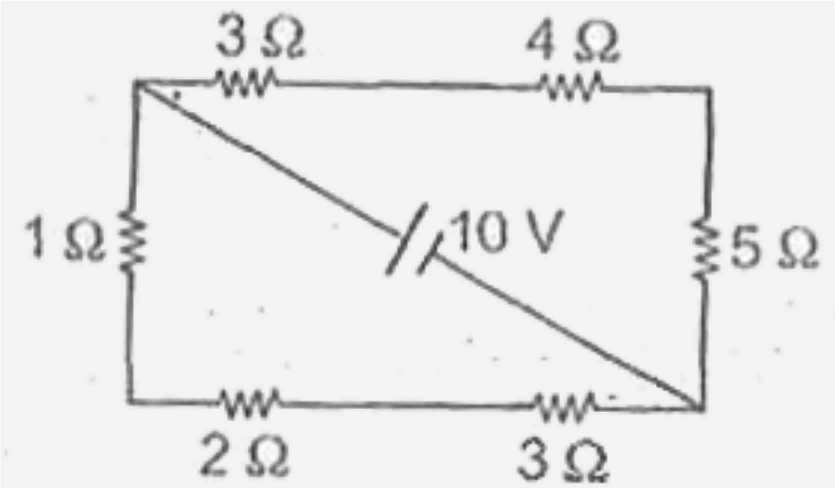
23. In the circuit shown , the current draw by the cell is



A. 1.2 A

B. 2.5 A

C. 0.6A

D. 3.6 A

Answer: B

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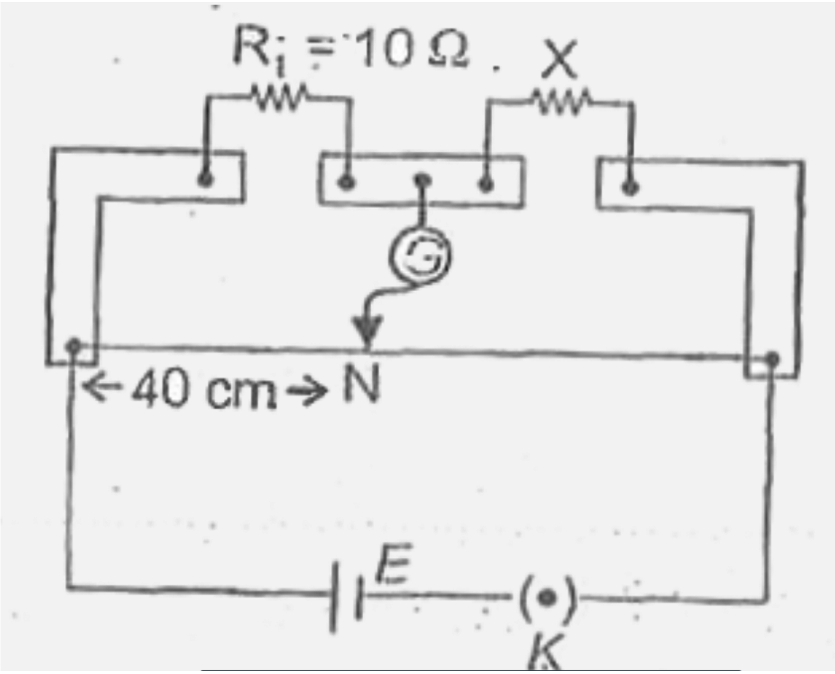
24. In the metrebridge experiment , the null point is obtained at N. The value of unkonw resistance X will be .



A. 60Ω

B. 40Ω

C. 6Ω

D. 15Ω

Answer: D

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25. The valancing length for a cell is 560 cm in a potentiometer experiment. When an external resistance of 10Ω is connected in paralled to the cell, the balancing length changes by 60 cm. If the internal resistance of the cell is $\frac{N}{10}\Omega$, where N is an integer then value of N is ___________.

A. 2Ω

B. 5Ω

C. 1.5Ω

D. 15Ω

Answer: B

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ASSIGNMENT (SECTION - A)

1. Electric current has both magnitude and direction it is a .

A. Vector quantity

B. Scalar quantity

C. Tensor quantity

D. None of these

Answer: B

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2. Identical pieces of Ge and Cu are taken and cooled then

A. Resistivity of both increase

B. Resistivity of both decrease

C. Resistivity of Cu increases and Ge decreases

D. Resistivity of Cu decreases and Ge increases

Answer: D

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3. A current of 10 A is mainatained in a conductor of cross - section $1cm^2$. If the free electron density in the conductor is $9 \times 10^{28} m^{-3}$, then drift velocity of free electrons is .

A. $6.94 \times 10^{-6} m/s$

B. $5.94 \times 10^{-2} m/s$

C. $1.94 \times 10^{-3} m/s$

D. $2.94 \times 10^{-4} m/s$

Answer: A

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4. A potential difference of 5 V is applied across a conductor of length 10 cm . If drift velcoity of electrons is $2.5 \times 10^{-4} m / s$, then electron mobility will be

A. $5 \times 10^{-4} m^2 V^{-1} S^{-1}$

B. $5 \times 10^{-6} m^2 V^{-1} s^{-1}$

C. $5 \times 10^{-2} m^2 V^{-1} s^{-1}$

D. Zero

Answer: B

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5. A potential difference of 10 V is applied across a conductor of resistance $1 k\Omega$. Find the number of electrons flowing through the conductor in 5 minutes.

A. 1.875×10^{16}

B. 1.875×10^{17}

C. 1.875×10^{22}

D. 1.875×10^{19}

Answer: D

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6. If n, e, τ, m, are representing electron density charge, relaxation time and mass of an electron respectively then the resistance of wire of length l and cross sectional area A is given by

A. $\dfrac{ml}{\mathrm{ne}^2\tau A}$

B. $\dfrac{m\tau A}{\mathrm{ne}^2 l}$

C. $\dfrac{\mathrm{ne}^2\tau A}{ml}$

D. $\dfrac{\mathrm{ne}^2 A}{m\tau l}$

Answer: A

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7. Ohm's law fails in

A. Diode

B. transistor

C. PN junction system

D. All of these

Answer: D

Watch Video Solution

8. The resistance of a rectangular block of copper of dimension $2mm \times 2mm \times 5m$ between two square faces is 0.02Ω . What ist he resistivity of copper ?

A. $1.6 \times 10^{-6}\Omega$

B. $1.6 \times 10^{-6} \Omega - m$

C. $1.6 \times 10^{-8} \Omega - m$

D. Zero

Answer: C

Watch Video Solution

9. If a copper wire is stretched to make it 0.1% longer, then the percentage change in resistance is approximately -

A. 0.1%

B. 0.8%

C. 0.4%

D. 0.2%

Answer: C

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10. A certain piece of copper is to be shaped into a conductor of minimum resistance . Its length and diameter should respectively be .

A. L,D

B. $2L, \frac{D}{2}$

C. $\frac{L}{2}, 2D$

D. $L, \frac{D}{2}$

Answer: C

Watch Video Solution

11. A wire of resistance x ohm is draw out, so that its length in increased to twice its original length, and its new resistance becomes 20 Ω then x will be .

A. 5Ω

B. 10Ω

C. 15Ω

D. 20Ω

Answer: A

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12. A piece of wire is cut into four equal parts and the pieces are bundled together side by side to from a thicker wire. Compared with that of the original wire, the resistance of the bundle is

A. The same

B. $\frac{1}{16}$ as much

C. $\frac{1}{8}$ as much

D. $\frac{1}{4}$ as much

Answer: B

Watch Video Solution

13. Two wires A an dB of the same material, having radii in the ratio I : 2 and carry currents in the ratio 4: I. The ratio of drift speed of electrons in A and Bis :

A. $16 : 1$

B. $1 : 16$

C. $1 : 4$

D. $4 : 1$

Answer: A

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14. Temperature coefficient of resistance of a wire at $0^\circ C$ is $0.00125^\circ C^{-1}$. At $25^\circ C$ its resistance is 1Ω . The resitance of the wire will be 1.2Ω at

A. 225K

B. 190°

C. $260^{\circ}C$

D. $185K$

Answer: B

Watch Video Solution

15. A conductor behaves as a superconductor

A. Above critcal temperature

B. At critical temperature

C. At $100^{\circ}C$

D. At boiling point of that metal

Answer: B

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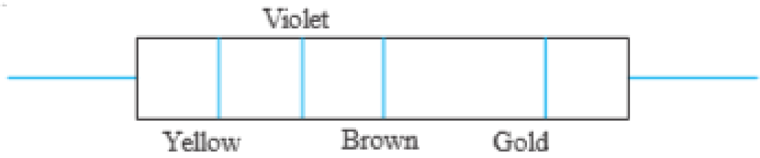
16. A carbon resistor has coloured strips as shown in figure. Its resistance is



A. $410\Omega \pm 2\%$

B. $450\Omega \pm 5\%$

C. $420\Omega \pm 3\%$

D. $405\Omega \pm 2\%$

Answer: B

Watch Video Solution

17. Two resistances are joined in parallel whose resultant is $\frac{6}{8}\Omega$. One of the resistance wire is broken and effective resistance becomes 2Ω. Then, the resistance in ohm of the wire that got broken was

A. $\frac{6}{5}$

B. 2

C. $\frac{3}{5}$

D. 3

Answer: D

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18. A wire has resistance 12Ω. It is bent in the form of a circle. The effective resistance between the two points on any diameter is equal to

A. 12Ω

B. 24Ω

C. 3Ω

D. 6Ω

Answer: C

Watch Video Solution

19. A technician has only two resistance coils. By using them in series or in parallel he is able to obtain the resistance 3,4,12 and 16 ohm. The resistance of two coils are

A. 6 and 10 ohms

B. 4 and 12 ohms

C. 7 and 9 ohms

D. 4 and 16 ohms

Answer: B

Watch Video Solution

20. Two resistors of resistance R_1 and R_2 having $R_1 > R_2$ are connected in parallel. For equivalent resistance R, the correct statement is

A. $R > r_1 + r_2$

B. $R > \sqrt{r_1 r_2}$

C. $r_1 < R < r_2$

D. $R < r_1$

Answer: D

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21. The resultant resistance value of n resistance each of r ohms and connected is series is X. When those n , resistance are connected in parallel , the resultant values is .

A. $\frac{x}{n}$

B. $\frac{x}{n^2}$

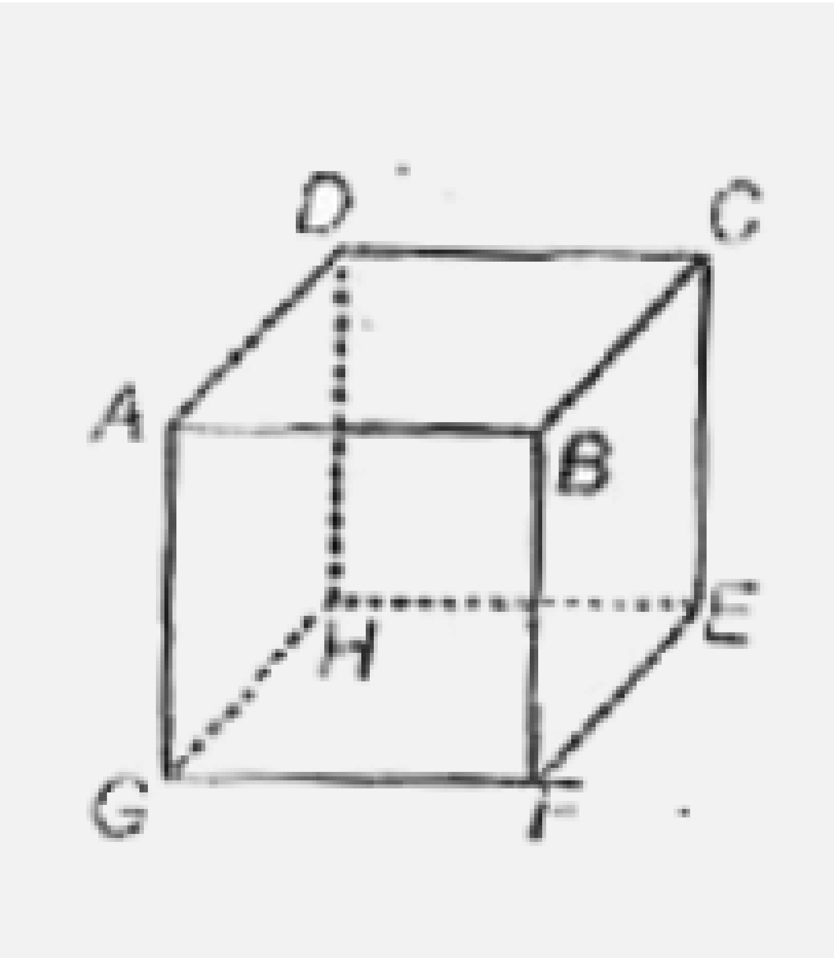
C. $n^2 x$

D. nx

Answer: B

Watch Video Solution

22. Twelve wires of equal resistacne R are connected to form a cube . The effective resistance between two diagonal ends A and E will be .



A. $\frac{5R}{6}$

B. $\frac{6R}{5}$

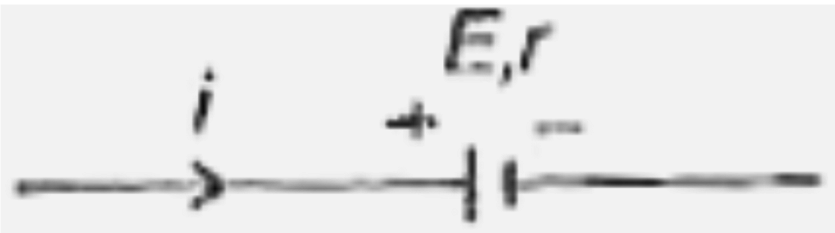
C. $12R$

D. 3R

Answer: A

Watch Video Solution

23. According to this diagram , the potential difference across the terminals is (internal resistance of cell =r)



A. $V = E - ir$

B. $V = E + ir$

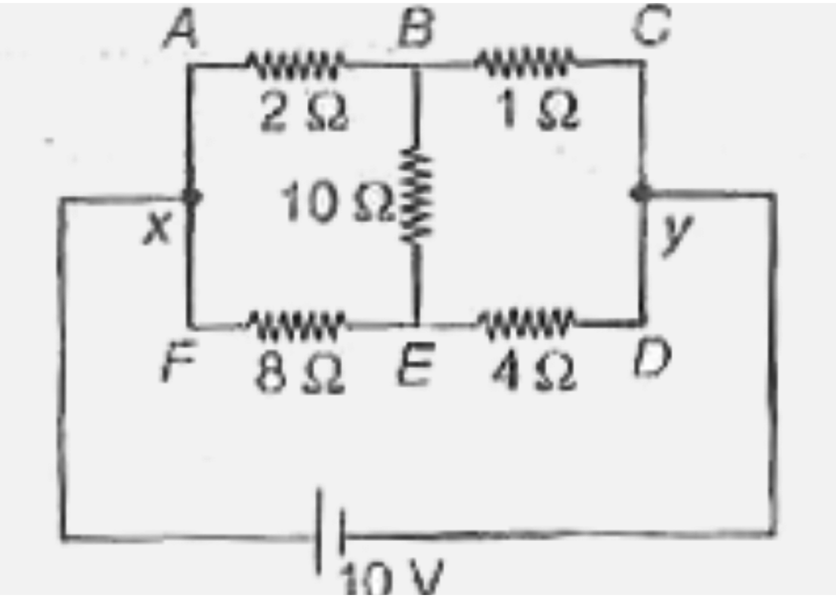
C. $V = E$

D. Zero

Answer: C

Watch Video Solution

24. A combination of five resistors are connected to a cell of emf 10 V as shown in figure. The potential difference $V_B - V_E$ will be .



A. $+5\text{V}$

B. $+3V$

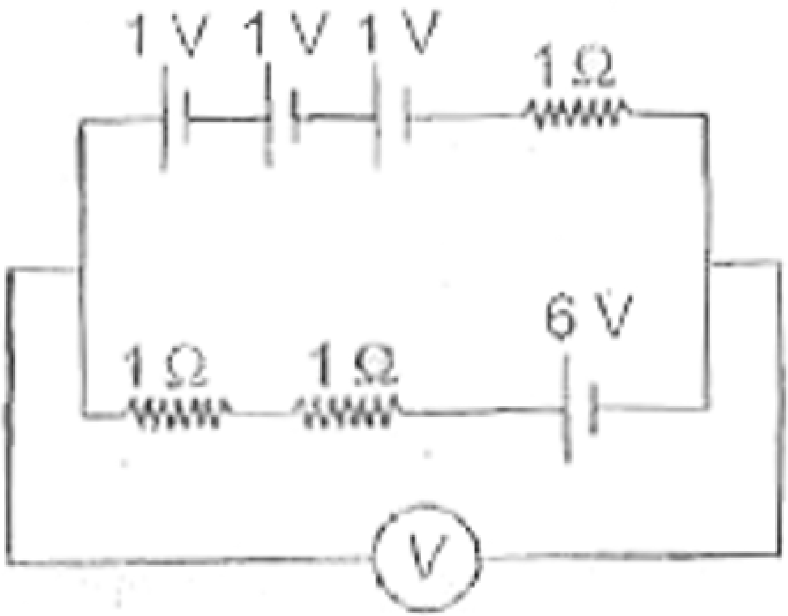
C. $+1V$

D. Zero

Answer: D

Watch Video Solution

25. Reading of an ideal voltmeter in the circuit below is



A. Zero

B. 2V

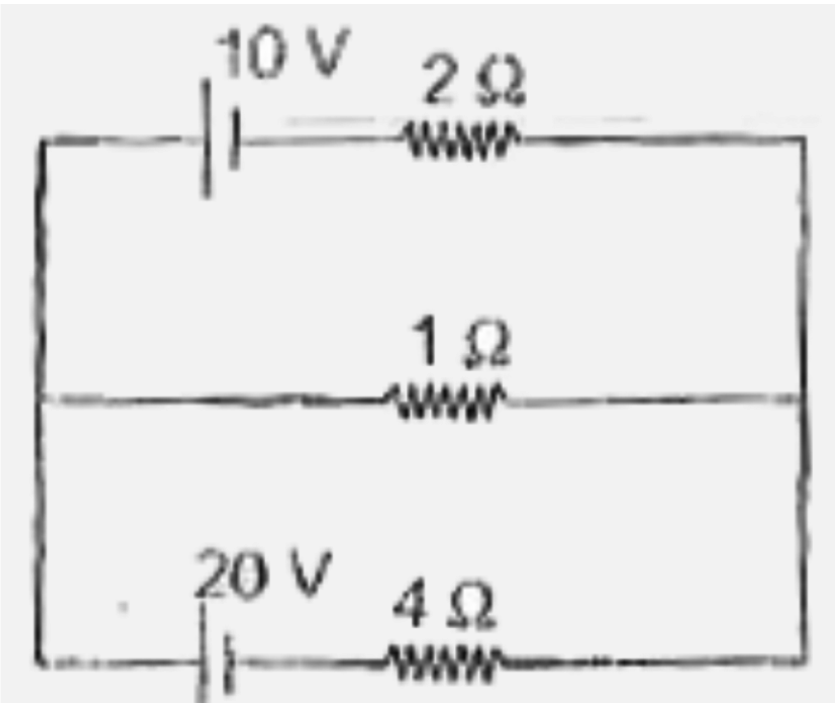
C. 4V

D. 6 V

Answer: C

Watch Video Solution

26. The value of current through 2Ω resistor is



A. $1.0A$

B. $1.5A$

C. $5.0A$

D. $2.1A$

Answer: D

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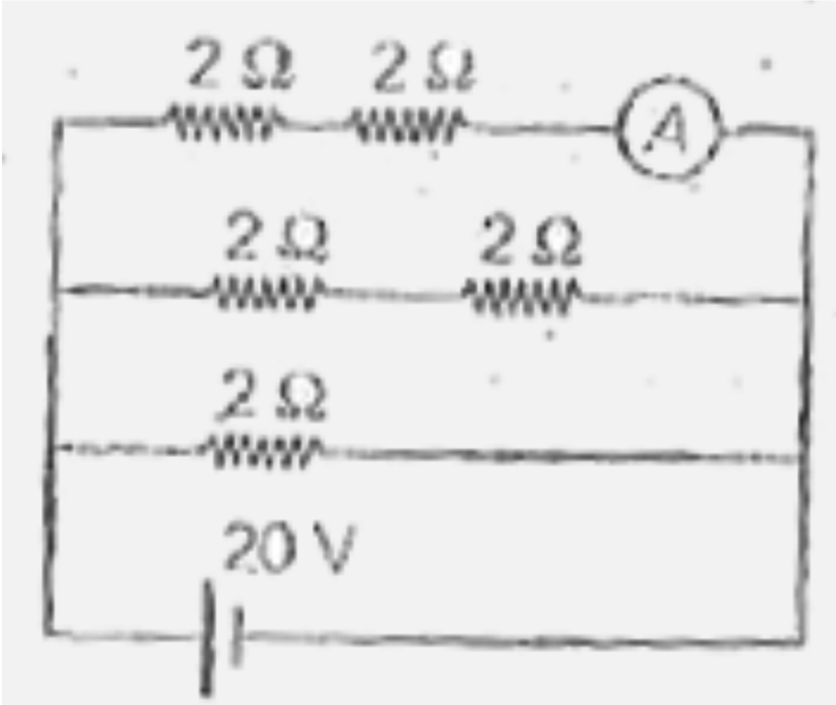
27. The reading of the ammeter in the circuit below is



A. 5A

B. 15A

C. 20A

D. 25A

Answer: A

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28. Thousand cells of same emf E and same internal resistance r are connected is series in same order without an external resistance . The potential drop across 399 cells is found to be .

A. Zero

B. 399E

C. 601E

D. 1000E

Answer: A

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29. Five cells each of emf E and internal resistance r are connecte in series. Due to oversight one cell is connected wrongly . The equivalent emf and internal resistance of the combination is

A. 5E

B. 2E

C. 3E

D. 4E

Answer: C

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30. 3.0 A current passing through Two batteries of different emf and internal resistances connected in series with each other and with an external load resistor. The current reversed, the current becomes 1.0 A. the ratio of the emf of the two batteries is

A. 2.5

B. 2

C. 1.5

D. 1

Answer: B

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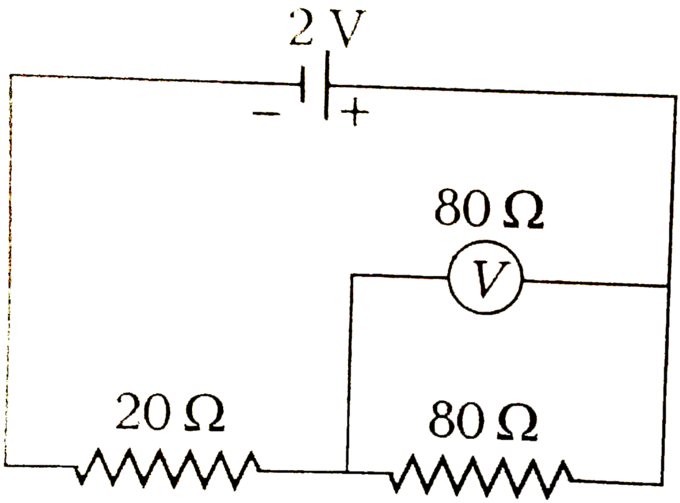
31. In the following circuit, the emf of the cell is 2 V and the internal resistance is negligible. The resistance of the voltmeter is 80Ω. The reading of the voltmeter will be



A. 2 volt

B. 1.33volt

C. 1.60 volt

D. 0.80 volt

Answer: B

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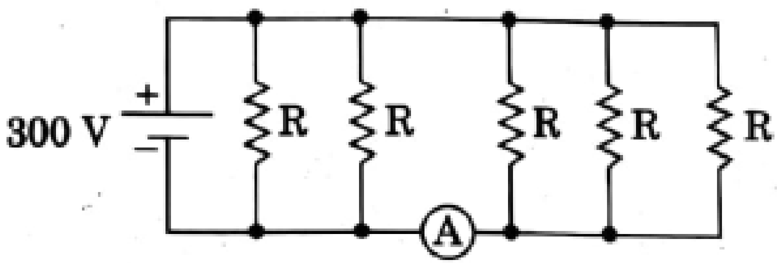
32. Five identical lamps each of resistance R = 1500 Ω are connected to 300 V as shown in figure . The reading of ideal ammeter A is



A. $\frac{1}{5}A$

B. $\frac{2}{5}A$

C. $\frac{3}{5}A$

D. $1A$

Answer: C

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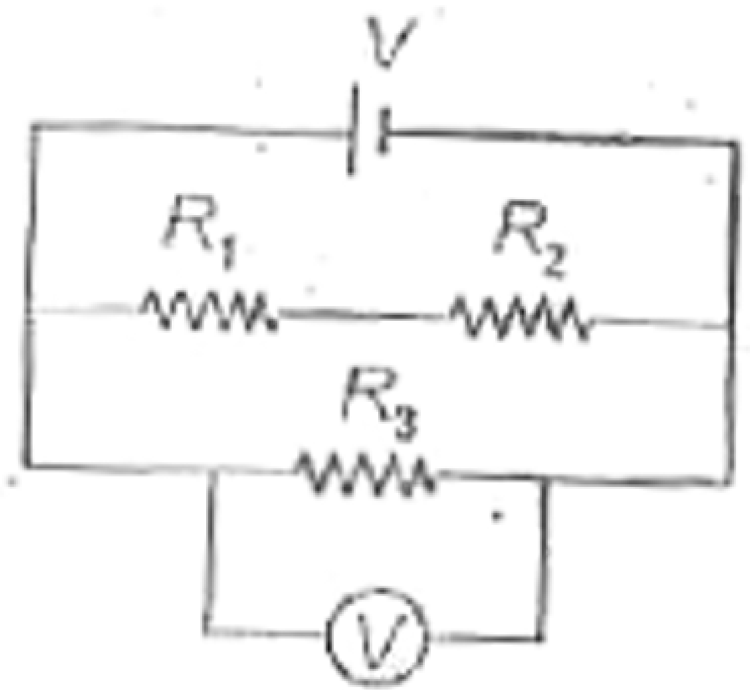
33. In the circuit shown R_1 is increased. What happens to the reading fo the voltmeter (ideal) ?



A. Increases

B. Decreases

C. First increases then decreases

D. Does not change

Answer: D

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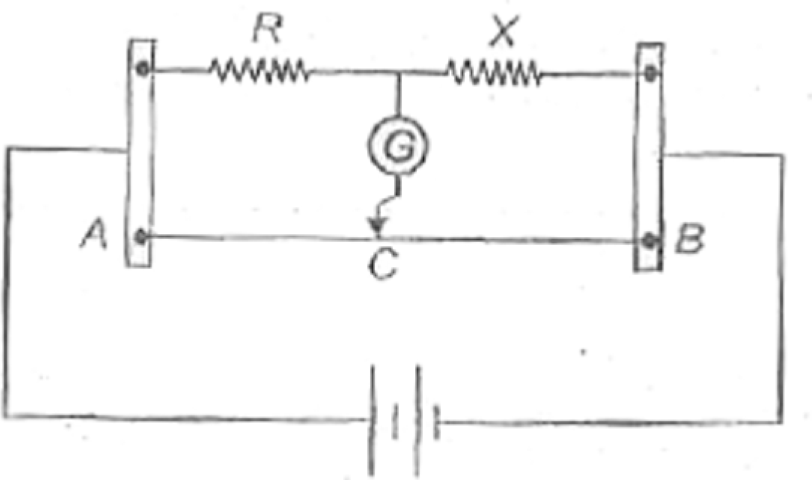
34. In the meter bridge shown , the resistance X has a negative temperature coefficient of resistance Negiecting the variaiton in other resistors, when current is passed for some time , in the circuit balance point should shift towards .



A. A

B. B

C. First A then B

D. It will remain at C

Answer: B

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35. A voltmeter is connected in parallel with a variable resistance R which is in series with an ammeter and a cell as shown in the figure . For one value of R=2Ω,the reading are 0.25A and 1.0 V. What is the internal resistance of the cell ?

A. 0.5Ω

B. 2Ω

C. 1.2Ω

D. 1Ω

Answer: B

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36. A galvanometer of resistance 100Ω gives full scale deflection for $10mA$ current. What should be the value of shunt, so that it can measure a current of 100mA?

A. 11.11Ω

B. 1.1Ω

C. 9.9Ω

D. 4.4Ω

Answer: A

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37. Tow cells of e.m.f E_1 and E_2 are joined in series and the balancing length of the potentiometer wire is 625 cm. If the terminals of E_1 are reversed , the balancing length obtained is 125 cm. Given $E_2 > E_1$,the ratio $E_1 : E_2$ willbe

A. $2:3$

B. $5:1$

C. $3:2$

D. $1:5$

Answer: A

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38. A 10 m long potentiometer wire is connected to a battery having a steady voltage . A leclanche cell is balanced at 4 m length of the wire . If the length is kept the same, but its cross - section is doubled the null point will be obtained at .

A. 8 m

B. 4 m

C. 2m

D. None of these

Answer: B

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39. Of the bulbs in a house, one glows brighter than the other, which of the two has a large resistance.

A. The bright bulb

B. The dim bulb

C. Both have the same resistance

D. The brightness does not depend upon the resistance .

Answer: B

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40. Two elelctric bulbs P and Q have their resistance in the ratio of 1: 2. They are connected in series across a battery. Find the ratio of the power dissipation in these bulbs.

A. $2:1$

B. $1:1$

C. $1:4$

D. $1:2$

Answer: A

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41. The same mass of aluminium is draw into two wires 1mm and 2mm thick . Two wires are connected in series and current is passed through them. Heat produced in the wires is in the ratio.

A. $16 : 1$

B. $8 : 32$

C. $8 : 2$

D. $4 : 2$

Answer: A

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42. How many 60 W bulbs may be safely run on 220 v using a 5 A fuse?

A. 18

B. 16

C. 14

D. 12

Answer: A

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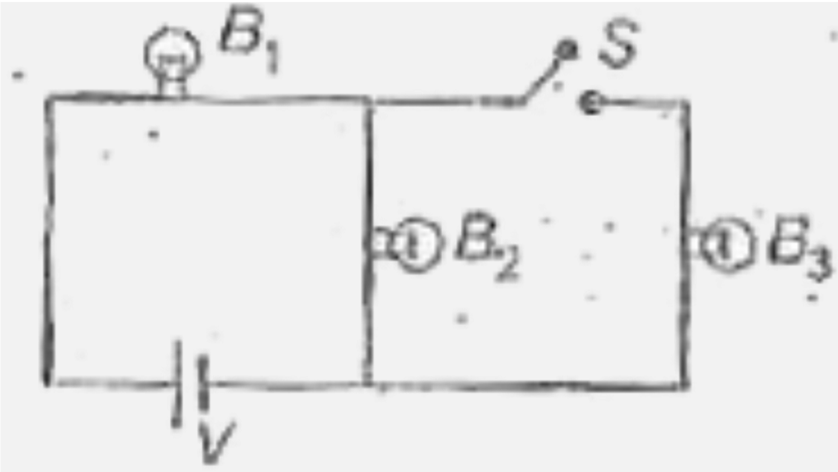
43. Three identical bulbs B_1, B_2 and B_3 are connected to the mains as shown in figure. If B_3 is disconnected for the from the circuit by opening switch S, then incandescence of bulb B_1 will . ,



A. increases

B. Decreases

C. Become zero

D. No change

Answer: B

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44. A standard 50W electirc bulb in series with a room heater is connected across the mains. If the 50W bulb is replaced by $100W$ bulb the heater output will

A. Double

B. Halve

C. increase

D. Decrease

Answer: C

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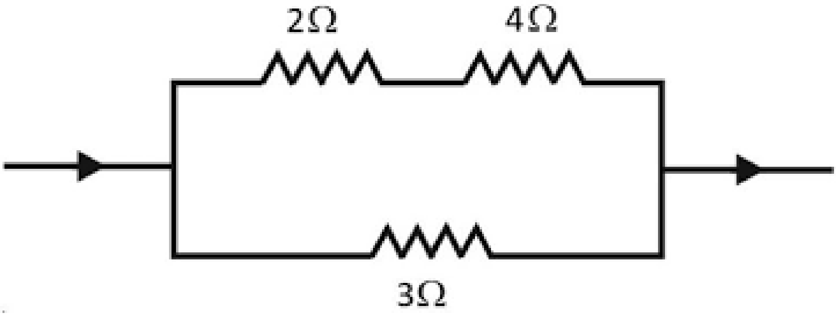
45. In a circuit shown if figure , the heat produced in 3 ohm resistor due to a current flowing in it is 12 J. The heat produced In 4 ohm resistor is .



A. 2J

B. 4J

C. 64 J

D. 32 J

Answer: B

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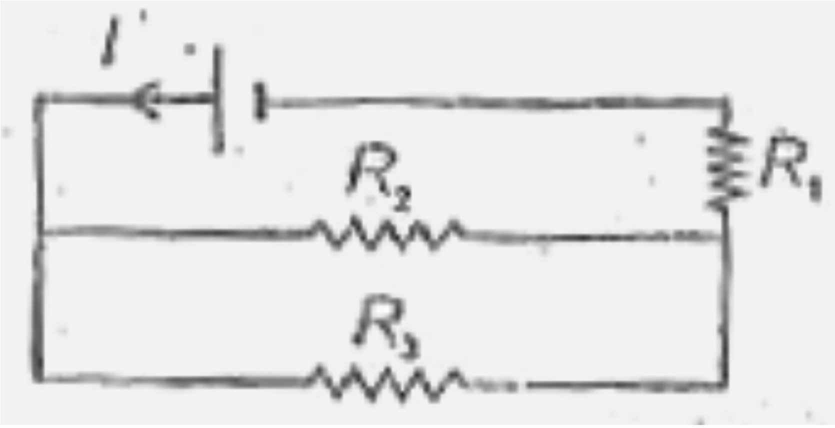
46. Refer to the circuit shown . What will be the total power dissipation in the circuit if P is the power dissipated in R_1 ? It is given that $R_2 = 4R_1$ and

$R_3 = 12R_1$



A. 4P

B. 7P

C. 13P

D. 17P

Answer: A

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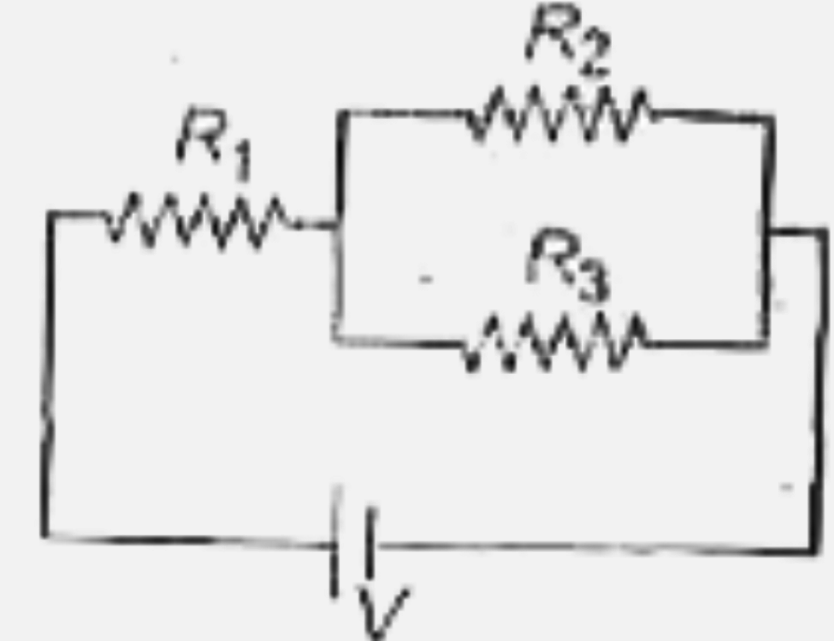
47. Three identical resistors $R_1 = R_2 = R_3$ are connected as shown to a battery of constant e.m.f . The power dissipated is



A. The least in R_1

B. Greatest in R_1

C. In the ratio 1:2 in resistance R_1 and R_2 respectively

D. The same in R_1 and the parallel combination of R_2 and R_3

Answer: B

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48. Four equal resistance dissipated 5 W of power together when connected in series to a battery of negligible internal resistance . The total power dissipated in these resistance when connected in parallel across the same battery would be .

A. 125W

B. 80W

C. 20W

D. 5W

Answer: B

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49. A cell of emf E and internal resistance r supplies current for the same time t through external resistance R_1 and R_2 separately. If the heat developed in both the cases is the same, then the internal resistance r will be

A. $\frac{(R+r)}{2}$

B. $\frac{(R-r)}{2}$

C. $\frac{(Rr)}{2}$

D. $\sqrt{(Rr)}$

Answer: D

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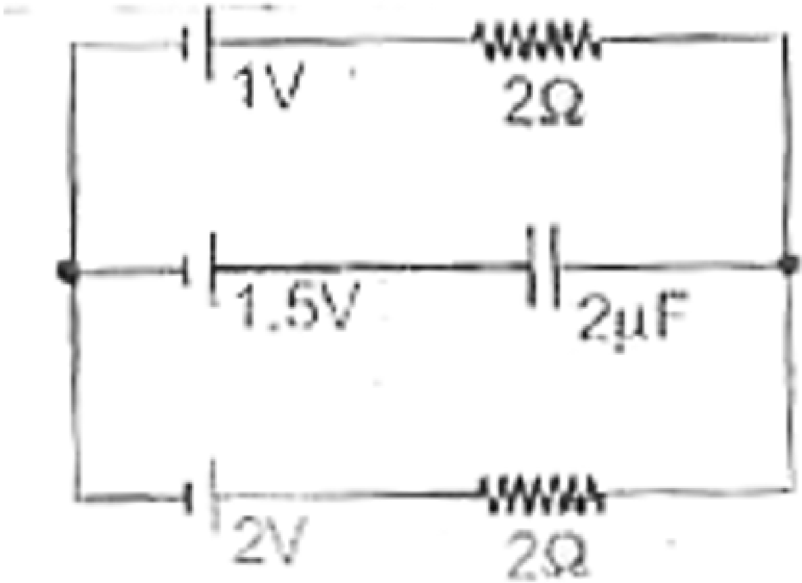
ASSIGNMENT (SECTION - B)

1. The charge in the $2\mu F$ capacitor at steady state is



A. Zero

B. $2\mu C$

C. $4\mu C$

D. $6\mu C$

Answer: A

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2. In the following diagram , the length of wires AB and BC are equal but the radius of wire AB is double that of BC. The ratio of potential gradient on wires AB and BC will be (wire are made of same material).

A. $4:1$

B. $1:4$

C. $2:1$

D. $1:1$

Answer: B

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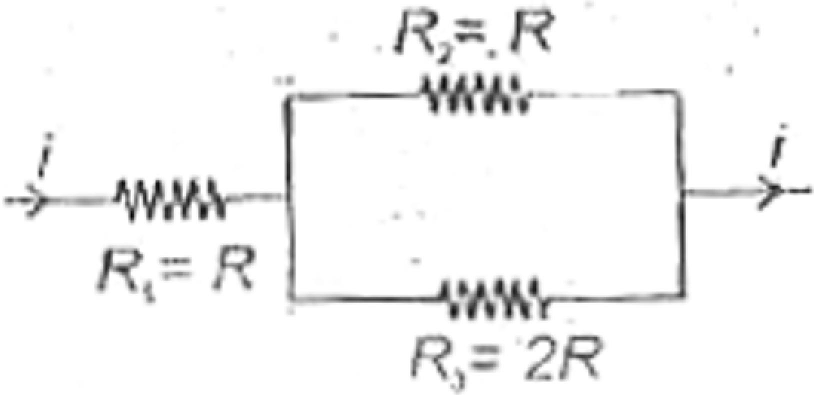
3. In the circuti shown ,the thermal power dissipated in R_1 is P. The thermal power dissipated in R_2 is .



A. P

B. $\frac{4P}{9}$

C. $\frac{2P}{3}$

D. $\frac{P}{9}$

Answer: B

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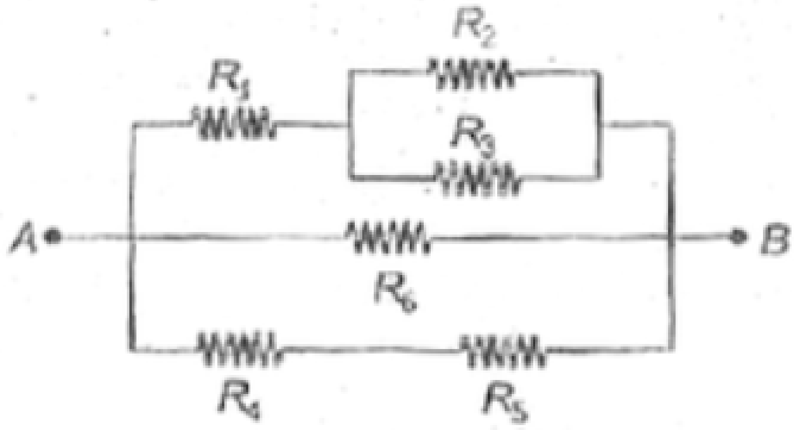
4. Consider the combination of resistors as shown in figure and pick out the correct statement



A. R_1 & R_2 are connected in parallel

B. R_1 & R_2 are connected in series

C. R_2 & R_3 are connected in parallel

D. $R_6 \& R_4$ are connected in parallel

Answer: C

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5. Select the correct statement .

A. A. Electric current is a vector quantity

B. B. Resistivity of a conductor decrease with increases in temperature

C. C. Resistance is the opposition to the flow of current

D. D. Currnet density is a scalar quantity .

Answer: C

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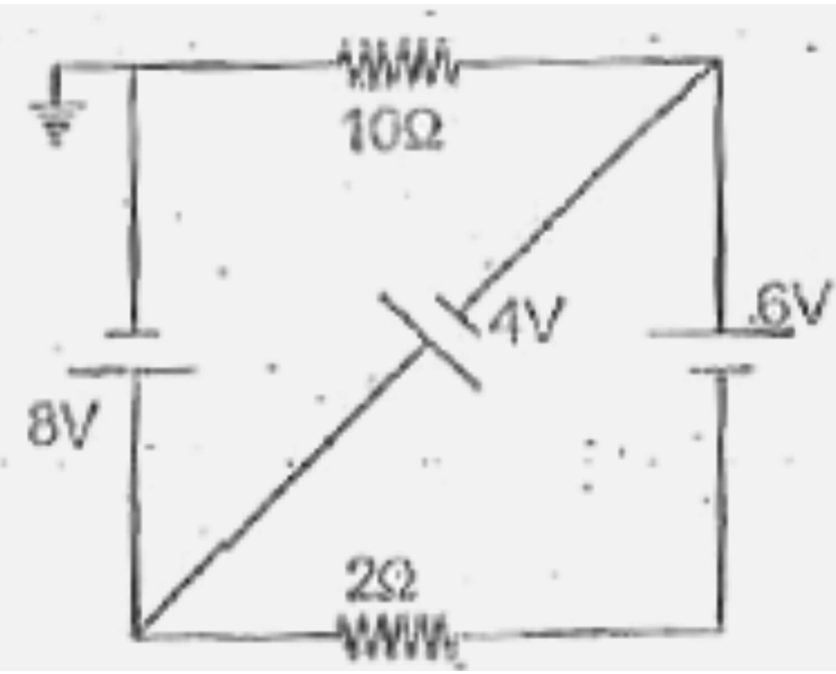
6. In the circuit shown in figure , all the cells are ideal . The currnet through 2Ω resistor is



A. $5A$

B. $1A$

C. $0.2A$

D. Zero

Answer: A

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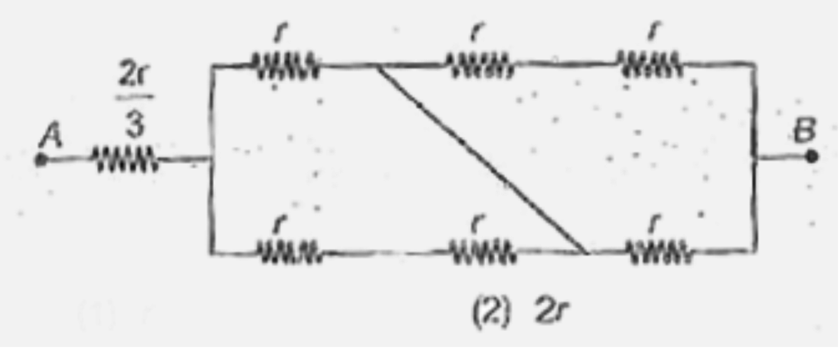
7. The effective resistance of the network between points A &B is .



A. r

B. 2r

C. $\frac{4r}{3}$

D. $\frac{7r}{3}$

Answer: B

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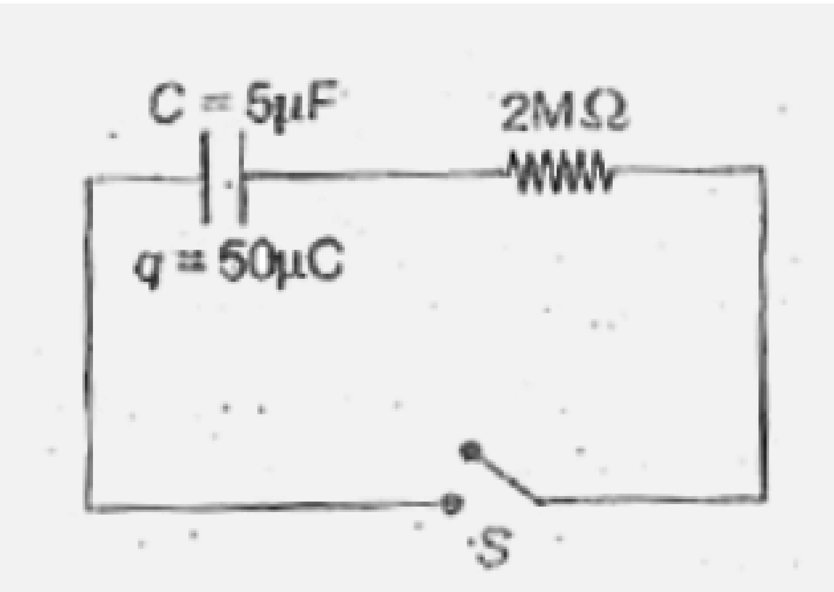
8. The following circuit consist of a $5\mu F$ capacitor , having charge $50\mu C$ as shown . The switch is closed at t = 0 . The value of current in $2M\Omega$ resistor at t = 0 is .



A. $1\mu A$

B. $2\mu A$

C. $5\mu A$

D. $5A$

Answer: C

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9. There are a large number of cells available, each marked (6 V, 0.5 Ω) to be used to supply current to a device of resistance 0.75Ω requiring 24 A current . How should the cells be arranged , so that maximum power is transmitted to the load using minimum number of cells ?

A. A. Six rows , each containig four cells

B. B. Four rows, each containing six cells

C. C. Four rows, each containing four cells

D. D. Six rows , each contining six cells .

Answer: B

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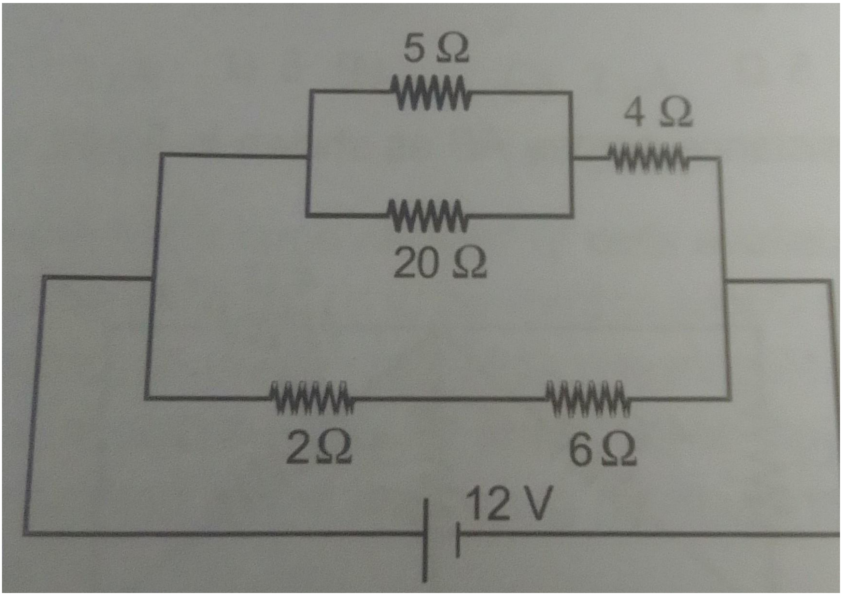
10. A circuit containing five resistors is connected to a battery with a 12 v emf as shown in figure. The potential difference across 4Ω resistor is



A. 3 V

B. 6 V

C. 9 V

D. 12 V

Answer: B

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11. The temperature coefficient of resistance of tungsten is $4.5 \times 10^{-3\circ} C^{-1}$ and that of germanium is $-5 \times 10^{-2\circ} C^{-1}$. A tungsten wire of resistance 100Ω is connected in series with a germanium wire of resistance R. The value of R for which the resistance of combination does not change with temperature is .

A. A. 9Ω

B. B. 11.11Ω

C. C. 0.9Ω

D. D. 111.1Ω

Answer: A

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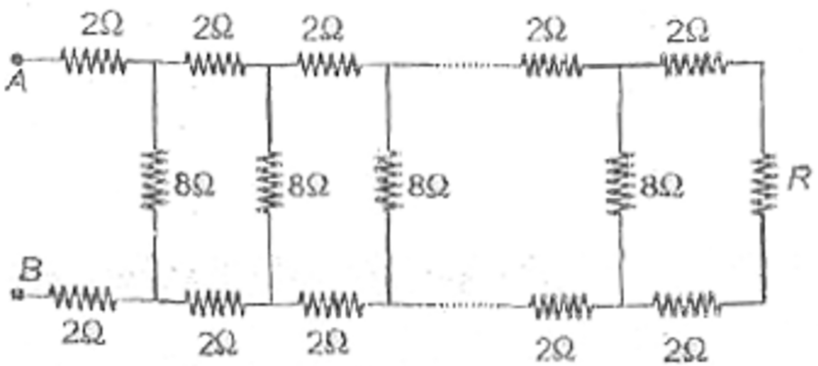
12. Consider the ladder network shown in figure . What should be the value of resistance R, so that effective resistance between A & B becomes independent of number of element in the combination ?



A. 2Ω

B. 4Ω

C. 8Ω

D. 16Ω

Answer: B

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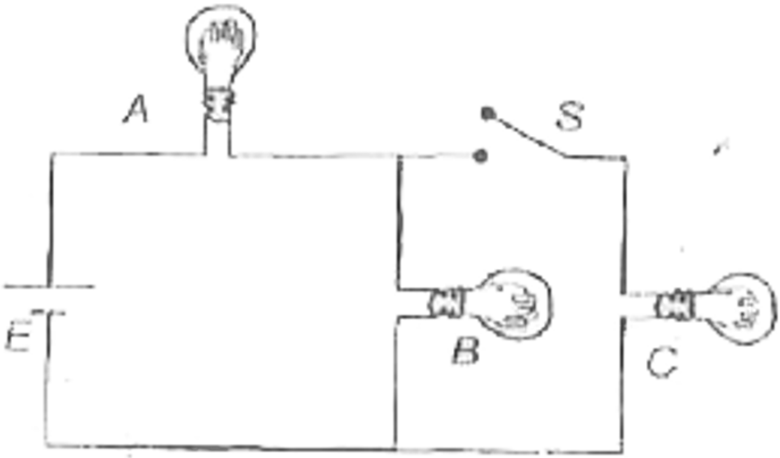
13. Three identical bulb are connected as shown in figure . When switch S is closed, the power consumed in bulb B is P . What will be the power consumed by the same bulb when switch S is opened ?



A. $\frac{9P}{4}$

B. $\frac{16P}{9}$

C. $\frac{9P}{16}$

D. $\frac{4P}{9}$

Answer: A

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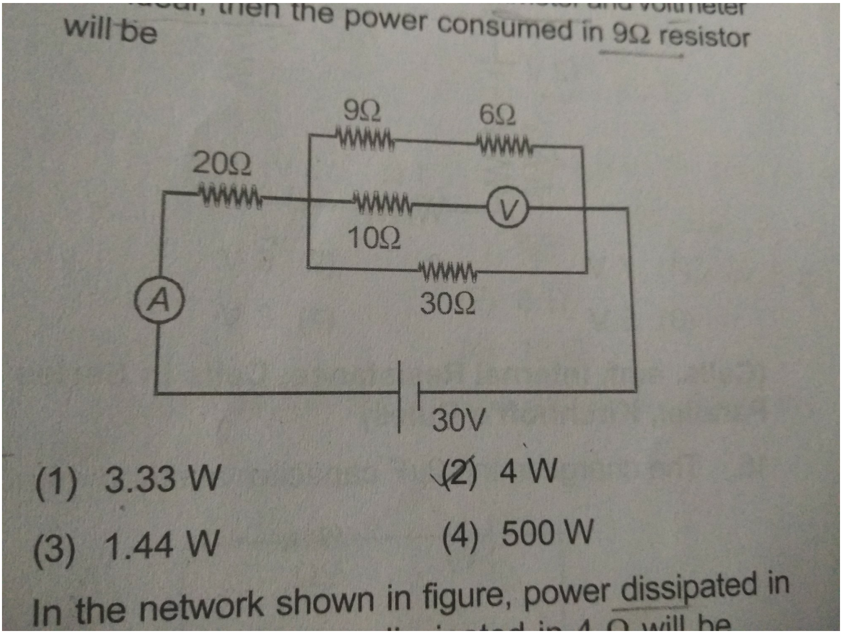
14. In the circuit shown in figure , if ammeter and voltmeter are ideal , then the power consumed in 9Ω resistor will be .



A. $3.33W$

B. $4W$

C. $1.44W$

D. $500W$

Answer: B

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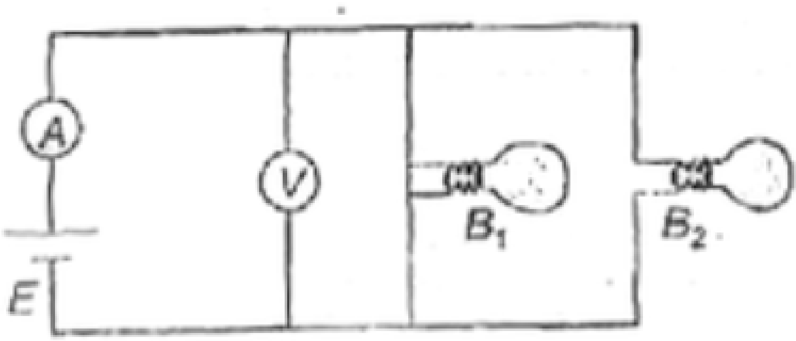
15. Two identical bulbs are conneted in parallel across an ideal source of emf E . The ammeter A voltmeter V are ideal . If bulb B_2 gets fused , then



A. Reading of A will increase but that of V will remain same

B. Reading of A will decreases but that of V will increases

C. Reading of A will decreases but that of V will remain same

D. Reading of A will increase and reading of V will also increase

Answer: C

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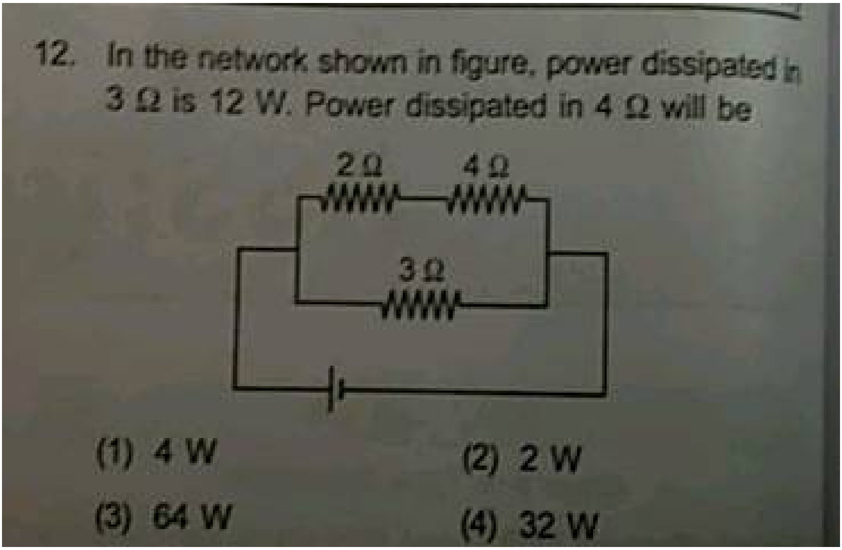
16. In the network shown in the figure, power dissipated in 3Ω and 12 W. Power dissipated in 4Ω will be


12. In the network shown in figure, power dissipated in 3 Ω is 12 W. Power dissipated in 4 Ω will be

(1) 4 W
(2) 2 W
(3) 64 W
(4) 32 W

A. 4 W

B. 2 W

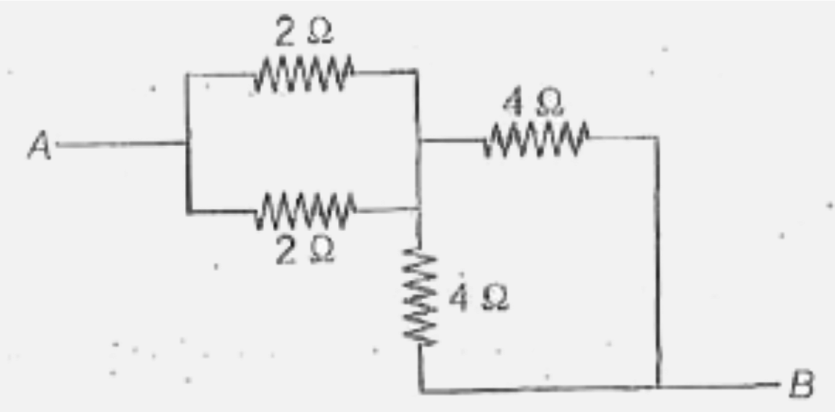
C. 64 W

D. 32 W

Answer: A

Watch Video Solution

17. Effective resistance across AB in the network shown in



A. 6Ω

B. 3Ω

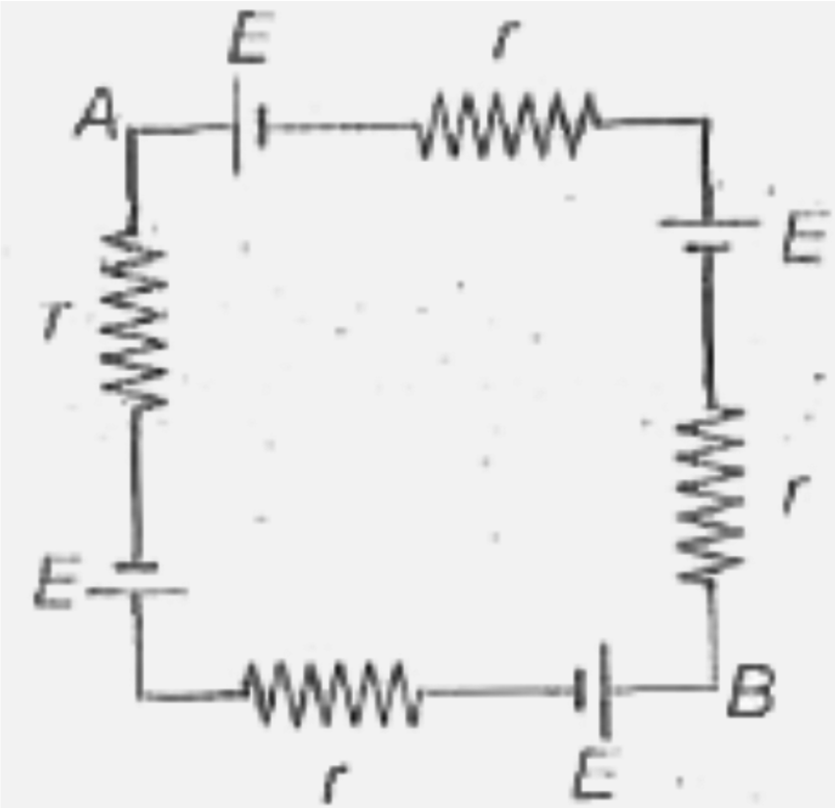
C. 5Ω

D. 8Ω

Answer: B

Watch Video Solution

18. Potential difference across AB in the network shown is



A. Zero

B. E

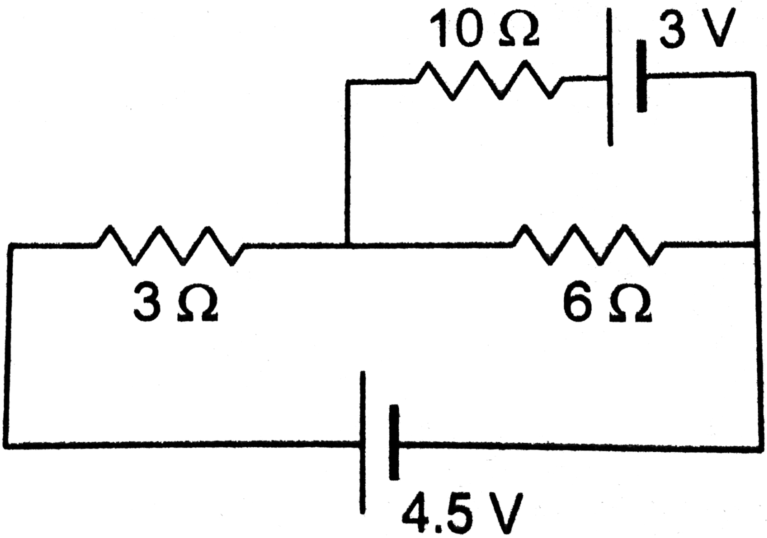
C. $E-\frac{Ir}{2}$

D. $E-2lr$

Answer: A

Watch Video Solution

19. Find the current through the $10(\Omega)$resistor shown in figure.



A. Zero

B. 1A

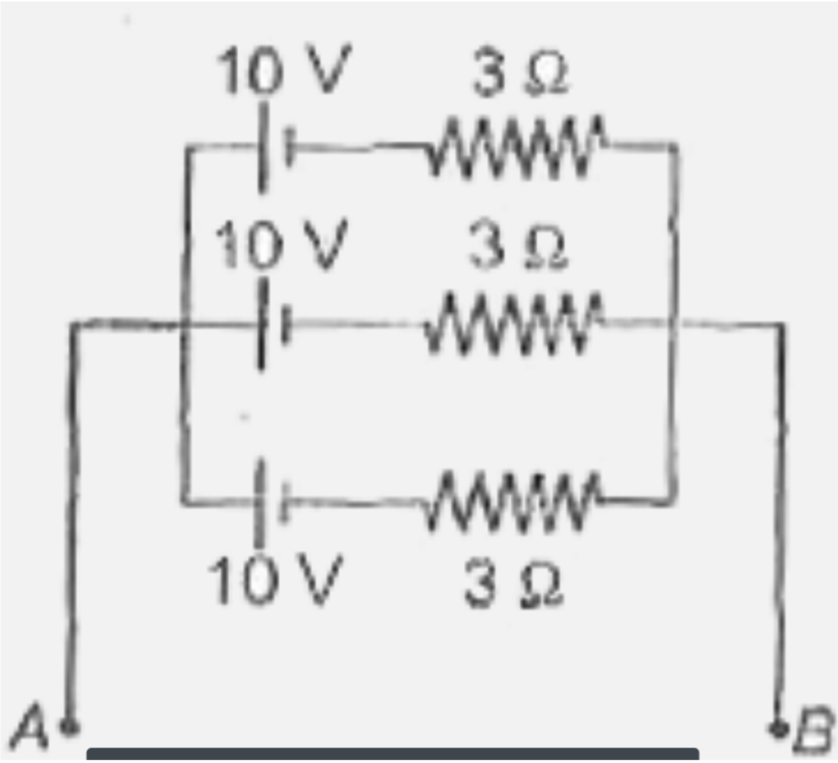
C. $1.5A$

D. $2A$

Answer: A

Watch Video Solution

20. Three identical cells are connected in parallel across AB. Net across AB is



A. 10 V

B. 30 V

C. 15 V

D. 12 V

Answer: A

Watch Video Solution

21. When current supplied by a cell to a circuit is $0.3A$, its terminal potential difference is 0.9 A. When the current supplied becomes 0.2 A, its terminal potential difference becomes 1.0 V . The internal resistance of the cell is

A. 0.5Ω

B. 2Ω

C. 1.2Ω

D. 1Ω

Answer: B

Watch Video Solution

22. Coefficient of linear expnsion of material of resistor is α . Its temperature coefficient of resistivity and resistance are α_p and α_R respectively , the correct relation is .

A. A. $\alpha_R = \alpha_\rho - \alpha$

B. B. $\alpha_R = \alpha_\rho + \alpha$

C. C. $\alpha_R = \alpha_\rho + 3\alpha$

D. D. $\alpha_R = \alpha_\rho - 3\alpha$

Answer: A

Watch Video Solution

23. A current of 10 A is mainatained in a conductor of cross - section $1cm^2$. If the free electron density in the conductor is $9 \times 10^{28} m^{-3}$, then drift velocity of free electrons is .

A. $6.94 \times 10^{-6} m/s$

B. $5.94 \times 10^{-2} m/s$

C. $1.94 \times 10^{-3} m/s$

D. $2.94 \times 10^{-4} m/s$

Answer: A

Watch Video Solution

24. Ten 60 W, 220 V bulbs are connected in series to 220 V supply . Power consumed in the circuit is

A. 6W

B. 12 W

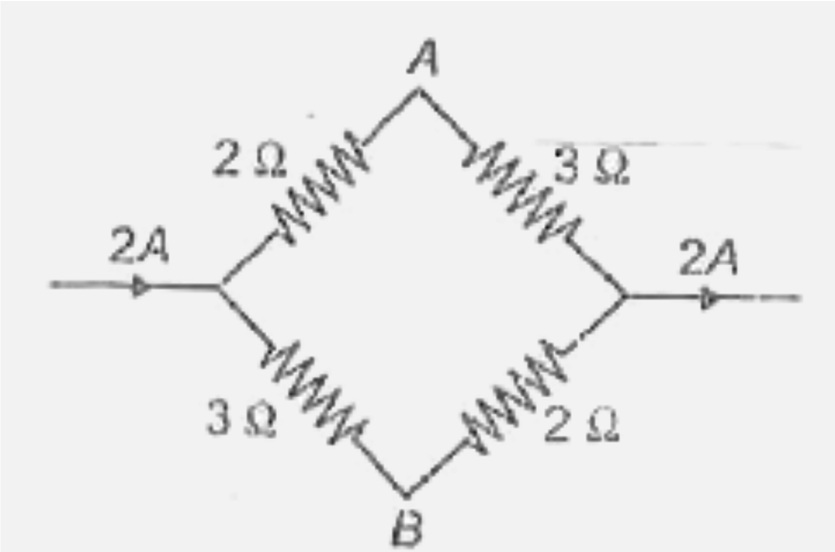
C. 180 W

D. 600 W

Answer: A

Watch Video Solution

25. Potentail difference $V_A - V_B$ in the network shown in



A. 1 V

B. $-1V$

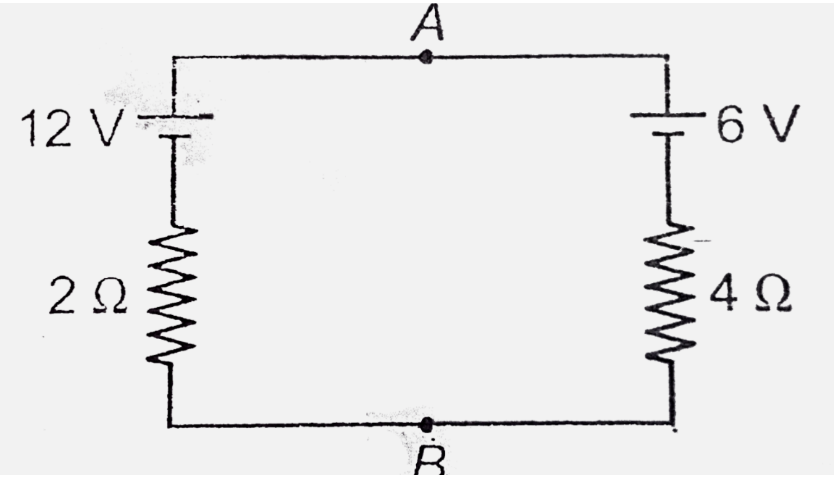
C. $2V$

D. $-2V$

Answer: A

Watch Video Solution

26. Potential difference across AB , i.e., $V_A - V_B$ is



A. $10V$

B. $8V$

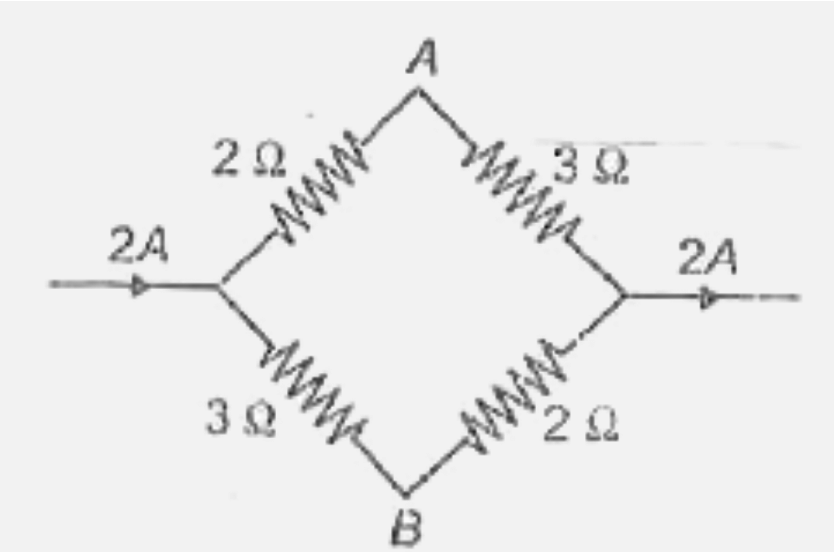
C. 6 V

D. Zero

Answer: A

Watch Video Solution

27. Potentail difference $V_A - V_B$ in the network shown in



A. 7 V

B. 6 V

C. 5 V

D. 8 V

Answer: A

Watch Video Solution

28. Five cells each of emf E and internal resistance r are connecte in series. Due to oversight one cell is connected wrongly . The equivalent emf and internal resistance of the combination is

A. 3r

B. 2r

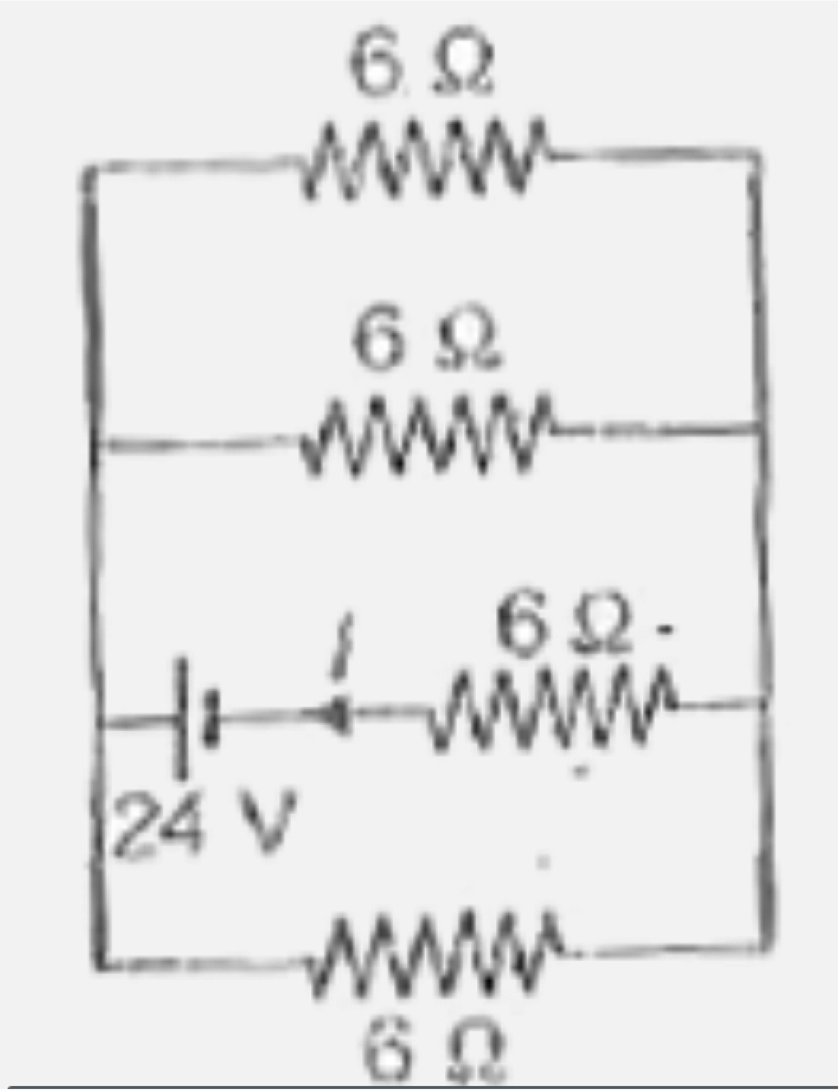
C. 5r

D. 4r

Answer: C

Watch Video Solution

29. Current I in the network shown is figure is



A. 16 A

B. 3 A

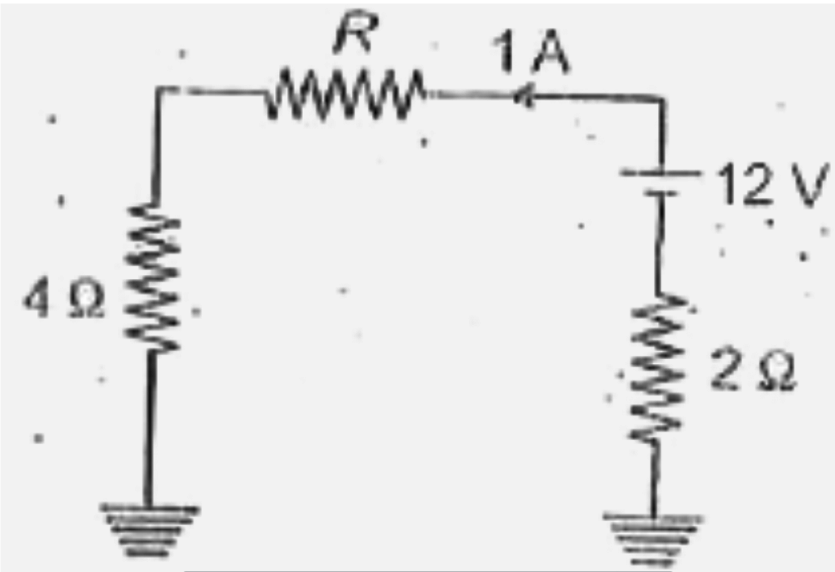
C. $4A$

D. $12A$

Answer: B

Watch Video Solution

30. Value of the resistance R in the figure is



A. 6Ω

B. 8Ω

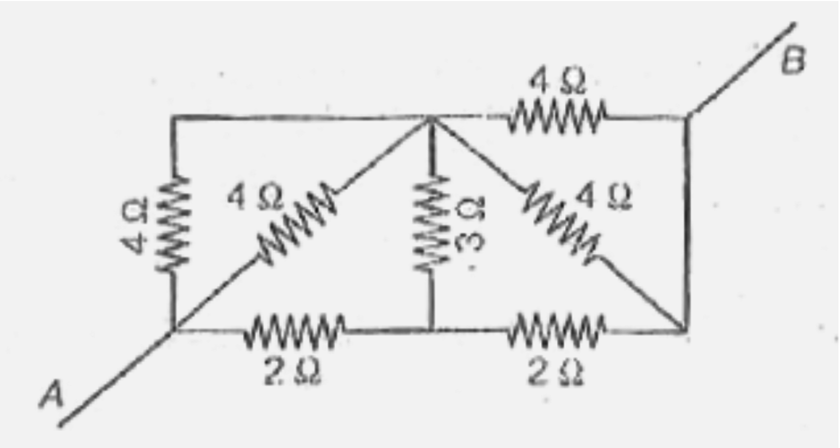
C. 10Ω

D. 12Ω

Answer: A

Watch Video Solution

31. Resistance across AB as shown in figure is



A. 2Ω

B. 4Ω

C. 6Ω

D. 12Ω

Answer: A

Watch Video Solution

ASSIGNMENT (SECTION - C)

1. The resistance of a wire is R ohm. If it is melted and stretched to n times its original length, its new resistance will be

A. nR

B. $\frac{R}{n}$

C. n^2R

D. $\frac{R}{n^2}$

Answer: C

Watch Video Solution

2. A potentiometer is an accurate and versatile devie make electrical measurement of EMF because the method involves

A. Cells

B. Potential gradients

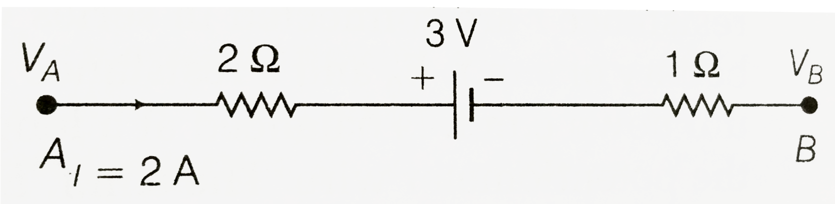
C. A condition of no current flow through the galvanometer

D. A combination of cells,galvanometer and resistance

Answer: C

Watch Video Solution

3. The potential difference $(V_A - V_B)$ between the points A and B in the given figure is



A. $-3V$

B. $+3V$

C. $+6V$

D. $+9V$

Answer: D

Watch Video Solution

4. A filament bult (500W, 100V) is to be used in a 230 V main supply. When a resistance R is connected in series, it works perfectly and the bulb consumes 500W. The value of R is

A. 230 Ω

B. 46Ω

C. 26Ω

D. 13Ω

Answer: C

Watch Video Solution

5. A potentiometer wire is 100 cm long and a constant potential difference is mainained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cmand 10 cm from the positive end of the wire in the cases. The ratio of emf is

A. $3:2$

B. $5:1$

C. $5:4$

D. $3:4$

Answer: A

Watch Video Solution

6. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$. The total heat produced in R is

A. $\frac{a^3R}{b}$

B. $\frac{a^3R}{6b}$

C. $\frac{a^3R}{3b}$

D. $\frac{a^3R}{2b}$

Answer: B

Watch Video Solution

7. A potentiometer wire of length L and a resistance r are connected in series with a battery of e.m.f. E_0 and a resistance r_1. An unknown e.m.f. is balanced at a length l of the potentiometer wire. The e.m.f. E will be given by

A. $\frac{LE_0r}{(r + r_1)l}$

B. $\frac{LE_0r}{lr_1}$

C. $\dfrac{E_0 r}{(r+r_1).\,\frac{l}{L}}$

D. $\dfrac{E_0 l}{L}$

Answer: C

Watch Video Solution

8. Two metal wires of identical dimensions are connected in series. If $\sigma 1$ and $\sigma 2$ are the conductivities of the metals respectively, the effective conductivity of the combination is

A. $\dfrac{\sigma_1\sigma_2}{\sigma_1+\sigma_2}$

B. $\dfrac{2\sigma_1\sigma_2}{\sigma_1+\sigma_2}$

C. $\dfrac{\sigma_1+\sigma_2}{2\sigma_1+\sigma_2}$

D. $\dfrac{\sigma_1+\sigma_2}{\sigma_1\sigma_2}$

Answer: B

Watch Video Solution

9. A circuit contains an ammeter, a battery of 30V and a resistanace 40.8Ω all connected in series. If th ammeter has a coil of resistance 480Ω and a shunt of 20Ω, then reading in the ammeter will be

A. 1A

B. $0.5A$

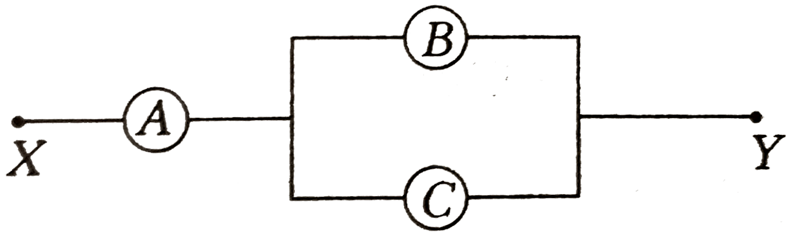
C. $0.25A$

D. $2A$

Answer: B

Watch Video Solution

10. A, B and C are voltmeters of resistance R, $1.5R$ and 3R respectively, as shown in the figure. When some potential difference is applied between X and Y, then the voltmeter readings are V_A, V_B and V_C, respectively. Then,



A. $V_A \neq V_B \neq V_C$

B. $V_A = V_B = V_C$

C. $V_A \neq V_B = V_C$

D. $V_A = V_B \neq V_C$

Answer: B

Watch Video Solution

11. A potentiometer wire has length 4 m and resistance Ω . The resistance that must be connected in series with the wire and and accumulator of amf 2V, so as to get a potential gradient 1 mV per cm on the wire is

A. 48Ω

B. 32Ω

C. 40Ω

D. 44Ω

Answer: B

Watch Video Solution

12. A resistance R draws power P when connected to an AC source.e If an inductance is now placeld in sereis with the resistance, such that impedance of the circuit becomes Z the power drawn will be

A. P

B. $P\left(\frac{R}{Z}\right)^2$

C. $P\sqrt{\frac{R}{Z}}$

D. $P\left(\frac{R}{Z}\right)$

Answer: B

Watch Video Solution

13. Two cities are $150km$ apart. Electric power is sent from one city to another city through copper wire. The fall of potential per km is 8V and the average resistance per km is 0.5Ω. The power loss in the wire is

A. 19.2 W

B. 19.2 KW

C. 19.2 J

D. 12.2 kW

Answer: B

Watch Video Solution

14. The resistance in the two arms of the meter bridge are 5Ω and $R\Omega$, respectively. When the resistance R is shunted with an equal resistance, then the new balance point is at $1.6l_1$. The resistance R is

A. 10Ω

B. 15Ω

C. 20Ω

D. 25Ω

Answer: B

Watch Video Solution

15. A potentiometer circuit has been setup for finding. The internal resistance of a given cell. The main battery used a negligible internal resistance. The potentiometer wire itsefl is $4m$ long. When the resistance, R, connected across the given cell, has value of

(i) Infinity $(ii) 9.5\Omega$,

the 'balancing length' , on the potentiometer wire are found to be $3m$ and $2.85m$, respectively.

The value of internal resistance of the cell is

A. 0.25Ω

B. 0.95Ω

C. 0.5Ω

D. 0.75Ω

Answer: C

Watch Video Solution

16. In an ammeter, 0.2% of min current passes through the galvanometer. If resistance of galvanometer is G, then the resistance ofammeter will be

A. $\frac{1}{499}G$

B. $\frac{499}{500}G$

C. $\frac{1}{500}G$

D. $\frac{500}{499}G$

Answer: C

Watch Video Solution

17. A wire of resistance 4Ω is stretched to twice its original length. The resistance of strenched wire would be

A. 4Ω

B. 8Ω

C. 16Ω

D. 2Ω

Answer: C

Watch Video Solution

18. The internal resistance of a 2.1 V cell which gives a current of $0.2A$ through a resistance of 10Ω is

A. 0.5Ω

B. 0.8Ω

C. 1.0Ω

D. 0.2Ω

Answer: A

Watch Video Solution

19. The resistance of the four arms P, Q, R and S in a Wheatstone's bridge are $10ohm30ohm$ and $90ohm$ rerspectively. The e.m.f. and internal resistance of the cell are $7V$ and $5ohm$ respectively. If the galvanometer resistance is $50ohm$, the current drawn for the cell will be

A. $0.2A$

B. $0.1A$

C. $2.0A$

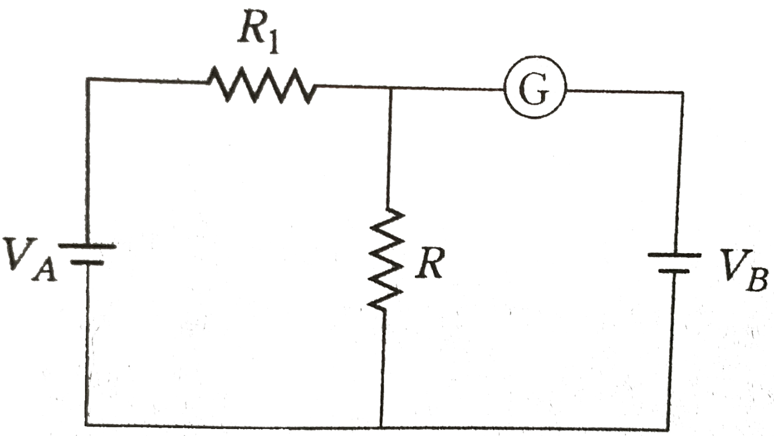
D. $1.0A$

Answer: A

Watch Video Solution

Watch Video Solution

20. In the circuit shown ,t he cells A and B have negligible resistance. For $V_A = 12V, R_1 = 500\Omega$ and $R = 100\Omega$ the galvanometer (G) shows no deflection. The value of V_B is



A. 12 V

B. 6V

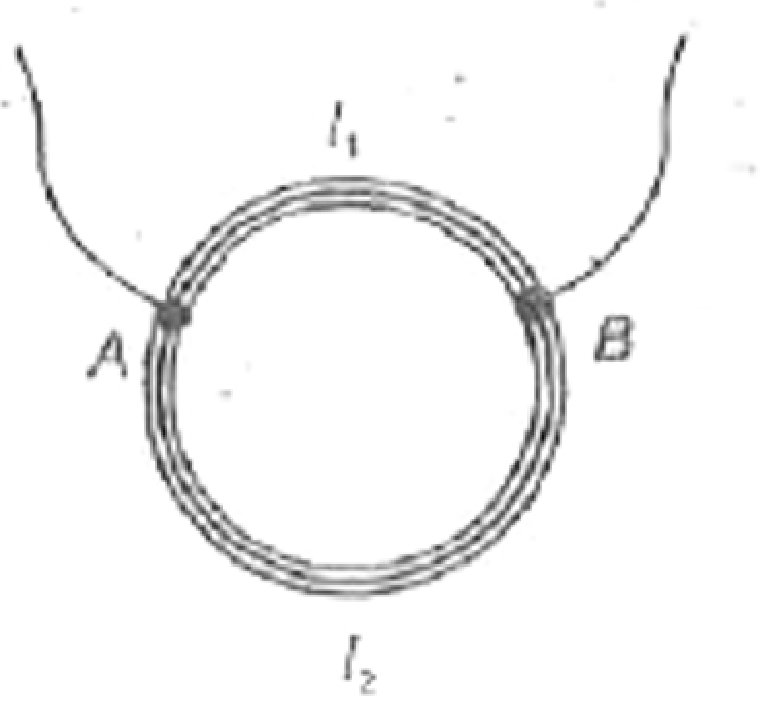
C. 4V

D. 2V

Answer: D

Watch Video Solution

21. A ring is made of a wire having a resistance $R_0 = 12\Omega$. Find the point A and B as shown in the figure, at which a current carrying conductor should be connected so that the resistacne R of the sub circuit between these points is equal to $\frac{8}{3}\Omega$.



A. $\frac{l_1}{l_2} = \frac{3}{8}$

B. $\frac{l_1}{l_2} = \frac{1}{2}$

C. $\frac{l_1}{l_2} = \frac{5}{8}$

D. $\frac{l_1}{l_2} = \frac{1}{3}$

Answer: B

Watch Video Solution

22. A millivoltmeter of 25 mV range is to be converted into an ammeter of 25A range. The value (in ohm) of necessary shunt will be

A. 1

B. 0.05

C. 0.001

D. 0.01

Answer: C

Watch Video Solution

23. If voltage across a bulb rated 220 V-100 W drops by 2.5% of its rated value, then the percentage of the rated value by which the power would decrease is

A. 0.05

B. 0.1

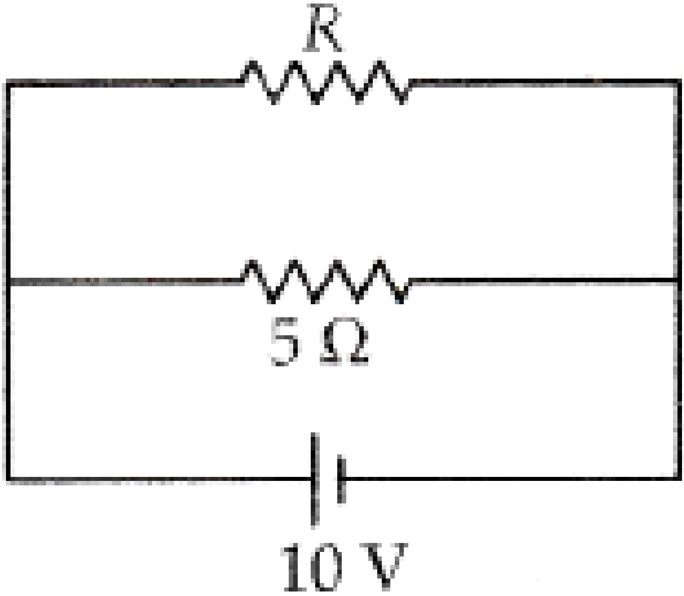
C. 0.2

D. 0.025

Answer: A

Watch Video Solution

24. The power dissipated in the circuit shown in the figure is 30 W. The value of R is



A. 20Ω

B. 15Ω

C. 10Ω

D. 30Ω

Answer: C

Watch Video Solution

25. A cell having an emf ε and internal resistance r is connected across a variable external resistance R. As the resistance R is increased, the plot of potential difference V across R is given by -

A.

B.

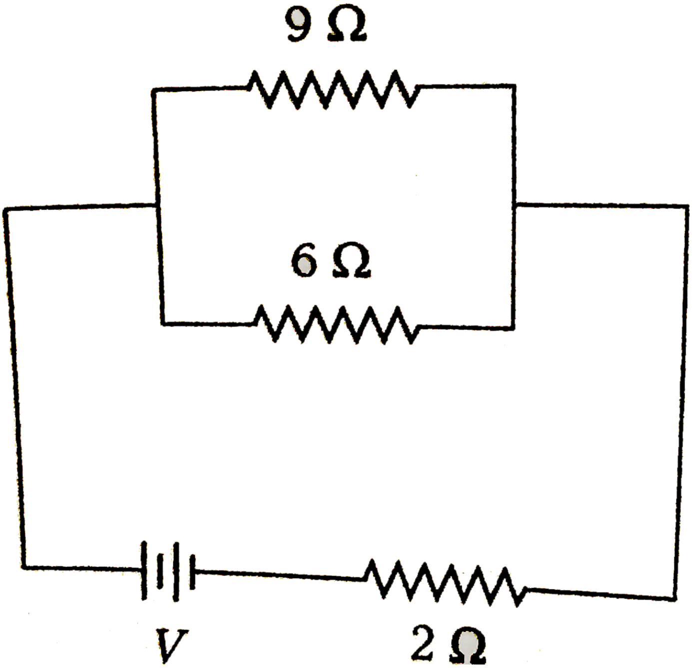
C.

D.

Answer: C

Watch Video Solution

26. If power dissipated in the 9Ω resistor in the circuit shown is 36 W, the potential difference across the 2Ω resistor is



A. 2V

B. 4V'

C. 8V

D. 10V

Answer: D

Watch Video Solution

27. A current of $2A$ flows through a 2Ω resistor when connected across a battery. The same battery supplies a current of $0.5A$ when connected across a 9Ω resistor. The internal resistance of the battery is

A. 1Ω

B. 0.5Ω

C. $1/3\Omega$

D. $-1/4\Omega$

Answer: C

Watch Video Solution

28. A galvanometer of resistance, G, is shunted by a resistance S ohm. To keep the main current in the circuit unchanged the resistance to be put in series with the galvanometer is

A. $\dfrac{G^2}{(S+G)}$

B. $\dfrac{G}{(S+G)}$

C. $\dfrac{S^2}{(S+G)}$

D. $\dfrac{SG}{(S+G)}$

Answer: A

Watch Video Solution

29. A thermocouple of negligible resistance produces an e.m.f. of $40\mu(V)/{}^0C$ in the linear range of temperature. A galvanometer of resistance 10 ohm whose sensitivity is 1 $\mu A/\text{division}$, is employed with the thermocouple. The smallest value of temperature difference that can be detected by system will be

A. $0.1^\circ C$

B. $0.25^\circ C$

C. $0.5^\circ C$

D. $1^\circ C$

Answer: B

Watch Video Solution

30. Consider the following two statements.

A. Kirchhoff's junction law follows from the conservation of charge.

B. Kirchhoff's loop law follows from the conservation of energy.

Which of the following is correct?

A. Both (A) and (B) are correct

B. Both (A) and (B) are wrong

C. (A) is correct and (B) is wrong

D. (A) is wrong and (B) is coorect

Answer: A

Watch Video Solution

31. A galvanometer has a coil of resistance 100Ω and gives full scale deflection for 30 mA current. If it is to work as a voltmeter of 30 V, the resistance required to be added is

A. 1000Ω

B. 900Ω

C. 1800Ω

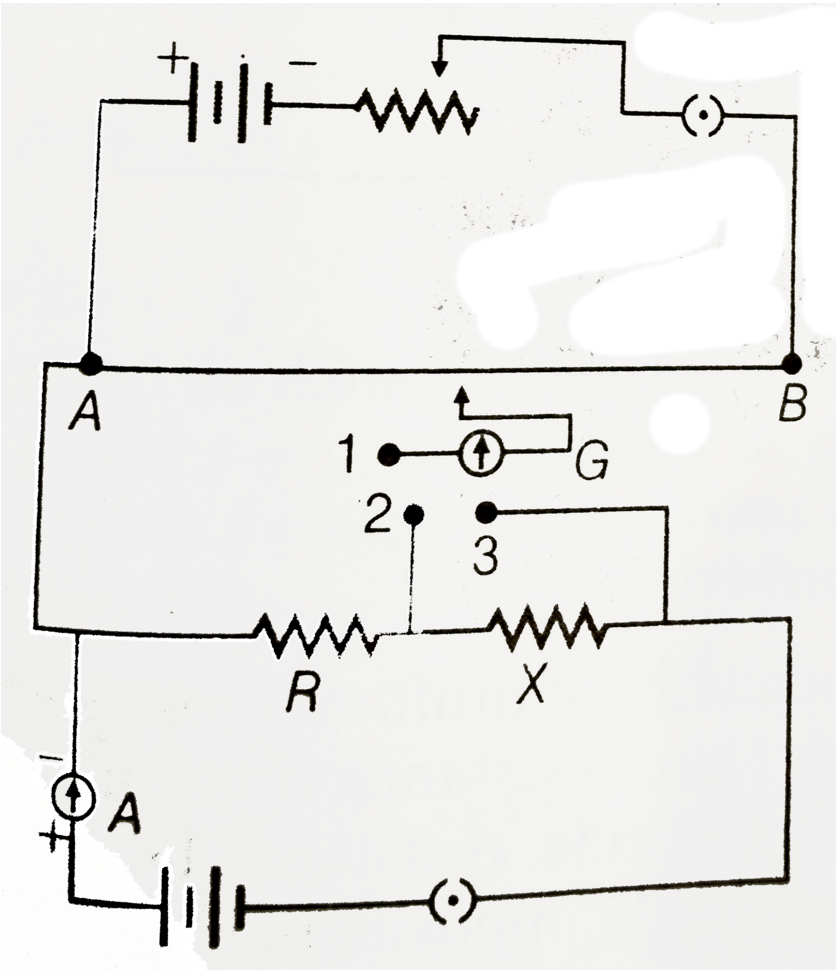
D. 500Ω

Answer: B

Watch Video Solution

32. A potentiometer circuit is set up as shown. The potential gradient across the potentiometer wire, is k volt/cm and the ammeter, present in the circuit, reads 1.0A when two way key is switched off. The balance points , when the key between the terminals (a) 1 and 2 (b) 1 and 3 , is plugged in, are found to be at length $l_1 cm$ and l_2 cm respectively. The magnitudes, of the resistors

R and X in ohm, are then equal, respectively to



A. $k(l_2 - l_1)$ and kl_2\

B. kl_1 and $k(l_2 - l_1)$

C. $k(l_2 - l_1)$ and kl_1

D. kl_1 and kl_2

Answer: B

Watch Video Solution

33. In producing chlorine by electrolysis $100kW$ power at $125V$ is being is consumed. How much chlorine per minute is liberated (ECE of chlorine is $0.367 \times 10^{-6} kgC^{-1}$)

A. $1.76 \times 10^{-3} Kg$

B. $9.67 \times 10^{-3} kg$

C. $17.61 \times 10^{-3} Kg$

D. $3.67 \times 10^{-3} Kg$

Answer: C

Watch Video Solution

34. The thermo e.m.f E in volts of a certain thermo- couple is found to vary with temperature difference θ in $.^\circ C$ between the two junctions according to the relation

$$E = 30\theta - \frac{\theta^2}{15}$$

The neutral temperature for the thermo-couple will be -

A. $450^\circ C$

B. $400^\circ C$

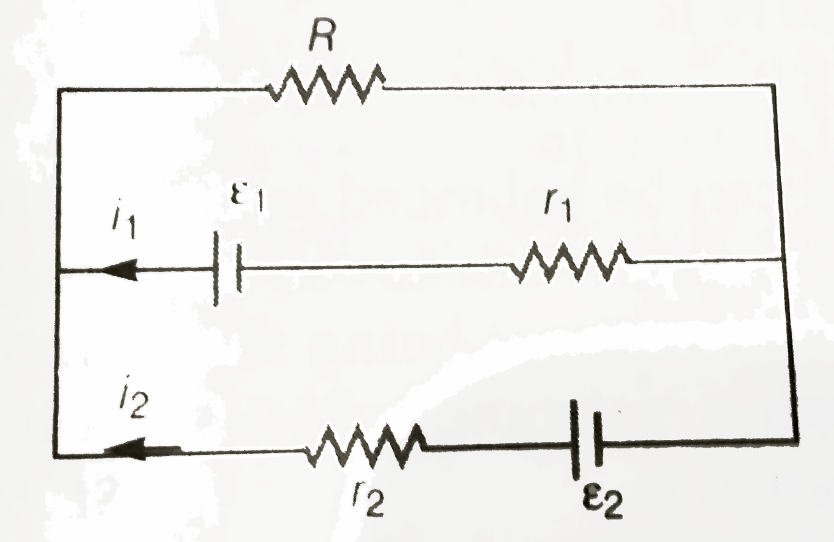
C. $225^\circ C$

D. $30^\circ C$

Answer: C

Watch Video Solution

35. See the electricall circuit shown in this figure. Which of the following equations is a correct equation for it ?



A. $\varepsilon_1 - i_2r_2 - \varepsilon_1 - i_1r_1 = 0$

B. $-\varepsilon_2 - (i_1 + i_2)R + i_2r_2 = 0$

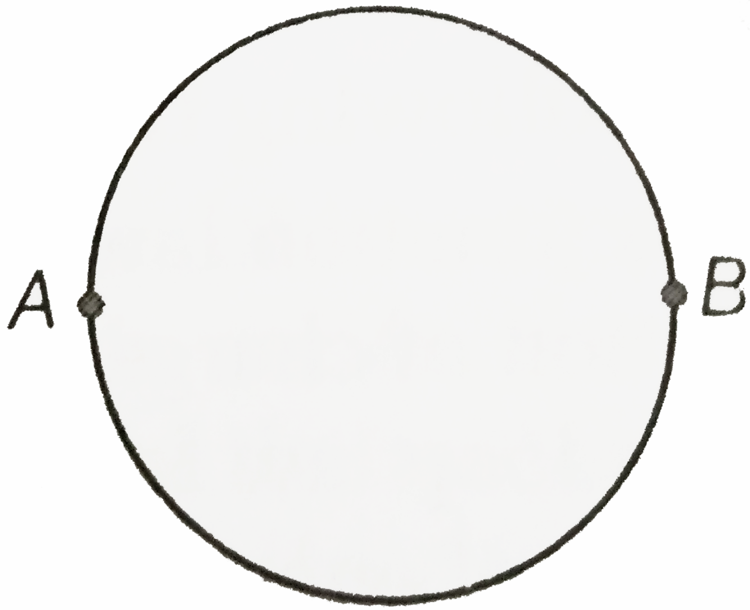
C. $\varepsilon_1 - (i_1 + i_2)R + i_1r_1 = 0$

D. $\varepsilon_1 - (i_1 + i_2)R - i_1r_1 = 0$

Answer: D

Watch Video Solution

36. A wire of resistance $12\Omega m^{-1}$ is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points A and B as shown in the figure is



A. 3Ω

B. $6\pi\Omega$

C. 6Ω

D. $0.6\pi\Omega$

Answer: D

Watch Video Solution

37. A galvanometer having a coil resistance of 60 Ω shows full scale deflection when a current of 1.0 amp passes through it. It can be converted into an ammeter to read currents upto 5.0 amp by :

A. Putting in series a resistance of 15Ω

B. Putting in series a resistance of 240Ω

C. Putting in parallel a resistance of 15Ω

D. Putting in parallel a resistance of 240Ω

Answer: C

Watch Video Solution

38. A student measures the terminal potential difference (V) of a cell (of emf ε and internal resistance r) as a function fo the current (I) folwing through it . The slope and intercept of the graph between V and I, respectively, equal to

A. $-r$ and ε

B. r and $-\varepsilon$

C. $-\varepsilon$ and r

D. ε and $-r$

Answer: A

Watch Video Solution

39. A cell can be balanced against 110cm and 100 cm fo potentiometer wire, respectively with and without being short circuited through a resistance of 10Ω. Its internal resistance is

A. Zero

B. 1Ω

C. 0.5Ω

D. 2Ω

Answer: B

Watch Video Solution

40. A wire of a certain material is stretched slowly by 10 percent. Its new resistance and specific resistance become respectively

A. 1.1 times , 1.1 times

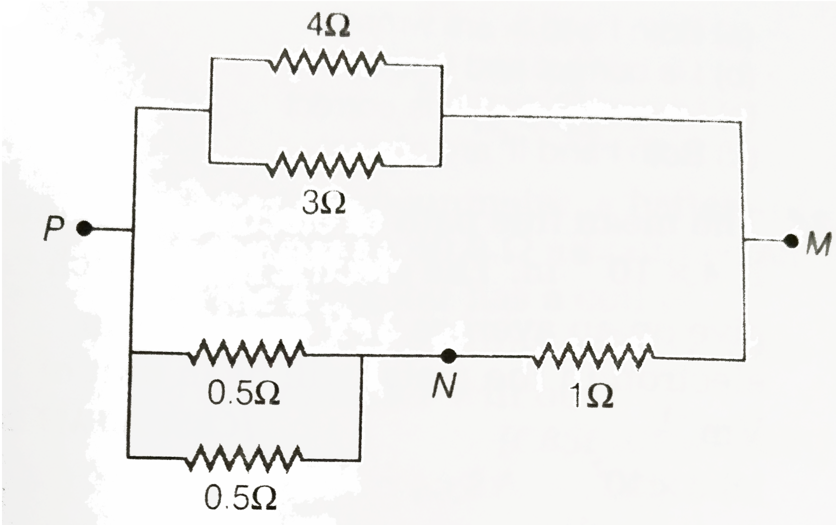
B. 1.2 time, 1.1 times

C. 1.21 times , same

D. Both remain the same

Answer: C

Watch Video Solution

41. 

In the circuit shown, the current throuhg the 4Ω resistor is 1A when the points P and M are connected to a DC voltage source. The potential difference between the points M and N is

A. 3.2 V

B. 1.5V

C. 1.0V

D. 0.5 V

Answer: A

Watch Video Solution

42. An electric kettle takes $4A$ current at $220V$. How much time will it take to boil $1kg$ of water from temperature $20^{\circ}C$?

A. 4.2 min

B. 6.3 min

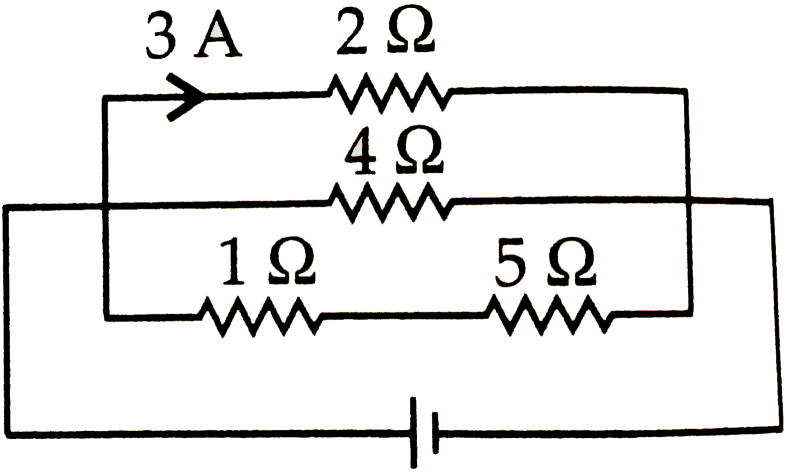
C. 8.4 min

D. 12.6 min

Answer: B

Watch Video Solution

43. A current of 3 A flows through the 2Ω resistor shown in the circuit below. The power dissipated in the 5Ω resistor is



A. 5 walt

B. 4 walt

C. 2 walt

D. 1 walt

Answer: A

Watch Video Solution

44. A galvanometer of resistance 50Ω is connected to a battery of 3 V along with a resistance of 2950Ω in series. A full scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this deflection to 20 divisions, the resistance in series should be

A. 4450Ω

B. 5050Ω

C. 5550Ω

D. 6050Ω

Answer: A

Watch Video Solution

45. The total power dissipated in watts in the circuit shown here is

A. 4

B. 16

C. 40

D. 54

Answer: D

Watch Video Solution

46. A steady current of $1.5A$ flows through a copper voltmeter for 10 min. if the electrochemical equivalent of copper is $30 \times 10^{-5} gC^{-1}$, the mass of copper deposited on the electrode will be

A. $0.27g$

B. $0.40g$

C. $0.50g$

D. $0.67g$

Answer: A

Watch Video Solution

47. If the cold junction of a thermocouple is kept at $0^{\circ} C$ and the hot junction is kept at $T^{\circ} C$, then the relation between neutral temperature (T_n) and tempearture of inversion (T_i) is

A. $T_n = T_i + T$

B. $T_n = T_i + T/2$

C. $T_n = 2T_i$

D. $T_n = T_i - T$

Answer: B

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48. Three resistances P, Q, R each of 2Ω and an unknown resistance S form the four arms of a Wheatstone's bridge circuit. When a resistance of 6Ω is connected in parallel to S, the bridge gets balanced. What is the value of S?

A. 1Ω

B. 2Ω

C. 3Ω

D. 6Ω

Answer: C

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49. The resistanca of an ammeter is 13Ω and its scale is graduated for a current upto 100 connected to this ammeter it becomes possible to measure currents upto 750 A by this meter. The value fo shunt resistance is

A. $2K\Omega$

B. 20Ω

C. 2Ω

D. 0.2Ω

Answer: C

Watch Video Solution

50. In producing chlorine by electrolysis $100kW$ power at $125V$ is being is consumed. How much chlorine per minute is liberated (ECE of chlorine is $0.367 \times 10^{-6} kgC^{-1}$)

A. 17.6 mg

B. 21.3 mg

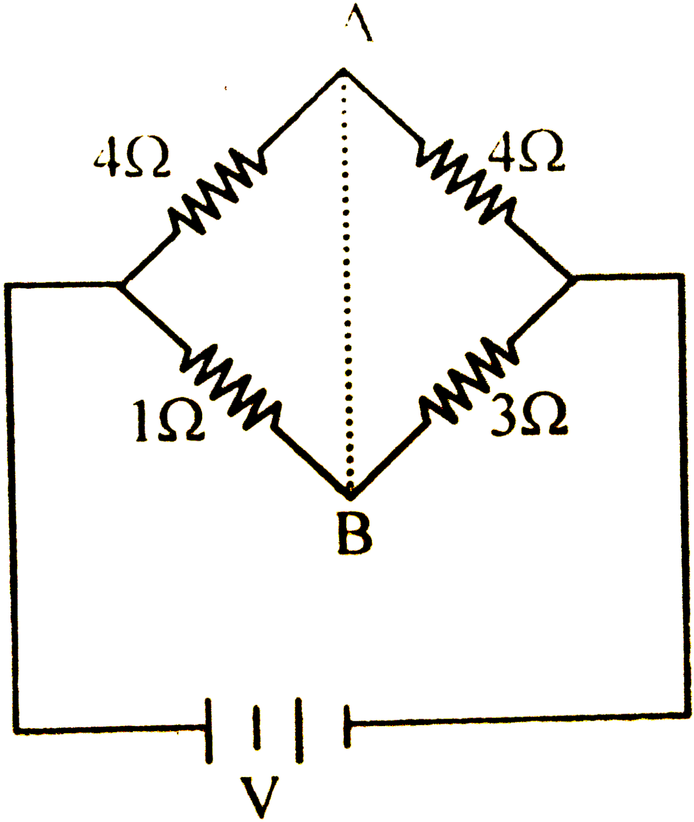
C. 24.3 mg

D. 13.6 mg

Answer: A

Watch Video Solution

51. In the circuit shown,if a conduction wire is connected between point A and B current in this wire will-



A. Flow fro, A to B

B. Flow in the direction which will be decided by the value of V

C. Be zero

D. Flow form B to A

Answer: D

Watch Video Solution

52. Two cells,Having the same e.m.f., are connected in series through an external resitance R.Cell have internal resistances R_1 and R_2 $(R_1 > R_2)$ respectively.When the circuit is closed,the potential difference across the first cell is zero.The value of R is:-

A. $r_1 - r_2$

B. $\dfrac{r_1 + r_2}{2}$

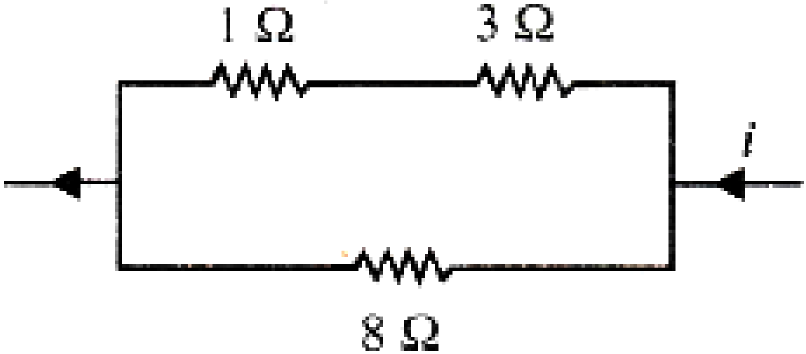
C. $\dfrac{r_1 + r_2}{2}$

D. $r_1 + r_2$

Answer: A

Watch Video Solution

53. Power dissipated across the 8Ω resistor in the circuit shown here is 2 w. The power U dissipated in watt units across the 3Ω resistor is .



A. 2

B. 1

C. 0.5

D. 3

Answer: D

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54. Kirchhoff's first and second laws for electrical circuits are consequences of:-

A. Conservation of energy

B. Conservation of electric charge and energy respectively

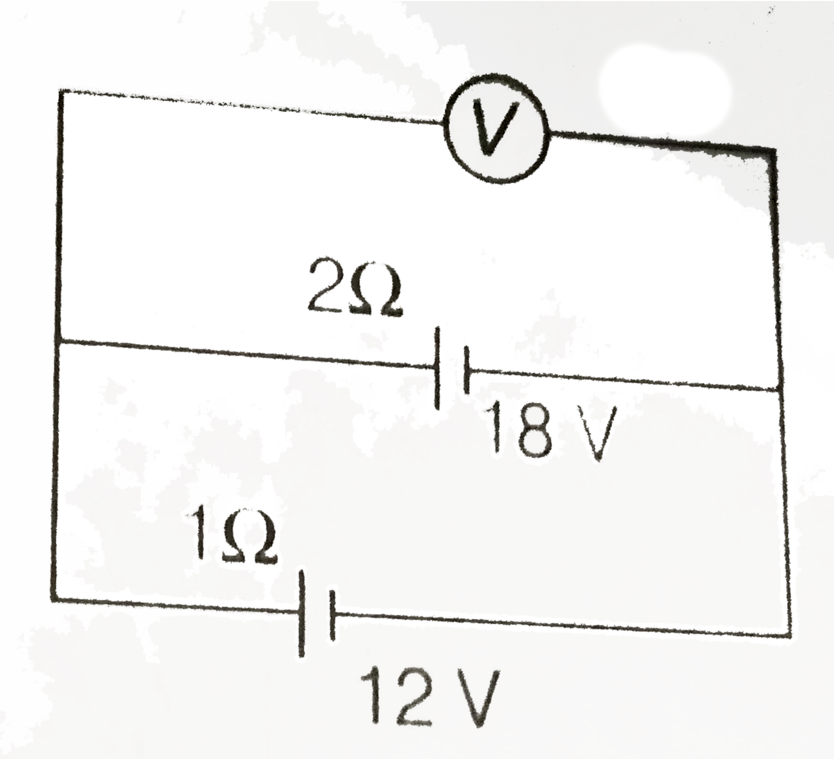
C. Conservationn of electric charge

D. Conservation of energy and electric charge respectively

Answer: B

Watch Video Solution

55. Two batteries, one of emf 18V and internal resistance 2Ω and the other of emf 12 and internal resistance 1Ω , are connected as shown. The voltmeter V will record a reading of



A. 15V

B. 30 V

C. 14V

D. 18 V

Answer: C

Watch Video Solution

56. For the network shown in the figure the value of the current i is -

A. $\frac{9V}{35}$

B. $\frac{5V}{18}$

C. $\frac{5V}{9}$

D. $\frac{18V}{5}$

Answer: B

Watch Video Solution

57. The temperature of inversion of a thermocouple is $620^{\circ}C$ and the neutral temperature is $300^{\circ}C$. What is the temperature of cold junction :

A. $20^{\circ}C$

B. $320^{\circ}C$

C. -20°

D. $40^{\circ} C$

Answer: C

Watch Video Solution

58. When a wire of uniform cross-section a , length l and resistance R is bent into a complete circle, resistance between two of diametrically opposite points will be

A. $\frac{R}{4}$

B. $\frac{R}{8}$

C. $4/R$

D. $\frac{R}{2}$

Answer: A

Watch Video Solution

59. A $5 - A$ wire can withstand a maximum power of $1W$ in circuit. The resistance of the fuse wire is

A. 0.2Ω

B. 5Ω

C. 0.4Ω

D. 0.04Ω

Answer: D

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60. Two rods are joined end to end. Both have a cross - sectional area of $0.01cm^2$. Each is 1 meter long . One rod is a copper with a resistivity of 1.7×10^{-6} ohm- centimeter ,the other is of iron with a resistivity 10-5 ohm-centimeter.

How much voltage is required to produce a current of 1 ampere in the rods

?

A. 0.117 V

B. 0.00144 V

C. 0.0145V

D. $1.7 \times 10^{-6} V$

Answer: A

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61. A 1250 W heater operates at $115V$. What is the resistance of the heating coil?

A. 1.6Ω

B. $13.\ 5\Omega$

C. 1250Ω

D. 10.6Ω

Answer: D

Watch Video Solution

62. A wire 50 cm long and 1 mm^2 in cross-section carries a current of 4 A when connected to a 2 V battery. The resistivity of the wire is

A. $4 \times 10^{-6} \Omega - m$

B. $1 \times 10^{-6} \Omega - m$

C. $2 \times 10^{-7} \Omega - m$

D. $5 \times 10^{-7} \Omega - m$

Answer: B

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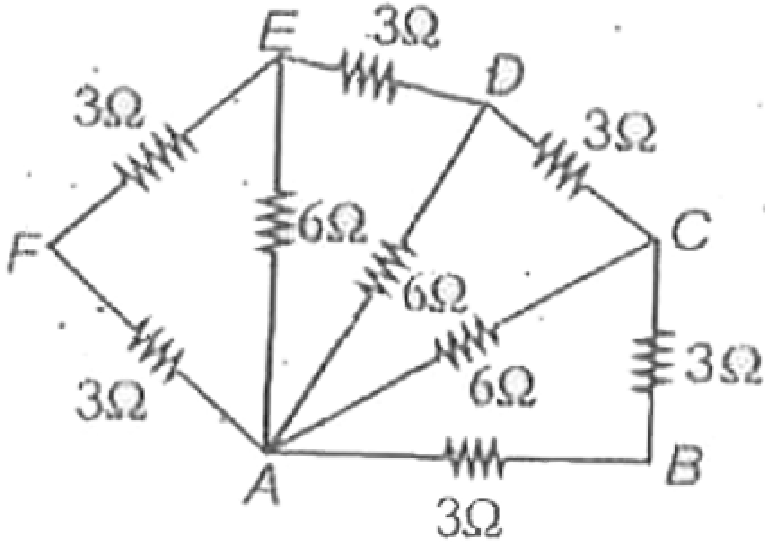
63. Six resistors of 3Ω each are connected along the sides of a hexagon and three resistors of 6Ω each are connected along AC, AD and AE as shown in the figure . The equivalent resistance between A and B is equal to .



A. 2Ω

B. 6Ω

C. 3Ω

D. 9Ω

Answer: A

Watch Video Solution

64. Identify the set in which all the three materials are good conductors of electricity ?

A. Cu,Hg and NaC

B. Cu, Ge and Hg

C. Cu, Ag and Au

D. Cu, Si and diamond

Answer: C

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65. A flow of 10^7 electrons per second in a conducing wire constitutes a current of .

A. $1.6 \times 10^{-12} A$

B. $1.6 \times 10^{26} A$

C. $1.6 \times 10^{-26} A$

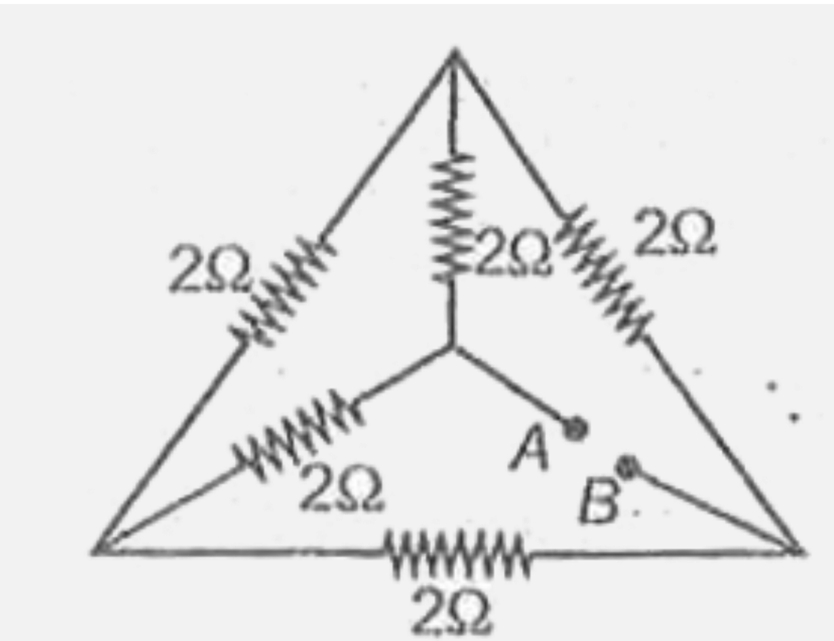
D. $1.6 \times 10^{12} A$

Answer: A

Watch Video Solution

66. In the network shown in the figure, each of the resisance is equal to 2Ω .

The resistance between the point A and B is



A. 3Ω

B. 4Ω

C. 1Ω

D. 2Ω

Answer: D

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67. Two wires of same metal have the same length but their cross-sections are in the ratio $3:1$. They are joined in series. The resistance of the thicker wire is 10Ω. The total resistance of the combination will be

A. 40Ω

B. 100Ω

C. $\frac{5}{2}\Omega$

D. $\frac{40}{3}\Omega$

Answer: A

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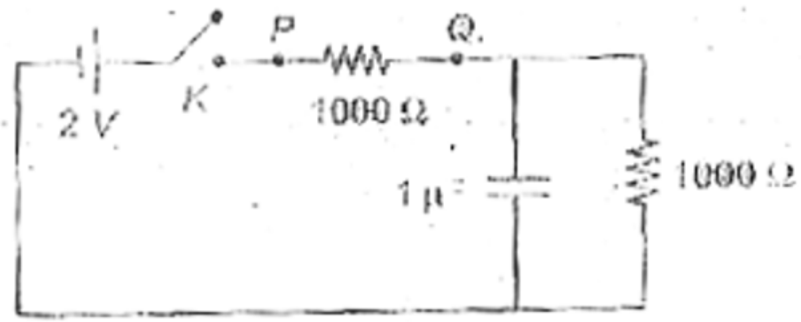
68. When the key K is presend at time t = 0 , then which of the following statements about the current I in the resistor PQ of given circuit is true ?



A. I oscillates between 1 mA and 2 mA

B. At t=0 ,I =2 m A and with time it goes to 1 mA

C. I = 1 mA at all t

D. I=2 mA at all t

Answer: B

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69. There are three copper wires of length and cross-sectional area (L,A), (2L,A/2)(L/2,2A). In which case in the resistance minimum?

A. wire of cross-sectional area 2A

B. wire of cross-sectional area 1/2 A

C. wire of cross - sectional area A

D. Same in all three cases

Answer: A

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70. Kirchhoff's first law i.e. $\sum I = 0$ at a junction is based on the law of conservation of

A. Momentum

B. Agular momentum

C. Charge

D. Energy

Answer: C

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71. A galvanometer having a resistance of 8 ohm is shunted by a wire of resistance 2 ohm . If the total current is 1 amp , the part of it passing through the shunt will be

A. $0.2A$

B. $0.8A$

C. $0.25A$

D. $0.5A$

Answer: B

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72. In meter bridge , the balancing length from left is found to be 20 cm when standard connected of 1Ω is in right gap . The value of unknown resistance is

A. 0.8Ω

B. 0.5Ω

C. 0.4Ω

D. 0.25Ω

Answer: D

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73. A potentiometer consists of a wire of length 4 m and resistance 10Ω. It is connected to a cell of emf 2V.The potential gradient of the wire is

A. 5 V/m

B. 2 V/m

C. 0.5 V/m

D. 10 V/m

Answer: C

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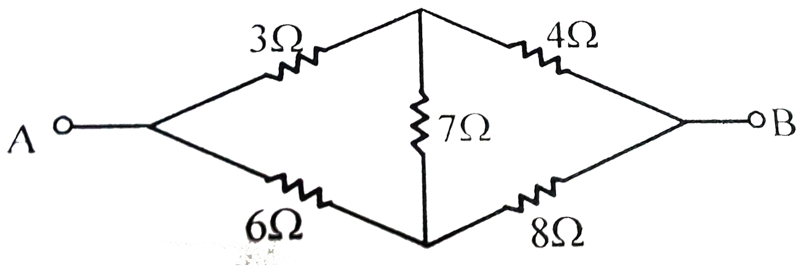
74. Calculate the net resistance of the circuit between A and B:



A. $\frac{8}{3}\Omega$

B. $\frac{14}{3}\Omega$

C. $\frac{16}{3}\Omega$

D. $\frac{22}{3}\Omega$

Answer: B

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75. A car battery of emf 12 V and internal resistance $5 \times 10^{-2}\Omega$, receives a current of 60 Å from external source, then terminal voltage of battery is:

A. 12 V

B. 9V

C. 15V

D. 20V

Answer: C

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76. The potentiometer is best for measuring voltage as .

A. It has a sensitive galvnometer

B. It has wire of higher resistance

C. It measures p.d in closed circuit

D. It measures p.d in open circuit

Answer: D

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77. If specific resistance of a potentiometer wire is $10^{-7}(\Omega)$ m and current flow through it is 0.1 A, cross-sectional area of wire is $10^{-6}m^2$ then potential gradient will be : -

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78. The specific resistance of a conductor increases with

A. Increase in temperature

B. Increase in cross-sectional area

C. Increase in cross- sectional and decreases in length

D. Decrase in cross-sectional area

Answer: A

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79. For a cell, the terminal potential difference is 2.2V when circuit is open and reduces to 1.8V when cell is connected to a resistance $R = 5\Omega$, the internal resistance (R) of cell is

A. $\frac{10}{9}\Omega$

B. $\frac{9}{10}\Omega$

C. $\frac{11}{9}\Omega$

D. $\frac{5}{9}\Omega$

Answer: A

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80. A heating coil is labelled $100W, 220V$. The coil is cut in two equal halves and the two pieces are joined in parallel to the same source. The energy now liberated per second is

A. 200 J

B. 400 J

C. 25 J

D. 50 J

Answer: B

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81. A $100W200V$ bulb is connected to a $160V$ power supply. The power consumption would be

A. 100 W

B. 125 W

C. 64 W

D. 80 W

Answer: C

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82. Two elelctric bulbs P and Q have their resistance in the ratio of 1: 2. They are connected in series across a battery. Find the ratio of the power dissipation in these bulbs.

A. $2:1$

B. $1:4$

C. $1:1$

D. $1:2$

Answer: D

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83. Two bulbs of (40 W, 200 V) and (100 W, 200 V). Then correct relation for their resistance:

A. $R_{40} < R_{100}$

B. $R_{40} > R_{100}$

C. $R_{40} = R_{100}$

D. No relation can be predicted

Answer: B

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84. Two $220V, 100W$ bulbs are connected first in series then in parallel. Each time the combination is connected to a $220V$ AC supply line. The power drawn by the combination in each case respectively will be

A. 50 watt, 100 watt

B. 100 watt, 50 watt

C. 200 watt, 150 watt

D. 50 watt, 200 watt

Answer: D

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ASSIGNMENT (SECTION - D)

1. A : For a given conductor , electric current does not vary even if its cross sectional area varies .

R : A conductor remains unchanged when current flows through it .

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: B

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2. A : When a steady current flows through a conductor of non - uniform cross-section , the current density , electric field and drift velcoity do not remain constant.

R : For a constant current the current density electric field and drift velocity are inversely proportional to cross - sectional area.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: A

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3. A : To a metal wire of diamete d and length L when the applied voltage is doubled, drift velocity gets doubled.

R : For a constant votage when the length is doubled, drift velocity will be halved but drift velocity is independent of diameter .

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: B

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4. A : Kirchhoff's Current law is applicable at any junction isor node in the circuit.

R : Kirchhoff's laws are general in nature .

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: B

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5. A : Voltage drop or gain across a capacitor depends on the direction of current and increase opposite to the direction of current .

R : Voltage drop or gain across a capacitor depends on the direction of current .

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: C

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6. A : The voltage across a battery may be less, equal or more than the emf of the battery.

R : Voltage across a battery also depends on the magnitude and direction of current .

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: A

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7. A : parctically a voltmeter will measure the voltage across the battery but not its EMF.

R : EMF of a cell is measured with the help of a potentiometer .

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: C

Watch Video Solution

8. A : potentiometer can act as an ideal voltmeter .

R : An idea, voltmeter has infinite resistance .

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: C

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9. A : Ohm's law is universally applicable for all conducting elements.

R : All conducting show straight line graphic variation on (I-V) plot.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: D

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10. A : A low voltage supply from which high currents are to be withdraw , must have very low internal resistance .

R : Maximum current drawn from a source is inversely proprtional to internal reisistance .

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: A

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11. A : High voltage (high tension) supply must have very large internal resistance.

R: If the circuit is accidentally shorted , then the current drawn will not exceed safely limits if internal resistance is high.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: A

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12. A :Alloys of metals usually have greater resistivity than that of their constituent metals.

R : Alloys usually have much lower thermal coefficient of resistance than pure metals.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: B

Watch Video Solution

13. A:Current density is a very is a vector quantity .

R : Electric current , passing through a given unit area is current density.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: B

Watch Video Solution

14. A : When two cells of equal EMF and equal internal resistances are connected is parallel with positive plate of the other than , the net EMF , of the combination will be equal to the EMF of each cell.

R : Effective internal resistance of the parallel combination of two identical cells will be half of the internal resistance of each cell.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: B

Watch Video Solution

15. A :The drift velocity of electrons in a conductor is very small still current in a conductor is establised almost instantaneously on closing the switch.

R: Electric field in the condutor sets up with speed of light.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: A

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16. A: When temperature of a metallic wire is increased, its resistance increase .

R : As the temperature is increaed , average relaxtion time increase.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: C

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17. A : The potentiometer wire should have uniform cross sectional area.

R : On the pottentiometer wire the jockey is gently tocuhed , not pressed hard.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion , then mark

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion then mark.

C. If Assertion is ture statement but Reason is false , then mark

D. If both Assertion and Reason are false statements then mark.

Answer: B

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