



# PHYSICS

## BOOKS - DC PANDEY ENGLISH

### CURRENT ELECTRICITY

#### Example Example Type

1. In a given time of  $10s$ ,  $40s$  electrons pass from right to left. In the same interval of time 40 protons also pass from left to right. Is the

average current zero? If not, then find the value of average current.



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2. A constant current of  $4A$  passes through a wire for  $8s$ . Find total charge flowing through that wire in the given time interval.



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3. A wire carries a current of  $2.0A$ . What is charge that has flowed through its cross section in  $1.0s$ ? How many electrons does this correspond to?



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4. The current in a wire varies with time according to the relation

$$i = (3.0A) + (2.0A/s)t$$

a. How many coulombs of charge pass a cross

section of the wire in the time interval between  $t = 0$  and  $t = 4.0s$ ?

b. What constant current would transport the same charge in the same time interval?



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5. Current passing through a wire decreases linearly from  $10A$  to  $0$  in  $4s$ . Find total charge flowing through the wire in the given time interval.



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6. Electric field inside a conductor is always zero. Is this statement true or false?



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7. An electron beam has an aperture of  $1.0\text{mm}^2$ . A total of  $6.0 \times 10^{16}$  electrons go through any perpendicular cross section per second. Find a. the current and b. the current density in the beam.



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8. Calculate the drift speed of the electrons when  $1A$  of current exists in a copper wire of cross section  $2mm^2$  The number of free electrons in  $1cm^3$  of copper is  $8.5 \times 10^{22}$



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9. Two copper wires of the same length have got different diameters

a. which wire has greater resistance?

b. greater specific resistance?



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**10.** A wire has a resistance  $R$ . What will be its resistance if it is stretched to double its length?



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**11.** A copper wire is stretched to make it 0.1 % longer. What is the percentage change in its resistance?



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**12.** The resistance of a thin silver wire is  $1.0\Omega$  at  $20^\circ C$ . The wire is placed in a liquid bath and its resistance rises to  $1.2\Omega$ . What is the temperature of the bath?  $\alpha$  for silver is  $3.8 \times 10^{-3} / (^\circ C)$





**13.** Read the following statements carefully

*Y*: The resistivity of semiconductor decreases with increases of temperature.

*Z*: In a conducting solid, the rate of collisions between free electrons and ions increases with the increase of temperature.

Select the correct statement (*s*) from the following

a. *Y* is true but *Z* is false b. *Y* is false but *Z* is true

c. Both  $Y$  and  $Z$  are true d.  $Y$  is true  $Z$  and  $Z$  is the correct reason for  $Y$



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**14.** An electric toaster uses nichrome for its heating element. When a negligibly small current passes through it. Its resistance at room temperature ( $27.0^{\circ}C$ ) is found to be  $75.3\Omega$ . When the toaster is connected to a  $230V$  supply, the current settles, after a few seconds, to a steady value of  $2.68A$ . What is



steady temperature of the nichrome element?

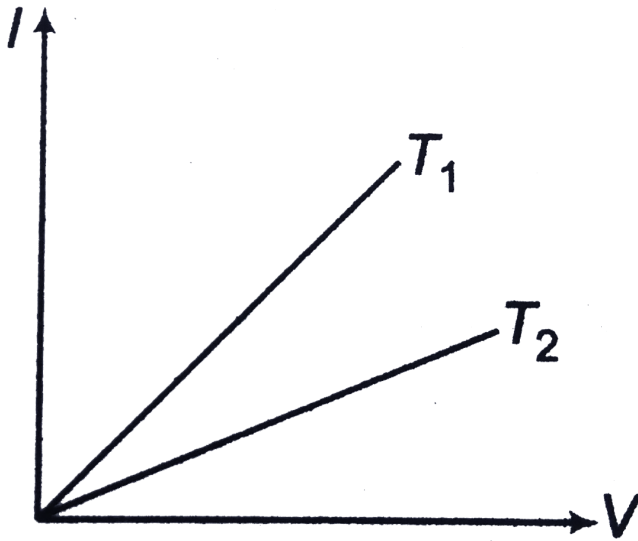
The temperature coefficient of resistance of nichrome averaged over the temperature range involved,  $1.70 \times 10^{-4} C^{-1}$



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**15.** The current voltage graphs for a given metallic wire two different temperature  $T_1$  and  $T_2$  are shown in figure The temperature  $T_2$  is greater than  $T_1$ . Is this statement true or

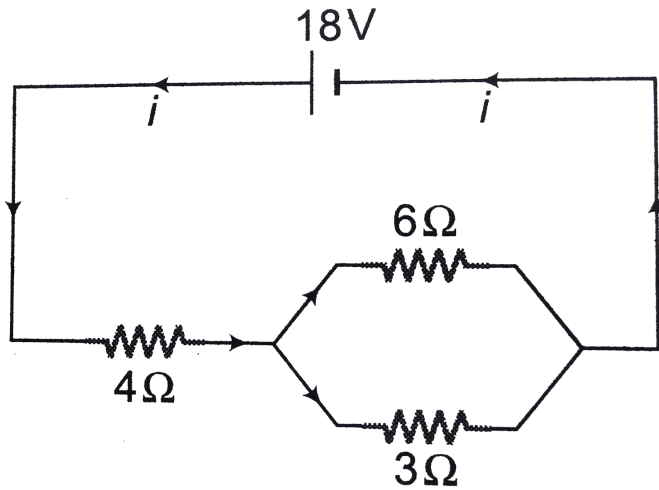
false?



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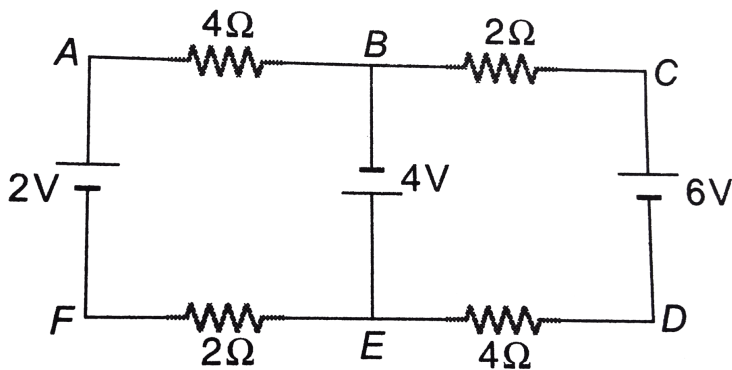
**16.** Compute the equivalent resistance of the network shown in figure and find the current

in drawn from the battery.



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**17.** Find currents in different branches of the electric circuit shown in figure.



How to

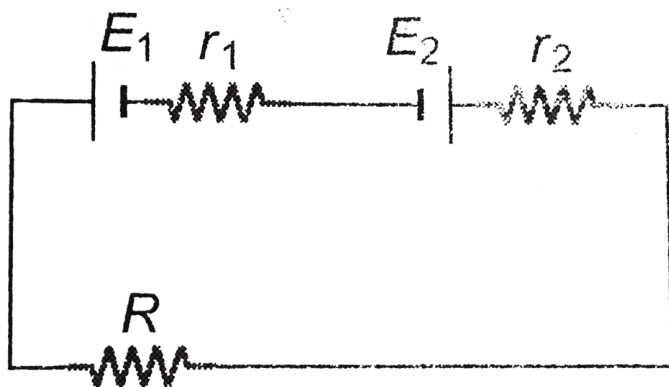
Proceed : In this problem there are three wires  $EFAB$ ,  $BE$  and  $BCDE$ . Therefore, we have three unknown currents  $i_1$ ,  $i_2$  and  $i_3$ . So, we require three equations. One equation will be obtained by applying Kirchhoff's junction law (either at  $B$  or at  $E$ ) and the remaining two equations, we get from the second law (loop law). We can make three loops  $ABEFA$ ,  $ACDF$  and  $BCDEB$ . But we have

to choose any two of them. Initially, we can choose any arbitrary directions of  $i_1$ ,  $i_2$  and  $i_3$ .



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**18.** In the circuit shown in figure



$E_1 = 10V$ ,  $E_2 = 4V$ ,  $r_1 = r_2 = 1\Omega$  and

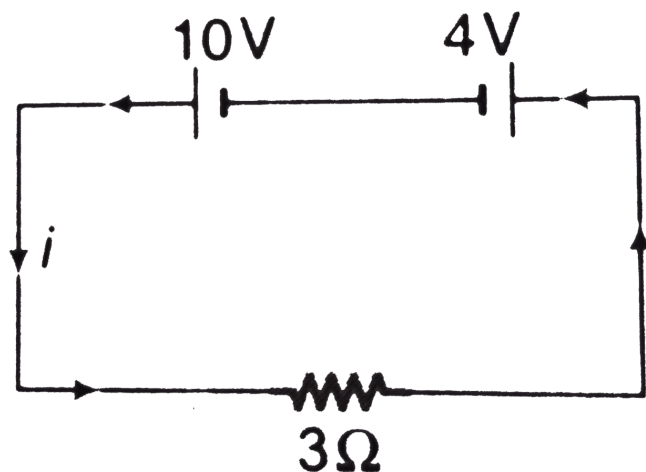
$R = 2\Omega$ .

Find the potential difference across battery 1 and battery 2.



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19. In the circuit shown in figure find



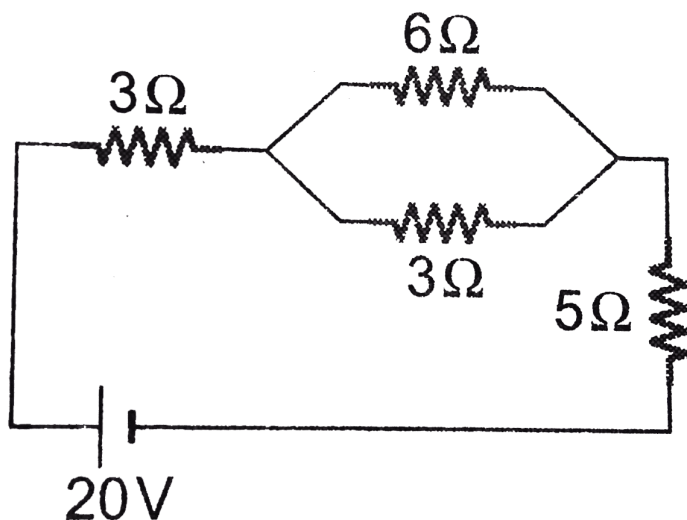
a. The power supplied by 10 V battery

- b. The power consumed by  $4V$  battery and
- c. The power dissipated in  $3\Omega$  resistance.



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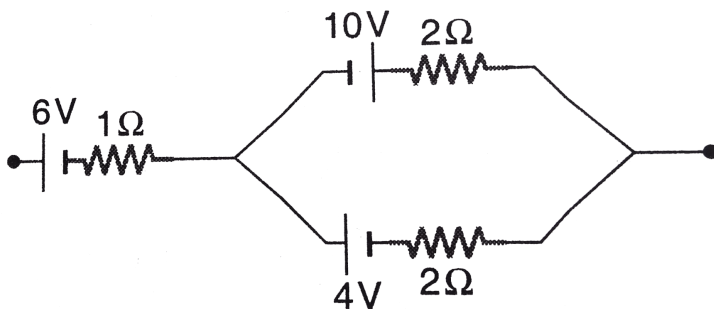
**20.** In the circuit shown in figure find the heat developed across each resistance in  $2s$ .





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21. Find the emf and internal resistance of a single battery which is equivalent to a combination of three batteries as show in figure.



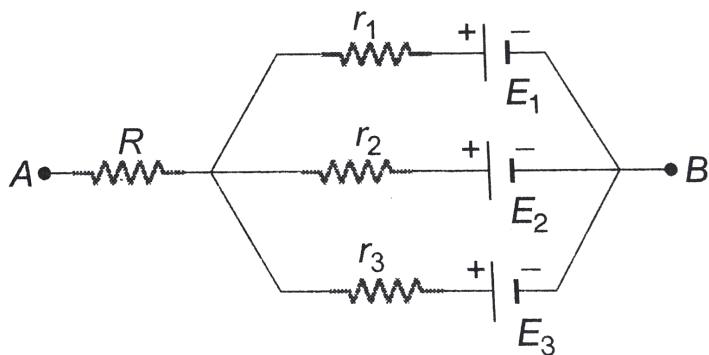
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22. In the circuit in figure

$$E_1 = 3V, E_2 = 2V, E_3 = 1V \quad \text{and}$$

$$R = r_1 = r_2 = r_3 = 1\Omega$$



Find the potential difference between the points  $A$  and  $B$  and the currents through each branch.



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23. What shunt resistance is required to make the  $1.00\text{mA}$ ,  $20\Omega$  Galvanometer into an ammeter with a range of 0 to  $50.0\text{A}$ ?



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24. How can we make a galvanometer with  $G = 20\Omega$  and  $i_g = 1.0\text{mA}$  into a voltmeter with a maximum range of  $10\text{V}$ ?



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**25.** Resistance of a milli ammeter is  $R_1$  of an ammeter is  $R_2$  of a voltmeter is  $R_3$  and of a kilovoltmeter is  $R_4$ . Find the correct order of  $R_1, R_2, R_3$  and  $R_4$ .



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**26.** A microammeter has as resistance of  $100\Omega$  and full scale range of  $50\mu A$ . It can be used a voltmeter or as a higher range ammeter provided a resistance is added to it. Pick the correct range and resistance combinations

50 V range with  $10k\Omega$  resistance in series

b. 10V range with  $200k\Omega$  resistance in series

c. 5mA range with  $1\Omega$  resistance in parallel

10mA range with  $1\Omega$  resistance in parallel



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27. A galvanometer gives full scale deflection with  $0.006A$  current. By connecting it to a  $4990\Omega$  resistance, it can be converted into a voltmeter of range  $30V$ . If connected to a

$\frac{2n}{249} \Omega$  resistance, it becomes an ammeter of range  $0 - 1.5A$ . the value of  $n$  is



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**28.** A potentiometer wire of length 100 cm has a resistance of  $10\Omega$ . It is connected in series with a resistance  $R$  and cell of emf  $2V$  and negligible resistance. A source of emf 10 mV is balanced against a length of  $40cm$  of the potentiometer wire. What is the value of  $R$ ?

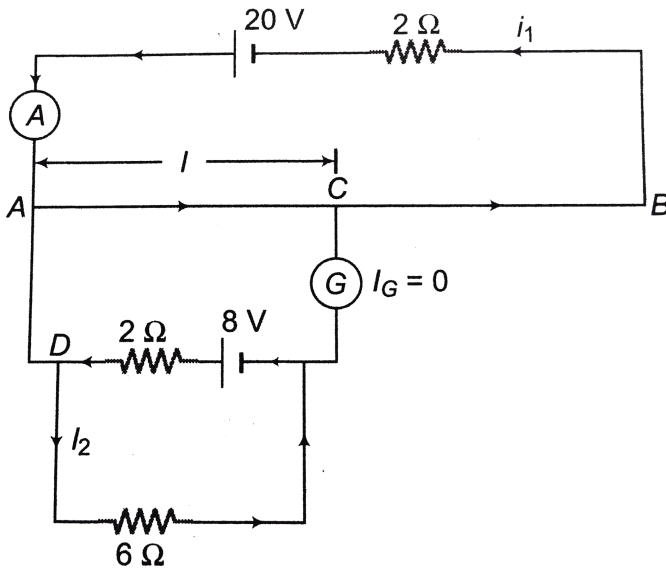


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29. When the switch is open in lower point loop of a potentiometer, the balance point length is  $60\text{cm}$ . When the switch is closed with a known resistance of  $R = 4\Omega$  the balance point length decreases to  $40\text{cm}$ . Find the internal resistance of the unknown battery.



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30.

In the figure shown wire  $AB$  has a length of  $100\text{ cm}$  and resistance  $8\ \Omega$ . Find the balance point length  $l$ .



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**31.** If resistance  $R_1$  in resistance box is  $300\Omega$  then the balanced length is found to be  $75.0\text{cm}$  from end  $A$ . The diameter of unknown wire is  $1\text{ mm}$  and length of the unknown wire is  $31.4\text{cm}$ . Find the specific resistance of the unknown wire



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**32.** In a meter bridge, null point is  $20\text{cm}$ , when the known resistance  $R$  is shunted by  $10\Omega$



resistance, null point is found to be shifted by 10 cm. Find the unknown resistance  $X$ .



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**33.** If we use  $100\Omega$  and  $200\Omega$  in place of  $R$  and  $X$  we get null point deflection.  $l = 33cm$ . If we interchange the resistors, the null point length is found to be  $67cm$ . Find end corrections  $\alpha$  and  $\beta$ .



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**34.** To locate null point deflection battery key ( $K_1$ ) is pressed before the galvanometer ( $K_2$ ) Explanation why?



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**35.** What are the maximum and minimum values of unknown resistance  $X$ , which can be determined using the post office box shown in the figure?



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**36.** The four colours on a resistor are: brown, yellow, green and gold as read from left to right. What is resistance corresponding to these colours.

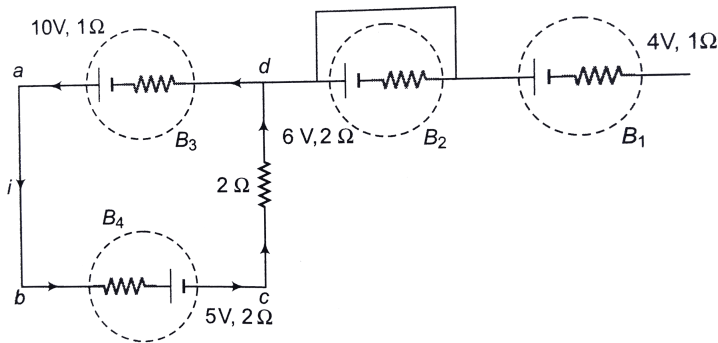


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### Example Type 1

**1.** Find the potential difference across each of the four batteries  $B_1, B_2, B_3$  and  $B_4$  as

shown in the figure.



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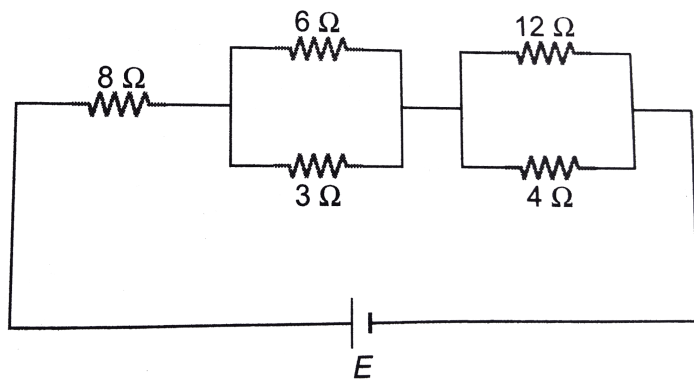
2. Draw a. current versus load and b. current versus potential difference (across its two terminals) graph for a cell.



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## Example Type 2

1. In the circuit shown in figure potential differences across  $6\Omega$  resistance is 4 volt. Find  $V$  and  $i$  values across each resistance. Also find emf  $E$  of the applied battery.



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## Example Type 3

1. Two resistors with temperature coefficients of resistance  $\alpha_1$  and  $\alpha_2$  have resistances  $R_{01}$  and  $R_{02}$  at  $0^\circ C$ . Find the temperature coefficient of the compound resistor consisting of the two resistors connected.

a.. In series and

b. in parallel



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## Example Type 4

1. Draw the circuit for experimental verification of Ohm's law using a source of variable *DC* voltage, a main resistance of  $100\Omega$ , two galvanometers and two resistances of value  $10^6\Omega$  and  $10^{-3}\Omega$  respectively. Clearly show the positions of the voltmeter and the ammeter.



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## Example Type 5

1. Prove that  $60W$  bulb glows more brightly than  $100W$  bulb if by mistake they are connected in series.



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2. The rated values of two bulbs are  $(P_1, V)$  and  $(P_2, V)$ . Find actual power consumed by both of them if they are connected in

- a. series
- b. Parallel



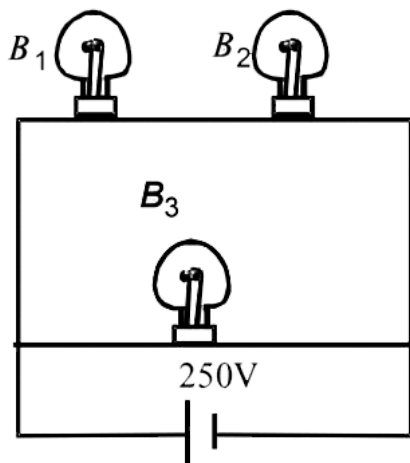
and  $V$  potential difference is applied across both of them.



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**3.** A 100 W bulb  $B_1$ , and two 60 W bulb  $B_2$  and  $B_3$ , are connected to a 250 V source, as shown in figure. Now  $W_1$ ,  $W_2$  and  $W_3$  are the output powers of the bulbs  $B_1$ ,  $B_2$  and  $B_3$ ,

respectively. Then



A.  $W_1 > W_2 = W_3$

B.  $W_1 > W_2 > W_3$

C.  $W_1 < W_2 = W_3$

D.  $W_1 < W_2 < W_3$



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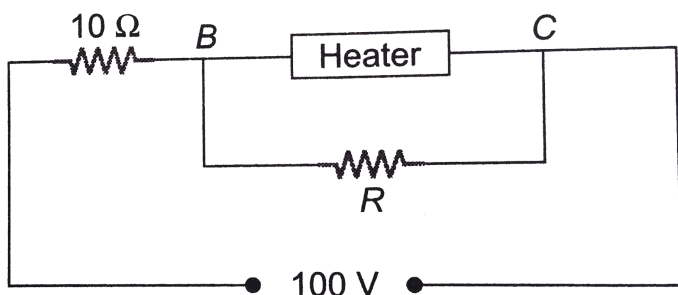
4. An electric bulb rated for  $500W$  at  $100V$  is used in a circuit having a  $200V$  supply. The resistance  $R$  that must be put in series with bulb, so that the bulb delivers  $500W$  is ..... $\Omega$ .



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5. A heater is designed to operate with a power of  $1000W$  in a  $100V$  line. It is connected in combination with a resistance of  $10\Omega$  and a

resistance  $R$ , to a  $100V$  mains as shown in figure. What will be the value of  $R$  so that the heater operates with a power of  $62.5W$ ?



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**Example Type 6**

1. Find the value of  $i$  in the circuit shown above.



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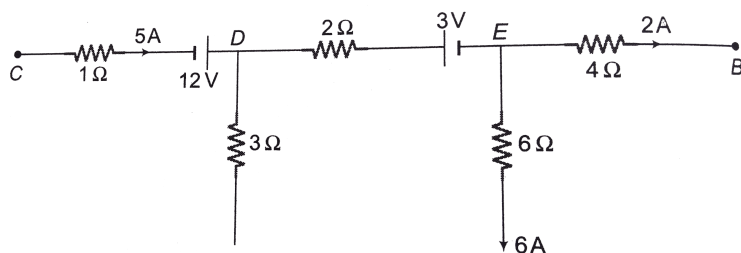
## Miscellaneous Examples

1. Two sources of equal emf are connected in series and having different internal resistance  $r_1$  and  $r_2$  ( $r_2 > r_1$ ). Find the external resistance  $R$  at which the potential difference

across the terminals of one of the sources becomes equal to zero.



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2.

Figure

shows the part of a circuit. Calculate the power dissipated in  $3\Omega$  resistance. What is the potential difference  $V_C - V_B$ ?



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3. The emf of a storage battery is  $90V$  before charging and  $100V$  after charging. When charging began the current was  $10A$ . What is the current at the end of charging if the internal resistance of the storage battery during the whole process of charging may be taken as constant and equal to  $2\Omega$ ?



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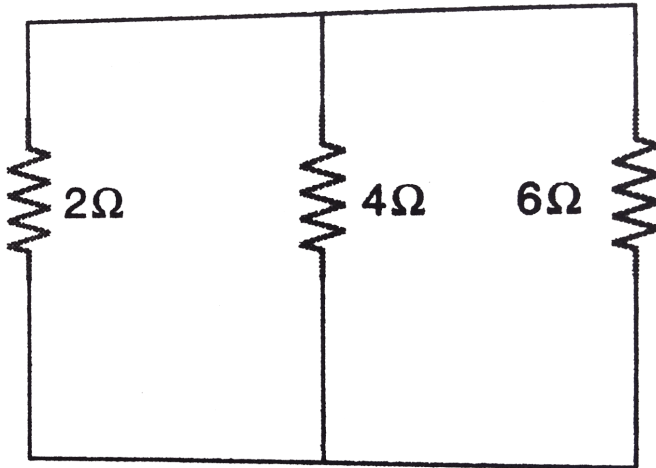
4. A battery has an open circuit potential difference of  $6V$  between its terminals. When a load resistance of  $60\Omega$  is connected across the battery, the total power supplied by the battery is  $0.4W$ . What should be the load resistance  $R$ , so that maximum power will be dissipated in  $R$ . Calculate this power. What is the total power supplied by the battery when such a load is connected?



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5. In which branch of the circuit shown in figure a  $11V$  battery be inserted so that it dissipates minimum power. What will be the current through the  $2\Omega$  resistance for this potential of the battery?



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6. An ammeter and a voltmeter are connected in series to a battery with an emf  $\xi = 6.0V$ . When a certain resistance is connected in parallel with the voltmeter, the readings of the latter decreases  $\eta = 2.0$  times, whereas the readings of the ammeter increase the same number of times, Find the voltmeter readings after the connection of the resistance.



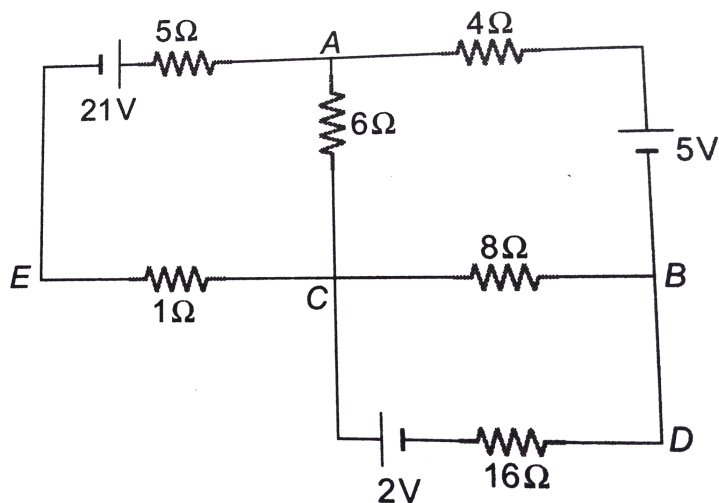
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7. A voltmeter of resistance  $R_1$  and an ammeter of resistance  $R_2$  are connected in series across a battery of negligible internal resistance. When a resistance  $R$  is connected in parallel to voltmeter reading of ammeter increases three times while that of voltmeter reduces to one third. Find the ratio of  $R_1$  and  $R_2$ .



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8. Find the current in each branches of the circuit.



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9. What amount of heat will be generated in a coil of resistance  $R$  due to a charge  $q$  passing

through it if the current in the coil

a. decreases down to zero uniformly during a time interval  $t_0$ ?

b. exponentially decreases down to zero having its value every  $t_0$  seconds?



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## Exercise 23.1

1. How many electrons per second pass through a section of wire carrying a current of

0.7A?



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2. A current of 3.6 A flows through an automobile headlight. How many coulombs of charge flow through the headlight in  $3.0h$ ?



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3. A current of  $7.5A$  is maintained in wire of  $45s$ . In this time

(a) how much charge and

(b) how many electrons flow through the wire?



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4. In the Bohr model, the electron of a hydrogen atom moves in circular orbit of radius  $5.3 \times 10^{-11}$  m with speed of  $2.2 \times 10^6$  m/s. Determine its frequency  $f$  and the current  $I$  in the orbit.



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5. The current through a wire depends on time as,  $i = (10 + 4t)$  Here,  $i$  is ampere and  $t$  in seconds. Find the charge crossed through section in time interval between  $t = 0$  to  $t = 10s$ .



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6. In an electrolyte, the positive ions move from left to right and negative ions from right to left. Is there a net current? If yes, in what direction?





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## Exercise 23.2

1. All points of a conductor are always at same potential, is this statement true or false?



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## Exercise 23.3

1. When a wire carries a current of  $1.20A$ , the drift velocity is  $1.20 \times 10^{-4}m/s$ . What is the velocity when the current is  $6.00A$ ?



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2. Find the velocity of charge leading to  $1A$  current which flows in a copper conductor of cross section  $1cm^2$  and length  $10km$ . Free electron density of copper is  $8.5 \times 10^{28}/m^3$ . How long will it take the electric charge to

travel from one end of the conductor to the other?



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## Exercise 23.4

1. In house wiring, copper wire  $2.05\text{mm}$  in diameter is often used. Find the resistance of  $35.0\text{m}$  long wire. Specific resistance of copper is  $1.72 \times 10^{-8} \Omega - \text{m}$ .



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2. The product of resistivity and conductivity of a conductor is constant. Is this statement true or false?



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3. You need produce a set of cylindrical copper wire  $3.50m$  long will have a resistance of  $0.125\Omega$  each. What will be the mass of each of these wires? Specific resistance of copper

$$= 1.72 \times 10^{-8} \Omega - m, \text{density of copper}$$

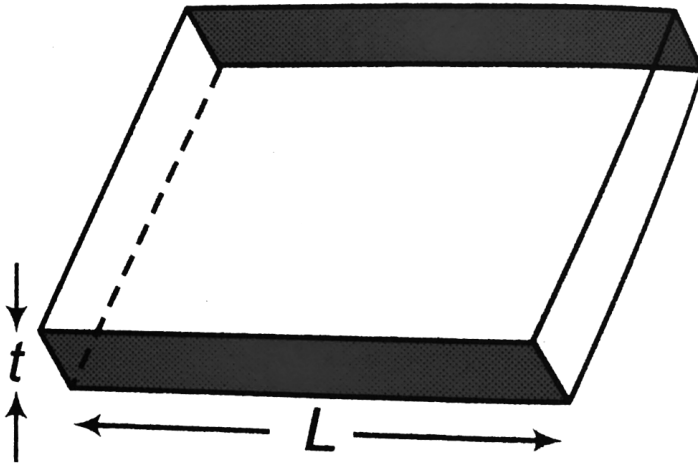
$$= 8.9 \times 10^3 \text{ kg/m}^3$$



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**4.** Consider a thin square sheet of side  $L$  and thickness, made of a material of resistivity  $\rho$ . The resistance between two opposite faces,

shown by the shaded areas in the figure is



- A. directly proportional to  $L$
- B. directly proportional to  $t$
- C. independent of  $L$
- D. independent of  $t$

**Answer: C**



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## Exercise 23.5

1. A piece of copper and another of germanium are cooled from room temperature to  $80K$ .

The resistance of

A. each of them increases

B. each of them decreases

C. copper increases and germanium decreases

D. copper decreases and germanium increases

**Answer: D**



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2. The resistance of a copper wire and an iron at  $20^{\circ}\text{C}$  are  $4.1\Omega$  and  $3.9\Omega$  respectively. Neglecting any thermal expansion, find the



temperature at which resistance of both are equal.

$$\alpha_{Cu} = 4.0 \times 10^{-3} K^{-1} \quad \text{and}$$

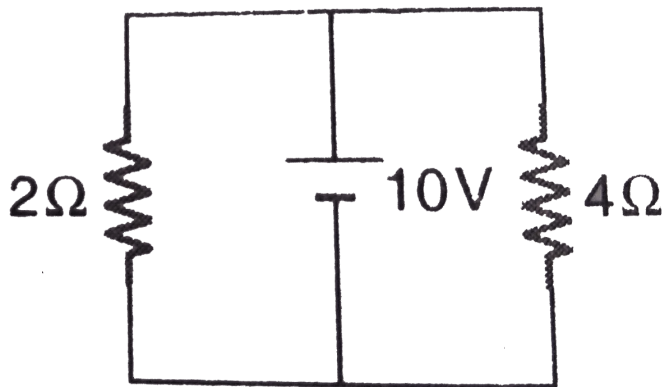
$$\alpha_{Fe} = 5.0 \times 10^{-3} K^{-1}$$



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## Exercise 23.6

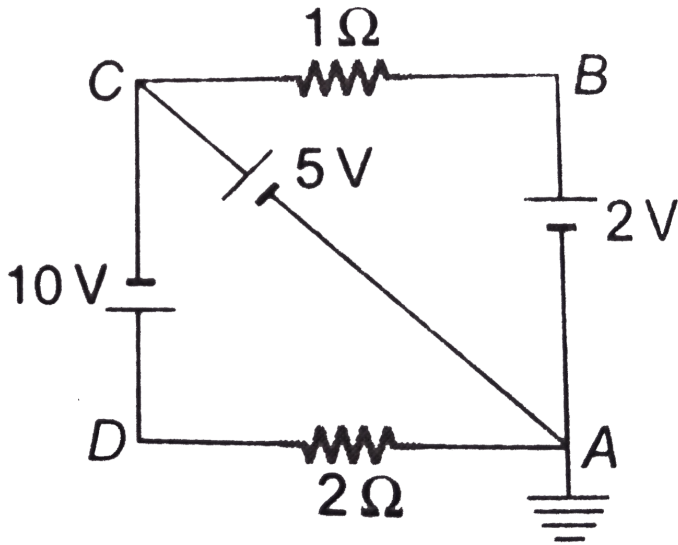
1. Find the current through  $2\Omega$  and  $4\Omega$  resistance.



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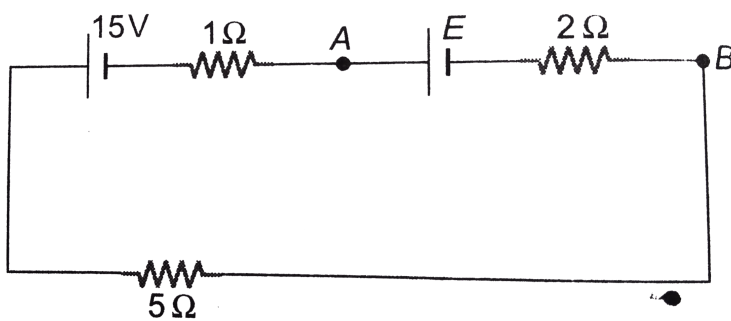
2. In the circuit shown in figure find the potentials of  $A$ ,  $B$ ,  $C$  and  $D$  and the current

through  $1\Omega$  and  $2\Omega$  resistance.



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3. For what value of  $E$  the potential of  $A$  is equal to the potential of  $B$ ?



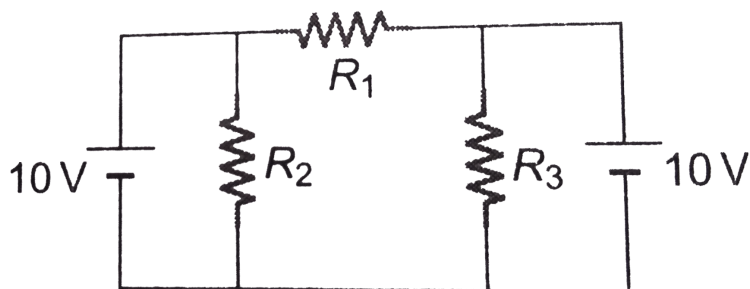
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4. Ten cells each of emf  $1V$  and internal resistance  $1\Omega$  are connected in series. In this arrangement, polarity of two cells is reversed and the system is connected to an external resistance of  $2\Omega$ . Find the current in the circuit.



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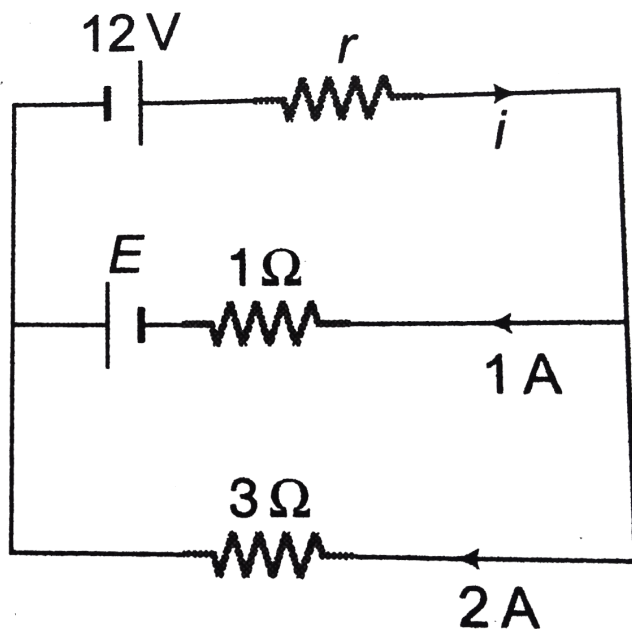
5. In the circuit shown in figure  $R_1 = R_2 = R_3 = 10\Omega$ . Find the currents through  $R_1$  and  $R_2$



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1. In the circuit shown in figure a  $12V$  battery with unknown internal resistance  $r$  is connected to another battery with unknown emf  $E$  and internal resistance  $1\Omega$  and to a resistance of  $3\Omega$  carrying a current of  $2A$ . The current through the rechargeable battery is  $1A$  in the direction shown. Figure the unknown current  $i$  internal resistance  $r$  and

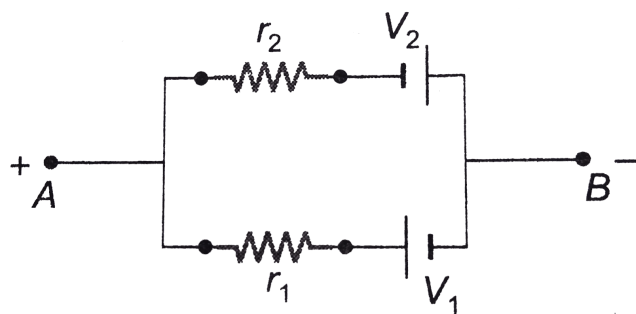
the emf  $E$ .



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## Exercise 23.8

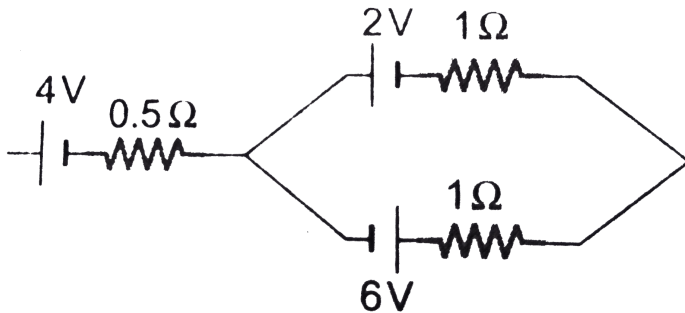
1. Find the emf ( $V$ ) and internal resistance ( $R$ ) of a single battery which is equivalent to a parallel combination of two batteries of emf  $V_1$  and  $V_2$  and internal resistances  $r_1$  and  $r_2$  respectively, with polarities as shown in figure



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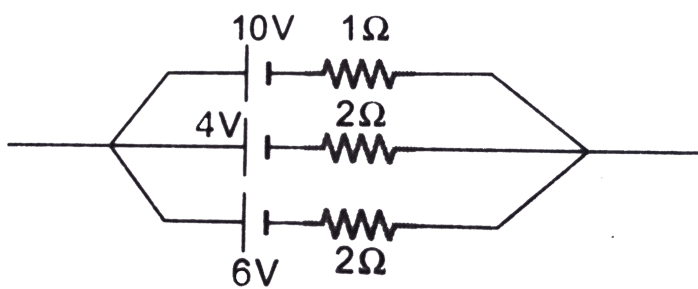


2. Find the net emf of the three batteries shown in figure



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3. Find the equivalent emf and internal resistance of the arrangement shown in figure.



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## Exercise 23.9

1. The full scale deflection current of a galvanometer of resistance  $1\Omega$  is  $5mA$ . How will you convert it into a voltmeter of range of  $5V$ ?



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2. A micrometer has a resistance of  $100\Omega$  and full scale deflection current of  $50\mu A$ . How can it be made to work as an ammeter of range  $5mA$ ?



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3. A voltmeter has a resistance  $G$  and range  $V$ . Calculate the resistance to be used in series with it to extend its range to  $nV$ .



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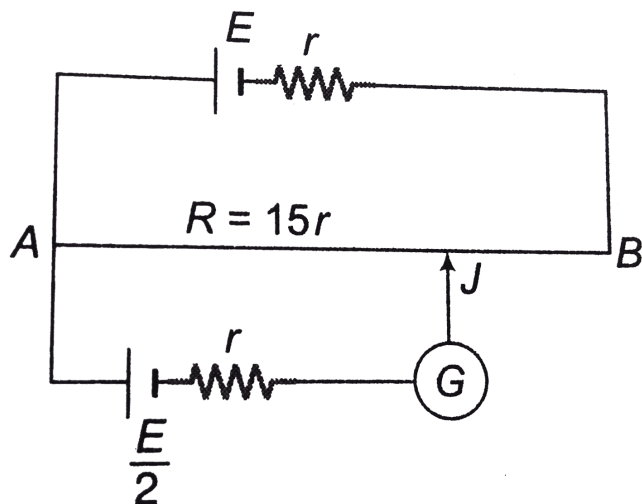
## Exercise 23.10

1. In a potentiometer experiment it is found that no current passes through the galvanometer when the terminals of the cell are connected across  $0.52m$  of the potentiometer wire. If the cell is shunted by a resistance of  $5\Omega$  balance is obtained when the cell connected across  $0.4m$  of the wire. Find the internal resistance of the cell.



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2. The potentiometer wire  $AB$  is 600 cm long.



a. At

what distance from  $A$  should the jockey  $J$  touch the wire to get zero deflection in the galvanometer.

b. If the jockey touches the wire at a distance

$560\text{cm}$  from A, what will be the current through the galvanometer.



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### Exercise 23.11

1. A resistance of  $2\Omega$  is connected across one gap of a meter bridge (the length of the wire is  $100\text{cm}$ ) and an unknown resistance, greater than  $2\Omega$  is connected across the other gap. When these resistances are interchanged, the

balance point shifts by  $20\text{cm}$ . Neglecting any corrections, the unknown resistance is

A.  $3\Omega$

B.  $4\Omega$

C.  $5\Omega$

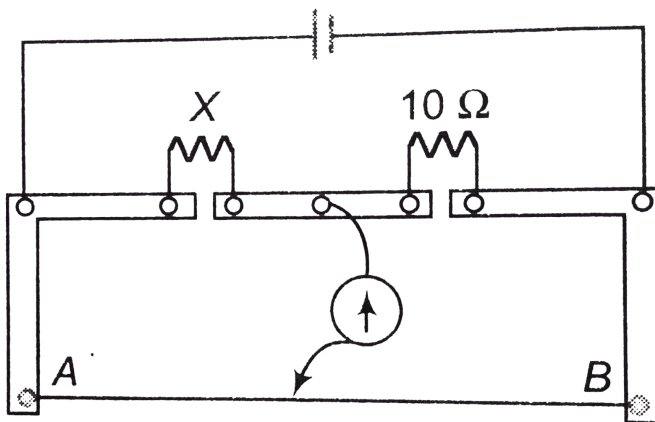
D.  $6\Omega$

**Answer: A**



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2. A meter bridge is setup as shown in figure, to determine an unknown resistance  $X$  using a standard  $10\Omega$  resistor. The galvanometer shows null point when tapping key is at  $52\text{cm}$  mark. The end correctiosnn are  $1\text{cm}$  and  $2\text{cm}$  respectively for the ends  $A$  and  $B$ . The determined value of  $X$  is





A.  $10.2\Omega$

B.  $10.6\Omega$

C.  $10.8\Omega$

D.  $11.11\Omega$

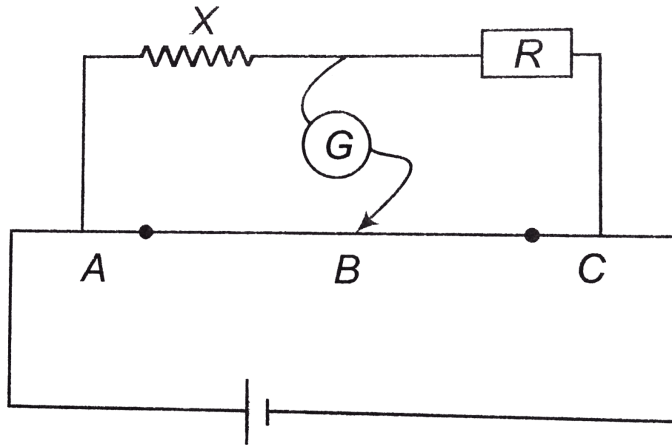
**Answer: B**



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**3.**  $R_1, R_2, R_3$  are different values of  $R, A, B$  and  $C$  are the null points obtained corresponding to  $R_1, R_2$  and  $R_3$  respectively.

For which resistor, the value of  $X$  will be the most accurate and why?



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## Exercise 23.12

1. In post office box experiment  $\frac{Q}{P} = \frac{1}{10}$ . In  $R$  if  $142 \Omega$  is used then we get deflection towards right and if  $R = 143\Omega$ , then deflection is towards left. What is the range of unknown resistance?

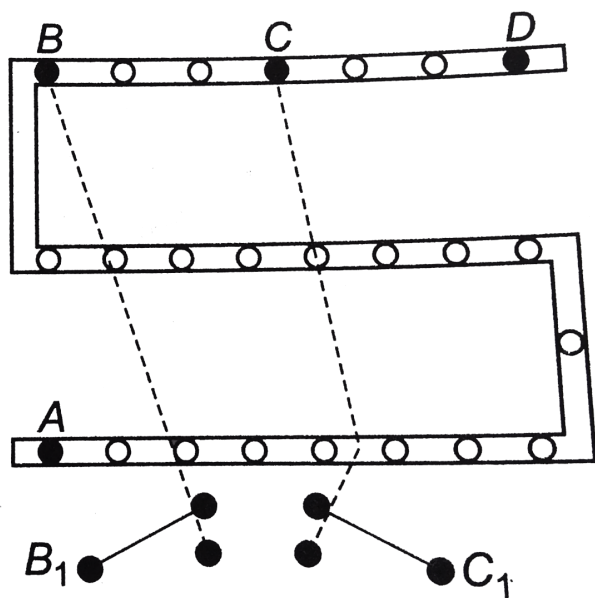


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2. What is the change in experiment if battery is connected between  $B$  and  $D$  and galvanometer is connected across  $A$  and  $C$ ?



3. For the post office arrangement to determine the value of unknown resistance, the unknown resistance should be connected between.



A.  $B$  and  $C$

B.  $C$  and  $D$

C.  $A$  and  $D$

D.  $B_1$  and  $C_1$

**Answer: C**



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## Exercise 23.13

1. For the given carbon resistor, let the first strip be yellow, second strip be red, third strip be orange and fourth be gold. What its resistance?



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2. The resistance of the given carbon resistor is  $(24 \times 10^6 \pm 5\%) \Omega$ . What is the sequence of colours on the strips provided on resistor?



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## Level 1 Assertion And Reason

1. Assertion : If potential difference across two points is zero, current between these two points should be zero.

Reason : Current passing from a resistor

$$I = \frac{V}{R}$$

A. If both Assertion and Reason are true  
and the Reason is correct explanation of  
the Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. If Assertion is true, but the Reason is false.

D. If Assertion is false but the Reason is true.

**Answer: D**

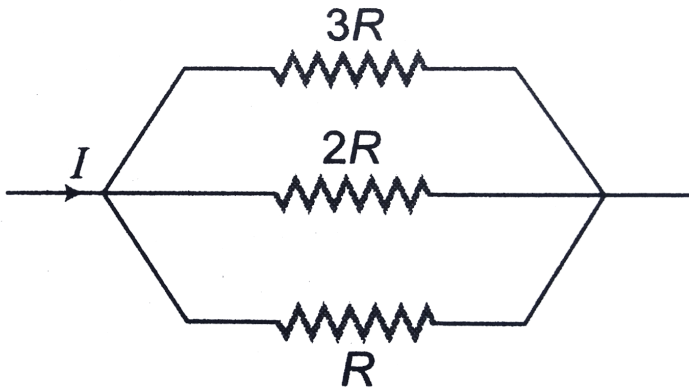


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2. Assertion: In the part of the circuit shown in figure, maximum power is produced across  $R$ .

Reason : Power  $P = \frac{V^2}{R}$



A. If both Assertion and Reason are true  
and the Reason is correct explanation of  
the Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

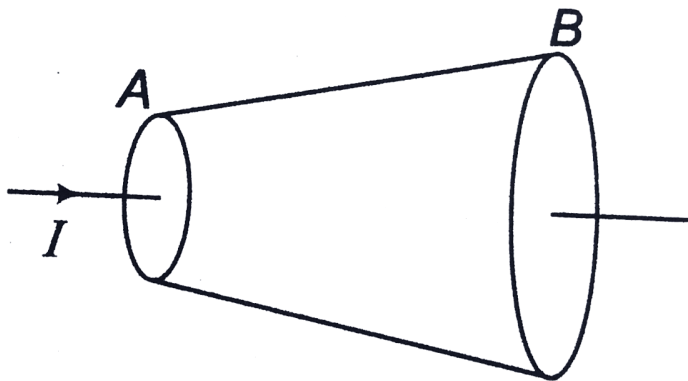
C. If Assertion is true, but the Reason is false.

D. If Assertion is false but the Reason is true.

**Answer: A::B**



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3.

Assertion : Current  $I$  is flowing through a cylindrical wire of non-uniform cross-section as shown. Section of wire near  $A$  will be more heated compared to the section near  $B$ .

Reason : Current density near  $A$  is more.

A. If both Assertion and Reason are true

and the Reason is correct explanation of

the Assertion.

B. If both Assertion and Reason are true

but Reason is not the correct

explanation of Assertion.

C. If Assertion is true, but the Reason is

false.

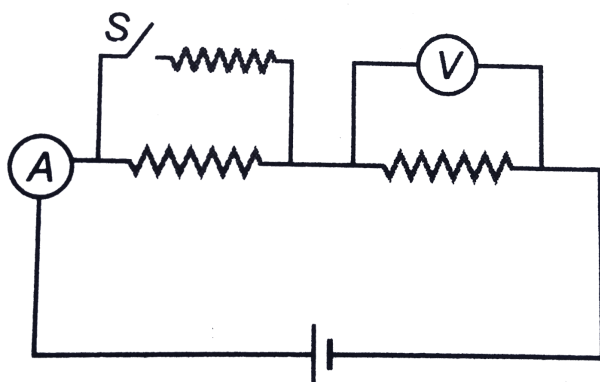
D. If Assertion is false but the Reason is

true.

**Answer: B**



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4.

Assertion: In the circuit shown in figure after closing the switch  $S$  reading of ammeter will increase while that of voltmeter will decrease.

Reason : Net resistance decreases as parallel combination of resistors is increased,

A. If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

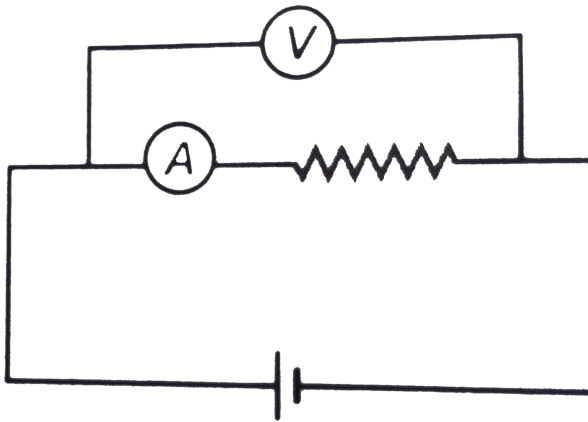
C. If Assertion is true, but the Reason is false.

D. If Assertion is false but the Reason is true.

**Answer: D**



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5.

Assertion : In the circuit shown in figure ammeter and voltmeter are non-ideal when positions of ammeter and voltmeter are changed, reading of ammeter will increase

while of voltmeter will decrease.

Reason : Resistance of an ideal ammeter is zero while that of an ideal voltmeter is infinite.

A. If both Assertion and Reason are true  
and the Reason is correct explanation of  
the Assertion.

B. If both Assertion and Reason are true  
but Reason is not the correct  
explanation of Assertion.



C. If Assertion is true, but the Reason is false.

D. If Assertion is false but the Reason is true.

**Answer: B**



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6.



Assertion: In the part of a circuit shown in

figure, given that  $V_b > V_a$ . The current should flow from b to a.

Reason: Direction of current inside a battery is always from negative terminal to positive terminal.

A. If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

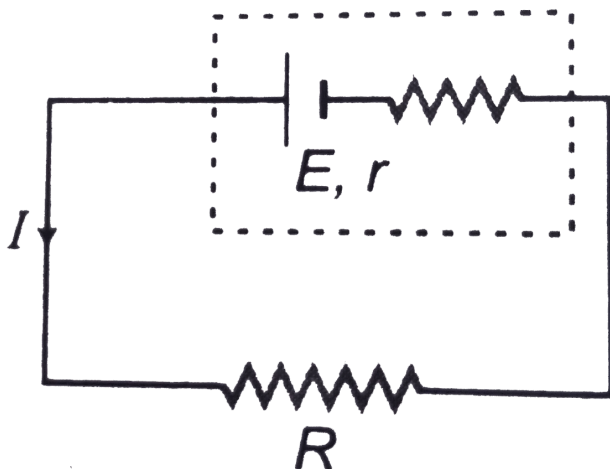
C. If Assertion is true, but the Reason is false.

D. If Assertion is false but the Reason is true.

**Answer: C**



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7.

Assertion :In the circuit shown in figure  $R$  is variable. Value of current  $I$  is maximum when  $R = r$ .

Reason: At  $R = r$ , maximum power is produced across  $R$ .

A. If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

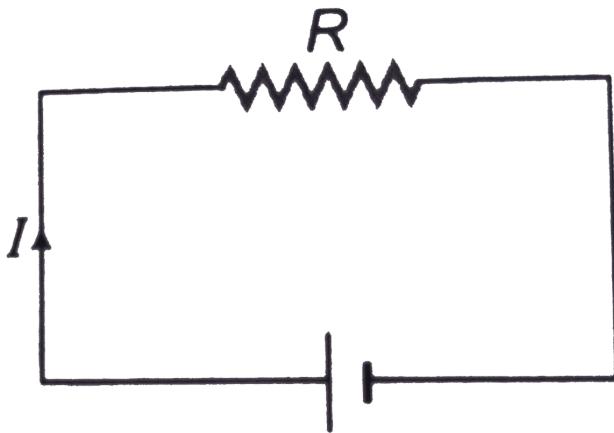
C. If Assertion is true, but the Reason is false.

D. If Assertion is false but the Reason is true.

Answer: D



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8.

Assertion: If variation in resistance due to temperature is taken into consideration, then current in the circuit  $I$  and power produced across the resistance  $P$  both will decrease with

time.

Reason:  $V = IR$  is ohm's law.

A. If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. If Assertion is true, but the Reason is false.

D. If Assertion is false but the Reason is true.

**Answer: C**



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**9. Assertion :** When a potential difference is applied across a conductor, free electrons start travelling with a constant speed called drift speed.

**Reason :** Due to potential difference an



electric field is produced inside the conductor, which electrons experience a force.

A. If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. If Assertion is true, but the Reason is false.

D. If Assertion is false but the Reason is true.

**Answer: D**



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**10. Assertion :** When temperature of a conductor is increased, its resistance increases.

**Reason :** Free electrons collide more frequently.

A. If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. If Assertion is true, but the Reason is false.

D. If Assertion is false but the Reason is true.

**Answer: A**



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**11. Assertion :** Two non-ideal batteries are connected in parallel with same polarities on same: side. The equivalent emf is smaller than either of the two emfs.

**Reason :** Two non-ideal batteries are connected in parallel, the equivalent internal resistance is smaller than either of the two internal resistances.

A. It both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. It both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. It Assertion is true, but the Reason is false.

D. It Assertion is false but the Reason is true.

**Answer: D**



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## Level 1 Objective

1. The net resistance of an ammeter should be small to ensure that

- A. to show large deflection
- B. to generate less heat
- C. to prevent the galvanometer

D. so that it maynot change the value of  
the actual current in the circuit

**Answer: D**



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2. A Steady current flows in a metallic conductor of non uniform cross section. The quantity/quantities which remain constant along the length of the conductor is/are

A. current, electric field and drift speed

B. drift speed only

C. current and drift speed

D. current only

**Answer: D**



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3. If  $M$  = mass,  $L$  = length,  $T$  = time and  $I$  = electric current, then the dimensional formula of resistance  $R$  will be given by



A.  $[R] = [ML^2T^{-3}I^{-2}]$

B.  $[R] = [ML^2T^{-3}I^2]$

C.  $[R] = [ML^2T^3I^{-2}]$

D.  $[R] = [ML^2T^3I^2]$

**Answer: A**



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**4. The unit of electrical conductivity is**

A.  $ohm - m^{-2}$

B.  $\text{ohm} \times m$

C.  $\text{ohm}^{-1}, m^{-1}$

D. none of these

**Answer: C**



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5. Through an electrolyte an electrical current is due to drift of

A. free electrons

B. positive and negative ions

C. free electrons and holes

D. protons.

**Answer: B**



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6. The current in a circuit with an external resistance of  $3.75\Omega$  is  $2.5A$ . When a resistance of  $1\Omega$  is introduced into the circuit, the

current becomes  $0.4A$ . The emf of the power source is

A.  $1V$

B.  $2V$

C.  $3V$

D.  $4V$

**Answer: B**



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7. The deflection in a galvanometer falls from 50 divisions to 20 divisions, when a  $12\Omega$  shunt is applied. The galvanometer resistance is

A.  $18\Omega$

B.  $24\Omega$

C.  $30\Omega$

D.  $36\Omega$

**Answer: A**



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8. If 2 % of the main current is to be passed through the galvanometer of resistance  $G$ , the resistance of shunt required is

A.  $\frac{G}{49}$

B.  $\frac{G}{50}$

C.  $49G$

D.  $50G$

**Answer: A**



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9. If the length of the filament of a heater is reduced by 10 % , the power of the heater will

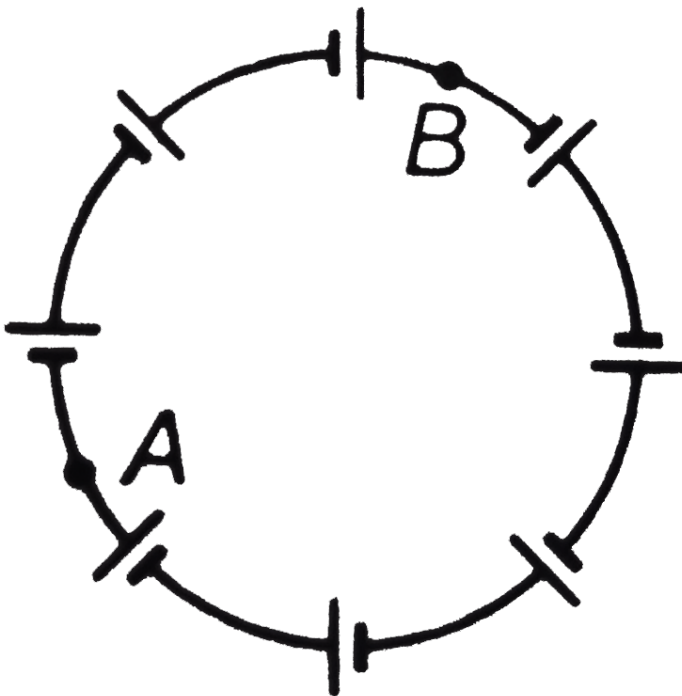
- A. increase by about 9 %
- B. increase by about 11 %
- C. increase by about 19 %
- D. decrease by about 10 %

**Answer: B**



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10.  $N$  identical current sources each of emf  $E$  and internal resistance  $r$  are connected to form a closed loop as shown in figure. The potential difference between points  $A$  and  $B$  which divides the circuit into  $n$  and  $(N-n)$  units is





A.  $NE$

B.  $(N - n)E$

C.  $nE$

D. zero

**Answer: D**



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**11.** A  $2.0\text{ V}$  potentiometer is used to determine the internal resistance of  $1.5\text{V}$  cell. The balance point of the cell in the circuit is  $75\text{cm}$ .

When a resistor of  $10\Omega$  is connected across cel, the balance point sifts to  $60cm$ . The internal resistance of the cell is

A.  $1.5\Omega$

B.  $2.5\Omega$

C.  $3.5\Omega$

D.  $4.5\Omega$

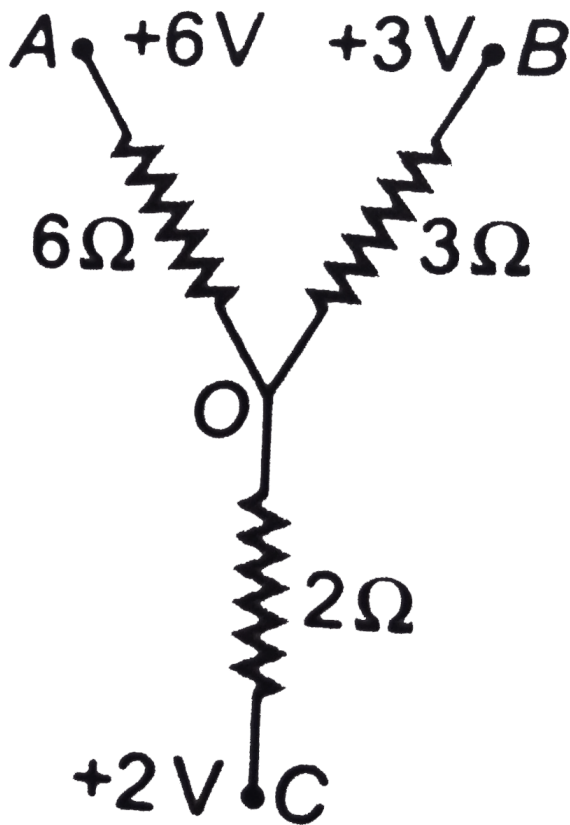
**Answer: B**



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**12.** Three resistance are joined together to form a letter Y, as shown in figure. If the potentials of the terminals  $A$ ,  $B$  and  $C$  are  $6V$ ,  $3V$  and  $2V$  respectively, then the

potential of the point O will be



A.  $4V$

B.  $3V$

C.  $2.5V$

D.  $0V$

**Answer: B**



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**13.** The drift velocity of free electrons in a conductor is  $v$ , when a current  $i$  is flowing in it. If both the radius and current are doubled, then the drift velocity will be

A.  $v$

B.  $v/2$

C.  $v/4$

D.  $v/8$

**Answer: B**



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**14.** A galvanometer is to be converted into an ammeter or voltmeter. In which of the

following cases the resistance of the device is largest?

A. an ammeter of range  $10A$

B. a voltmeter of range  $5V$

C. an ammeter of range  $5A$

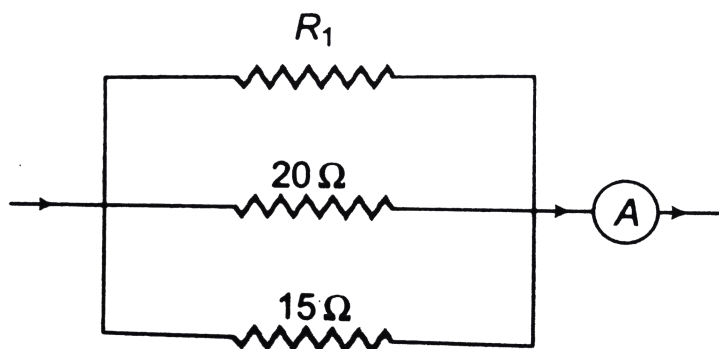
D. a voltmeter of range  $10V$

**Answer: D**



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15. In the given circuit current flowing through the resistance  $20\Omega$  is  $0.3A$ , while the ammeter reads  $0.8A$ . What is the value of  $R_1$



A.  $30\Omega$

B.  $40\Omega$

C.  $50\Omega$

D.  $60\Omega$



**Answer: D**



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**16.** An ammeter and a voltmeter are joined in series to a cell. Their readings are  $A$  and  $V$  respectively. If a resistance is now joining parallel with the voltmeter. Then

A. both  $A$  and  $V$  will increase

B. both  $A$  and  $V$  will decrease

C.  $A$  will decrease,  $V$  will increase

D.  $A$  will increase,  $V$  will decrease

**Answer: D**



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**17.** A resistor  $R$  has power of dissipation  $P$  with cell voltage  $E$ . The resistor is cut in equal parts and all parts are connected in parallel with same cell. The new power dissipation is

A.  $nP$

B.  $nP^2$

C.  $n^2P$

D.  $n/P$

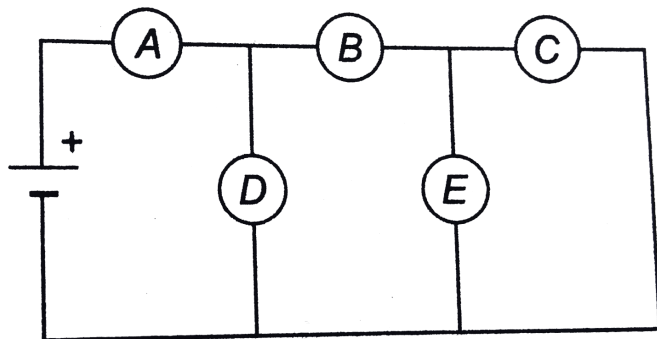
**Answer: C**



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**18.** In the circuit diagram shown in figure, a fuse bulb can cause all other bulbs to go out.

Identify the bulb



A.  $B$

B.  $C$

C.  $A$

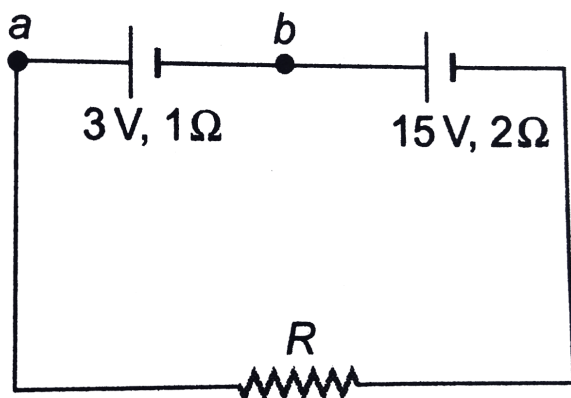
D.  $D$  or  $E$

**Answer: C**



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19. Two batteries one of the emf  $3V$ , internal resistance  $1\Omega$  and the other of emf  $15V$ , internal resistance  $2\Omega$  are connected in series with a resistance  $R$  as shown. If the potential difference between points  $a$  and  $b$  is zero, the resistance  $R$  in  $\Omega$  is



A. 5

B. 7

C. 3

D. 1

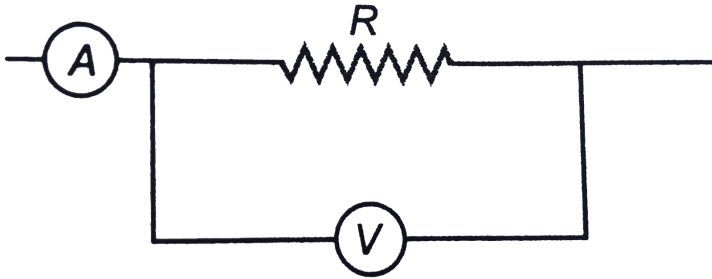
**Answer: C**



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**20.** A part of a circuit is shown in figure. Here reading of ammeter is  $5A$  and voltmeter is  $100V$ . If voltmeter resistance is  $2500\Omega$ , then

the resistance  $R$  is approximately



A.  $20\Omega$

B.  $10\Omega$

C.  $100\Omega$

D.  $200\Omega$

**Answer: A**



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21. A copper wire of resistance  $R$  is cut into ten parts of equal length. Two pieces each are joined in series and then five such combination are joined in parallel. The new combination will have resistance

A.  $R$

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

C.  $\frac{R}{5}$

D.  $\frac{R}{25}$



**Answer: D**



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**22.** Two resistances are connected in two gaps of a meter bridge. The balance point is  $20\text{cm}$  from the zero end. A resistance of  $15\Omega$  is connected in series with the smaller of the two. The null point shifts to  $40\text{cm}$ . The value of the smaller resistance in  $\Omega$  is

A. 3

B. 6

C. 9

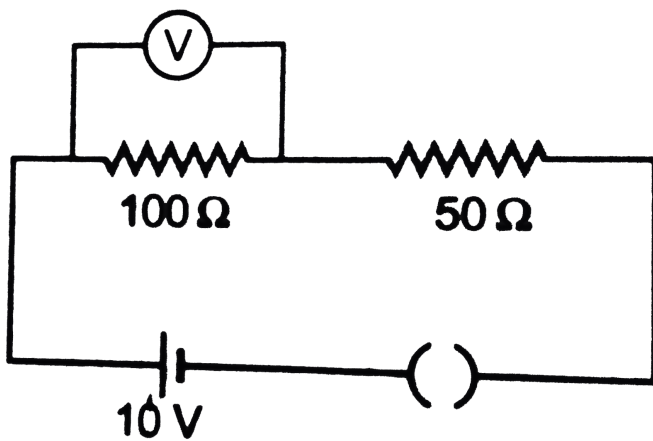
D. 12

**Answer: C**



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**23.** In the given circuit, the voltmeter records 5 volt. The resistance of the voltmeter in  $\Omega$  is



A. 200

B. 100

C. 10

D. 50

**Answer: B**



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**24.** The wire of potentiometer has resistance  $4\Omega$  and length  $1m$ . It is connected to a cell of emf 2 volt and internal resistance  $1\Omega$ . If a cell of emf 1.2 volt is balanced by it, the balancing length will be

A.  $90cm$

B.  $60cm$

C.  $50cm$

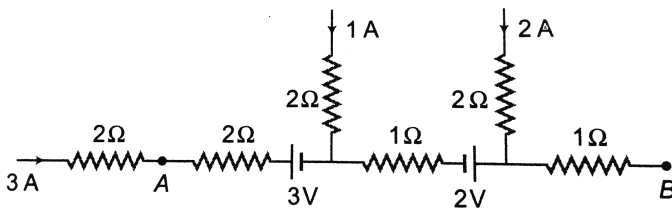
D.  $75cm$

**Answer: D**



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**25.** The potential difference between points  $A$  and  $B$ , in a section of a circuit shown in



A. 5 volt

B. 1 volt

C. 10 volt

D. 17 volt

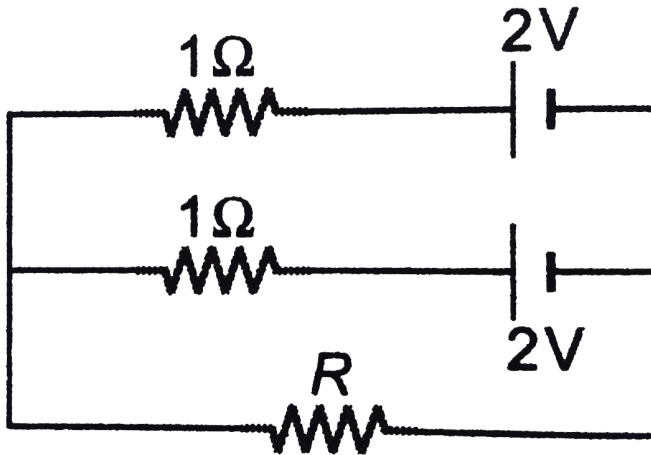
**Answer: D**



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**26.** Two identical batteries, each of emf  $2V$  and internal resistance  $r = 1\Omega$  are connected as shown. The maximum power that can be

developed across  $R$  using these batteries is



A.  $3.2W$

B.  $8.2W$

C.  $2W$

D.  $4W$

**Answer: C**



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27. 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 of cell ( $r$ ) 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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**28.** Potentiometer wire of length  $1m$  is connected in series with  $490\Omega$  resistance and  $2V$  battery. If  $0.2m\frac{V}{c}m$  is the potential gradient, then resistance of the potentiometer wire is approximately

A.  $4.9\Omega$

B.  $7.9\Omega$

C.  $5.9\Omega$

D.  $6.9\Omega$

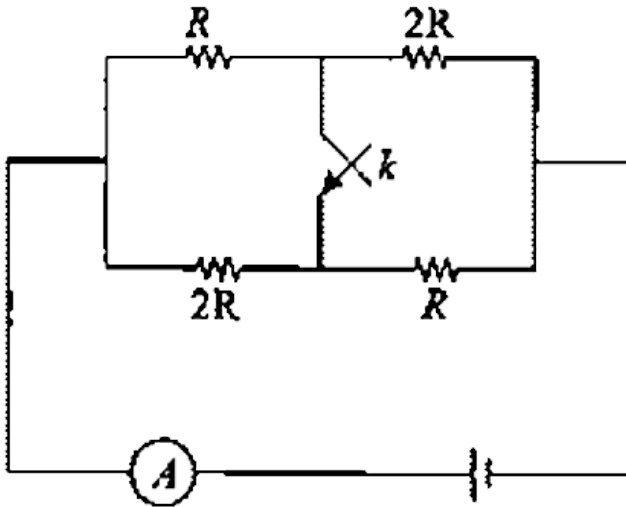
**Answer: A**



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**29.** Find the ratio of currents as measured by ammeter in two cases when the key is open

and when the key is closed :



A.  $9/8$

B.  $10/11$

C.  $8/9$

D. none of these

**Answer: C**



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30. A galvanometer has a resistance of  $3663\Omega$ .

A shunt  $S$  is connected across it such that ( $1/34$ ) of the total current passes through the galvanometer. Then the value of the shunt is

A.  $222\Omega$

B.  $111\Omega$

C.  $11\Omega$

D.  $22\Omega$

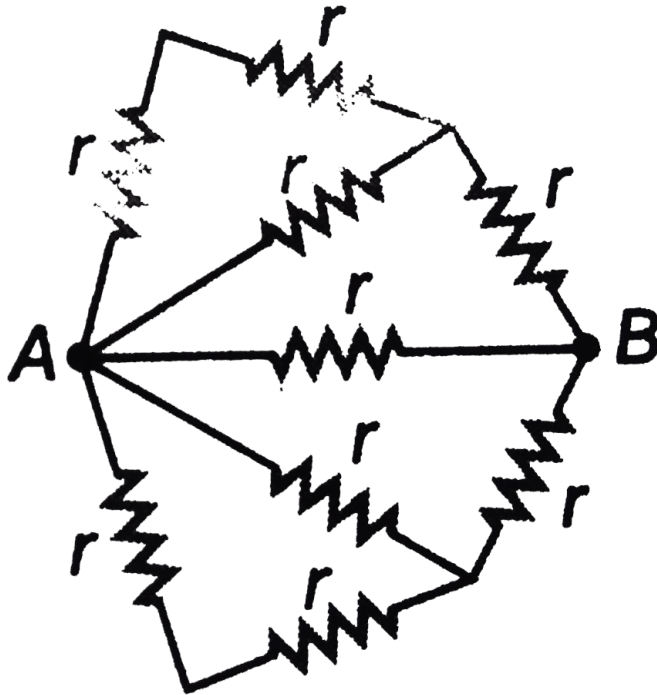
**Answer: B**



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**31.** The network shown in figure is an arrangement of nine identical resistors. The resistance of the network between points  $A$

and  $B$  is  $1.5\Omega$ . The resistance  $r$  is



A.  $1.1\Omega$

B.  $3.3\Omega$

C.  $1.8\Omega$

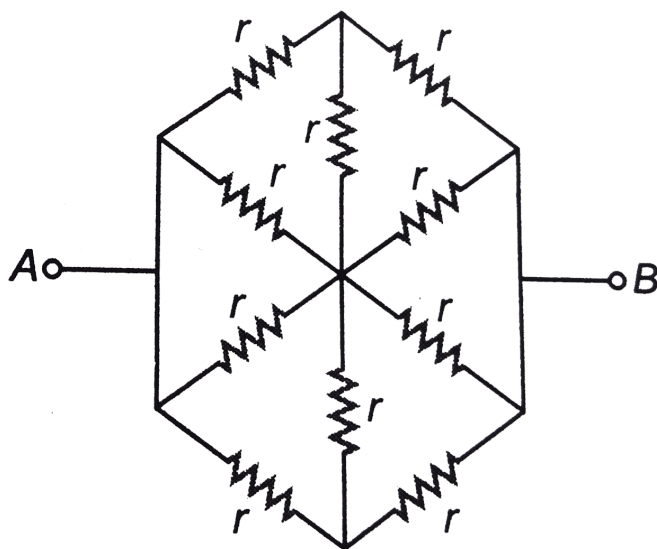
D.  $1.6\Omega$

Answer: B



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32. The equivalent resistance of the hexagonal network as shown figure between points  $A$  and  $B$  is



A.  $r$

B.  $0.5r$

C.  $2r$

D.  $3r$

**Answer: B**

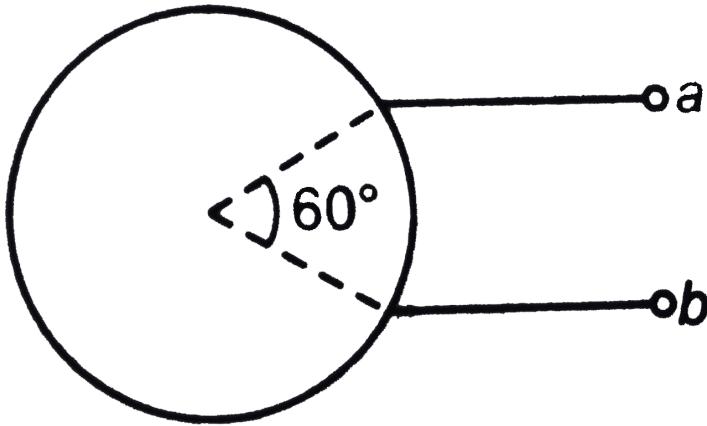


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**33.** A uniform wire of resistance  $18\Omega$  is bent in the form of a circle. The effective resistance



across the points a and b is



A.  $3\Omega$

B.  $2\Omega$

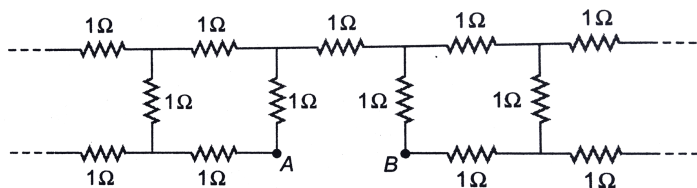
C.  $2.5\Omega$

D.  $6\Omega$

**Answer: C**



34. Each resistor shown in figure is an infinite network of resistance  $1\Omega$ . The effective resistance Between points A and B is



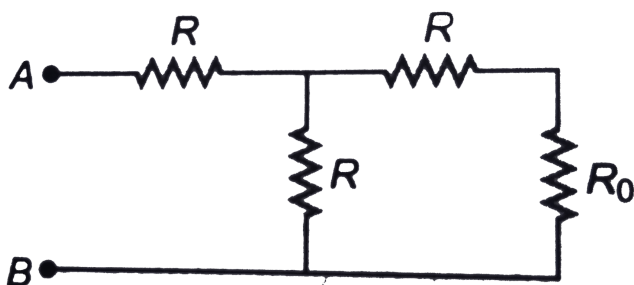
- A. less than  $1\Omega$
- B.  $1\Omega$
- C. more thn  $1\Omega$  but less than  $3\Omega$
- D.  $3\Omega$

**Answer: C**



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**35.** In the circuit shown in figure the total resistance between points  $A$  and  $B$  is  $R_0$ . The value of resistance  $R$  is



A.  $R_0$

B.  $\sqrt{3}R_0$

C.  $\frac{R_0}{2}$

D.  $\frac{R_0}{\sqrt{3}}$

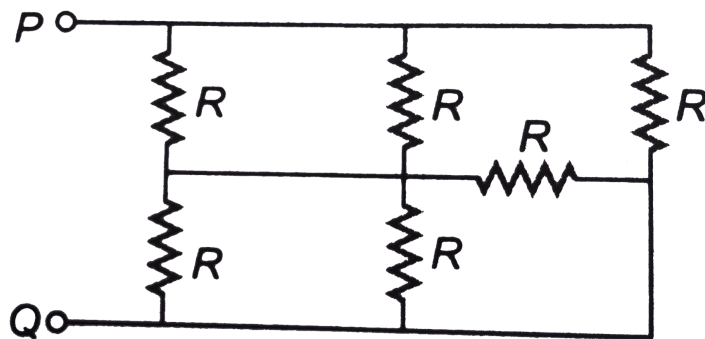
**Answer: D**



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**36.** In the circuit shown in figure  $R = 55\Omega$  the equivalent resistance between the point  $P$

and  $Q$  is



A.  $30\Omega$

B.  $35\Omega$

C.  $55\Omega$

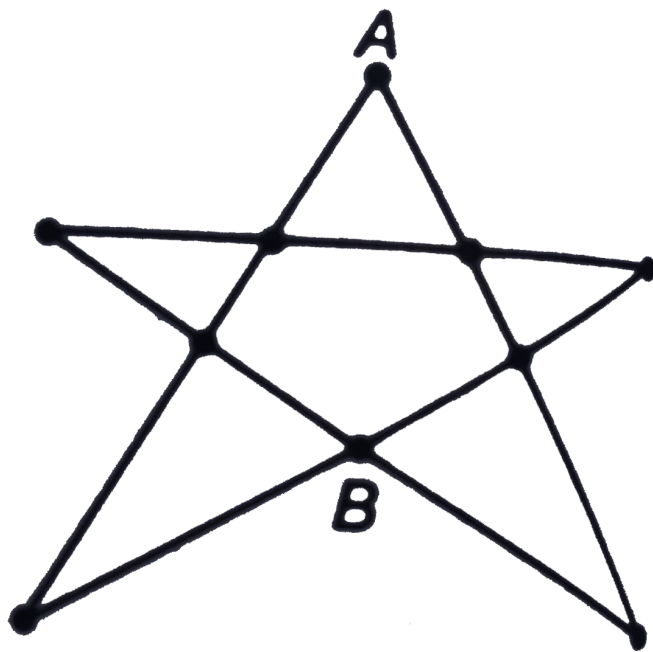
D.  $25\Omega$

**Answer: D**



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37. The resistance of all the wires between any two adjacent dots is  $R$ . Then, equivalent resistance between  $A$  and  $B$  as shown in figure is



A.  $(7/3)R$

B.  $(7/6)R$

C.  $(14/8)R$

D. none of these

**Answer: B**



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**38.** A uniform wire of resistance  $4\Omega$  is bent into circle of radius  $r$ . As specimen of the same wire is connected along the diameter of the

circle. What is the equivalent resistance across the ends of this wire?

A.  $\frac{4}{(4 + \pi)} \Omega$

B.  $\frac{3}{(3 + \pi)} \Omega$

C.  $\frac{2}{(2 + \pi)} \Omega$

D.  $\frac{1}{(1 + \pi)} \Omega$

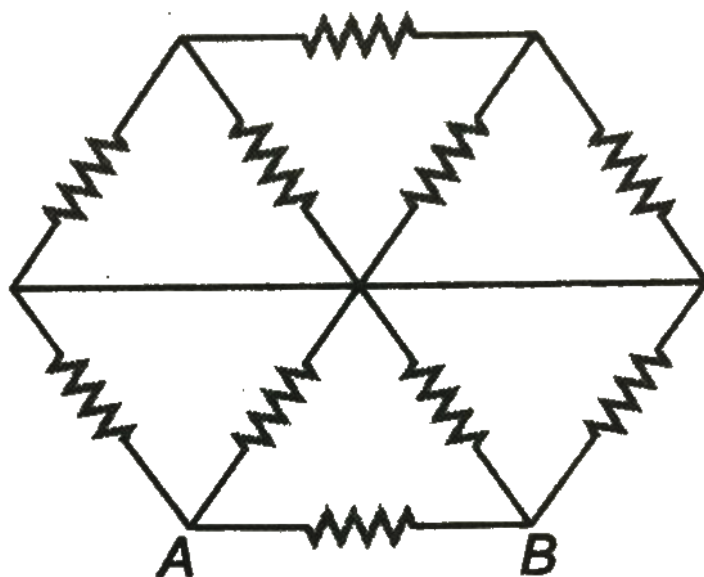
**Answer: A**



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39. In the network shown in figure, each resistance is  $R$ . The equivalent resistance between points A and B is



A.  $\frac{20}{11}R$

B.  $\frac{19}{11}R$

C.  $\frac{8}{15}R$

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

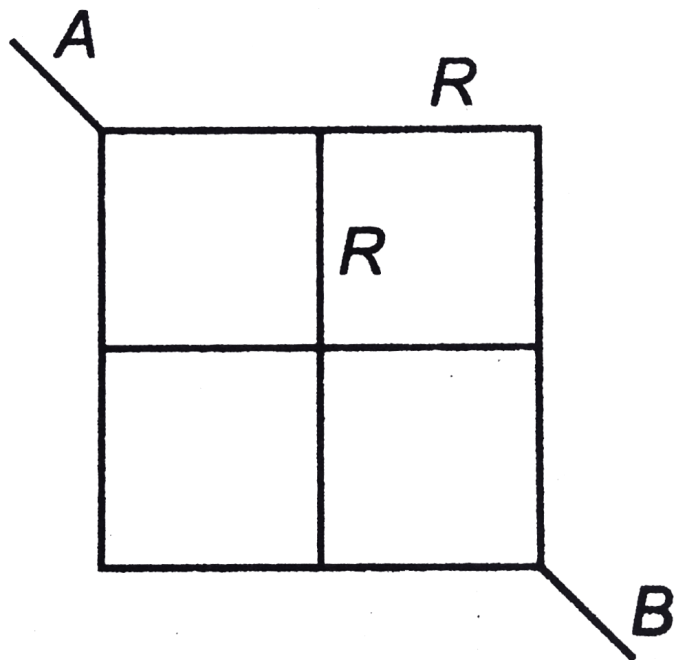
**Answer: D**



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**40.** The equivalent resistance between the points  $A$  and  $B$  is ( $R$  is the resistance of each

side of smaller square)



A.  $R$

B.  $\frac{3R}{2}$

C.  $2R$

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

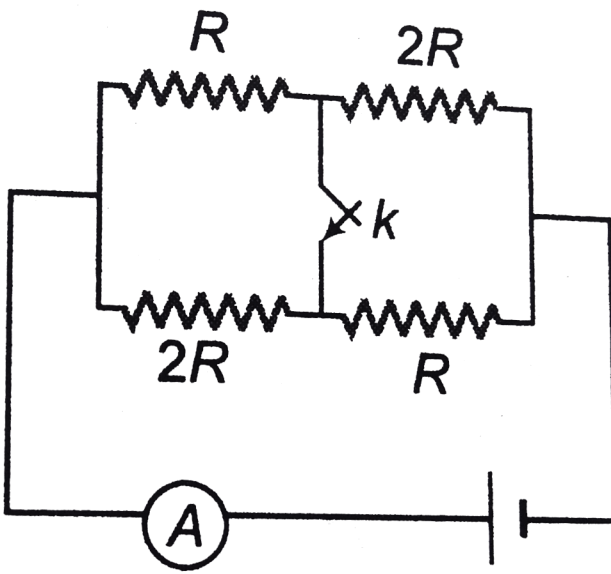
**Answer: B**



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## OBJECTIVE\_TYPE

1. The potential difference between points  $A$  and  $B$  in the circuit shown in figure will be



A.  $1V$

B.  $2V$

C.  $-3V$

D. none of these

**Answer: D**



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## Level 1 Subjective

1. When a steady current passes through a cylindrical conductor, is there an electric field inside the conductor?



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2. Determine True or False. Electrons in a conductor have no motion in the absence of a potential difference across it.



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3. 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  $2.2 \times 10^6$  m/ s. What is the current associated with electron motion?





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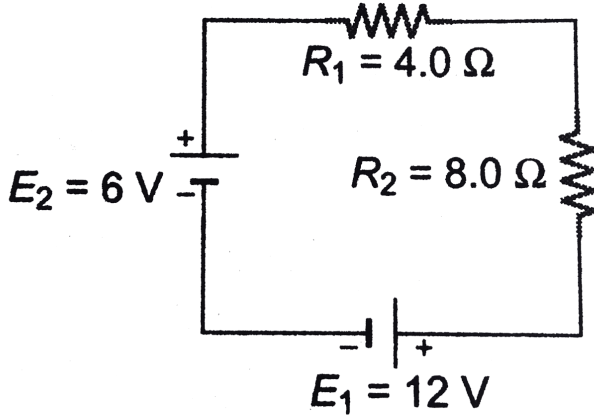
4. A  $120V$  house circuit has the following light bulbs switched on :  $40W$ ,  $60W$  and  $75W$ . Find the equivalent resistance of these bulbs.



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5. Assume that the batteries in figure have negligible internal resistance. Find



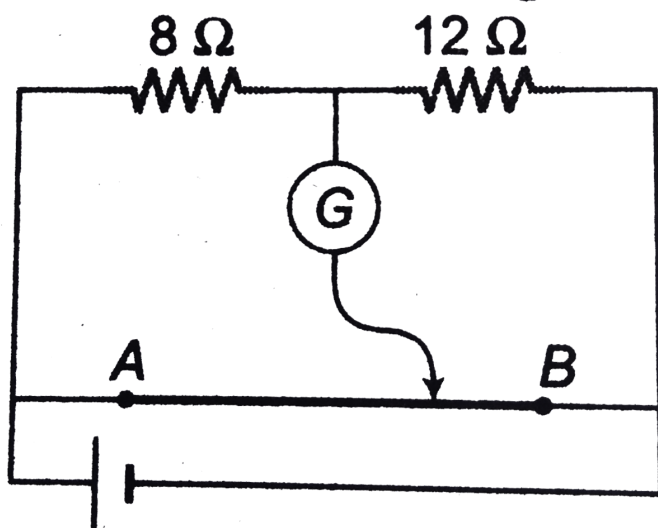


- a. the current in the circuit,
- (b) the power dissipated in each resistor and
- (c) the power of each battery, stating whether energy is supplied by or absorbed by it



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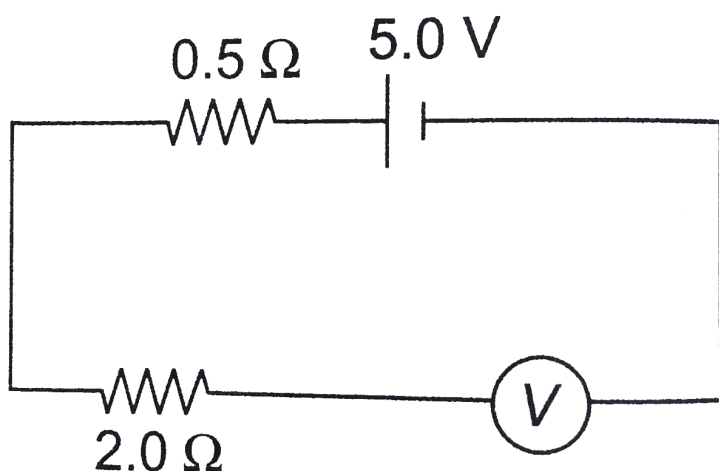
6. The potentiometer wire  $AB$  shown in figure is  $40\text{cm}$  long. Where the free end of the galvanometer should be connected on  $AB$  so that the galvanometer may show zero deflection?

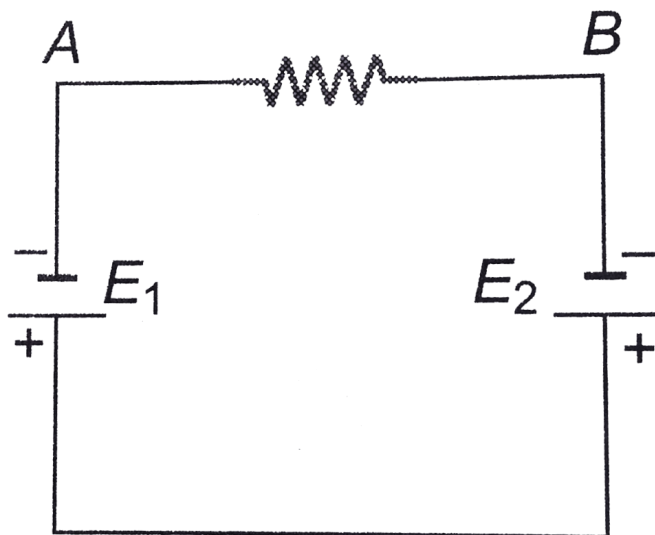


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7. An ideal voltmeter  $V$  is connected to a  $2.0\Omega$  resistor and a battery with emf  $5.0V$  and internal resistance  $0.5\Omega$  as shown in figure

- (a) What is the current in the  $2.0\Omega$  resistor?
- (b) What is the terminal voltage of the battery?
- (c) What is the reading of the voltmeter?





8.

In Figure  $E_1 = 12V$  and  $E_2 = 8V$

(a) What is the direction of the current in the resistor?

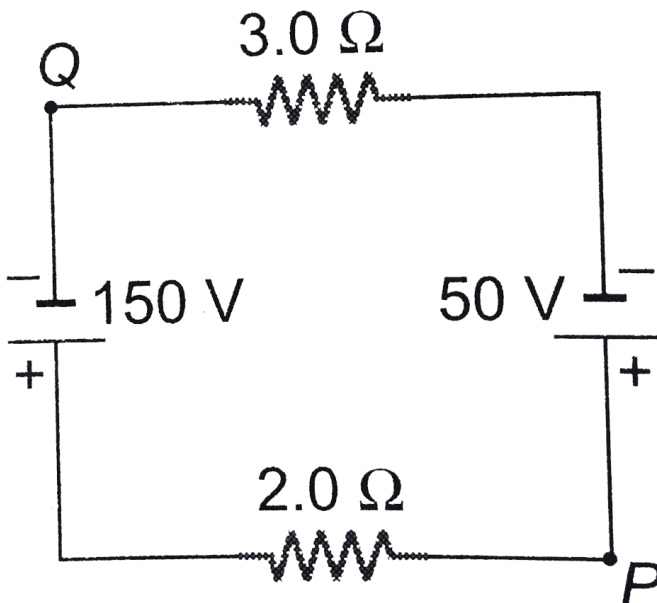
(b) Which battery is doing positive work?

(c) Which point,  $A$  or  $B$ , is at the higher potential?



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9. In Figure if the potential at Point  $P$  is  $100V$ , what is the potential at point  $Q$ ?





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10. Copper has one conduction electron per atom. Its density is  $8.89\text{g}/\text{cm}^3$  and its atomic mass.  $63.54\text{g}/\text{mol}$ . If a copper wire of diameter  $1.0\text{mm}$  carries a current of  $2.0\text{A}$ , what is the drift speed of the electrons in the wire?



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11. An aluminium wire carrying a current has diameter  $0.84\text{mm}$ . The electric field in the wire  $0.49\text{V} / \text{m}$ . What is

(a) the current carried by the wire?

(b) the potential difference between two points in the wire  $12.0\text{m}$  apart?

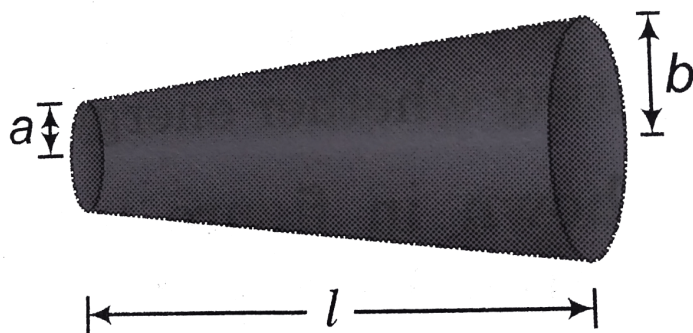
(c) the resistance of a  $12.0\text{m}$  length of this wire?

Specific resistance of aluminium is  $2.75 \times 10^{-8} \Omega - \text{m}$ .



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12. A conductor of length  $l$  has a non-uniform cross-section. The radius of cross-section varies linearly from  $a$  to  $b$ . The resistivity of the material is  $\rho$ . Find the resistance of the conductor across its ends.



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**13.** If a battery of emf  $E$  and internal resistance  $r$  is connected across a load of resistance  $R$ . Show that the rate at which energy is dissipated in  $R$  is maximum when  $R = r$  and this maximum power is  $P = E^2 / 4r$ .



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**14.** Two identical batteries each of emf  $E = 2$  volt and internal resistance  $r = 1$  ohm are

available  $t$ . produce heat in an external resistance by passing a current through it. What is the maximum power that can be developed across an external resistance  $R$  using these batteries?



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**15.** Two coils connected in series have resistance of  $600K\Omega$  and  $300\Omega$  at  $20^{\circ}C$  and temperature coefficient of  $0.001$  and  $0.004(^{\circ}C)^{-1}$  respectively. Find resistance of

the combination at a temperature of  $50^{\circ}C$ .

What is the effective temperature coefficient of combination?



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**16.** An aluminium wire  $7.5m$  long is connected in parallel with a copper wire  $6m$  long. When a current of  $5A$  is passed through the combination, it is found that the current in the aluminium wire is  $3A$ . The diameter of the aluminium wire is  $1mm$ . Determine the

diameter of the copper wire. Resistivity of copper is  $0.017\mu\Omega - m$  and that of the aluminium is  $0.028\mu\Omega - m$ .



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**17.** The potential difference between two points in a wire  $75.0cm$  apart is  $0.938V$ , when the current density is  $4.40 \times 10^7 A / m^2$ . What is

(a) the magnitude of  $E$  in the wire?

(b) the resistivity of the material of which the wire is made?



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**18.** A rectangular block of metal of resistivity  $\rho$  has dimensions  $d \times 2d \times 3d$ . A potential difference  $V$  is applied between two opposite faces of the block.

(a) To which two faces of the block should the potential difference  $V$  be applied to give the maximum current density? What is the

maximum current density?

(b) To which two faces of the block should the potential difference  $V$  be applied to give the maximum current? What is this maximum current?



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**19.** An electrical conductor designed to carry large currents has a circular cross-section  $2.50\text{mm}$  in diameter and is  $14.0\text{m}$  long. The resistance between its ends is  $0.104\Omega$ .

(a) What is the resistivity of the material?

(b) If the electric field magnitude in the conductor is  $1.28\text{V}/\text{m}$ , what is the total current?

(c) If the material has  $8.5 \times 10^{28}$  free electrons per cubic metre, find the average drift speed under the conditions of part (b).



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**20.** The resistance of a copper wire and an iron at  $20^\circ\text{C}$  are  $4.1\Omega$  and  $3.9\Omega$  respectively.

Neglecting any thermal expansion, find the temperature at which resistance of both are equal.

$$\alpha_{Cu} = 4.0 \times 10^{-3} K^{-1} \quad \text{and}$$

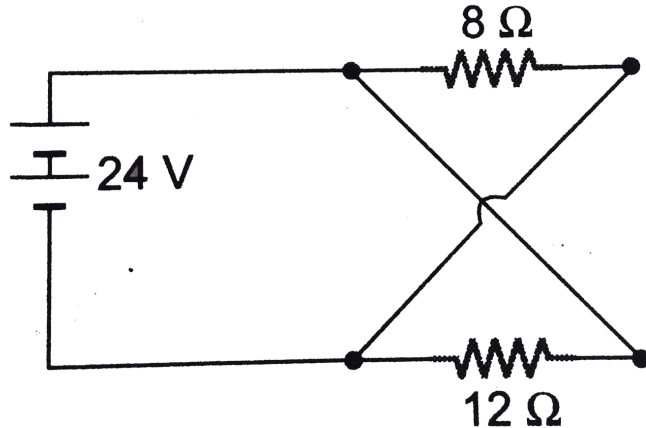
$$\alpha_{Fe} = 5.0 \times 10^{-3} K^{-1}$$



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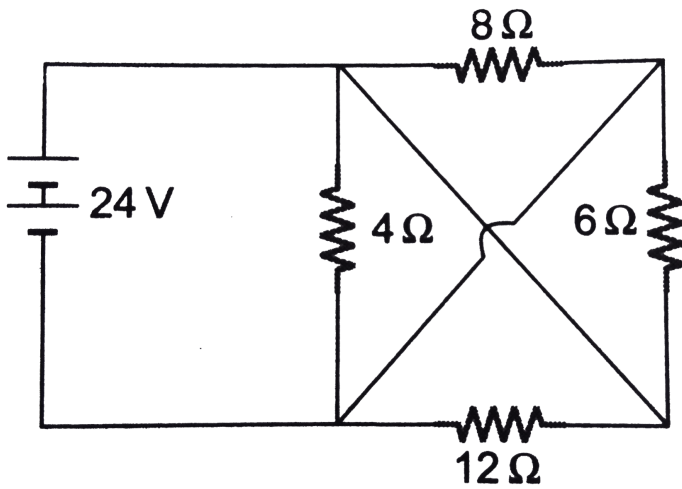
**21.** Find the current supplied by the battery in the circuit shown in figure.





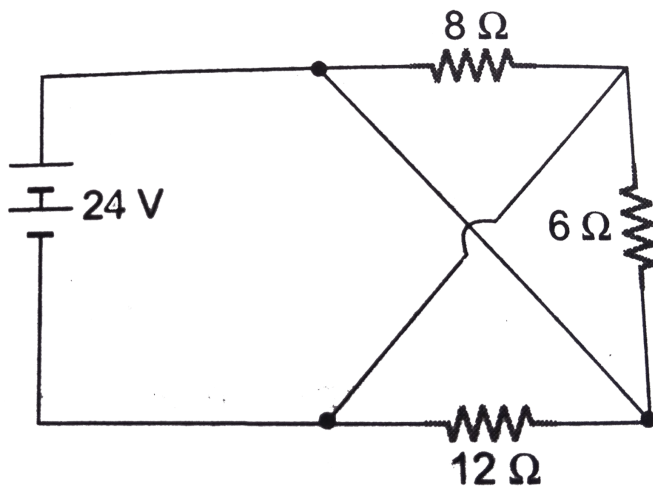
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**22.** Calculate battery current and equivalent resistance of the network shown in figure.



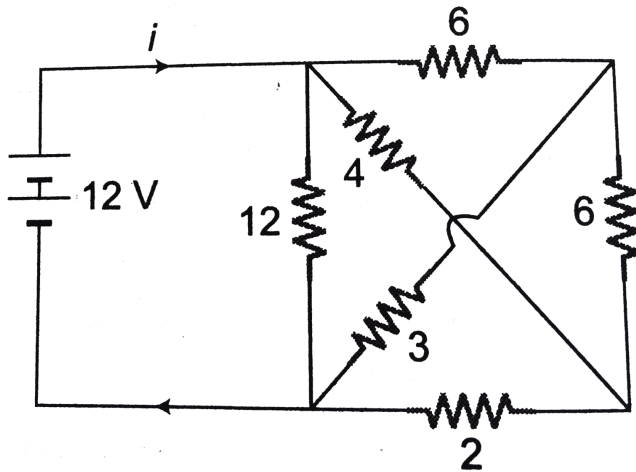
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**23.** Compute total circuit resistance and battery current as shown in figure.



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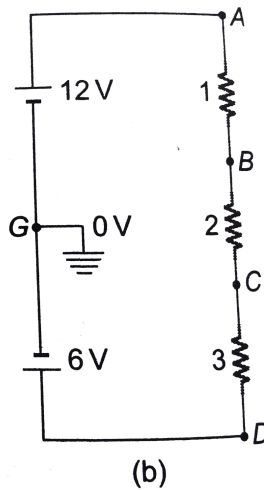
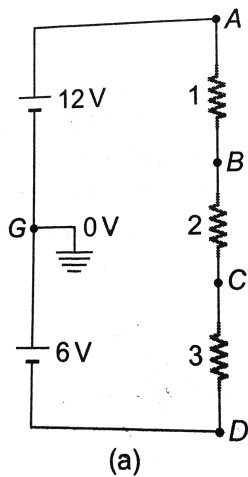
**24.** Compute the value of battery current in shown in figure. All resistance are in ohm.



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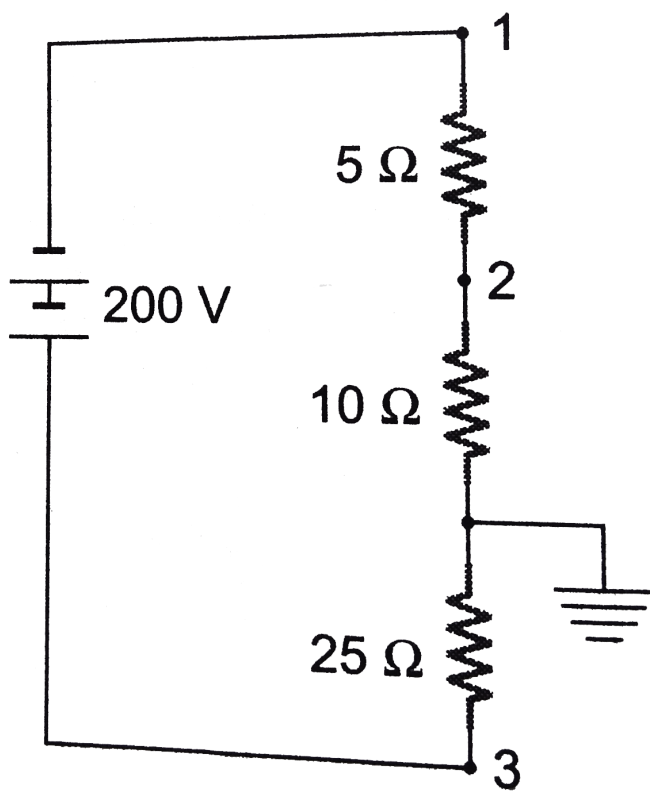
**25.** Calculate the potentials of points  $A$ ,  $B$ ,  $C$  and  $D$  as shown in Fig. a. What would be the new potential values if connections of  $6V$  battery are reversed as shown in fig b. All

resistance are on ohm.



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**26.** Give the magnitude and polarity of the following voltages in the circuit of figure:



i.  $V_1$  ii.  $V_2$  iii.  $V_3$  iv.  $V_{3-2}$

v.  $V_{1-2}$

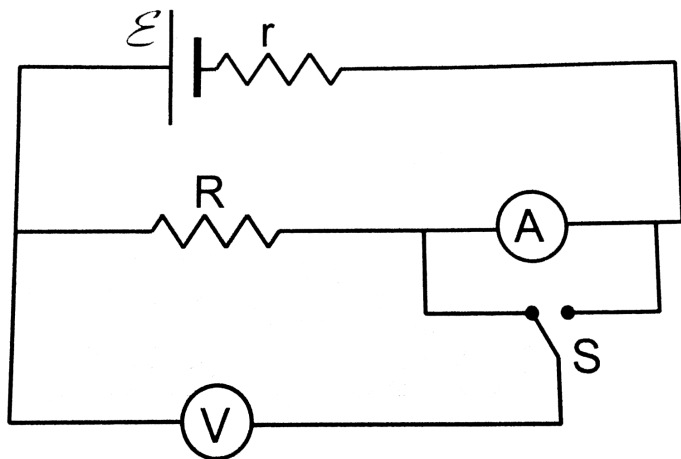
$V_{1-3}$



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27. The emf ( $\varepsilon$ ) and the internal resistance  $r$  of the battery shown in figure are  $4.3\text{V}$  and  $1.0\Omega$  respectively. The external resistance  $R$  is  $50\Omega$ . The resistances of the ammeter and voltmeter are  $2.0\Omega$  and  $200\Omega$  respectively. (a) Find the reading of the two meters. (b) The switch is thrown to the other side, What will be the readings of the two

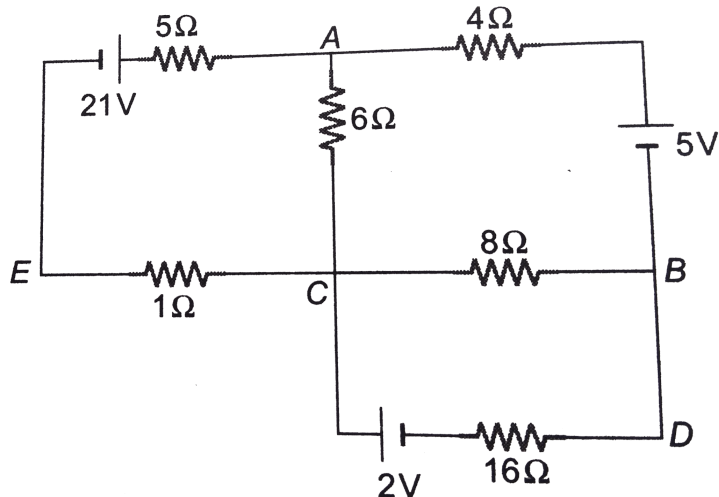
meters now?



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**28.** Find the current in each branches of the circuit.

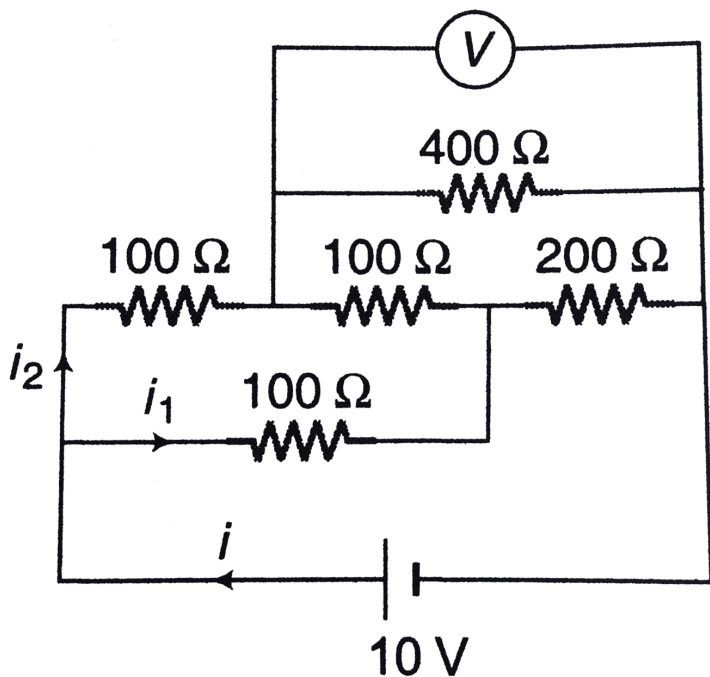




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29. An electrical circuit is shown in figure. Calculate the potential difference across the resistor of  $400\Omega$  as will be measured by the voltmeter  $V$  of resistance  $400\Omega$  either by

applying Kirchhoff's rules or otherwise.



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**30.** In the circuit shown in figure  $V_1$  and  $V_2$  are two voltmeter of resistances  $3000\Omega$  and  $2000\Omega$

respectively. In additions  $R_1 = 2000\Omega$ ,

$R_2 = 3000\omega$  and  $E = 200V$  then

a. Fid the reading of voltmeters  $V_1$  and  $V_2$

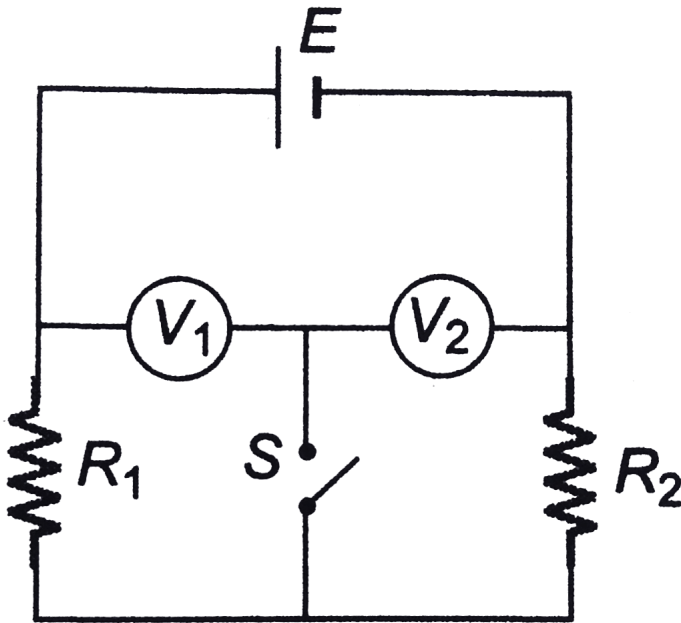
when

i. switch  $S$  is open

ii. Switch  $S$  is closed

b. Current through  $S$ , when it is closed

(Disregard the resistance of battery)



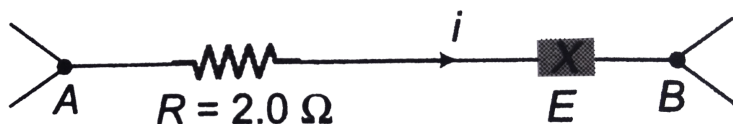
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**31.** In figure circuit section  $AB$  absorbs energy at the rate of  $5.0\text{ W}$  when a current  $i = 1.0\text{ A}$  passes through it in the indicated direction.

(a) What is the potential difference between points  $A$  and  $B$ ?

(b) Emf device  $X$  does not have internal resistance. What is its emf?

(c) What is its polarity (the orientation of its positive and negative terminals)?



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32. The potential difference across the terminals of a battery is  $8.4V$  when there is a current of  $1.50A$  in the battery from the negative to the positive terminal. When the current is  $3.50A$  in the reverse direction, the potential difference becomes  $9.4V$ .

(a) What is the internal resistance of the battery?

(b) What is the emf of the battery?



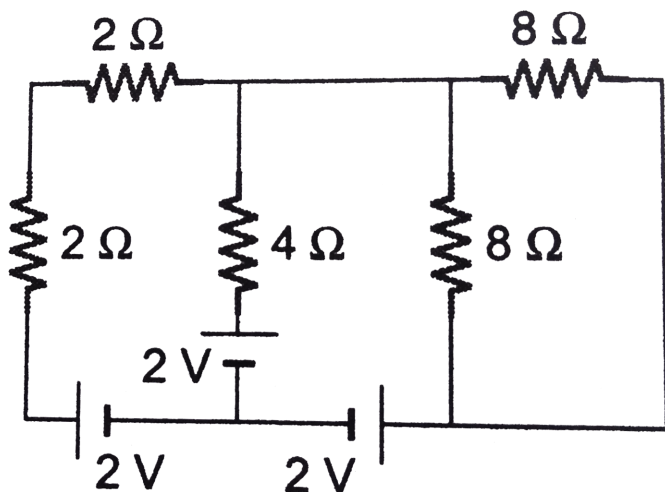
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**33.** A battery of emf  $2.0V$  and internal resistance  $0.10\Omega$  is being charged with a current of  $5.0A$ . Find the potential difference between the terminals of the battery?



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**34.** Find the currents in different resistors shown in figure



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**35.** A resistance box, a battery and a galvanometer of resistance  $G$  ohm are connected in series. the galvanometer is shunted by resistance of  $S$  ohm, find the change in resistance in the be required to

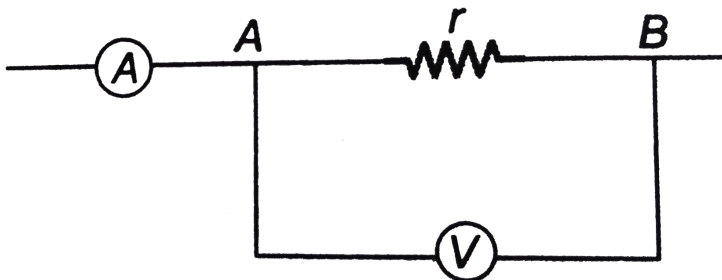


maintain the current from the battery unchanged.



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**36.** Determine the resistance  $r$  if an ammeter shows a current of  $I = 5A$  and a voltmeter  $100V$ . The internal resistance of the voltmeter is  $R = 2,500\Omega$

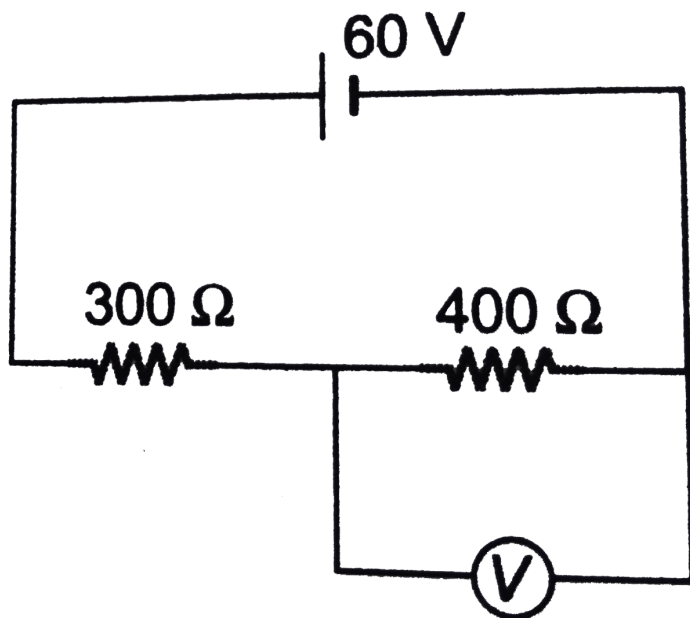




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**37.** In the circuit, a voltmeter reads  $30V$  when it is connected across  $400\ \Omega$  resistance. Calculate what the same voltmeter will read when it is connected across the  $300\Omega$

resistance?

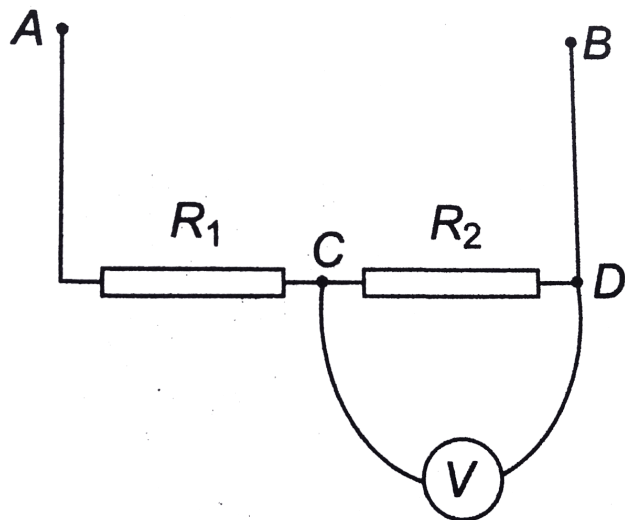


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**38.** Resistance  $R_1$  and  $R_2$ , each  $60\ \Omega$ , are connected in series. The Potential difference

between points  $A$  and  $B$  is  $120V$ . Find the reading of voltmeter connected resistance

$$r = 120\Omega$$



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**39.** A moving coil galvanometer of resistance  $20\Omega$  gives a full scale deflection when a current of  $1mA$  is passed through it. It is to be converted into an ammeter reading  $20A$  on full scale. But the shunt of  $0.005\Omega$  only is available. What resistance should be connected in series with the galvanometer coil?



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**40.** A cell of emf  $3.4V$  and internal resistance  $3\Omega$  is connected to an ammeter having resistance  $2\Omega$  and to an external resistance of  $100\Omega$ . When a voltmeter is connected across the  $100\Omega$  resistance, the ammeter reading is  $0.04A$ . Find the voltage reading by the voltmeter and its resistance. Had the voltmeter been an ideal one what would have been its reading?



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41. (a) A voltmeter with resistance  $R_v$  is connected across the terminals of a battery of emf  $E$  and internal resistance  $r$ . Find the potential difference measured by the voltmeter.

(b) If  $E = 7.50V$  and  $r = 0.45\Omega$ , find the minimum value of the voltmeter resistance  $R_v$  so that the voltmeter reading is within 1.0 % of the emf of the battery. (c) Explain why your answer in part (b) represents a minimum value.



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**42.** An ammeter with resistance  $R_A$  is connected in series with a resistor  $R$ , a battery of emf  $\mathcal{E}$  and internal resistance  $r$ . The current measured by the ammeter is  $I_A$ . Find the current through the circuit if the ammeter is removed so that the battery and the resistor form a complete circuit. Express your answer in terms of  $I_A$ ,  $r$ ,  $R_A$  and  $R$ . Show that more "ideal" the ammeter, the smaller the difference between this current and the current  $I_A$ . Itbr.

(b) If  $R = 3.80\Omega$ ,  $\mathcal{E} = 7.50V$  and  $r = 0.45\Omega$ , find the maximum value of the ammeter



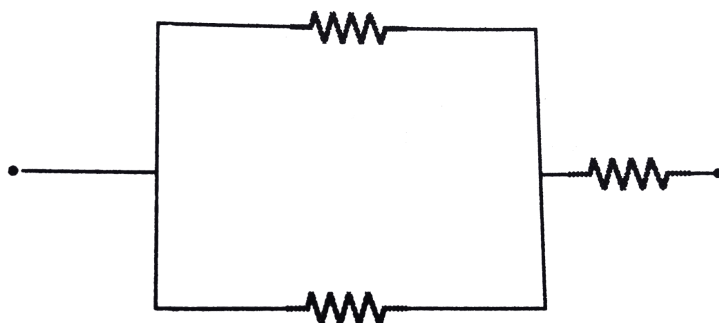
resistance  $R_A$  so that  $I_A$  is within 99 % of the current in the circuit when the ammeter is absent. (c) Explain why your answer in part (b) represents a maximum value.



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**43.** Each of three resistors in figure has a resistance of  $2.4\Omega$  and can dissipate a maximum of 36 W without becoming excessively heated. What is the maximum

power the circuit can dissipate?



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**44.** A storage battery with emf  $2.6V$  loaded with external resistance produces a current  $1A$ . In this case, the potential difference between the terminals of the storage battery equals  $2V$ . Find the thermal power generated

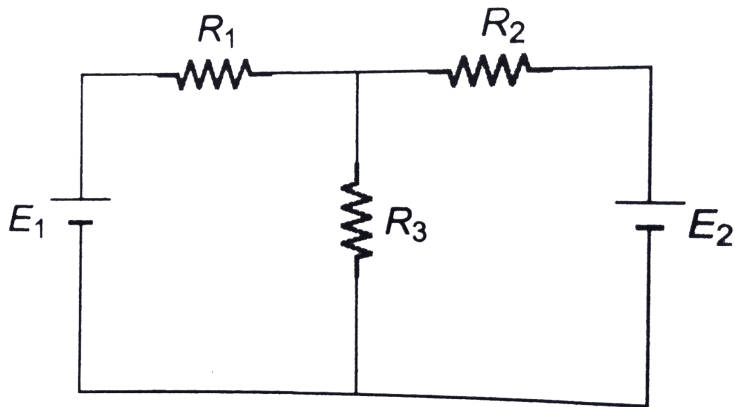
in the battery and the net power supplied by the battery for external circuit.



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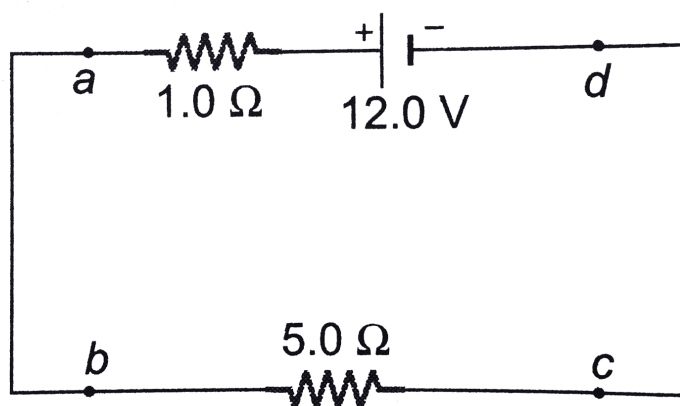
**45.** In the circuit shown in figure  $E_1 = 7V$ ,  $E_2 = 1V$ ,  $R_1 = 2\Omega$ ,  $R_2 = 2\Omega$  and  $R_3 = 3\Omega$  respectively. Find the power supplied

by the two batteries.



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46. In the circuit shown in figure find



a) the rate of conversion of internal (chemical) energy to electrical energy within the battery

(b) the rate of dissipation of electrical energy in the battery

(c) the rate of dissipation of electrical energy in the external resistor.



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**47.** Three resistors having resistances of  $1.60\Omega$ ,  $2.40\Omega$  and  $4.80\Omega$  are connected in parallel to a  $28.0V$  battery that has negligible internal resistance. Find

(a) the equivalent resistance of the combination.

(b) the current in each resistor.

(c) the total current through the battery.

(d) the voltage across each resistor.

(e) the power dissipated in each resistor.

(f) which resistor dissipates the maximum

power the one with the greatest resistance or the least resistance? Explain why this should be.



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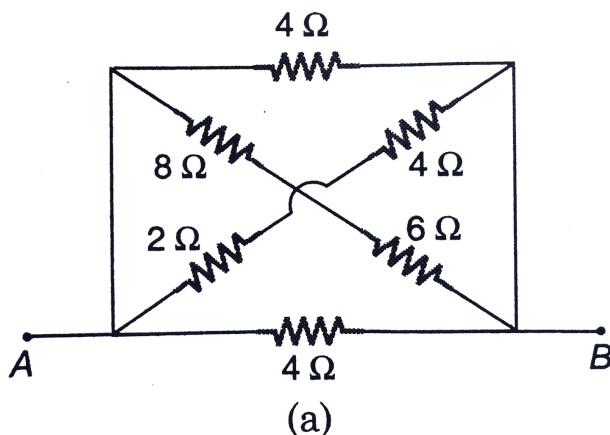
**48.** The power of resistor is the maximum power the resistor can safely dissipate without too rise in temperature. The power rating of a  $15k\Omega$  resistor is  $5.0W$ . What is the maximum allowable potential difference across the terminals of the resistor?

(b) A  $9.0k\Omega$  resistor is to be connected across a  $120V$  potential difference. What power rating is required?

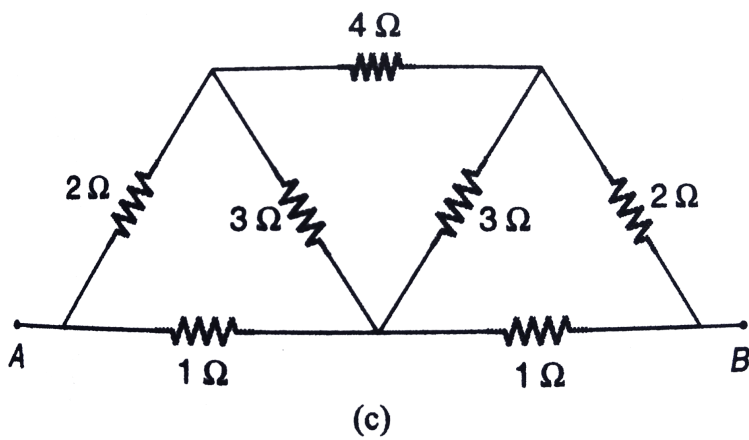
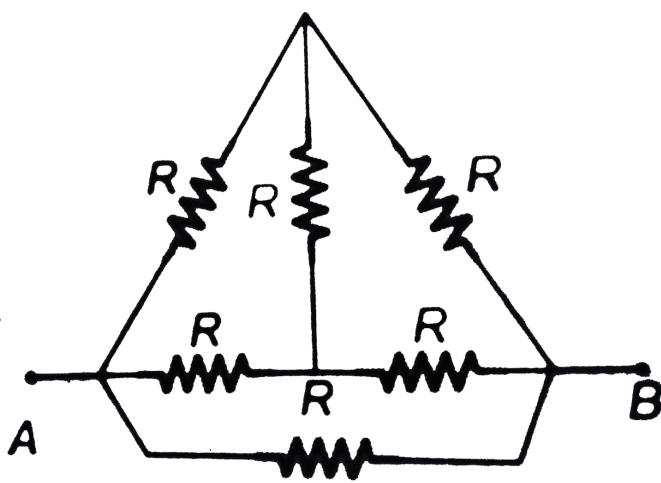


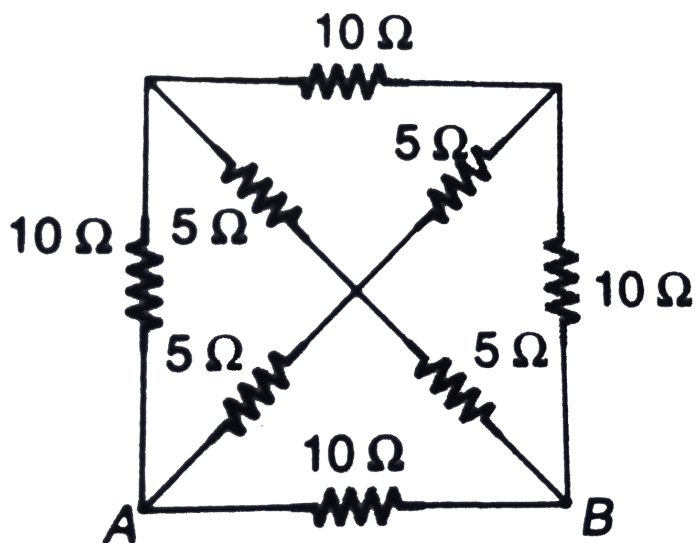
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49. Find the equivalent resistance between points  $A$  and  $B$  in the following circuits?

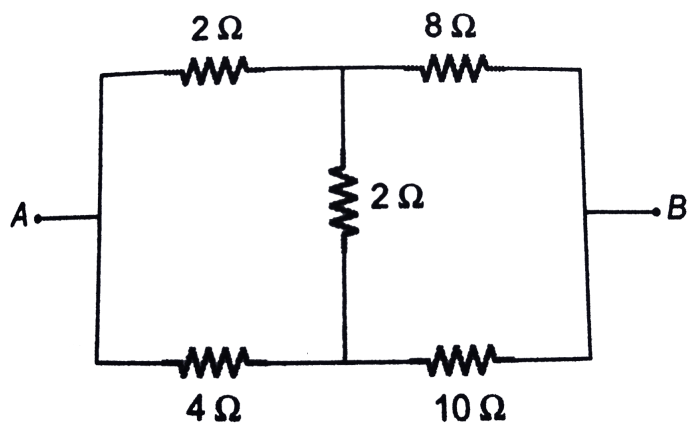


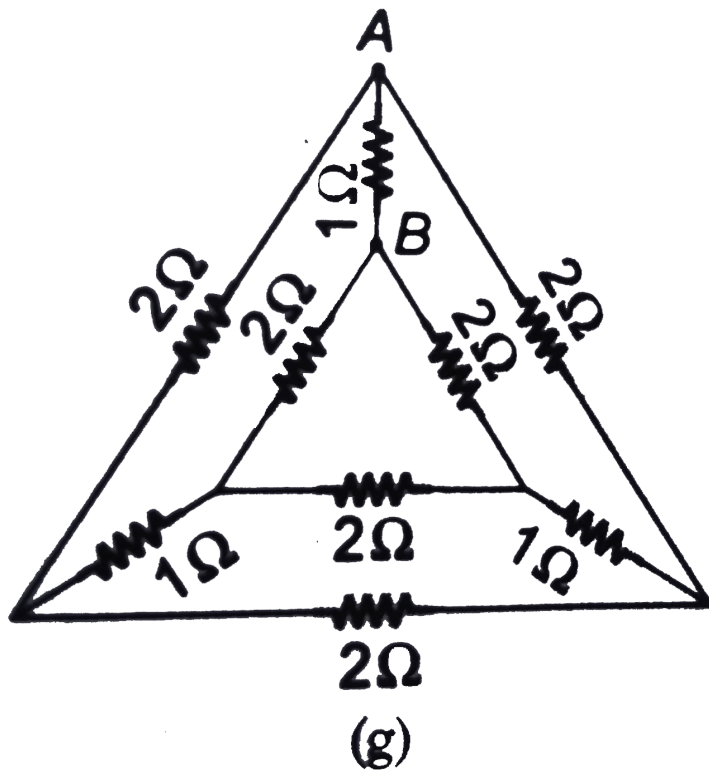
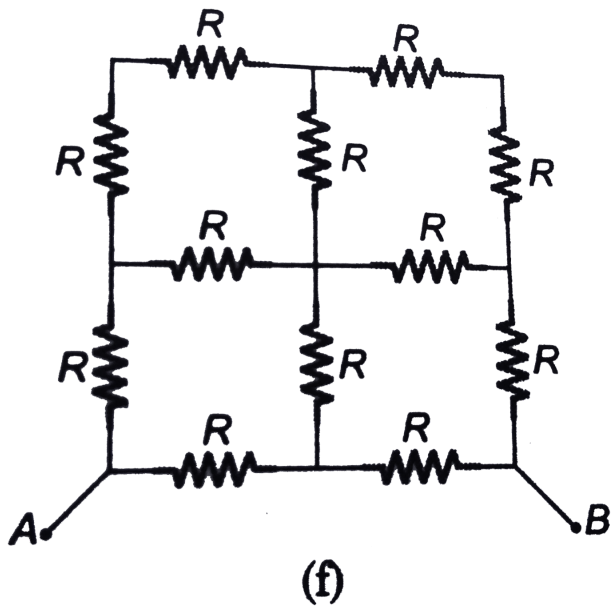






(d)

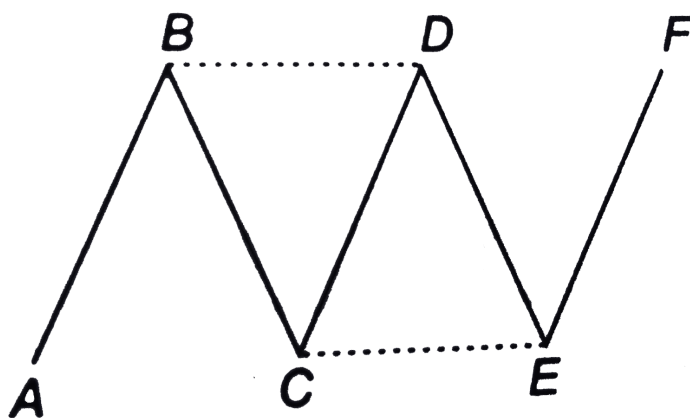






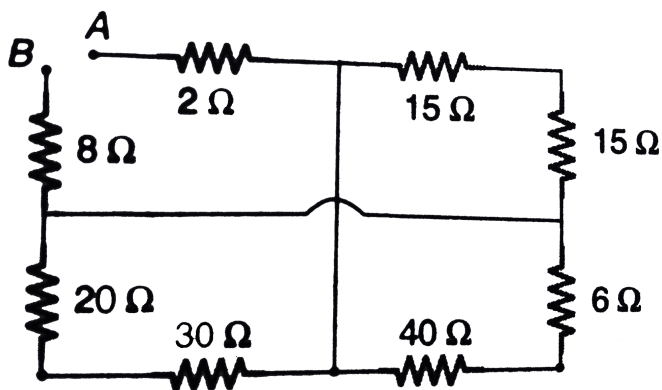
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50. What will be the change in the resistance of a circuit between  $A$  and  $F$  consisting of five identical conductors, if two similar conductors are added as shown by the dashed line in figure?



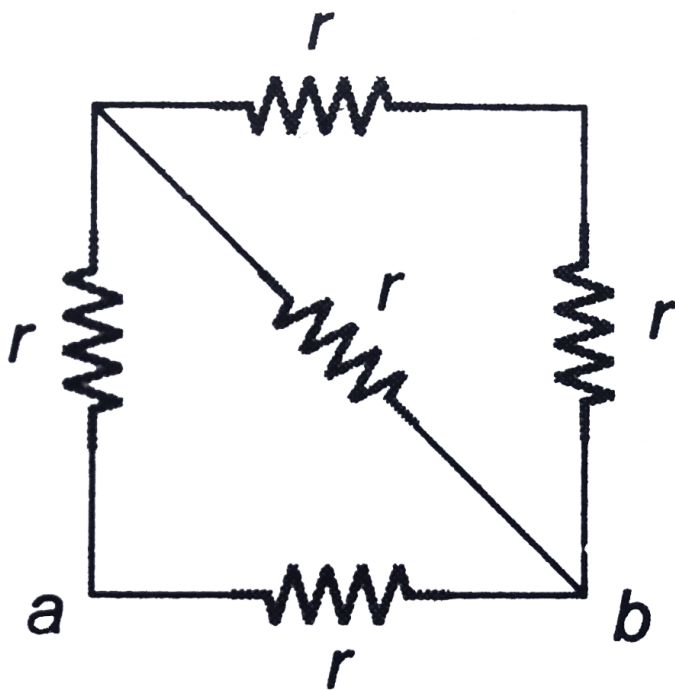
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51. Find  $R_{AB}$  in the circuit shown in figure.

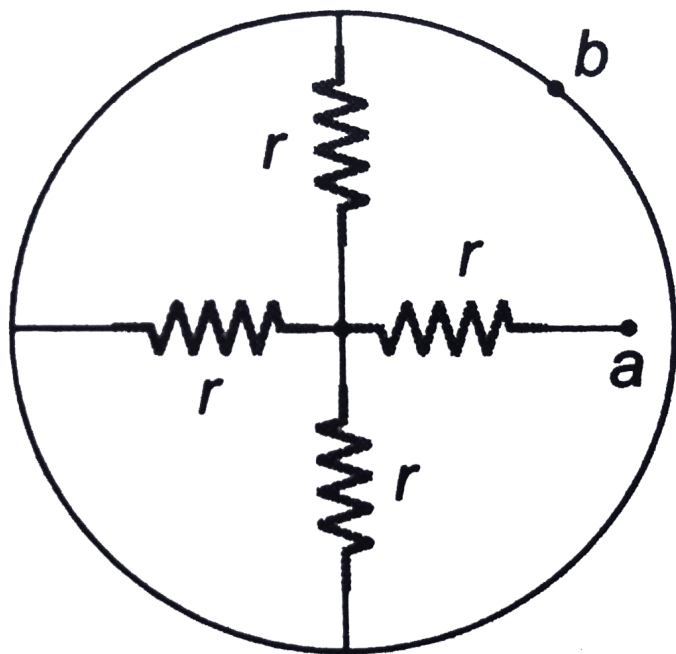
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52. Find the equivalent resistance of the networks shown in figure between the points

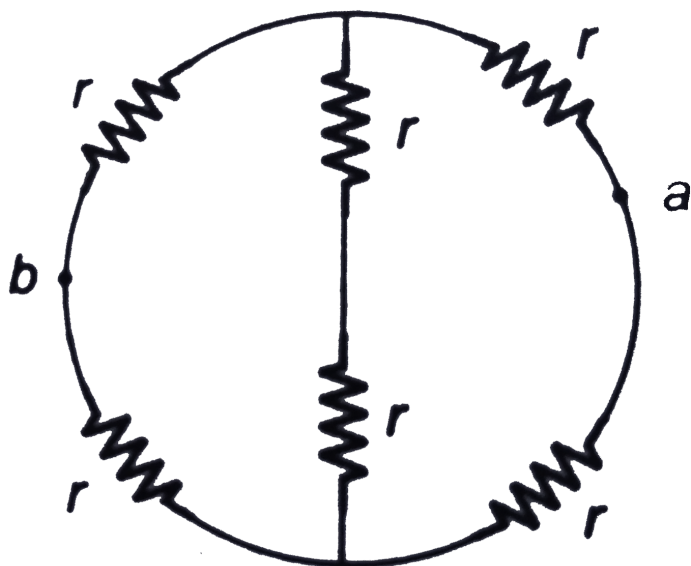
a and b.



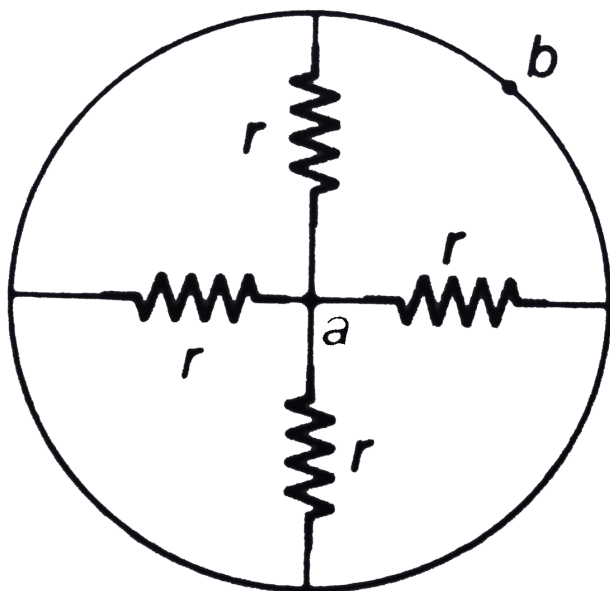
(a)



(b)

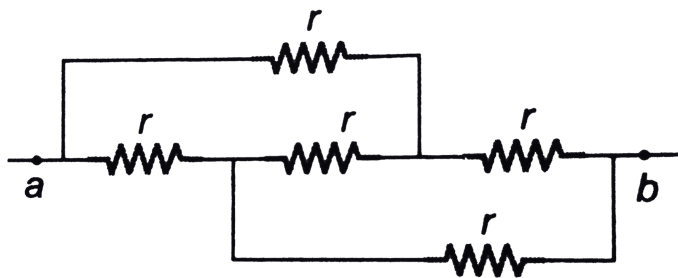


(c)



(d)



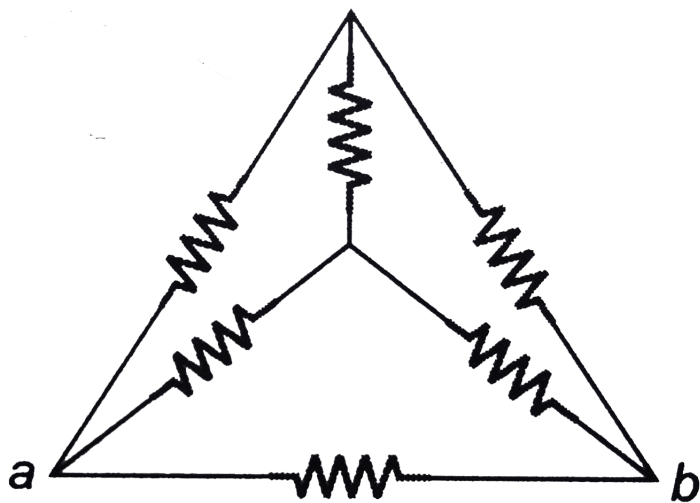


(e)

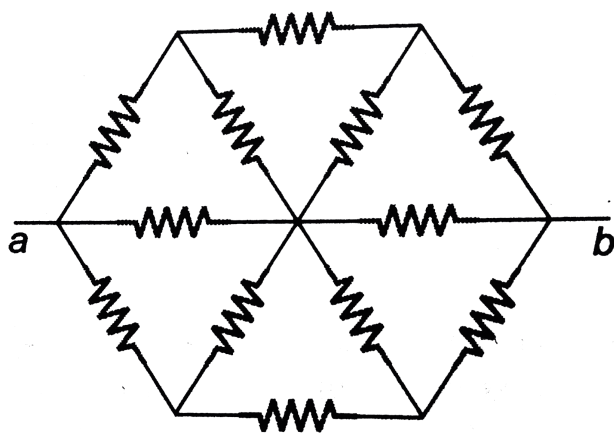


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**53.** Find the equivalent resistance of the circuits shown in figure between the points  $a$  and  $b$ . Each resistor has a resistance  $r$ .



(a)



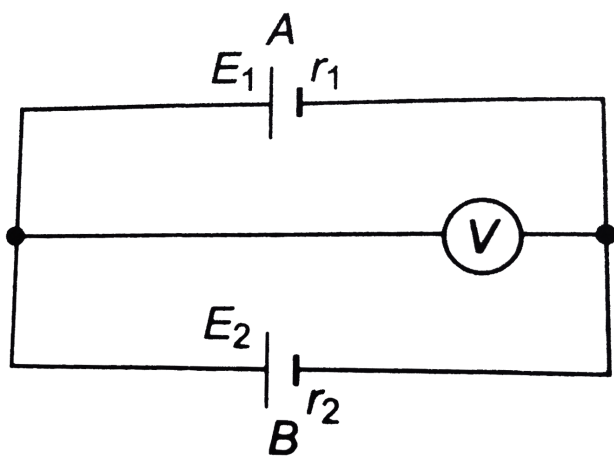
(b)



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## Level 2 Single Correct

1. Two cells  $A$  and  $B$  of emf  $1.3V$  and  $1.5V$  respectively are arranged as shown in figure. The voltmeter reads  $1.45V$ . The voltmeter is assumed to be ideal. Then



A.  $r_1 = 2r_2$

B.  $r_1 = 3r_2 - 2$

C.  $r_2 = 2r_1$

D.  $r_2 = 3r_1$

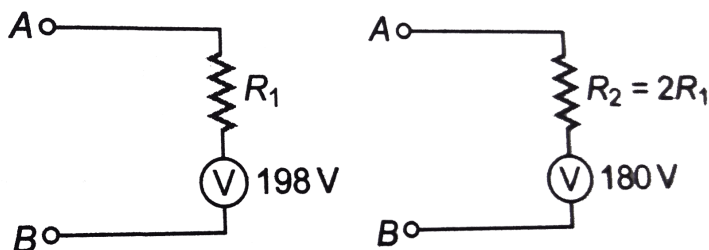
**Answer: B**



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2. A voltmeter connected in series with a resistance  $R_1$  to a circuit indicates a voltage  $V_1 = 198V$ . When a series resistor  $R_2 = 2R_1$

is used, the voltmeter indicates as voltage  $V_2 = 180V$ . If the resistance of the voltmeter is  $R_V = 900\Omega$ , then the applied voltage across  $A$  and  $B$  is



A. 210V

B. 200V

C. 220V

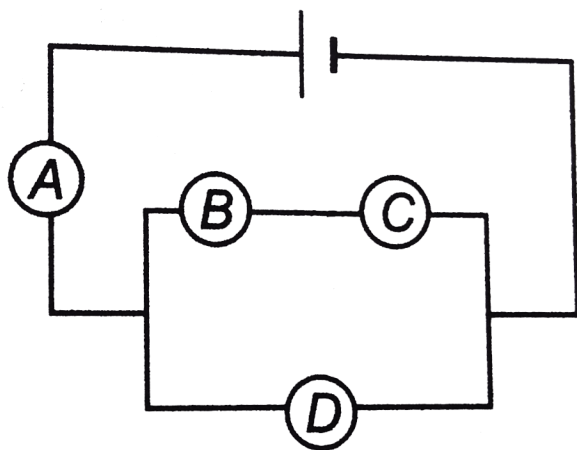
D. 240V

**Answer: C**



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3. All bulbs in the circuit shown in figure are identical. Which bulb glows most brightly?



A. *B*

B.  $A$

C.  $D$

D.  $C$

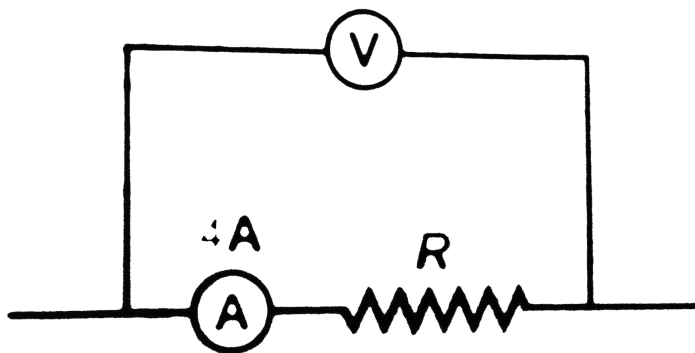
**Answer: B**



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4. A student connects an ammeter  $A$  and a voltmeter  $V$  to measure a resistor as shown in figure. If the voltmeter reads  $20V$

and the ammeter reads  $4A$ , then  $R$  is



- A. equal to  $5\Omega$
- B. greater than  $5\Omega$
- C. less than  $5\Omega$
- D. greater or less than  $5\Omega$  depending upon  
the direction of current

**Answer: C**

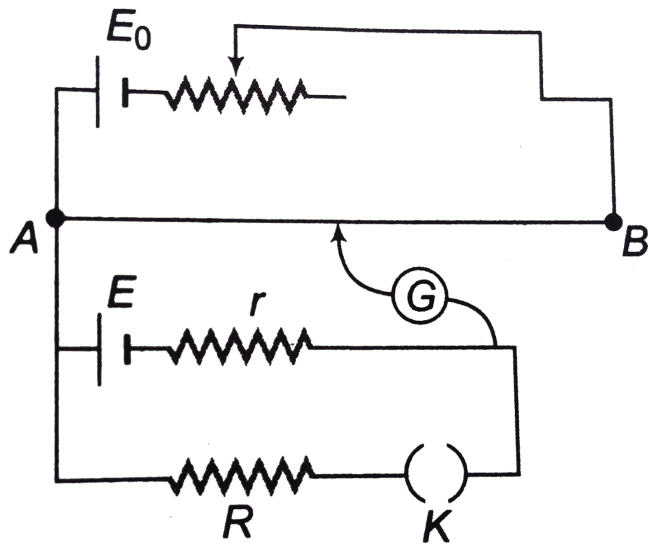




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5. The given figure represents an arrangement of potentiometer for the calculation of internal resistance ( $r$ ) of the unknown battery ( $E$ ). The balance length is  $70.0\text{cm}$  with the key opened and  $60.0\text{cm}$  with the key closed.  $R$  is  $132.40\Omega$ . The internal resistance ( $r$ ) of the

unknown cell will be



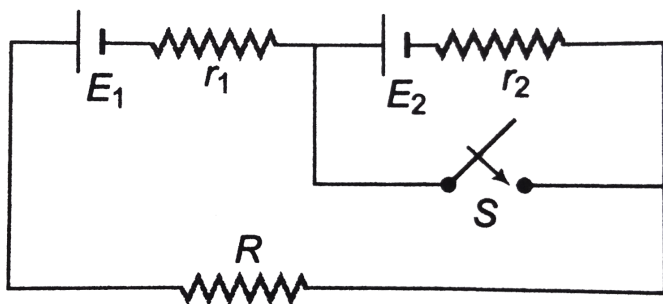
- A.  $22.1\Omega$
- B.  $113.5\Omega$
- C.  $154.5\Omega$
- D.  $10\Omega$

Answer: A



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6. Switch  $S$  is closed at time  $t = 0$ . Which one of the following statements is correct?



A. Current in the resistance  $R$  increases if

$$E_1 r_2 < E_2 (R + r_1)$$

B. Current in the resistance  $R$  increases if

$$E_1 r_2 > E_2 (R + r_1)$$

C. Current in the resistance  $R$  decreases if

$$E_1 r_2 > E_2 (R + r_1)$$

D. Current in the resistance  $R$  decreases if

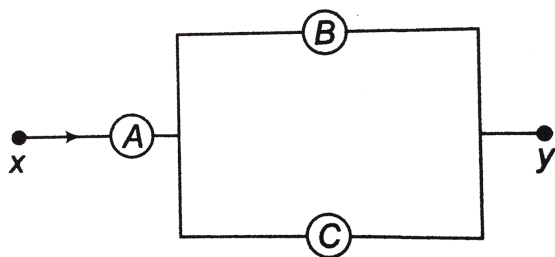
$$E_1 r_2 = E_2 (R + r_1)$$

**Answer: B**



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7.  $A$ ,  $B$  and  $C$  are voltmeters of resistances  $R$ ,  $1.5R$  and  $3R$  respectively. When some potential difference is applied between  $x$  and  $y$  the voltmeter readings are  $V_A$ ,  $V_B$  and  $V_C$ , then



A.  $V_A = V_B = V_C$

B.  $V_A \neq V_B = V_C$

C.  $V_A = V_B \equiv V_C$

D.  $V_A + V_B = V_C$

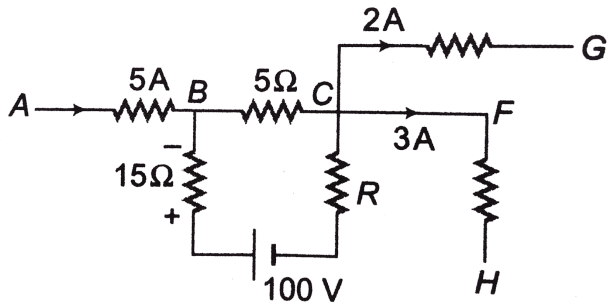
**Answer: A**



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**8.** In the circuit shown the voltage drop across the  $15\Omega$  resistor is  $30V$  having the polarity as indicated. The ratio of potential difference

across  $5\Omega$  and resistance  $R$  is



A.  $2/7$

B.  $0.4$

C.  $5/7$

D.  $1$

**Answer: D**

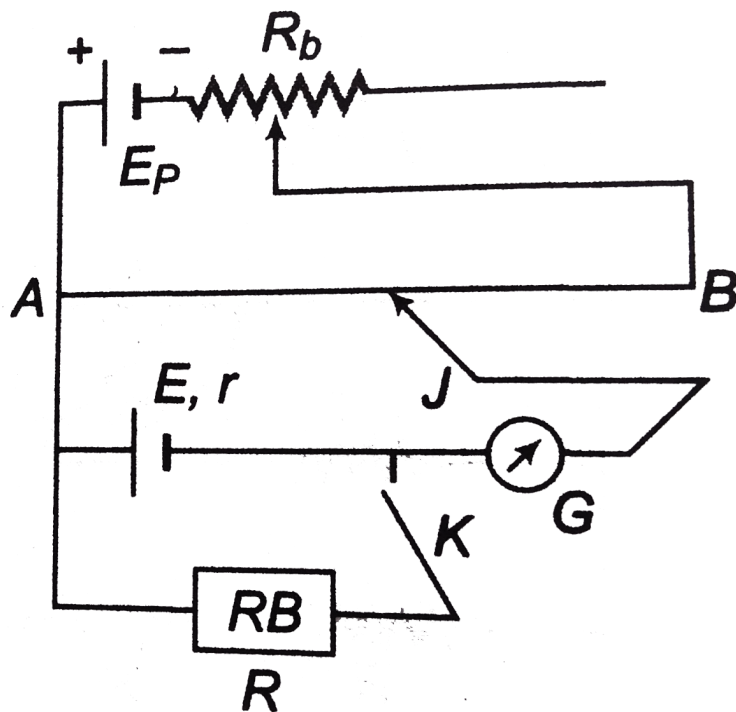


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9. In an experiment on the measurement of internal resistance of a cell by using a potentiometer, when the key  $K$  is kept open then balancing length is obtained at  $y$  metre. When the key  $K$  is closed and some resistance  $R$  is inserted in the resistance box, then the balancing length is found to be  $x$  metre. Then



the internal resistance is



A.  $\frac{(x - y)}{y} R$

B.  $\frac{(y - x)}{x} R$

C.  $\frac{(y - x)}{y} R$

D.  $\frac{(x - y)}{x} R$

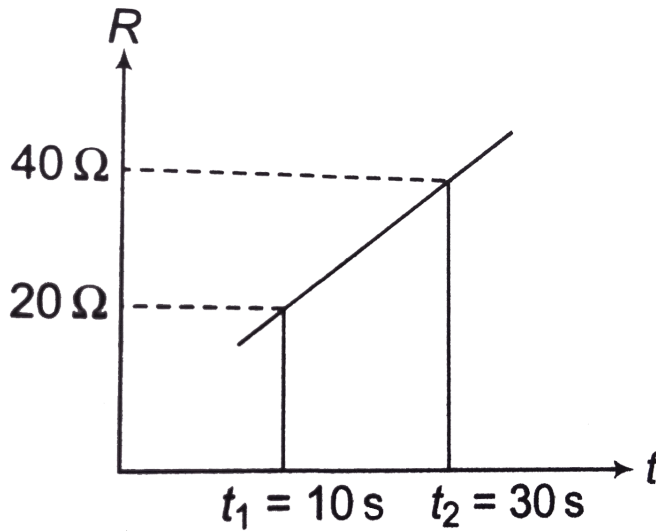
**Answer: B**



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**10.** A source of emf  $E = 10V$  and having negligible internal resistance is connected to a variable resistance. The resistance varies as shown in figure. The total charge that has passed through the resistor  $R$  during the time

interval from  $t_1$  or  $t_2$  is



- A.  $40 \log_4$
- B.  $30 \log_e 3$
- C.  $20 \log_e 2$
- D.  $10 \log_e 2$

**Answer: D**



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11. In order to increase the resistance of a given wire of unknown of uniform cross section to four times its value, a fraction of its length is stretched uniformly till the full length of the wire becoes  $\frac{3}{2}$  times the original length. What is the value of this fraction?

A.  $\frac{1}{4}$

B.  $\frac{1}{8}$

C.  $\frac{1}{16}$

D.  $\frac{1}{6}$

**Answer: B**



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**12.** In a meter bridge, null point is  $20\text{cm}$ , when the known resistance  $R$  is shunted by  $10\Omega$  resistance, null point is found to be shifted by  $10\text{ cm}$ . Find the unknown resistance  $X$ .

A.  $10\text{cm}$

B.  $20\text{cm}$

C.  $30\text{cm}$

D.  $40\text{cm}$

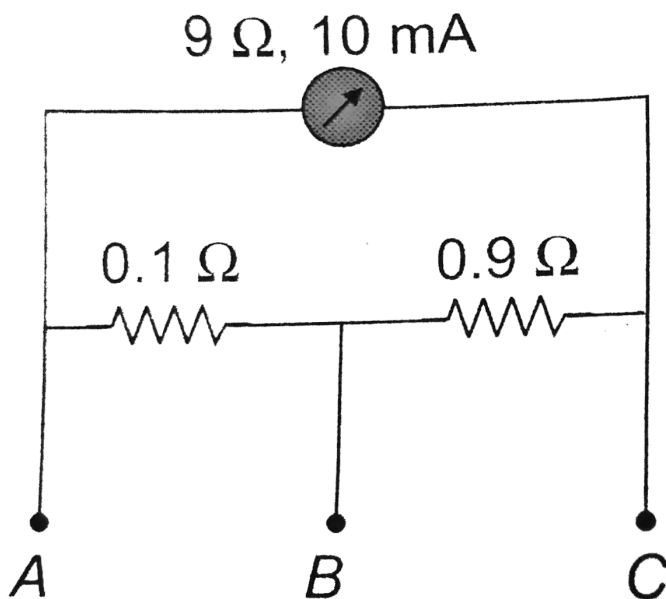
**Answer: B**



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**13.** A milliammeter of range  $10\text{mA}$  and resistance  $9\Omega$  is joined in a circuit as shown. The metre gives full-scale deflection for current  $I$  when  $A$  and  $B$  are used as its

terminals, i.e., current enters at  $A$  and leaves at  $B$  ( $C$  is left isolated). The value of  $I$  is



A.  $100\text{mA}$

B.  $900\text{mA}$

C.  $1\text{A}$

D.  $1.1A$

**Answer: C**

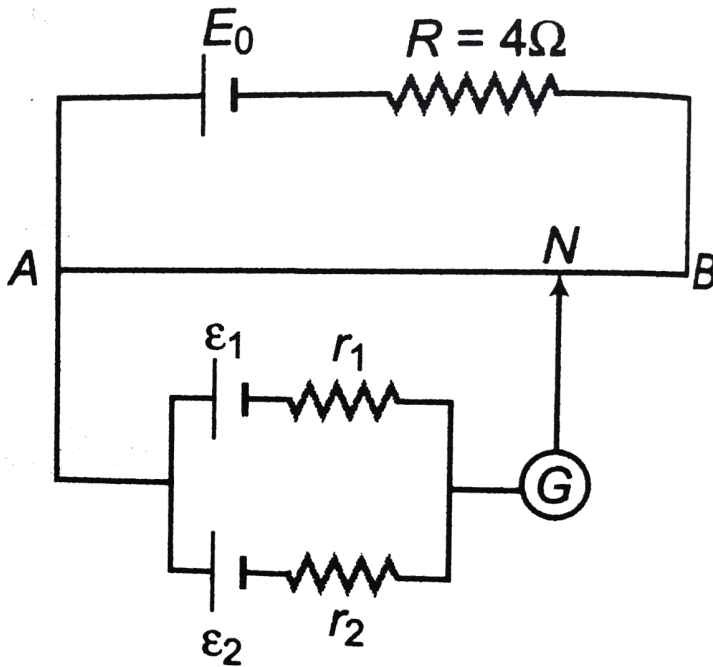


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**14.** A battery of emf  $E_0 = 12V$  is connected across a  $4m$  long uniform wire having resistance  $4\Omega/m$ . The cell of small emfs  $\varepsilon_1 = 2V$  and  $\varepsilon_2 = 4V$  having internal resistance  $2\Omega$  and  $6\Omega$  respectively are connected as shown in the figure. If



galvanometer shows no deflection at the point  $N$  the distance of points  $N$  from the point  $A$  is equal to



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

B.  $\frac{4}{3}m$

C.  $\frac{3}{2}m$

D. none of these

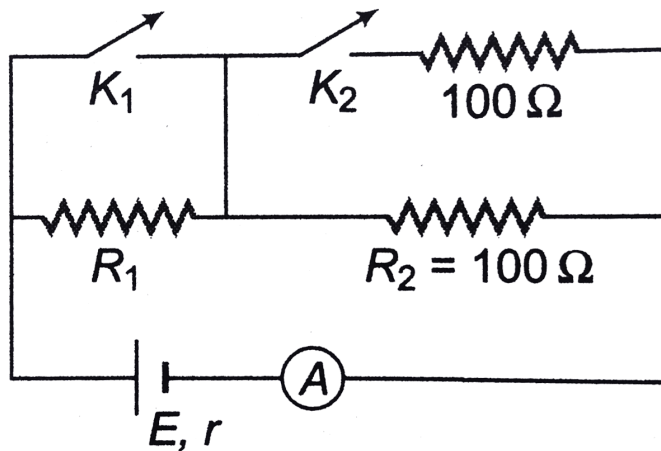
**Answer: D**



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**15.** In the circuit shown, keys  $K_1$  and  $K_2$  both are closed the ammeter reads  $I_0$ . But when  $K_1$  is open and  $K_2$  is closed, the ammeter reads  $I_0/2$ . Assuming that ammeter resistance is much less than  $R_2$ , the values of  $r$  and  $R_1$  is

Omega are



A. 25,50

B. 25100

C. 0,100

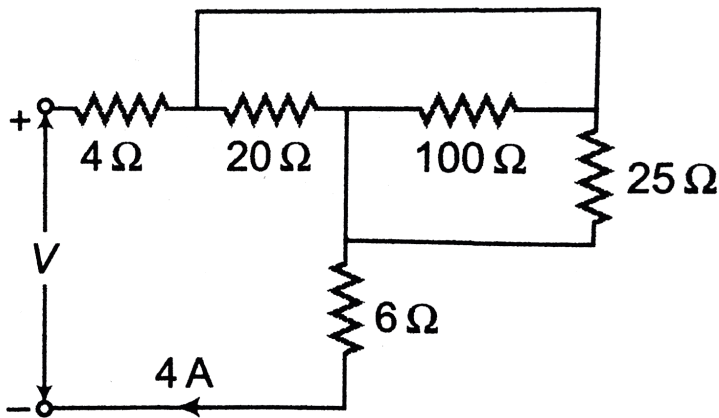
D. 0,50

**Answer: D**



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16. In the circuit shown in figure ,  $V$  must be



A.  $50\text{V}$

B.  $80\text{V}$

C.  $100\text{V}$

D.  $1290V$

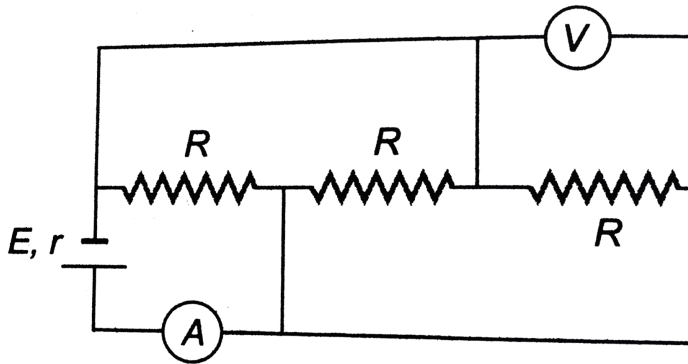
**Answer: B**



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**17.** In the circuit shown in figure ammeter and voltmeter are ideal. If  $E = 4V$ ,  $R = 9\Omega$  and  $r = 1\Omega$  then readings of ammeter and

voltmeter are



A.  $1A, 3V$

B.  $2A, 3V$

C.  $3A, 4V$

D.  $4A, 4V$

**Answer: A**



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18. A moving coil galvanometer is converted into an ammeter reading up to  $0.03A$  by connecting a shunt of resistance  $\frac{r}{4}$ . What is the maximum current which can be sent through this galvanometer if no shunt is used (here  $r$ =resistance of galvanometer)

A.  $0.004A$

B.  $0.005A$

C.  $0.006A$

D.  $0.008A$

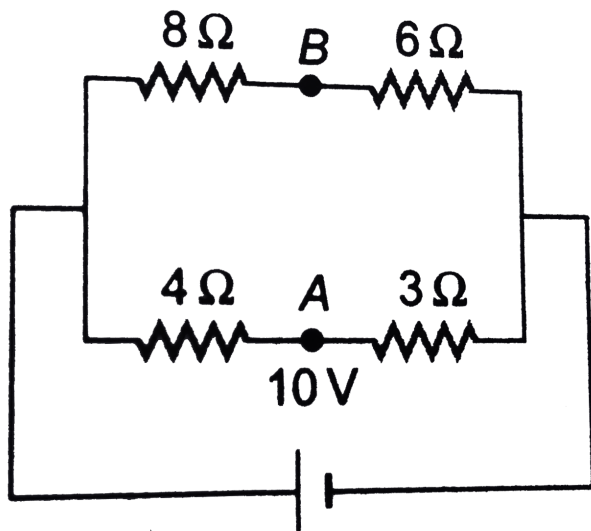
**Answer: C**



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**19.** 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

**Answer: D**



20. Two wires  $A$  and  $B$  made of same material and having their lengths in the ratio  $6:1$  are connected in series. The potential difference across the wire  $3V$  and  $2V$  respectively. If  $r_A$  and  $r_B$  are the radii of  $A$  and  $B$  respectively, then  $\frac{r_B}{r_A}$  is

A.  $\frac{1}{4}$

B.  $\frac{1}{2}$

C.  $1$

D. 2

**Answer: B**



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21. A galvanometer of resistance  $50\Omega$  is connected to a battery of  $3V$  along with resistance of  $2950\Omega$  in series. A full scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this

deflection to 20 division the above series  
resistance should be

A.  $4450\Omega$

B.  $5050\Omega$

C.  $5550\Omega$

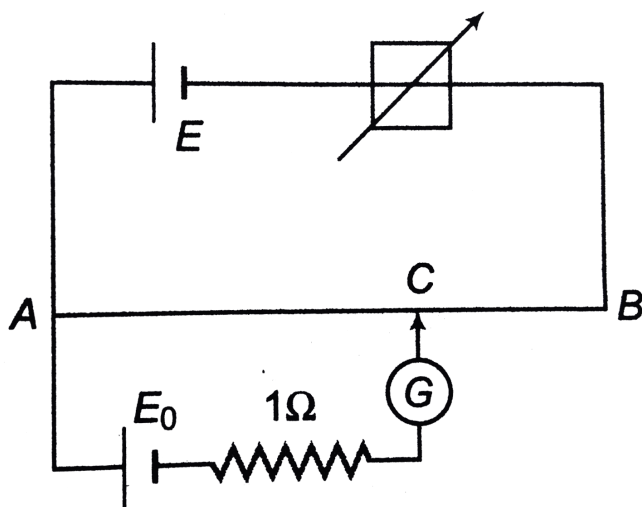
D.  $6050\Omega$

**Answer: A**



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22. Figure shows a potentiometer arrangement with  $R_{AB} = 10\Omega$  and rheostat of variable resistance  $d$ . For  $x = 0$  null deflection point is found at  $20\text{cm}$  from  $A$ . For unknown value of  $x$  null deflection point was at  $30\text{cm}$  from  $A$ , then the value of  $x$  is



A.  $10\Omega$

B.  $5\Omega$

C.  $2\Omega$

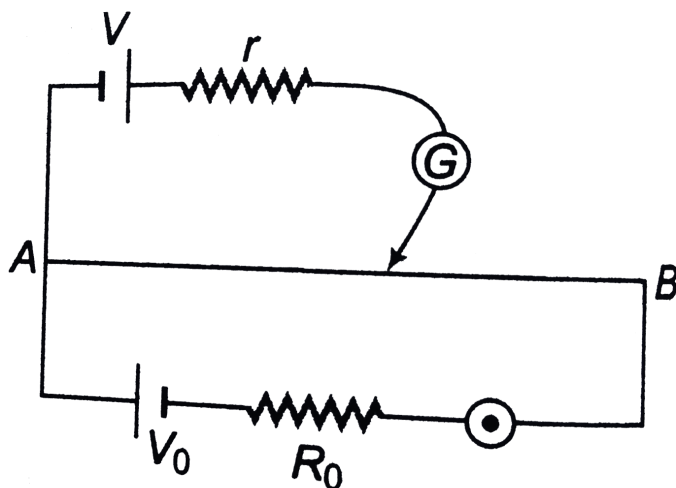
D.  $1\Omega$

**Answer: B**



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**23.** In the given potentiometer arrangement the null point



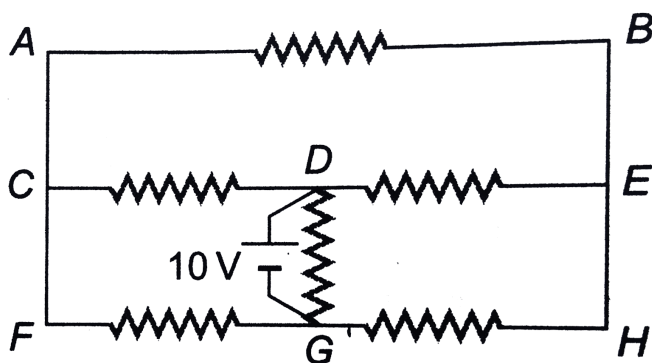
- A. can be obtained for any value of  $V$
- B. can be obtained only if  $V < V_0$
- C. can be obtained only if  $V > V_0$
- D. can never be obtained

**Answer: D**



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24. All resistance shown in the circuit are  $2\Omega$  each. The current in the resistance between  $D$  and  $E$  is



A.  $5A$

B.  $2.5A$



C.  $1A$

D.  $7.5A$

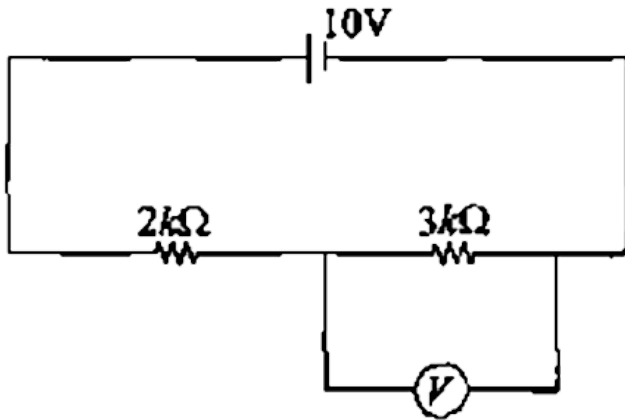
**Answer: B**



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**25.** In the circuit shown in figure-3.334, the resistance of voltmeter is  $6k\Omega$ . The voltmeter

reading will be :



A.  $6V$

B.  $5V$

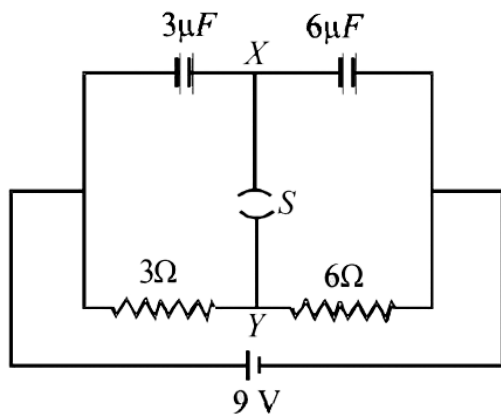
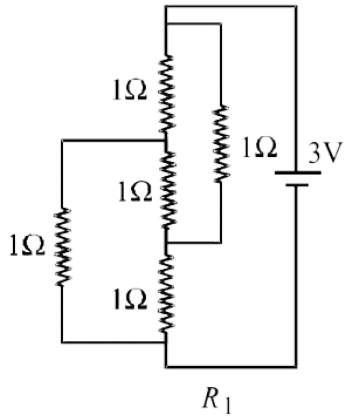
C.  $4V$

D.  $3V$

**Answer: B**



**26.** Figure shows three resistor configurations  $R_1$ ,  $R_2$  and  $R_3$  connected to 3V battery. If the power dissipated by the configuration  $R_1$ ,  $R_2$  and  $R_3$  is  $P_1$ ,  $P_2$  and  $P_3$ , respectively. Then -



A. 1 : 1 : 1

B. 4 : 4 : 1

C. 4 : 1 : 1

D. 1 : 4 : 4

**Answer: D**



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## Level 2 More Than One Correct

1. Two heaters designed for the same voltage  $V$  have different power ratings. When connected individually across a source of voltage  $V$ , they produce  $H$  amount of heat each in time  $t_1$  and  $t_2$  respectively. When used

together across the same source, they produce

H amount of heat in time  $t$

A. if they are in series  $t = t_1 + t_2$

B. if they are in series  $t = 2(t_1 + t_2)$

C. if they are in parallel  $t = \frac{t_1 t_2}{(t_1 + t_2)}$

D. if they are in parallel  $t = \frac{t_1 t_2}{2(t_1 + t_2)}$

**Answer: A::C**



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2. Two cells of emf  $E_1 = 6V$  and  $E_2 = 5$  are joined in parallel with same polarity on same side without any external load. If their internal resistance are  $r_1 = 2\Omega$  and  $r_2 = 3\Omega$  respectively, then

A. terminal potential difference across any

cell is less than  $5V$

B. terminal potential differences any cell is

$5.6V$

C. current through the cells is  $0.2A$

D. current through the cells is zero if

$$E_1 = E_2$$

**Answer: B::C::D**

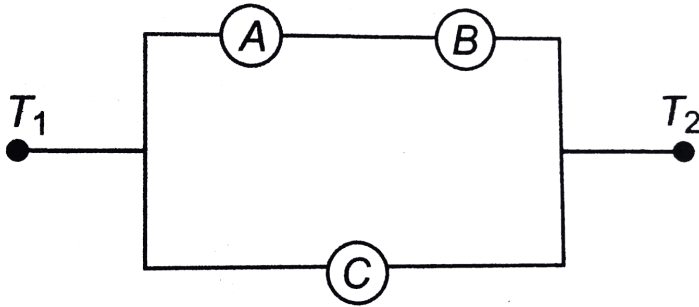


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**3.** Three ammeters  $A$ ,  $B$ , and  $C$  of resistances  $R_A$ ,  $R_b$  and  $R_C$  respectively are joined as shown. When some potential difference is applied across the terminals  $T_1$  and  $T_2$  their



readings are  $I_A$ ,  $I_B$  and  $I_C$  respectively Then,



A.  $I_A = I_B$

B.  $I_A R_A + I_B R_B = I_C R_C$

C.  $\frac{I_A}{I_C} = \frac{R_C}{R_A}$

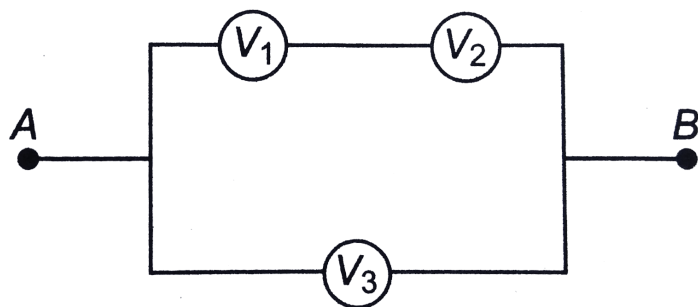
D.  $\frac{I_B}{I_C} = \frac{R_C}{R_A + R_B}$

**Answer: A::B::D**



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4. Three voltmeters all having different resistance, are joined as shown. When some potential difference is applied across  $A$  and  $B$ , their readings are  $V_1$ ,  $V_2$  and  $V_3$ . Then



A.  $V_1 = V_2$

B.  $V_1 \neq V_2$

C.  $V_1 + V_2 = V_3$

D.  $V_1 + V_2 > V_3$

**Answer: B::C::D**



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5. Two conductors made of the same material have lengths  $L$  and  $2L$  but have equal resistance. The two are connected in series in a circuit which current is flowing. Which of the following is/are correct?

A. The potential difference across the two conductors is the same

B. the drift speed is larger in conductor of length  $L$

C. The electric field in the first conductor is twice that in the second

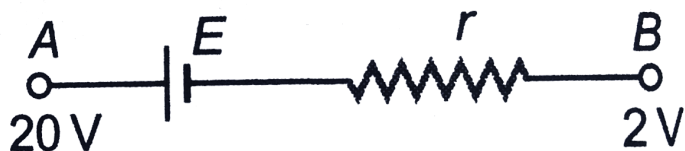
D. the electric field in the second conductor is twice that in the first

**Answer: A::B::C**



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6. In the figure shown



A. current will flow from  $A$  to  $B$

B. current may flow  $A$  to  $B$

C. current may flow from  $B$  to  $A$

D. the direction of current will depend on

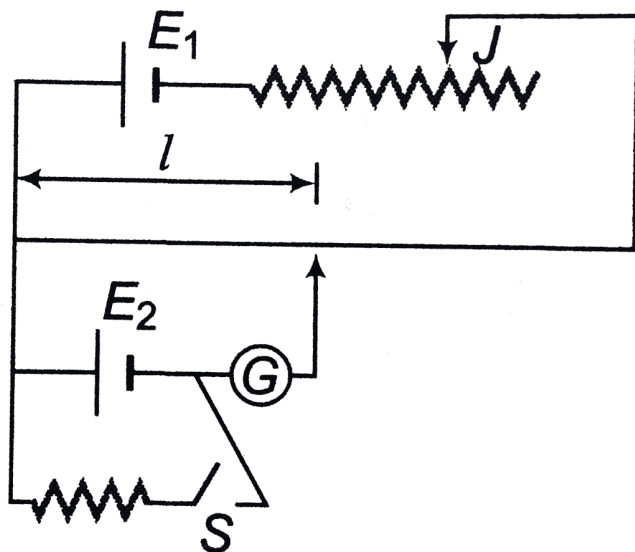
$E$

Answer: B::C::D



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7. In the potentiometer experiment shown in figure, the null point length is  $l$ . Choose the correct options given below



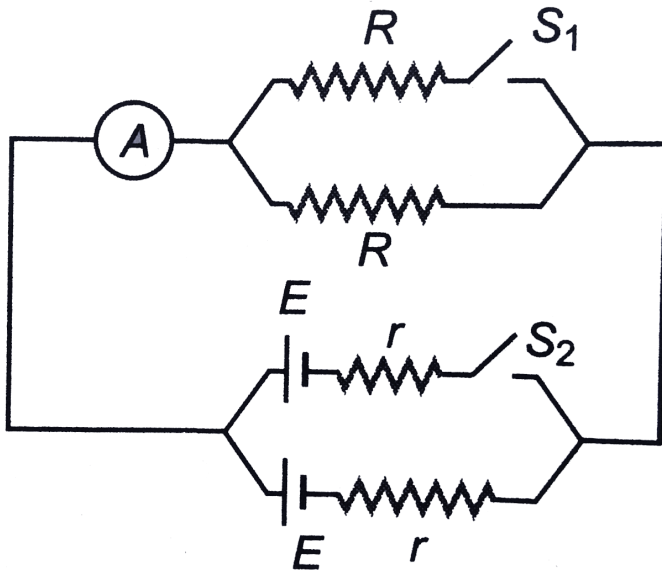
- A. If jockey  $J$  is shifted towards right  $I$  will increase
- B. if value of  $E_1$  is increased  $I$  is decreased
- C. if valued of  $E_2$  is increased  $I$  in increased
- D. if switched  $S$  is closed  $I$  will decrease

**Answer: A::B::C::D**



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8. In the circuit shown in figure, reading of ammeter will



A. increase if  $S_1$  is closed

B. decrease if  $S_2$  is closed

C. increase if  $S_2$  is closed



D. decrease if  $S_2$  is closed

**Answer: A::C**



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**9.** In the circuit shown in figure it is given that

$V_b - V_a = 2$  volt. Choose the correct options



A. current in the wire of 6 A

B. direction of current is from a to b

C.  $V_a - V_c = 12 \text{ volt}$

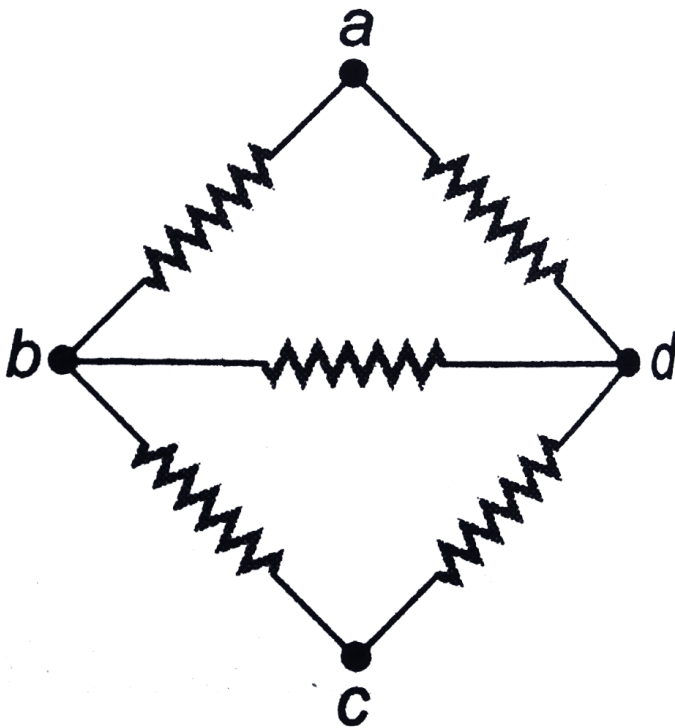
D.  $V_C - V_a = 12\text{volt}$

**Answer: A::D**



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**10.** Each resistance of the network shown in figure is  $r$ . Net resistance between



A. *a* and *b* is  $\frac{7}{3}r$

B. *a* and *c* is  $r$

C. *b* and *d* is  $r$

D. *b* and *d* is  $\frac{r}{2}$

**Answer: B::D**



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## Level 2 Comprehension Example Type

1. The length of a potentiometer wire is  $600\text{cm}$  and it carries a current of  $40\text{mA}$ . For a cell of emf  $2\text{V}$  and internal resistance  $10\Omega$ , the null point is found to be at  $500\text{cm}$ . On connecting a voltmeter across the cell, the balancing

length is decreased by  $10\text{cm}$

The voltmeter reading will be

A.  $1.96\text{V}$

B.  $1.8\text{V}$

C.  $1.64\text{V}$

D.  $0.96\text{V}$

**Answer: A**



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2. The length of a potentiometer wire is  $600\text{ cm}$  and it carries a current of  $40\text{ mA}$ . For a cell of emf  $2\text{ V}$  and internal resistance  $10\Omega$ , the null point is found to be at  $500\text{ cm}$ . On connecting a voltmeter across the cell, the balancing length is decreased by  $10\text{ cm}$

The resistance of the voltmeter is

A.  $500\Omega$

B.  $290\Omega$

C.  $490\Omega$

D.  $20\Omega$

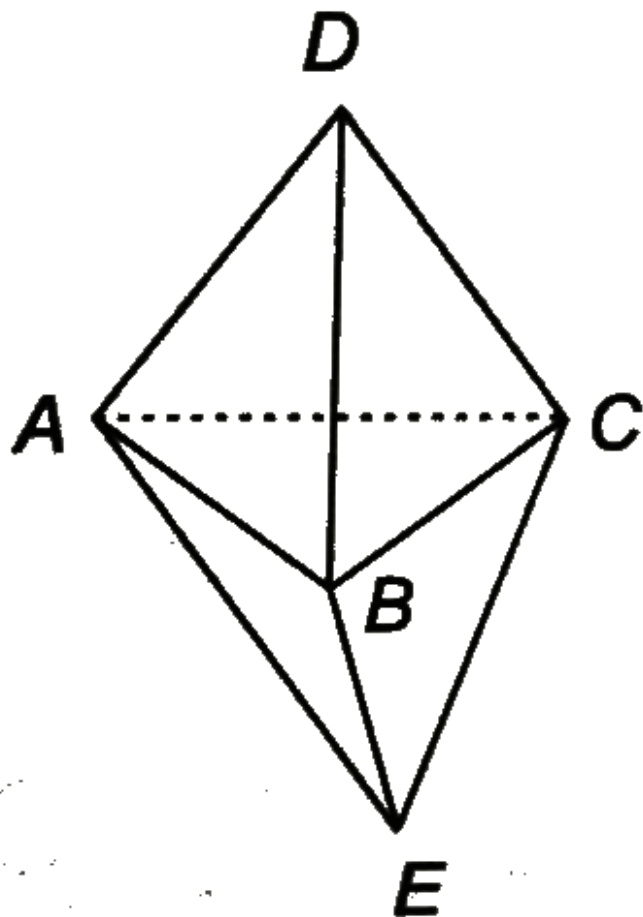
**Answer: C**



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## Level 2 Subjective

1. Find the equivalent resistance of the triangular bipyramid between the points.



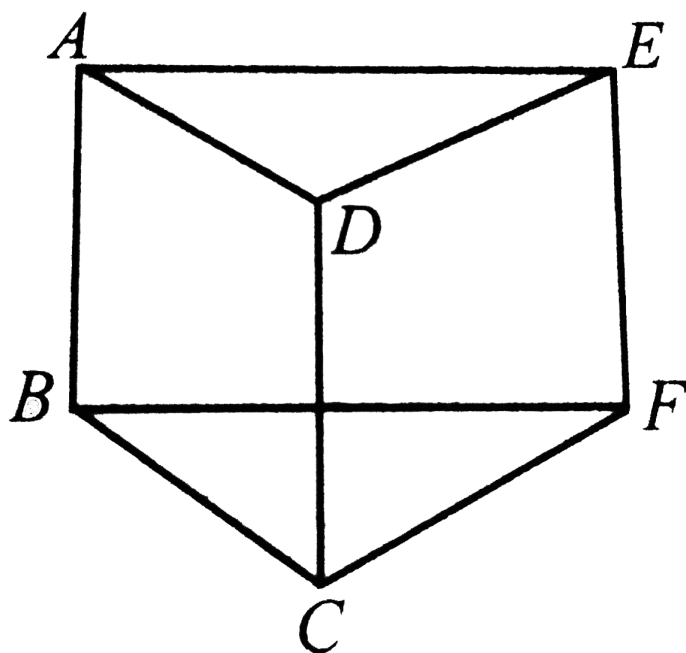
a.  $A$  and  $C$ , b.  $D$  and  $E$



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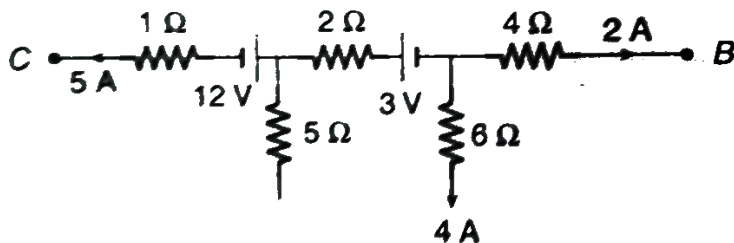


2. Nine wires each of resistance  $r = 5\Omega$  are connected to make a prism as shown in fig. find the equivalent resistance of the arrangement across AB (in  $\Omega$ )



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



a. power dissipated in  $5\Omega$  resistance,

b. Potential difference  $V_C - V_B$

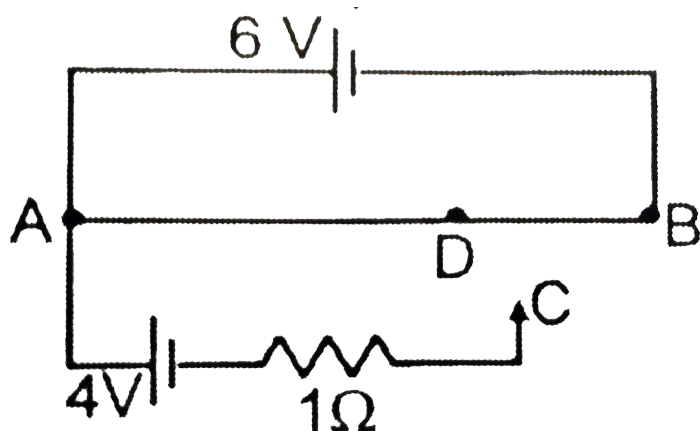
c. Which battery is being charged?



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4. A 6 volt battery of negligible internal resistance is connected across a uniform wire AB of length  $100\text{cm}$ . The positive terminal of another battery of emf  $4\text{V}$  and internal resistance  $1\Omega$  is joined to the point A as shown in figure. Take the potential at B to be zero. (a) What are the potentials at the points A and C ? (b) At which D of the wire AB, the potential is equal to the potential at C. (c) If the point C and D are connected by a wire. What will be the current through it ? (d) If the  $4\text{V}$  battery is replaced by  $7.5\text{ V}$  battery, what should be

the answers of parts (a) and (b) ?



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5. A thin uniform wire  $AB$  of length  $1\text{ m}$ , an unknown resistance  $X$  and a resistance of  $12\Omega$  are connected by thick conducting strips, as shown in the figure. A battery and a

galvanometer (with a sliding jockey connected to it) are also available. Connections are to be made to measure the unknown resistance  $X$ .

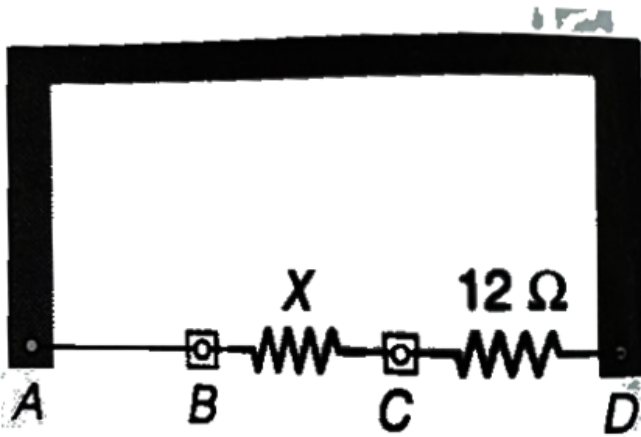
Using the principle of Wheatstone bridge answer the following questions :

(a) Are there positive and negative terminals on the galvanometer?

(b) Copy the figure in your answer book and show the battery and the galvanometer (with jockey connect at appropriate points.

(c) After appropriate connections are made, it is found that no deflection takes place in th, from galvanometer when the sliding jockey

touches the wire at a distance of  $60\text{cm}$  from  $A$ .  
Obtain value of the resistance  $X$ .

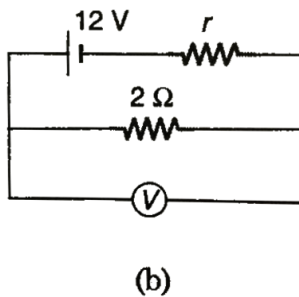
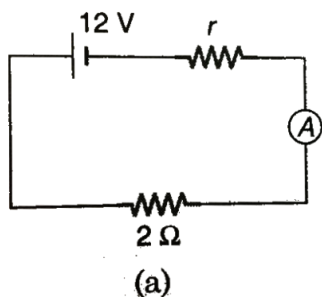


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6. A galvanometer (coil resistance  $99\Omega$ .) is converted into an ammeter using a shunt of  $1\Omega$  and connected as shown in figure (a). The

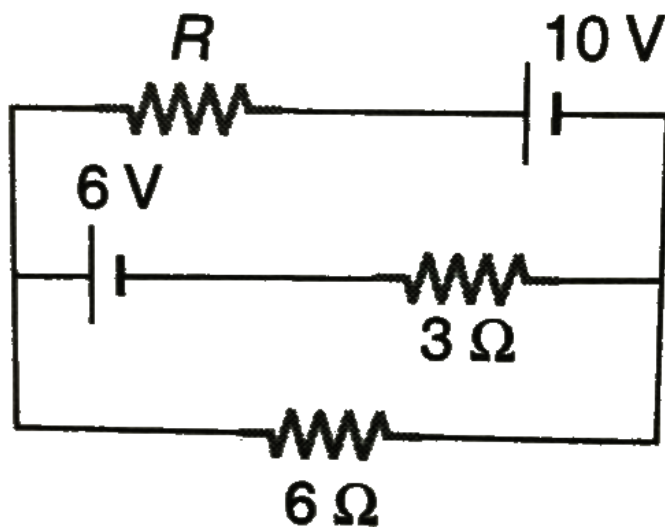
ammeter reads  $3A$ . The same galvanometer is converted into a voltmeter by connecting a resistance of  $101\Omega$  in series. This voltmeter is connected at, shown in figure (b). Its reading is found to be  $\frac{4}{5}$  of the full scale reading. Find :

- (a) internal resistance  $r$  of the cell
- (b) range of the ammeter and voltmeter
- (c) full scale deflection current of the galvanometer.



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7. In a circuit shown in figure if the internal resistances of the sources are negligible then at what value of resistance  $R$  will the thermal power generated in it will be the maximum. What is the value of maximum power?

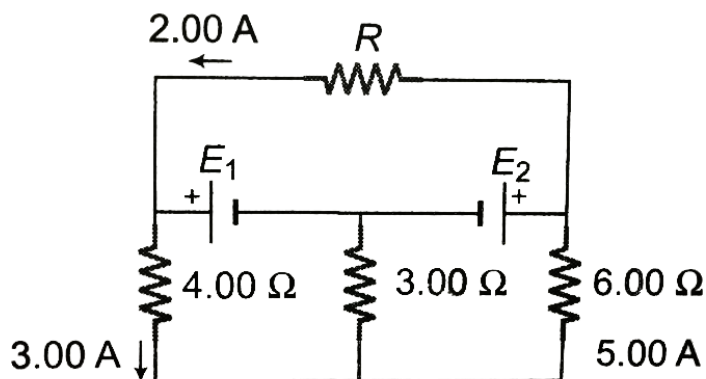






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8. In the circuit shown in figure find:

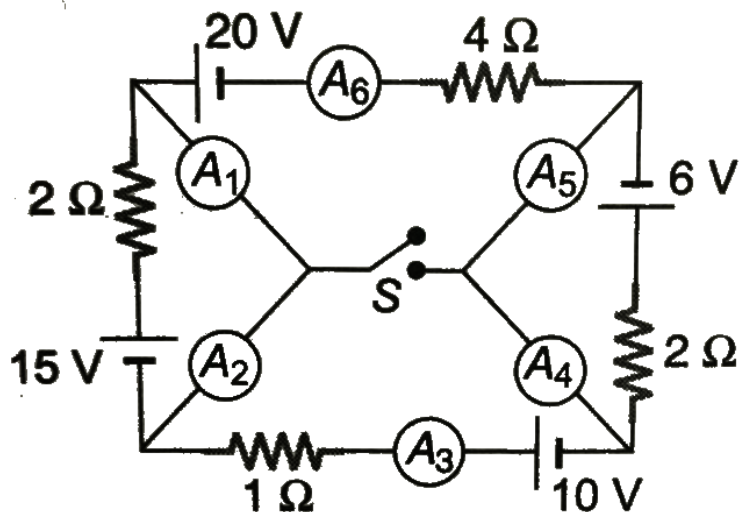


a. the current in the  $3.00\Omega$  resistor, b. the unknown emfs  $E_1$  and  $E_2$  and c the resistance  $R$ .



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9. In the circuit shown all the ammeters are ideal.



(a), If the switch  $S$  is open, find the reading of all ammeters and the potential difference across the switch.

(b) If the switch  $S$  is closed, find the current through all ammeters and the switch also.



**10.** An accumulator of emf  $2V$  and negligible internal resistance is connected across a uniform wire of length  $10\text{ m}$  and resistance  $30\Omega$ . The appropriate terminals of a cell of emf  $1.5V$  and internal resistance  $1\Omega$  is connected to one end of the wire and the other terminal of the cell is connected through a sensitive galvanometer to a slider on the wire. What is the length of the wire that will be required to produce zero deflection of the galvanometer?

How will the balancing length change?

(a) When a coil of resistance  $5\Omega$  is placed in series with the accumulator.

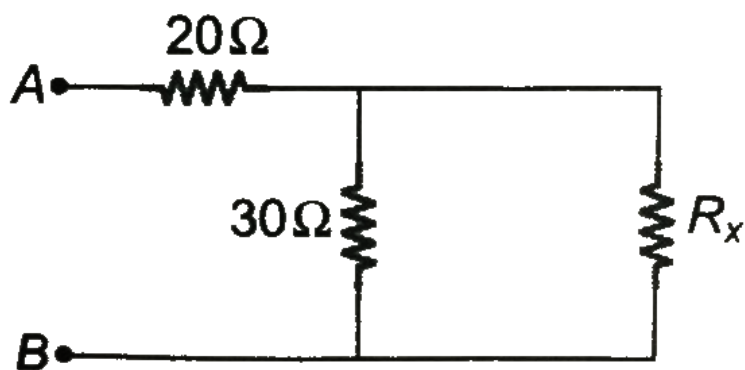
(b) The cell of  $1.5V$  is shunted with  $5\Omega$  resistor?



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**11.** A circuit shown in the figure has resistances  $20\Omega$  and  $30\Omega$ . At what value of resistance  $R_x$  will the thermal power generated in it be practically independent of small variations of

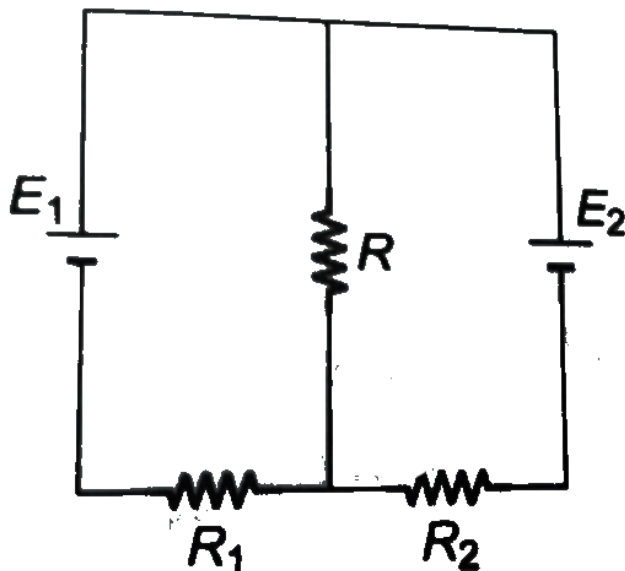
that resistance? The voltage between points  $A$  and  $B$  is supposed to be constant in this case.



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**12.** 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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13. A conductor has a temperature independent resistance  $R$  and a total heat capacity  $C$ . At the moment  $t = 0$  it is

connected to a *DC* voltage  $V$ . Find the times  $t$  dependence of the conductors temperature assuming the thermal power dissipated into surrounding space to vary as  $q = k(T - T_0)$  where  $k$  is a constant  $T_0$  is the surrounding temperature (equal to conductor's temperature at the initial moment).



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## Example

1. How many electrons pass through a bulb in 1 min, if the current is 400 mA. ( $e = 1.6 \times 10^{-19} C$ )?



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2.  $10^{20}$  electrons, each having a charge of  $1.6 \times 10^{-19} C$ , pass from a point A towards another point B in 0.1 s. What is the current in ampere ? What is its direction ?



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3. A wire carries a current of  $2.0A$ . What is charge that has flowed through its cross section in  $1.0s$ ? How many electrons does this correspond to?



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4. If an electron revolves in a circle of radius  $\pi / 2$  cm with uniform speed  $6 \times 10^5 m / s$ . Find the electric current. (Take,  $\pi^2 = 10$ )



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5. (a) The amount of charge passed in time  $t$  through a cross-section of wire is

$$q = \alpha t - \beta t^2$$

where  $\alpha$  and  $\beta$  are constant.

(i) Find current in terms of time  $t$ .

(ii) Sketch  $i$  versus  $t$  graph.

(b) The current through a wire depends on time as

$$i = 4 + 3t + 2t^2$$

Find the charge crossed through a section of wire in 6 sec.



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6. The current in a wire varies with time according to the relation

$$i = (3.0A) + (2.0A/s)t$$

a. How many coulombs of charge pass a cross section of the wire in the time interval between  $t = 0$  and  $t = 4.0s$ ?

b. What constant current would transport the same charge in the same time interval?



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7. An electron beam has an aperture of  $2\text{mm}^2$ .

A total of  $7 \times 10^{16}$  electrons flow through any perpendicular cross-section per second.

Calculate the current density in the electron beam.



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8. Find the current flowing through a copper wire of length  $0.2\text{m}$ , area of cross-section  $1\text{mm}^2$ , when connected to a battery of  $4\text{ V}$ .

Given that electron mobility  
 $= 4.5 \times 10^{-6} m^2 V^{-1} s^{-1}$  and charge on  
electron  $= 1.6 \times 10^{-19} C$ . The number  
density of electron in copper is  
 $8.5 \times 10^{28} m^{-3}$ .



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9. An aluminium wire of diameter 0.24 cm is connected in series to a copper wire of diameter 0.16 cm. The wires carry an electric current of 10 ampere. Find (i) current-density

in the aluminium wire (ii) drift velocity of electrons in the copper wire. Given : Number of electrons per cubic metre volume of copper  $= 8.4 \times 10^{28}$ .



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**10.** What is the drift velocity of electrons in a silver wire of length 2 m, having cross-sectional area  $6.14 \times 10^{-6} m^2$  and carrying a current of 5A. Given, atomic weight of silver = 108, density of silver  $= 9.5 \times 10^3 kg/m^3$ ,

charge of electron  $= 1.6 \times 10^{-19} C$ ,

Avogadro's number  $= 6.023 \times 10^{26}$  per kmol?



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**11.** The resistance of a wire is  $R$  ohm. What will be its new resistance if it is stretched to  $n$  times its original length ?



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**12.** 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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**13.** All the edges of a block with parallel faces are unequal. Its longest edge is twice its shortest edge. The ratio of the maximum to minimum resistance between parallel faces is.





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**14.** Calculate the electric field in a copper wire of cross-sectional area  $2.0\text{mm}^2$  carrying a current of  $1\text{A}$ . The resistivity of copper  $= 1.7 \times 10^{-8}(\Omega)\text{m}$ .

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**15.** A copper wire has a resistance of  $10\Omega$  and an area of cross-section  $1\text{mm}^2$ . A potential difference of  $10\text{ V}$  exists across the wire.

Calculate the drift speed of electrons if the number of electrons per cubic metre in copper is  $8 \times 10^{28}$  electrons.



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**16.** A current of 1.0 ampere is flowing through a copper wire of length 0.1 metre and cross-section  $1.0 \times 10^{-6} m^2$ . (i) If the specific resistance of copper be  $1.7 \times 10^{-8} \Omega m$ , calculate the potential difference across the ends of the wire. (ii) Determine current density

in the wire. (iii) If there be one free electron per atom in copper, then determine the drift velocity of electrons. Given : density of copper  $= 8.9 \times 10^3 \text{ kg m}^{-3}$ , atomic weight  $= 63.5$ ,  $N = 6.02 \times 10^{26}$  per kg-atom.



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**17.** Find the relaxation time for free electrons in copper, if the density of mobile electrons in copper, if the density of mobile electrons is  $8.4 \times 10^{28} \text{ m}^{-3}$ . The resistivity of copper at

room temperature is  $1.7 \times 10^{-8} \Omega m$ .

Given : mass of electron =  $9.11 \times 10^{-31} kg$

and charge on electron =  $1.6 \times 10^{-19} C$ .



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**18.** A wire has a resistance  $R$ . Find new resistance,

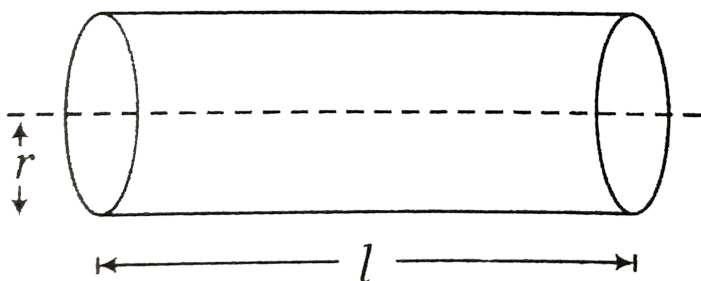
(i) if radius of cross-section of a cylindrical wire is doubled, then find ratio of initial to final resistance.

(ii) if length of wire is increased by  $10\%$ , then

find the percentage increase in its resistance.

(iii) if length of wire is increased by 20 % , then

find the percentage increase in its resistance.



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**19.** The resistance of a thin silver wire is  $1.0\Omega$  at  $20^{\circ}C$ . The wire is placed in a liquid bath and its resistance rises to  $1.2\Omega$ . What is the

temperature of the bath?  $\alpha$  for silver is  $3.8 \times 10^{-3} / (^\circ C)$



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**20.** Resistance of platinum wire in a platinum resistance thermometer at melting ice, boiling water and at a hot bath are  $6\Omega$ ,  $6.5\Omega$  and  $6.2\Omega$ , respectively. Find temperature of hot bath.



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21. The temperature coefficient of resistance of a wire is  $0.00145^{\circ}C^{-1}$ . At  $100^{\circ}C$  its resistance is  $2\Omega$ . At what temperature the resistance of the wire be  $3\Omega$ ?



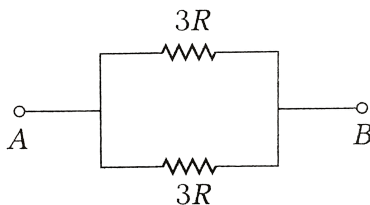
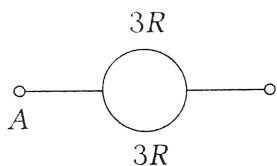
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22. How will you represent a resistance of  $3700\Omega \pm 10\%$  by colour code?



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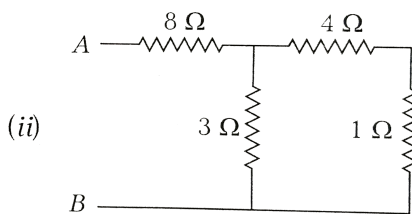
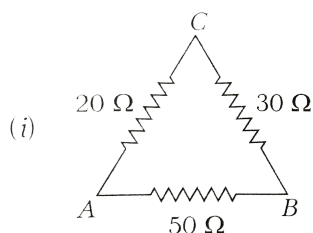
**23.** A wire of resistance  $6R$  is bent in the form of a circle. What is the effective resistance between the ends of the diameter?



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**24.** Find the equivalent resistance between  $A$  and  $B$  in the following cases





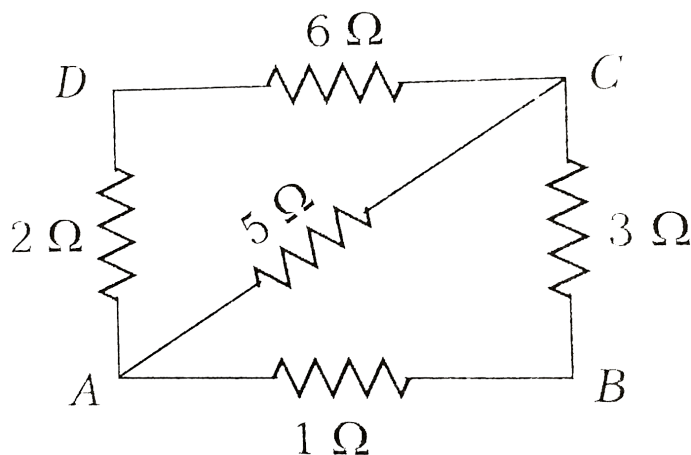
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**25.** A letter A consists of a uniform wire of resistance  $1\ \text{ohm per cm}$ . The sides of the letter are each  $20\ \text{cm}$  long and the cross-piece in the middle is  $10\ \text{cm}$  long while the apex angle is  $60^\circ$ . Find the resistance of the letter between the two ends of the legs.



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**26.** Find in the given network of resistors, the equivalent resistance between the points A and B



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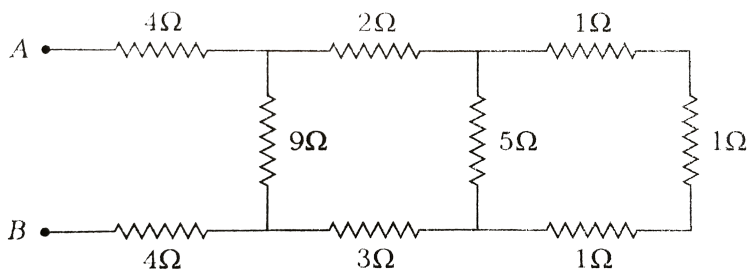
**27.** Find the effective resistance between points A and B for the network shown in the figure below.

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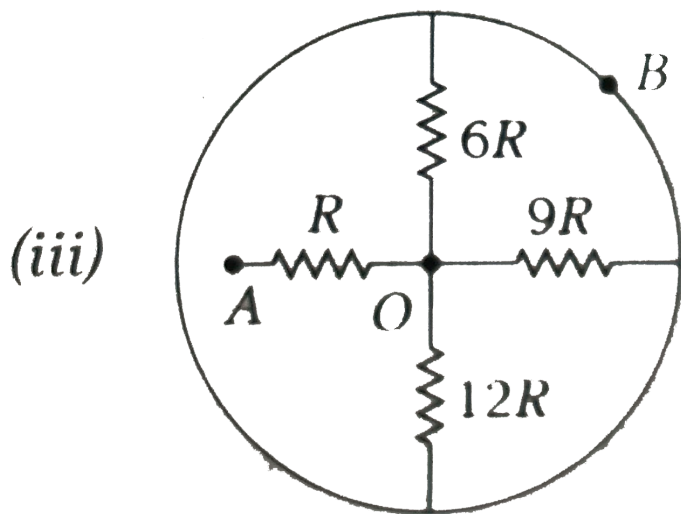
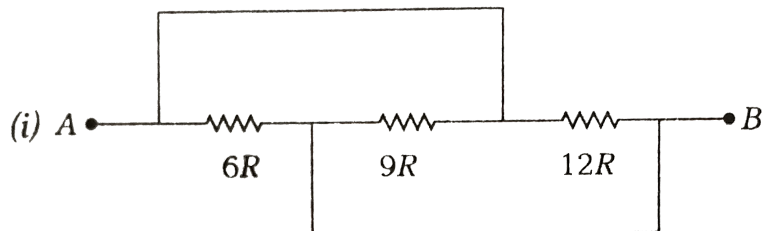
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**28.** Find the equivalent resistance between A and B in the following case



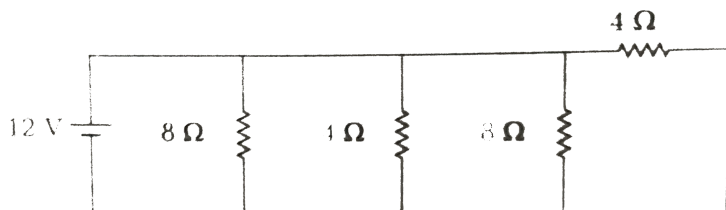
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**29.** Find the equivalent resistance between A and B.

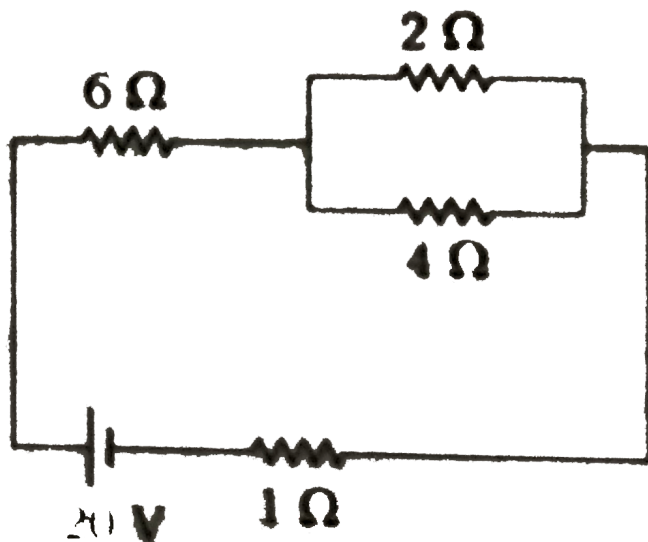


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**30.** Determine the current supplied by the battery in the circuit as shown

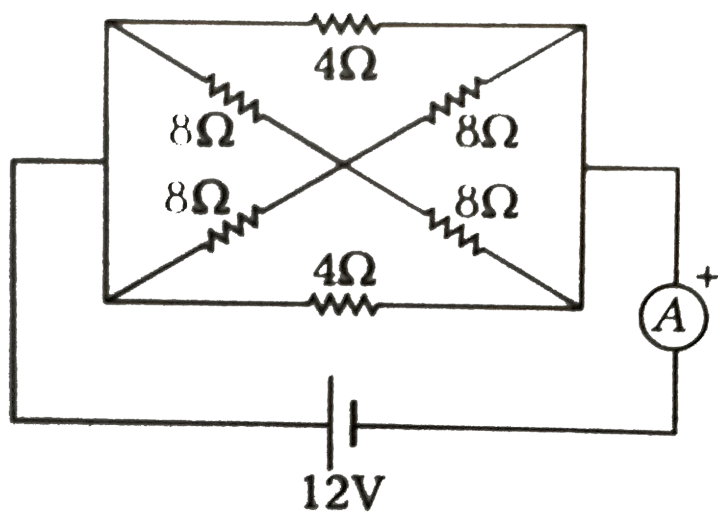


(ii) Find currents in resistance  $2\ \Omega$  and  $4\ \Omega$ .



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31. Calculate the current shown by the ammeter A in the circuit shown in figure.



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**32.** Find the equivalent resistance between P and Q.

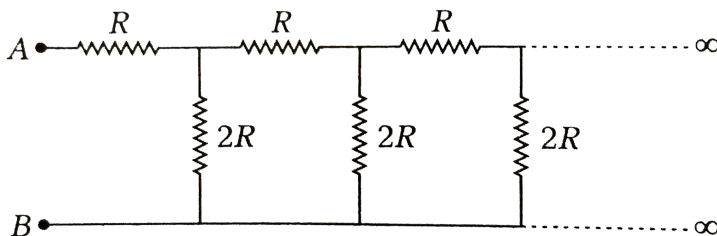
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**33.** Find the equivalent resistance between A and B.







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**34.** The reading on a high resistance voltmeter when a cell is connected across it is 3 V. When the terminals of the cell are also connected to a resistance of  $4\ \Omega$ , then the voltmeter reading drops to 1.2 V. Find the internal resistance of the cell.



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**35.** A battery of emf 2 V and internal resistance  $r$  is connected in series with a resistor of  $10\Omega$  through an ammeter of resistance  $2\Omega$ . The ammeter reads 50 mA. Draw the circuit diagram and calculate the value of  $r$ .



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**36.** A voltmeter of resistance  $994\Omega$  is connected across a cell of emf 1 V and internal resistance  $6\Omega$ . Find the potential difference

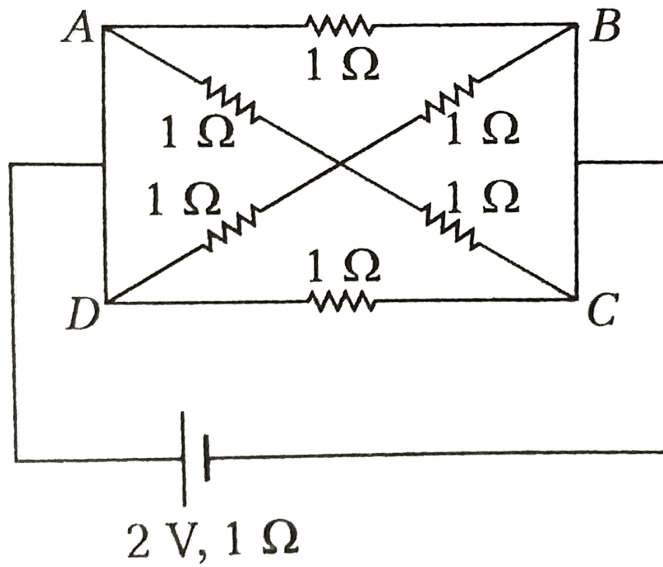
across the voltmeter, that across the terminals of the cell and percentage error in the reading of the voltmeter.



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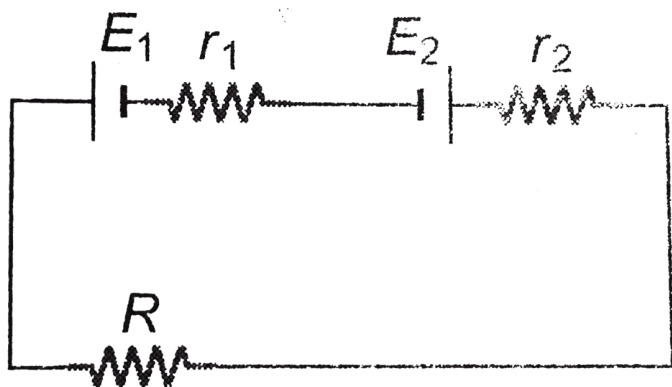
**37.** Find the current drawn from a cell of emf 2 V and internal resistance  $2\Omega$  connected to the

network given below.



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38. In the circuit shown in figure



$E_1 = 10V$ ,  $E_2 = 4V$ ,  $r_1 = r_2 = 1\Omega$  and

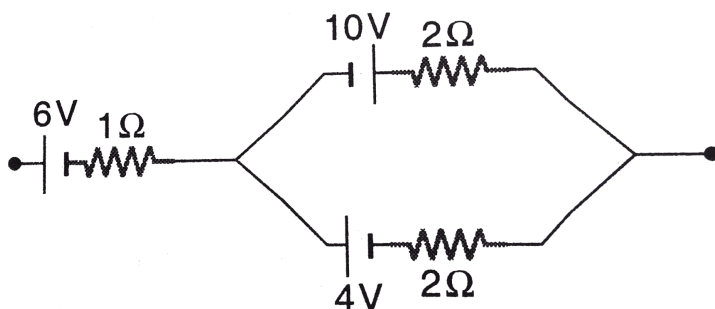
$R = 2\Omega$ .

Find the potential difference across battery 1 and battery 2.



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**39.** Find the emf and internal resistance of a single battery which is equivalent to a combination of three batteries as show in figure.



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**40.** Two identical cells of emf 1.5 V each joined in parallel provide supply to an external circuit consisting of two resistances of  $7\Omega$  each joined in parallel. A very high resistance voltmeter reads the terminal voltage of cells to be 1.4 V. Calculate the internal resistance of each cell.



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**41.** Find the minimum number of cell required to produce an electron current of  $1.5A$  through a resistance of  $30\Omega$  .Given that the emf internal resistance of each cell are  $1.5V$  and  $1.0\Omega$  respectively



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**42.** 36 cells each of internal resistance  $0.5\Omega$  and emf  $1.5 V$  each are used to send current through an external circuit of  $2\Omega$  resistance.

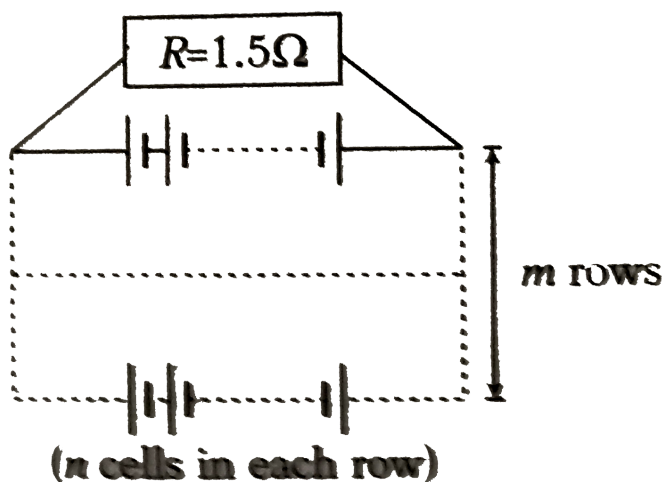


Find the best mode of grouping them and the current through the external circuit.



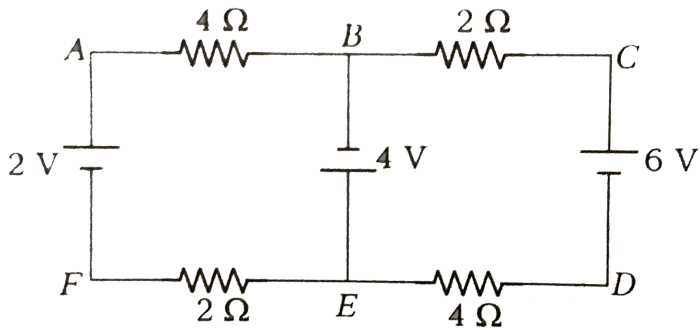
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**43.** 12 cells, each of emf  $1.5\text{ V}$  and internal resistance of  $0.5\Omega$ , are arranged in  $m$  rows each containing  $n$  cells connected in series, as shown. Calculate the values of  $n$  and  $m$  for which this combination would send maximum current through an external resistance of  $1.5\Omega$



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**44.** Find currents in different branches of the electric circuit shown in figure.



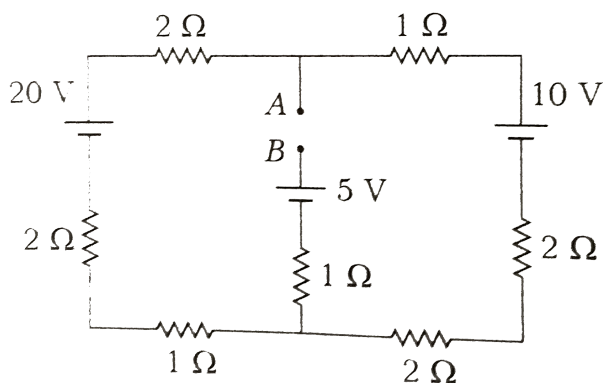
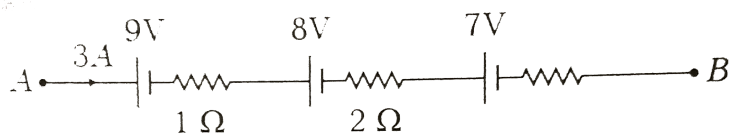
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**45.** In example above, find the potential difference between points F and C.



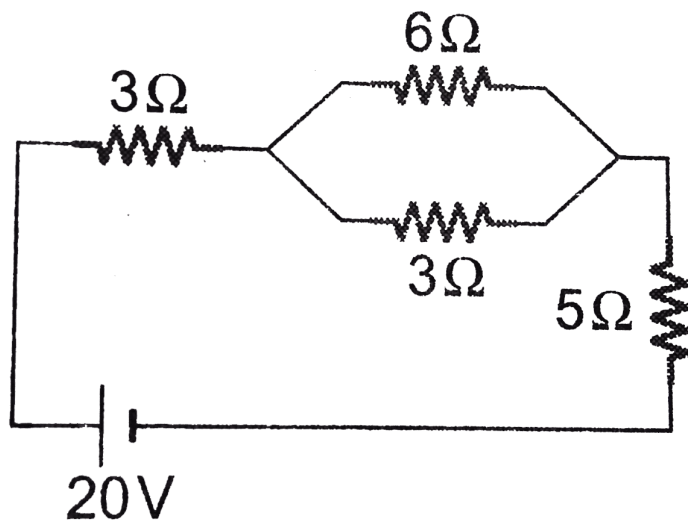
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**46.** (i) Find the potential difference between A and B.



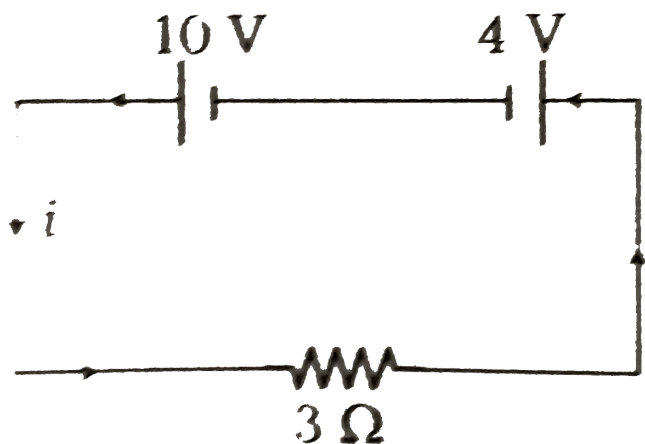
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47. In the circuit shown in figure find the heat developed across each resistance in  $2s$ .



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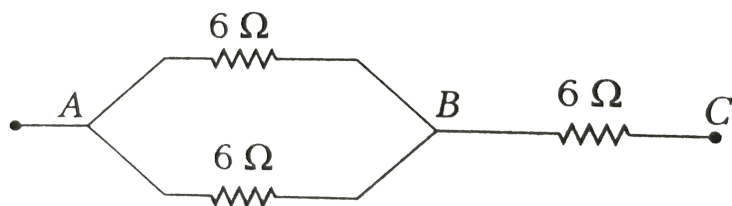
**48.** In the circuit shown in the following figure, find



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**49.** In the following figures, each of the three resistances, the rating of  $24\text{ W}$  and resistance

of  $6\Omega$ . Find the maximum power rating of the circuit.



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**50.** Two bulbs having rating of  $60\text{ W}$ ,  $220\text{ V}$  and  $100\text{ W}$ ,  $220\text{ V}$  are joined (i) in series, (ii) in parallel. Which of the two will glow brighter in each case?



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**51.** Two bulbs having rating of 40 W, 220 V and 100 W, 220 V are joined in series and alternately, (i) 300 V and (ii) 440 V is applied. Find out which will fuse in each case.



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**52.** In the above example, if we join the bulbs in parallel and 300 V is applied, which of the two bulbs will fuse?

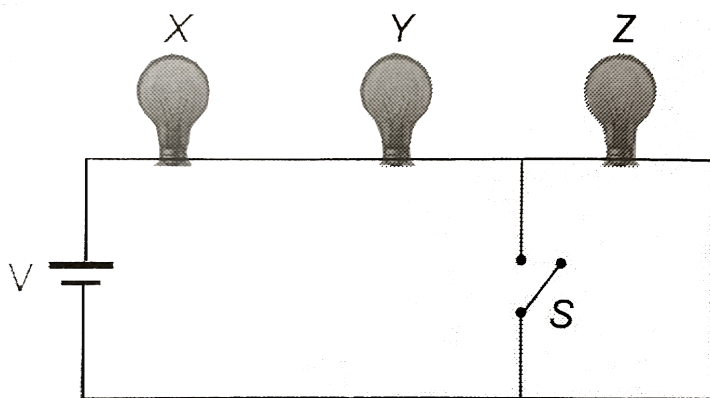


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**53.** Two coils of power 60 W and 100 W and both operating at 220 V takes time 2 min and 1.5 min separately to boil certain amount of water. If they are joined (i) in series and (ii) in parallel, then find the ratio of time taken by them to boil the same water in the two cases.

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54. A series circuit consists of three bulbs connected to a battery as shown. When switch  $S$  is closed, what happens to (a) Power consumed in bulb  $X$  and  $Y$  (b) Power consumed in bulb  $Z$  (c ) the current in the circuit (d) the voltage drop across three bulbs and (e) the power consumed in circuit?



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55. What shunt resistance is required to make the  $1.00\text{mA}$ ,  $20\Omega$  Galvanometer into an ammeter with a range of 0 to  $50.0\text{A}$ ?



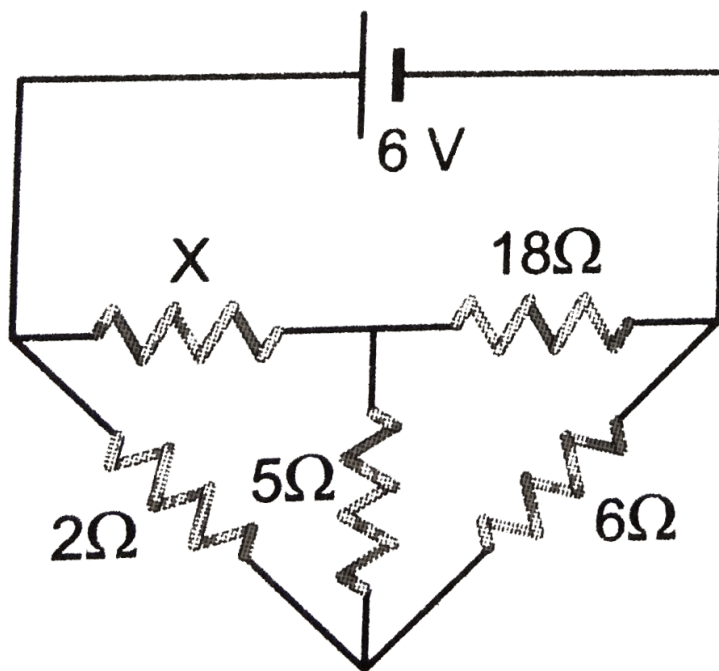
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56. How can we make a galvanometer with  $G = 20\Omega$  and  $i_g = 1.0\text{mA}$  into a voltmeter with a maximum range of  $10\text{V}$ ?



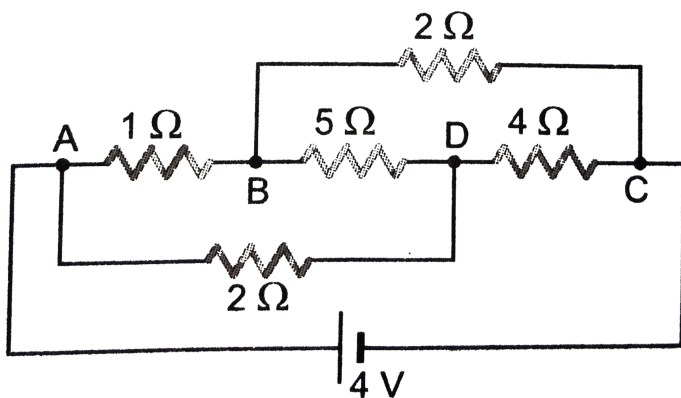
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57. Find out the magnitude of resistance  $X$  in the circuit shown in figure, When no current flows through the  $5\Omega$  resistance



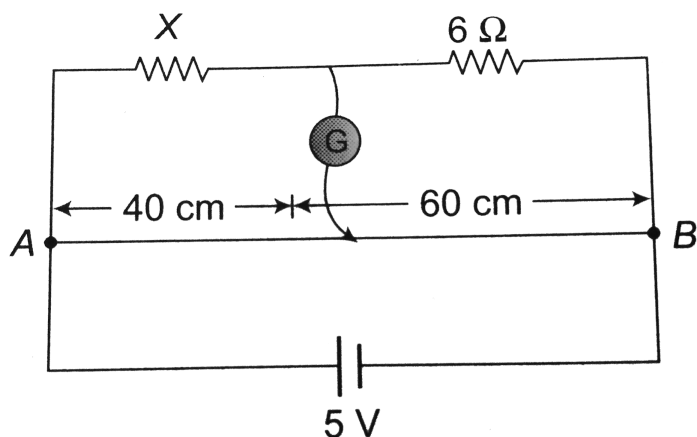
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58. Calculate the current the current drawn from the battery by the network of resistors shown in figure.



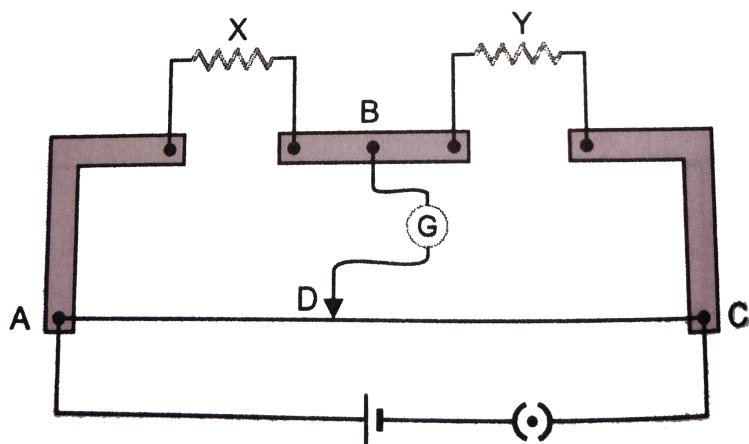
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59. In the circuit shown, a meter bridge is in its balanced state. The meter bridge wire has a resistance  $.10\text{ ohm}/\text{cm}$ . The value of unknown resistance  $X$  and the current drawn from the battery of negligible resistance is



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60. The figure



Shows the experimental set up of a meter bridge. The null point is found to be 60 cm away from the end A with X and Y in positions as shown. When a resistance of  $15\Omega$  is connected in series with Y, the null point is found to shift by 10 cm towards the end A of the wire. Find the position of the null point if

resistance of  $30\Omega$  were connected in parallel with Y.



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**61.** A potentiometer wire is 10 m long and has a resistance of  $18\Omega$ . It is connected to a battery of emf 5 V and internal resistance  $2\Omega$ . Calculate the potential gradient along the wire.



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**62.** A cell can be balanced against  $110\text{cm}$  and  $100\text{cm}$  of potentiometer wire, respectively with and without being short circuited through a resistance of  $10\Omega$ . Its internal resistance is



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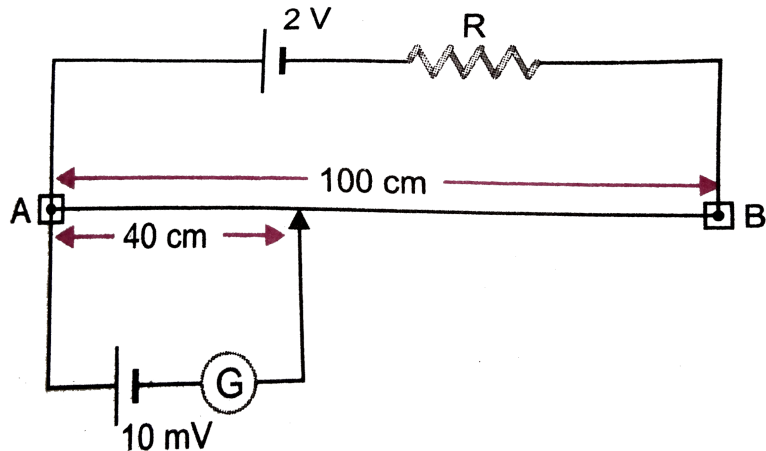
**63.** In a potentiometer arrangement, a cell of emf  $2.25\text{V}$  gives a balance point at  $30.0\text{ cm}$  length of the wire. If the cell is replaced by another cell and the balance point shifts to

60.0 cm, then what is the emf of the second cell?



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**64.** A potentiometer wire of length  $100\text{cm}$  having a resistance of  $10\Omega$  is connected in series with a resistance  $R$  and a cell of emf  $2V$  of negligible internal resistance. A source of emf



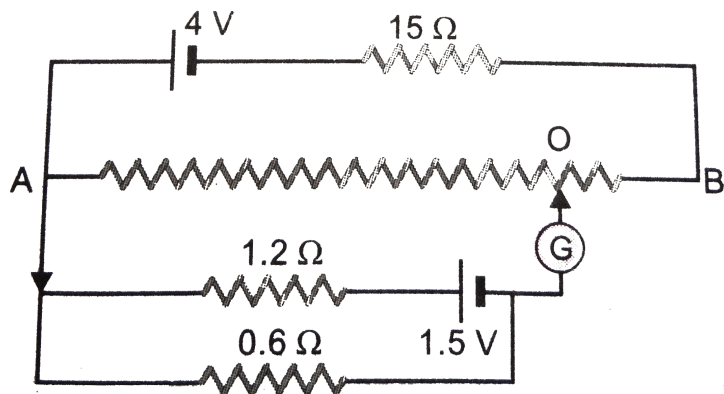
of  $10\text{mV}$  is balanced against a length of  $40\text{cm}$  of the potentiometer wire. What is the value of resistance  $R$ ?



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**65.**  $AB$  is 1 meter long uniform wire of  $10\Omega$  resistance. Other data are shown in the

diagram. Calculate (i) potential gradient along  $AB$  (ii) length  $AO$  when galvanometer shows no deflection



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**Check point**

1. The current flowing through wire depends on time as,  $I = 3t^2 + 2t + 5$

The charge flowing through the cross - section of the wire in time  $t = 0$  to  $t = 2$  second is

A. 22 C

B. 20 C

C. 18 C

D. 5 C

**Answer: A**



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2. The charge of an electron is  $1.6 \times 10^{-19} C$ .

How many electrons strike the screen of a cathode ray tube each second when the beam current is 16 mA

A.  $10^{17}$

B.  $10^{19}$

C.  $10^{-19}$

D.  $10^{-17}$

**Answer: A**



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**3.** A conductor carries a current of  $0.2A$ . Find the amount of charge that will pass through the cross-section of the conductor in  $30s$ . How many electrons will flow in this time interval if the charge on one electron is  $1.6 \times 10^{-19}C$  ?

**A.**  $0.375 \times 10^{19}$

**B.**  $375 \times 10^{19}$

C.  $3.75 \times 10^{19}$

D.  $37.5 \times 10^{19}$

**Answer: C**



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**4.** In a closed circuit, the current  $I$  (in ampere) at an instant of time  $t$  (in second) is given by  $I = 4 - 0.08t$ . The number of electrons flowing in 50 s through the cross-section of the conductor is



A.  $1.25 \times 10^{19}$

B.  $6.25 \times 10^{20}$

C.  $5.25 \times 10^{19}$

D.  $2.25 \times 10^{20}$

**Answer: B**



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5. Drift velocity  $v_d$  varies with the intensity of electric field as per their relation

A.  $v_d \propto E$

B.  $v_d \propto \frac{1}{E}$

C.  $v_d = \text{constant}$

D.  $v_d \propto E^2$

**Answer: A**



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6. When the current  $i$  is flowing through a conductor, the drift velocity is  $v$ . If  $2i$  current is flowed through the same metal but having

double the area of cross-section, then the drift velocity will be

A.  $v/4$

B.  $v/2$

C.  $v$

D.  $4v$

**Answer: C**



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7. A metallic resistor is connected across a battery. If the number of collisions of the free electrons with the lattice is somehow decreased in the resistor (for example, by cooling it), the current will

A. increase

B. decrease

C. remain constant

D. become zero

**Answer: B**



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8. When current flows through a conductor, then the order of drift velocity of electrons will be

A.  $10^{10} \text{ cm s}^{-1}$

B.  $10^{-2} \text{ cm s}^{-1}$

C.  $10^4 \text{ cm s}^{-1}$

D.  $10^{-1} \text{ cm s}^{-1}$

**Answer: B**



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9. The drift velocity does not depend upon

- A. cross-section of the wire
- B. length of the wire
- C. number of the free electrons
- D. magnitude of the current

**Answer: B**



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**10.** The number density of free electrons in a copper conductor estimated in Example 3.1 is  $8.5 \times 10^{28} m^{-3}$ . How long does an electron take to drift from one end of a wire 3.0 m long to its other end? The area of cross-section of the wire is  $2.0 \times 10^{-6} m^2$  and it is carrying a current of 3.0 A.

A.  $2.73 \times 10^4 s$

B.  $4.73 \times 10^4 s$

C.  $5 \times 10^4 s$

D.  $6 \times 10^8 s$

**Answer: A**



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**11.** Calculate the amount of charge flowing in 2 minutes in a wire of resistance  $10\Omega$  when a potential difference of 20 V is applied between its ends

A. 120 C



B. 240 C

C. 20 C

D. 4 C

**Answer: B**



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12. If  $n$ ,  $e$ ,  $\tau$ ,  $m$ , 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.  $\frac{ml}{ne^2\tau A}$

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

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

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

**Answer: A**



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**13.** The following four wires of length  $L$  and radius  $r$  are made of the same material. Which of these will have the largest extension, when the same tension is applied?

A. Length = 50 cm, diameter = 0.5 mm

B. Length = 100 cm, diameter = 1 mm

C. Length = 200 cm, diameter = 2 mm

D. Length = 300 cm, diameter = 3 mm

**Answer: A**



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**14.** Carbon resistors, used in electronic circuits are marked for their value of resistance and tolerance by a colour code. A given resistor has colour scheme brown, red, green and gold. Its value in ohm is

A.  $52 \times 10^6 \pm 10 \%$

B.  $24 \times 10^5 \pm 5 \%$

C.  $12 \times 10^4 \pm 10 \%$

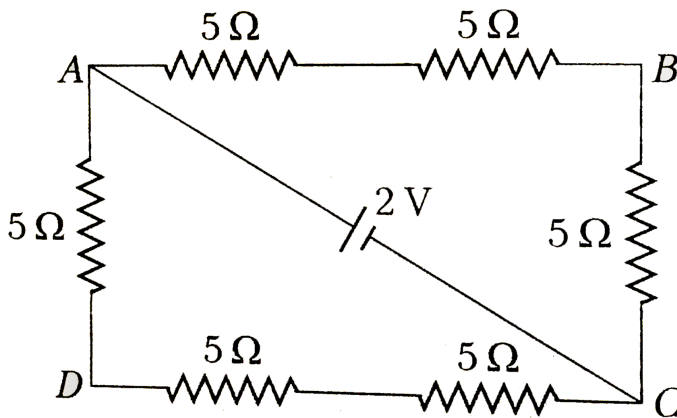
D.  $12 \times 10^5 \pm 5 \%$

**Answer: D**



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**15.** The potential difference between points A and B of the following figure is



A.  $\frac{2}{3}\text{ V}$

B.  $\frac{8}{9}V$

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

D.  $2V$

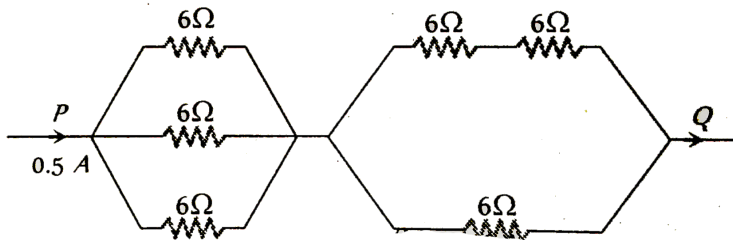
**Answer: C**



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**16.** Resistances of 6 ohm each are connected in the manner shown in adjoining figure. With the current 0.5 ampere as shown in figure, the

potential difference  $V_P - V_Q$  is



A.  $3.6V$

B.  $6.0V$

C.  $3.0V$

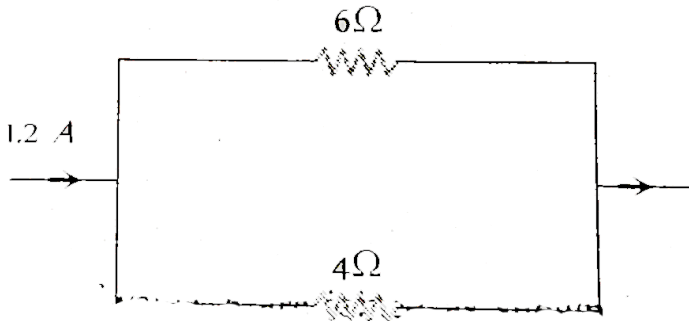
D.  $7.2V$

**Answer: C**



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17. In the figure given below, the current passing through  $6\Omega$  resistor is



A.  $0.40\text{ A}$

B.  $0.48\text{ A}$

C.  $0.72\text{ A}$

D.  $0.80\text{ A}$

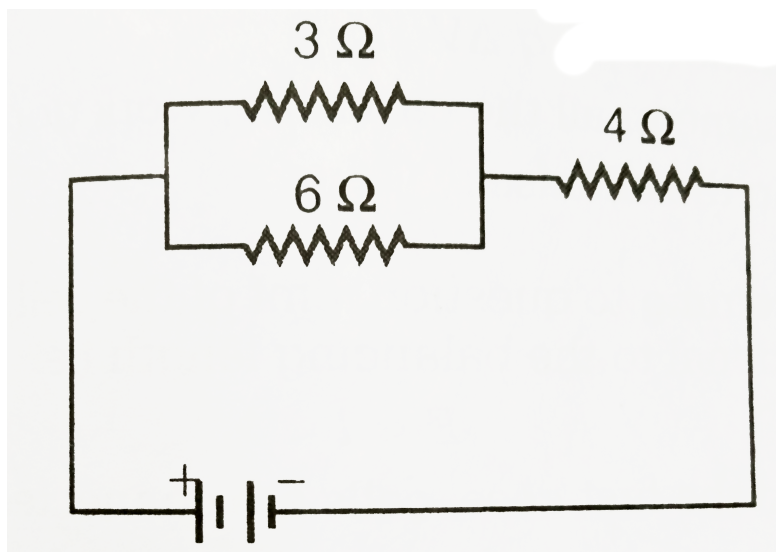
**Answer: B**





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18. Current through  $3\Omega$  resistor is  $0.8\text{A}$ , then potential drop through  $4\Omega$  resistor is



A.  $9.6\text{V}$

B.  $2.6\text{V}$

C.  $4.8V$

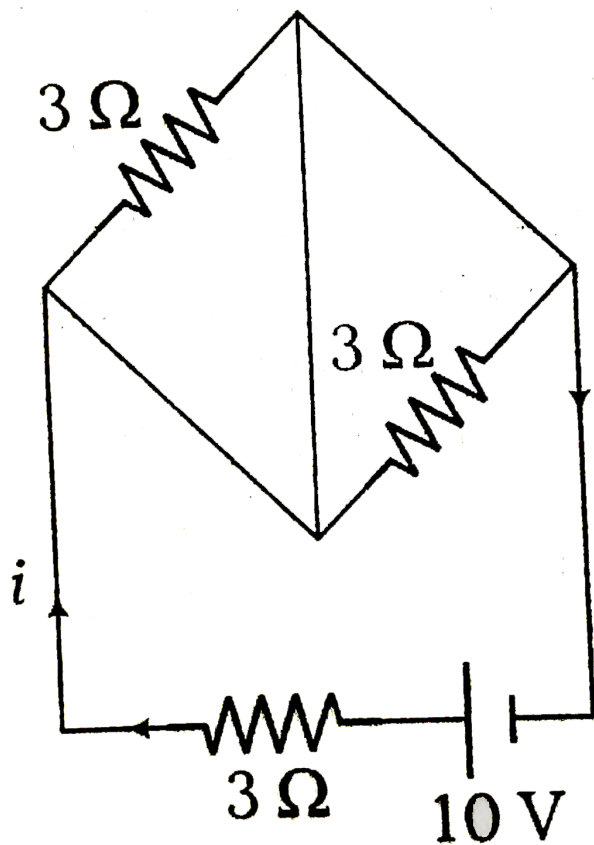
D.  $1.2V$

**Answer: C**



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19. Current  $I$  as shown in the circuit will be



A.  $10\text{ A}$

B.  $\frac{10}{3}\text{ A}$

C. zero

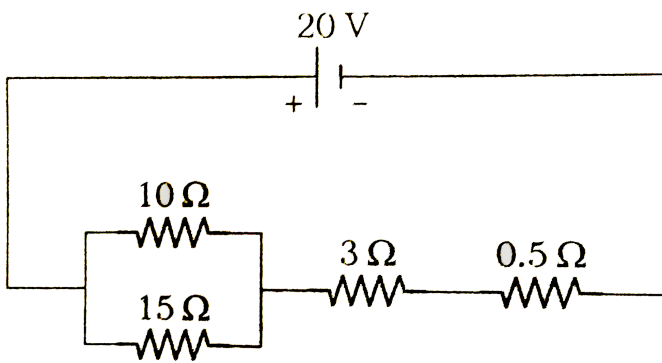
D. infinite

**Answer: B**



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**20.** In the circuit, the current flowing through  $10\Omega$  resistance is



A.  $12A$

B.  $1.2A$

C.  $0.8A$

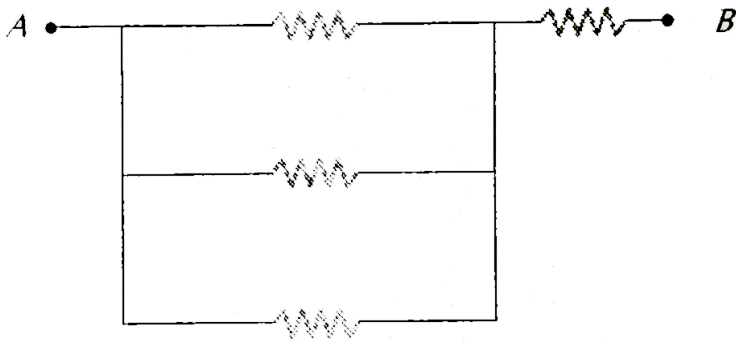
D.  $0.4A$

**Answer: B**



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21. If all the resistors shown have the value 2 ohm each, the equivalent resistance over AB is



A. 2 ohm

B. 4 ohm

C.  $1\frac{2}{3}$  ohm

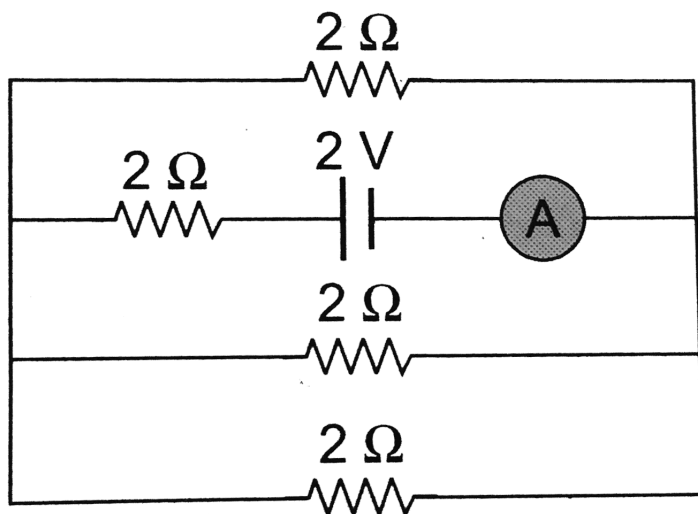
D.  $2\frac{2}{3}$  ohm

**Answer: D**



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**22.** The reading of the ammeter as per figure shown is



A.  $\frac{1}{8}A$

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

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

D.  $2A$

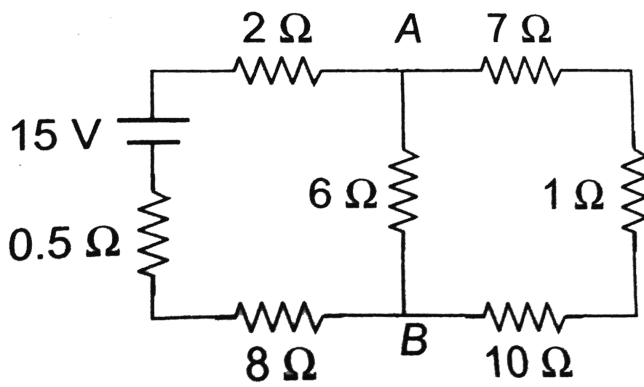
**Answer: B**



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**23.** The current from the battery in circuit diagram shown is





A.  $1A$

B.  $2A$

C.  $1.5A$

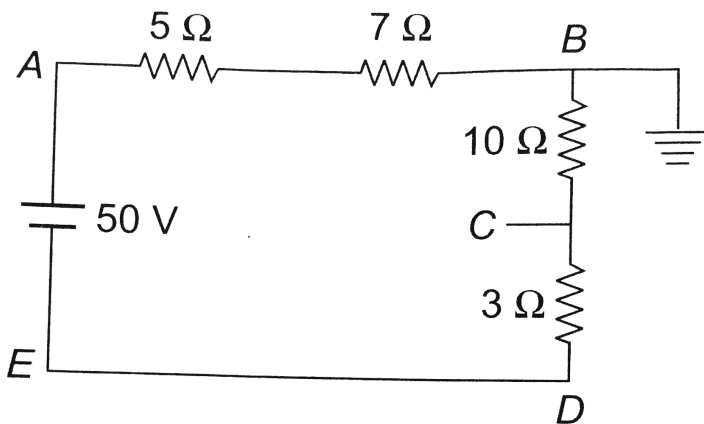
D.  $3A$

**Answer: A**



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24. In the circuit shown, the point  $B$  is earthed. The potential at the point ' $A$ ' is



A. 14 V

B. 24 V

C. 26 V

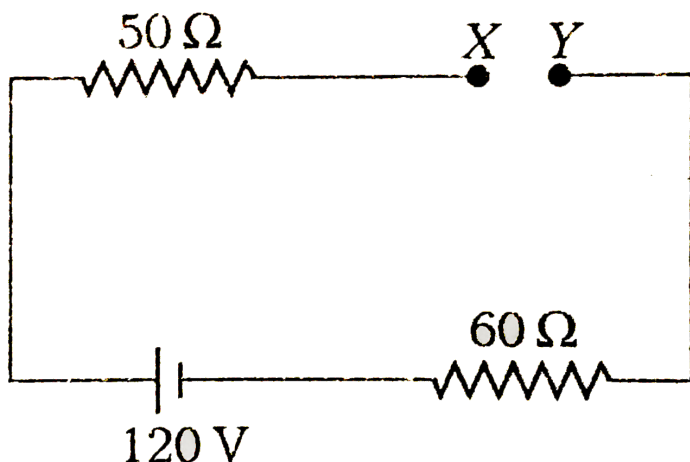
D. 50 V

**Answer: B**



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**25.** In the circuit shown, potential difference between X and Y will be



A. zero

B. 20 V

C. 60 V

D. 120 V

**Answer: D**



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**26.** A current of 2.0 ampere passes through a cell of e.m.f. 1.5 volts having internal resistance of 0.15 ohm. The potential difference

measured, in volts, across both the ends of the cell will be

A. 1.35

B. 1.50

C. 1.00

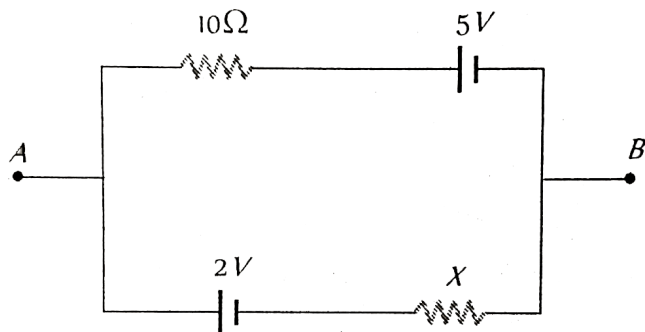
D. 1.20

**Answer: D**



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27. If  $V_{AB} = 4V$  in the given fig are, then resistance  $\chi$  will be



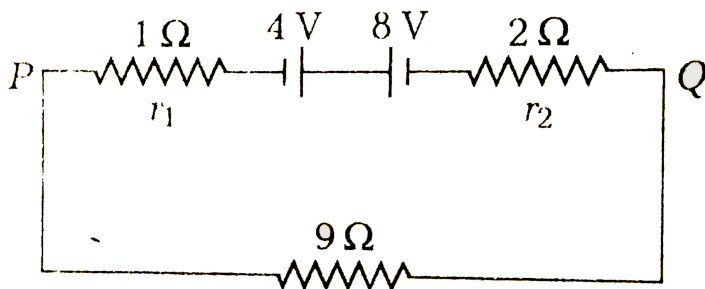
- A.  $5\Omega$
- B.  $10\Omega$
- C.  $15\Omega$
- D.  $20\Omega$

**Answer: D**



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



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

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

C.  $\frac{1}{9}$  A and 9 V

D.  $\frac{1}{2}$  A and 12 V

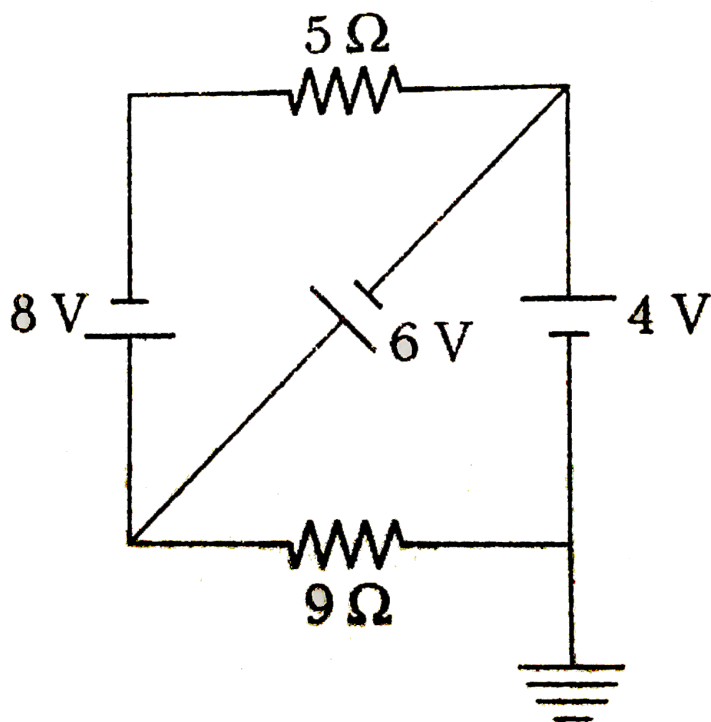
**Answer: A**



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29. The current through the  $5\Omega$  resistor is



A.  $10\text{ A}$

B.  $1\text{ A}$

C.  $2.5\text{ A}$

D.  $0.4A$

**Answer: D**



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**30.** Two cells , each of  $emf E$  and internal resistance  $r$ , are connected in parallel across a resistor  $R$ . The power delivered to the resistor is maximum if  $R$  is equal to

A.  $R = r/2$

B.  $R = r$

C.  $R = 2r$

D.  $R = 0$

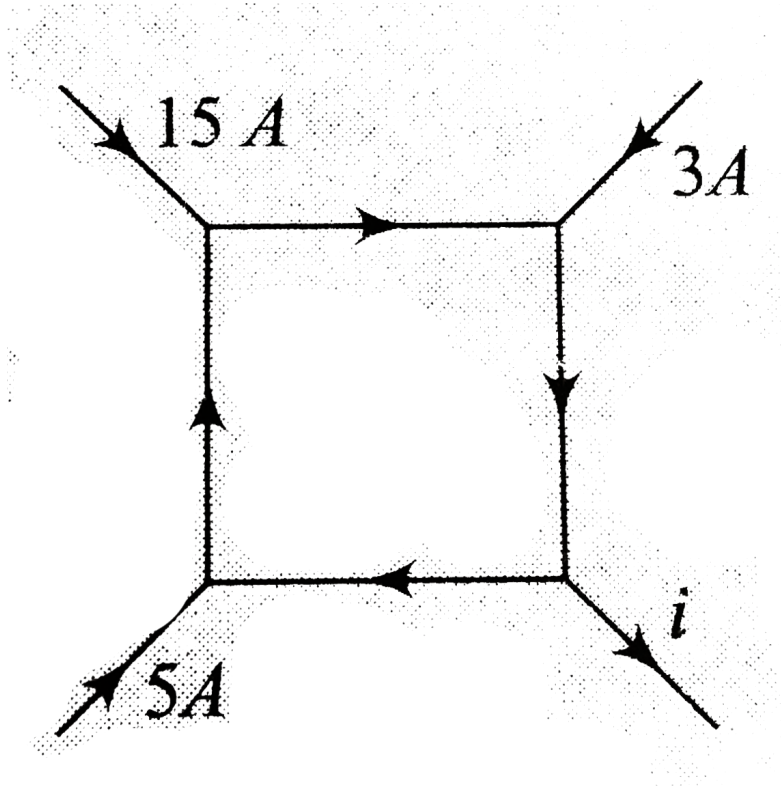
**Answer: A**



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**31.** Shown is a network of currents. The magnitude of the current is also shown there.

Find the current  $i$ .



A.  $3\text{ A}$

B.  $13\text{ A}$

C.  $23\text{ A}$

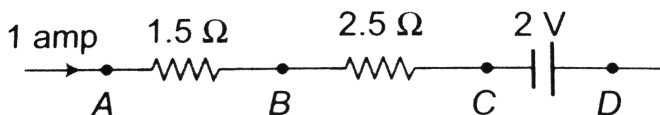
D.  $-3A$

**Answer: C**



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**32.** In the circuit element given here, if the potential at point  $B = V_B = 0$ , then the potentials of  $A$  and  $D$  are given as



A.  $V_A = -1.5V, V_D = +2V$

B.  $V_A = -1.5V, V_D = +0.5V$

C.  $V_A = +1.5V, V_D = +0.5V$

D.  $V_A = +1.5V, V_D = -0.5V$

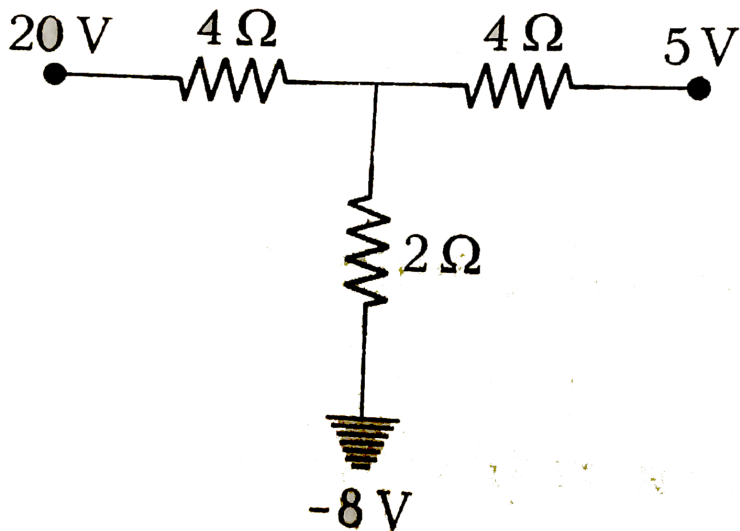
**Answer: D**



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**33.** Three resistances are connected to form a T-shape as shown in the figure. Then, the

current in the  $4\Omega$  resistor is



A.  $0.93\text{ A}$

B.  $4.5\text{ A}$

C.  $2.5\text{ A}$

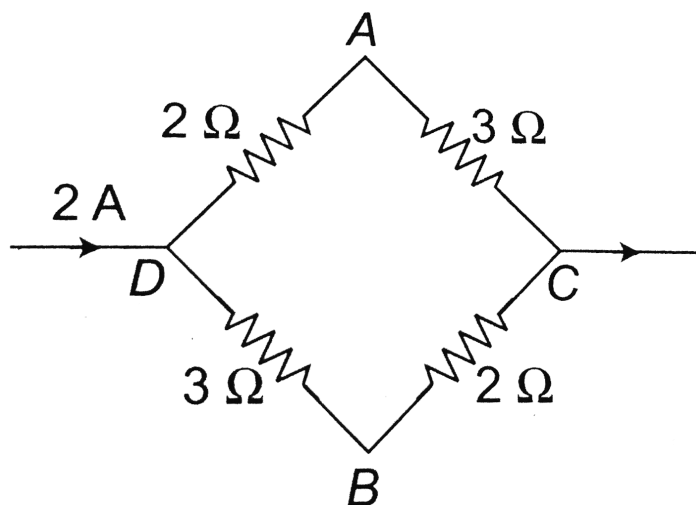
D.  $1.57\text{ A}$

**Answer: B**



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34. A current of  $2A$  flows in a system of conductor as shown. The potential difference  $(V_A - V_B)$



A.  $+4V$



B.  $+2V$

C.  $+1V$

D.  $-1V$

**Answer: C**



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**35.** How much work is required to carry a  $6\mu C$  charge from the negative terminal to the positive terminal of a 9 V battery?

A.  $54 \times 10^{-3} J$

B.  $54 \times 10^{-6} J$

C.  $54 \times 10^{-9} J$

D.  $54 \times 10^{-12} J$

**Answer: B**



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**36.** two resistors  $R$  and  $2R$  are connected in series in an electric circuit. The thermal energy developed in  $R$  and  $2R$  are in the ratio

A. 1 : 2

B. 2 : 1

C. 1 : 4

D. 4 : 1

**Answer: A**



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**37.** The resistor of resistance ' R ' is connected to 25 V supply and heat produced in it is 25 J / sec. The value of R is

A.  $225\Omega$

B.  $1\Omega$

C.  $25\Omega$

D.  $50\Omega$

**Answer: C**



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**38.** In India electricity is supplied for domestic use at  $220V$ . It is supplied at  $110V$  in USA. If the resistance of a  $60W$  bulb for use in India is

$R$ , the resistance of a  $60W$  bulb for use in USA will be

A.  $R/4$

B.  $R/2$

C.  $R$

D.  $2R$

**Answer: A**



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**39.** If  $R_1$  and  $R_2$  are respectively the filament resistances of a 200 watt bulb and 100 watt bulb designed to operate on the same voltage, then

A.  $R_1$  is two times  $R_2$

B.  $R_2$  is two times  $R_1$

C.  $R_2$  is four times  $R_1$

D.  $R_1$  four times  $R_2$

**Answer: B**



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40. Two electric bulbs have tungsten filament of same length. If one of them gives  $60W$  and the other  $100W$  , then

- A.  $100\text{ W}$  bulb has thicker filament
- B.  $60\text{ W}$  bulb has thicker filament
- C. Both filaments are of same thickness
- D. it is not possible to get different wattage unless the lengths are different

**Answer: A**



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**41.** A resistor of resistance  $R$  is connected to an ideal battery. If the value of  $R$  is decreased, the power dissipated in the resistor will

A. increase

B. decrease

C. remain unchanged



D. None of these

**Answer: B**



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**42.** How many calories of heat will be approximately developed in a  $210W$  electric bulb in 5 min ?

A. 800000 cal

B. 63000 cal

C. 1050 cal

D. 15000 cal

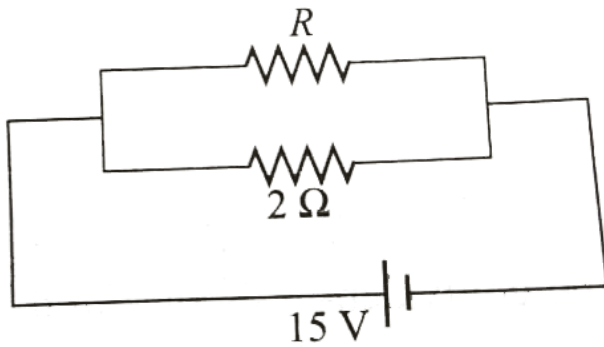
**Answer: D**



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**43.** If in the circuit shown in Fig.7.55, power dissipation is  $150W$  , then find the value of

$R(\text{in}\Omega)$ .



**Fig. 7.55**

A.  $2\Omega$

B.  $6\Omega$

C.  $5\Omega$

D.  $4\Omega$

**Answer: B**



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**44.** A wire when connected to  $220V$  mains supply power dissipation  $P_1$  Now the wire is cut into two equal pieces which are connected in parallel to the same supply power dissipation in this case is  $P_2$  then  $P_1 : P_2$  is

A. 1

B. 4

C. 2

D. 3

**Answer: B**



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**45.** 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. the two bulbs is the same

B. Both the bulbs is 200 V

C. 40 W bulb is greater than the potential drop across 100 W bulb

D. 100 W bulb is greater than the potential drop across 40 W bulb

**Answer: C**



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**46.** One kilowatt hour is equal to

A.  $36 \times 10^5 J$

B.  $36 \times 10^3 J$

C.  $10^3 J$

D.  $10^5 J$

**Answer: A**



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**47.** 3 identical bulbs are connected in series and these together dissipate a power  $P$  . If now the bulbs are connected in parallel, then the power dissipated will be

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

B.  $3P$

C.  $9P$

D.  $\frac{P}{9}$

**Answer: C**



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**48.** Two bulbs are working in parallel order. Bulb A is brighter than bulb B . If  $R_A$  and  $R_B$  are their resistance respectively then



A.  $R_A = R_B$

B.  $R_B > R_A$

C.  $R_A > R_B$

D. None of these

**Answer: B**



**Watch Video Solution**

**49.** Electric bulb  $50W - 100V$  glowing at full power are to be used in parallel with battery  $120V, 10\Omega$ . Maximum number of bulbs that

can be connected so that they glow in full power is

A. 2

B. 8

C. 4

D. 6

**Answer: C**



**Watch Video Solution**

**50.** Some electric bulbs are connected in series across a 220 V supply in a room. If one bulb is fused then remaining bulbs are connected again in series across the same supply. The illumination in the room will

A. increase

B. decrease

C. remain the same

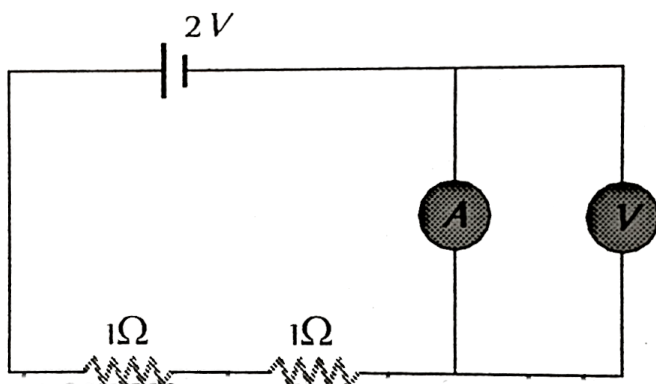
D. not continuous

**Answer: A**



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51. In the circuit shown, A and V are ideal ammeter and voltmeter respectively. Reading of the voltmeter will be



A.  $2V$

B.  $1V$

C.  $0.5V$

D. Zero

**Answer: D**



**Watch Video Solution**

**52.** The net resistance of a voltmeter should be large to ensure that

A. it does not get overheated

B. it does not draw emissive current

C. it can measure large potential difference

D. it does not appreciably change the potential difference to be measured.

**Answer: D**



**Watch Video Solution**

**53.** Two galvanometers A and B require 3 mA and 6 mA respectively, to produce the same deflection of 10 divisions. Then,

A. A is more sensitive than B

B. B is more sensitive than A

C. A and B are equally sensitive

D. sensitiveness of B is twice that of A

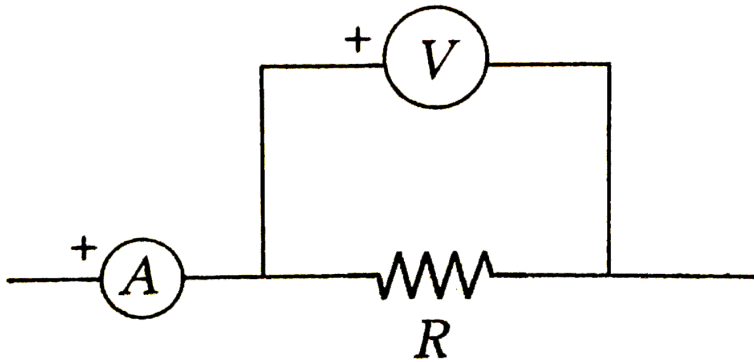
**Answer: A**



**Watch Video Solution**

**54.** An ammeter A, a voltmeter V and a resistance R are connected as shown in the figure. If the voltmeter reading is  $1.6V$  and the

ammeter reading is  $0.4\text{A}$ , then  $R$  is



- A. equal to  $4\Omega$
- B. greater than  $4\Omega$
- C. less than  $4\Omega$
- D. *between*  $3\Omega$  and  $4\Omega$

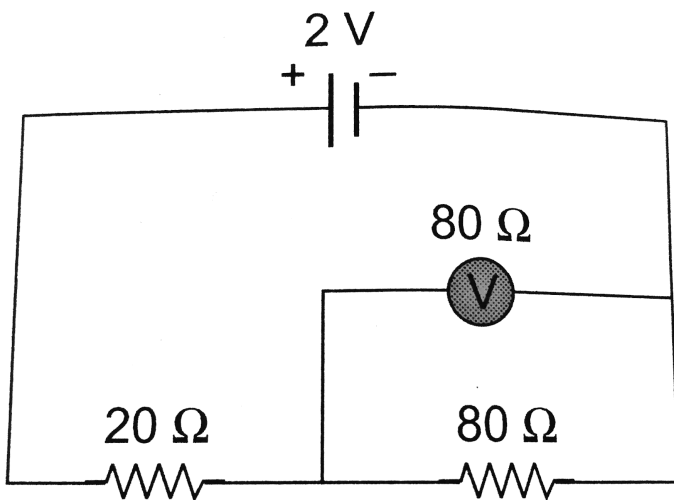
**Answer: B**



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55. In the adjoining circuit, the e.m.f. of the cell is 2 volt and the internal resistance is negligible. The resistance of the voltmeter is  $80\Omega$ . The reading of the voltmeter will be



A.  $0.80V$

B.  $1.60V$

C.  $1.33V$

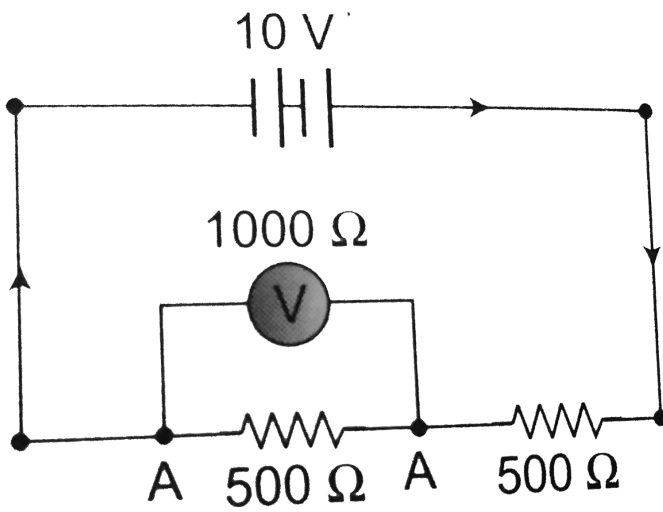
D.  $2.00V$

**Answer: C**



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**56.** What is the reading of voltmeter in the following figure ?



A.  $3\text{ V}$

B.  $2\text{ V}$

C.  $5\text{ V}$

D.  $4\text{ V}$

**Answer: D**



57. A galvanometer of resistance  $25\Omega$  gives full scale deflection for a current of 10 milliampere , is to be changed into a voltmeter of range 100 V by connecting a resistance of ' R ' in series with galvanometer. The value of resistance R in  $\Omega$  is

A. 10000

B. 975

C. 10025

D. 9975

**Answer: D**



**Watch Video Solution**

**58.** An ammeter and a voltmeter are joined in series to a cell. Their readings are  $A$  and  $V$  respectively. If a resistance is now joining parallel with the voltmeter. Then

A. Both  $A$  and  $V$  will decrease

B. Both A and V will increase

C. A will decrease, V will increase

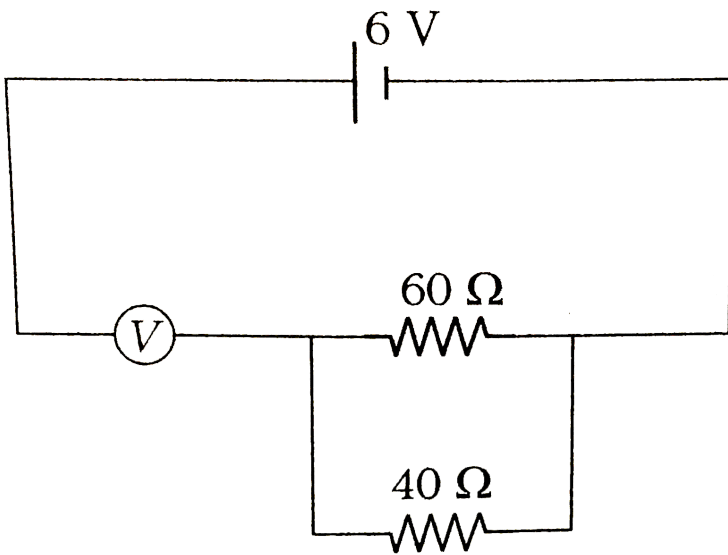
D. A will increase, V will decrease

**Answer: D**



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**59.** In the circuit shown in the figure, the voltmeter reading is



A.  $2.4V$

B.  $3.4V$

C.  $4.0V$

D.  $6.0V$

**Answer: D**





60. The shunt required for 10% of main current to be sent through the moving coil galvanometer of resistance  $99\Omega$  will be-

A.  $9.9\Omega$

B.  $10\Omega$

C.  $11\Omega$

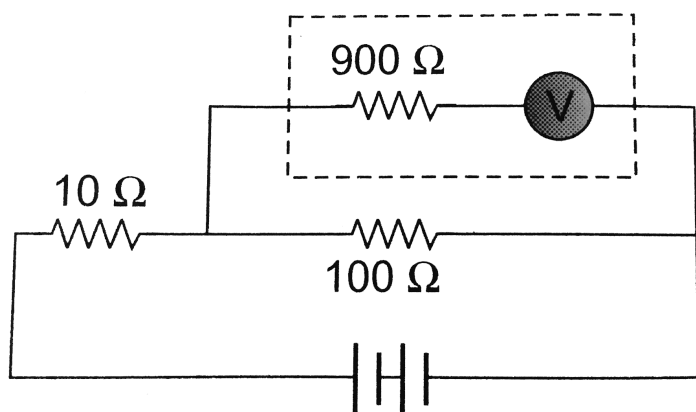
D.  $9\Omega$

**Answer: C**





61. The potential difference across the  $100\Omega$  resistance in the following circuit is measured by a voltmeter of  $900\Omega$  resistance. The percentage error made in reading the potential difference is



A.  $\frac{10}{9}$

B. 0.1

C. 1.0

D. 10.0

**Answer: B**



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**62.** A microammeter has a resistance of  $100\Omega$  and full scale range of  $50\mu A$ . It can be used as a voltmeter or as a higher range ammeter

provided a resistance is added to it. Pick the correct range and resistance combinations

A. 50 V range with  $10\text{ k}\Omega$  resistance in series

B. 10 V range with  $200\text{ k}\Omega$  resistance in series

C. 10 mA range with  $1\Omega$  resistance in parallel

D. None of the above

**Answer: B**



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**63.** Show that the percentage error in the measurement of resistance by a metre bridge is minimum when the null point is near about the centre of the wire.

A. 20 cm

B. 50 cm

C. 80 cm

D. 100 cm

**Answer: C**



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**64.** A resistance of  $1980\Omega$  is connected in series with a voltmeter, after which the scale division becomes 100 times larger. Find the resistance of voltmeter.

A.  $10\Omega$

B.  $20\Omega$

C.  $30\Omega$

D.  $40\Omega$

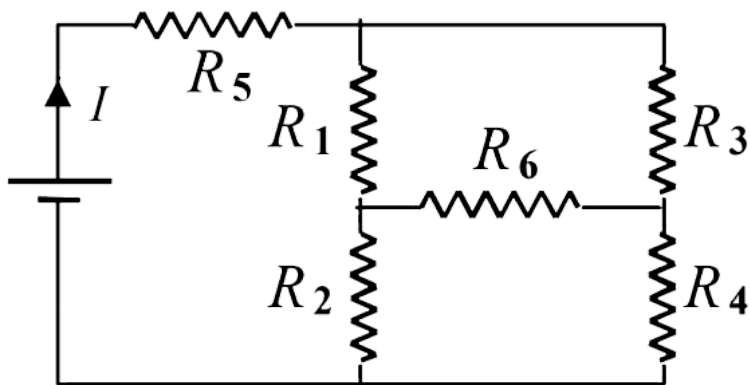
**Answer: B**



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**65.** In the given circuit, it is observed that the current  $I$  is independent of the value of the resistance  $R_6$ . Then the resistance values must

satisfy



A.  $R_1 R_2 R_3 = R_3 R_4 R_5$

B.  $\frac{1}{R_5} + \frac{1}{R_6} = \frac{1}{R_1 + R_2} + \frac{1}{R_3 + R_4}$

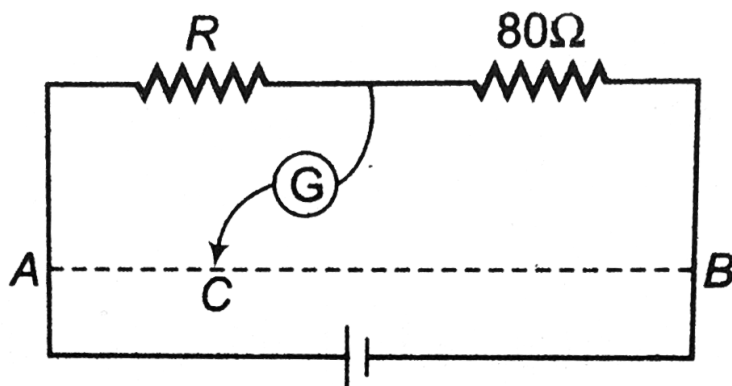
C.  $R_1 R_4 = R_2 R_3$

D.  $R_1 R_3 = R_2 R_4 = R_5 R_6$

**Answer: C**



66.  $AB$  is a wire of uniform resistance. The galvanometer  $G$  shows no deflection when the length  $AC = 20\text{cm}$  and  $CB = 80\text{cm}$ . The resistance  $R$  is equal to.



A.  $320\Omega$



B.  $8\Omega$

C.  $20\Omega$

D.  $40\Omega$

**Answer: C**



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**67.** A potentiometer is used for the compaisem of e.m.f. of two cells  $E_1$  and  $E_2$ . For cell  $E_1$  the no deflection point os obtained at  $20cm$  and

for  $E_2$  the no deflection point is obtained at  $30\text{cm}$ . The ratio of their e.m.f.'s will be

A.  $2/3$

B.  $3/2$

C. 1

D. 2

**Answer: A**



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**68.** In a potentiometer experiment, the galvanometer shows no deflection when a cell is connected across  $60\text{cm}$  of the potentiometer wire. If the cell is shunted by a resistance of  $6\Omega$ , the balance is obtained across  $50\text{cm}$  of the wire. The internal resistance of the cell is

A.  $0.5\Omega$

B.  $0.6\Omega$

C.  $1.2\Omega$

D.  $1.5\Omega$

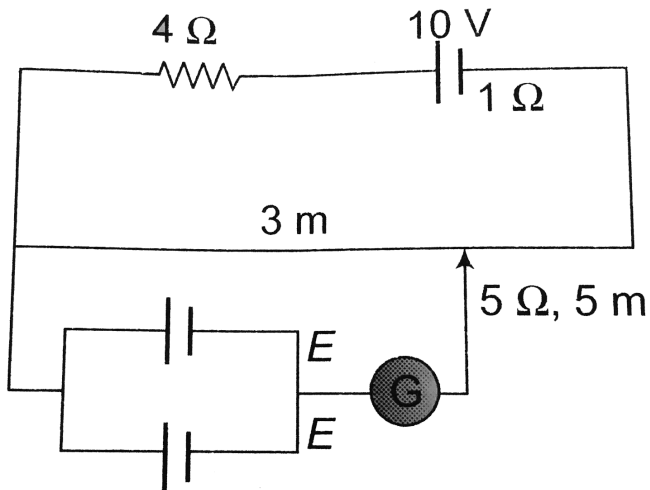
**Answer: C**



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**69.** A resistance of  $4\Omega$  and a wire of length 5 meters and resistance  $5\Omega$  are joined in series and connected to a cell of e.m.f.  $10V$  and internal resistance  $1\Omega$ . A parallel combination of two identical cells is balanced across  $300cm$

of wire. The e.m.f.  $E$  of each cell is



- A.  $1.5\text{ V}$
- B.  $3.0\text{ V}$
- C.  $0.67\text{ V}$
- D.  $1.33\text{ V}$

**Answer: B**



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70. Potentiometer wire of length  $1m$  is connected in series with  $490\Omega$  resistance and  $2V$  battery. If  $0.2m\frac{V}{c}m$  is the potential gradient, then resistance of the potentiometer wire is approximately

A.  $4.9\Omega$

B.  $7.9\Omega$

C.  $5.9\Omega$

D.  $6.9\Omega$

**Answer: A**



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## Taking it together

1. What is terminal potential difference of a cell? Can its value be greater than the emf of a cell? Explain.

- A. being discharged
- B. open circuit
- C. being charged
- D. being either charged or discharged

**Answer: C**



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2. Identify the material commonly used for making coil of a resistance box.



A. Molybdenum

B. Manganese

C. Manganin

D. Magnesium

**Answer: C**



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**3. Which of the following is a vector quantity?**

A. Current density

B. Current

C. Wattless current

D. Power

**Answer: A**



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**4.** Electric field ( $E$ ) and current density ( $J$ ) have relation

A.  $E \propto J$

B.  $E \propto J^2$

C.  $E \propto \frac{1}{J^2}$

D.  $E^2 \propto \frac{1}{J}$

**Answer: A**



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**5.** Consider the following two statements:

(A) Kirchhoff's junction law follows from conservation of charge.

(B) Kirchhoff's loop law follows from conservative nature of electric field .

A. Both A and B are wrong

B. A is correct but B is wrong

C. A is wrong but B is correct

D. Both A and B are correct

**Answer: D**



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6. For measurement of potential difference, potentiometer is preferred in comparison to voltmeter because

A. potentiometer is more sensitive than voltmeter

B. the resistance of potentiometer is less than voltmeter

C. potentiometer is cheaper than voltmeter

D. potentiometer does not take current from the circuit

**Answer: D**



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**7. What is immeterial for an electric fuse wire ?**

- A. Its specific resistance
- B. Its radius
- C. Its length
- D. Current flowing through it

**Answer: C**



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8. Conductivity increases in the order of

A. Al, Ag, Cu

B. Al, Cu, Ag

C. Cu, Al, Ag

D. Ag, Cu, Al

**Answer: B**



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9. By mistake, a voltmeter is connected in series and an ammeter is connected in parallel, with a resistance in an electrical circuit. What will happen to the instruments?

A. Both ammeter and voltmeter will be damaged

B. Neither the ammeter nor the voltmeter will be damaged

C. Only the ammeter will be damaged



D. Only the voltmeter will be damaged

**Answer: C**



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**10.** If  $E$  is the emf of a cell of internal resistance  $r$  and external resistance  $R$ , then potential difference across  $R$  is given as

A.  $V = E / (R + r)$

B.  $V = E$

C.  $V = E / (1 + r / R)$

D.  $V = E / (1 + R / r)$

**Answer: C**



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**11.** the two nonideal batteries are connected in series. Consider the following statements :

(A) The equivalent emf is larger than either of the two emfs.

(B) the equivalent internal resistances is

smaller than either of the two internal resistances.

A. Each of A and B is correct

B. A is correct but B is wrong

C. B is correct but A is wrong

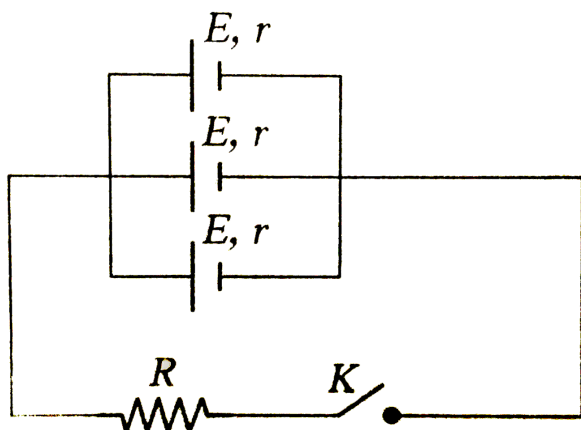
D. Each of A and B is wrong

**Answer: B**



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12. When  $n$  cells are joined in parallel combination as shown, the strength of the current  $i$  is given by



A.  $\frac{nE}{R + nr}$

B.  $\frac{E}{R + (r/n)}$

C.  $\frac{E}{r + Rn}$

D. None of these

**Answer: B**



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**13.** A student has 10 resistors of resistance '  $r$  '.

The minimum resistance made by him from given resistors is

A.  $10r$

B.  $\frac{r}{10}$

C.  $\frac{r}{100}$

D.  $\frac{r}{5}$

**Answer: B**



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**14.** A wire has resistance  $12\Omega$ . It is bent in the form of a circle. The effective resistance between two points across a diameter is.

A.  $12\Omega$

B.  $6\Omega$

C.  $3\Omega$

D.  $24\Omega$

**Answer: C**



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**15.** A steady current  $i$  is flowing through a conductor of uniform cross-section. Any segment of the conductor has

A. zero charge

B. only positive charge

C. only negative charge

D. charge proportional to current  $i$

**Answer: A**



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**16.** There are  $n$  cells, each of emf  $E$  and internal resistance  $r$ , connected in series with an external resistance  $R$ . One of the cells is



wrongly connected, so that it sends current in the opposite direction. The current flowing in the circuit is

A.  $\frac{(n-1)E}{(n+1)r+2}$

B.  $\frac{(n-1)E}{nr+R}$

C.  $\frac{(n-2)E}{nr+R}$

D.  $\frac{(n-2)E}{(n-2)r+R}$

**Answer: C**



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17. The maximum power dissipated in an external resistance  $R$ , when connected to a cell of emf  $E$  and internal resistance  $r$ , will be

A.  $\frac{E^2}{r}$

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

C.  $\frac{E^2}{3r}$

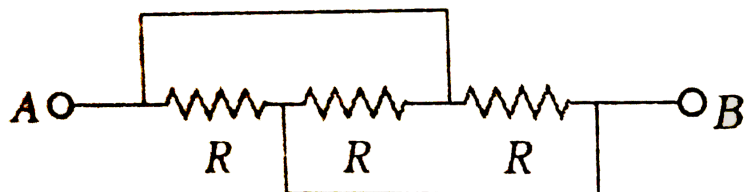
D.  $\frac{E^2}{4r}$

**Answer: D**



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18. The resistance across A and B in the figure below will be



A.  $3R$

B.  $R$

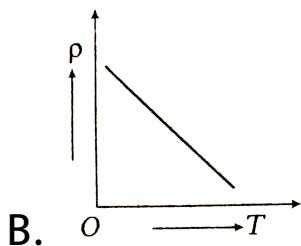
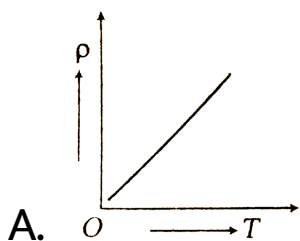
C.  $\frac{R}{3}$

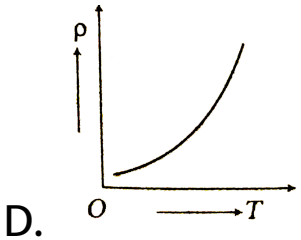
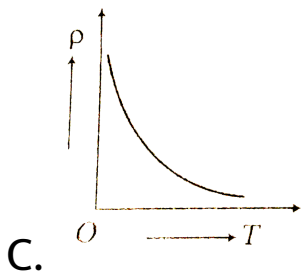
D. None of these

**Answer: C**



19. The temperature ( $T$ ) dependence of resistivity ( $\rho$ ) of a semiconductor is represented by :





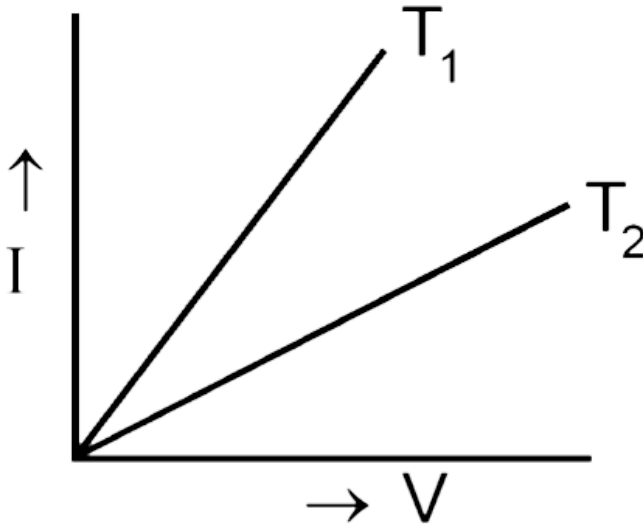
**Answer: C**



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**20.** The current ( $I$ ) and voltage ( $V$ ) graphs for a given metallic wire at two different

temperature ( $T_1$ ) and ( $T_2$ ) are shown in fig. It is concluded that



- A.  $T_1 > T_2$
- B.  $T_1 < T_2$
- C.  $T_1 = T_2$
- D.  $T_1 > 2T_2$

**Answer: B**



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**21.** Which of the following characteristics of electrons determines the current in a conductor?

A. Drift velocity alone

B. Thermal velocity alone

C. Both drift velocity and thermal velocity

D. Neither drift nor thermal velocity

**Answer: A**



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22. An ammeter and a voltmeter of resistance  $R$  connected in series to an electric cell of negligible internal resistance. Their readings are  $A$  and  $V$  respectively. If another resistance  $R$  is connected in parallel with the voltmeter

A. Both  $A$  and  $V$  will increase

B. Both  $A$  and  $V$  will decrease



C. A will decrease and V will increase

D. A will increase and V will decrease

**Answer: C**



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**23.** The resistance of a wire is  $10\Omega$ . Its length is increased by 10 % by stretching. The new resistance will now be

A.  $12\Omega$

B.  $1.2\Omega$

C.  $13\Omega$

D.  $11\Omega$

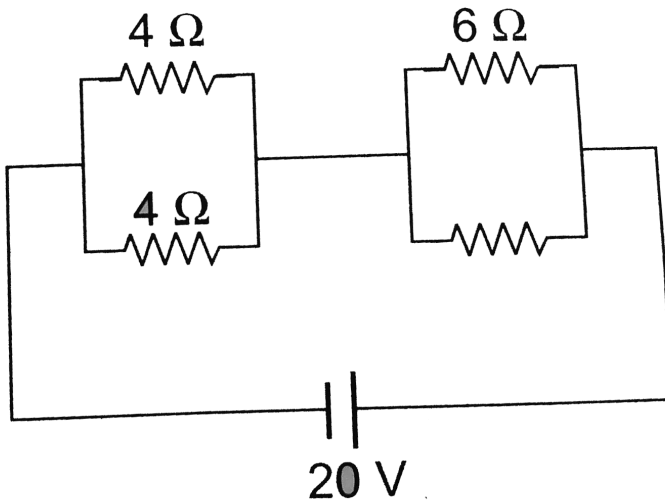
**Answer: A**



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**24.** Four resistances are connected in a circuit in the given figure. The electric current flowing through  $4\Omega$  and  $6\Omega$  resistance is

respectively



A. 2 A and 4 A

B. 1 A and 2 A

C. 1 A and 1 A

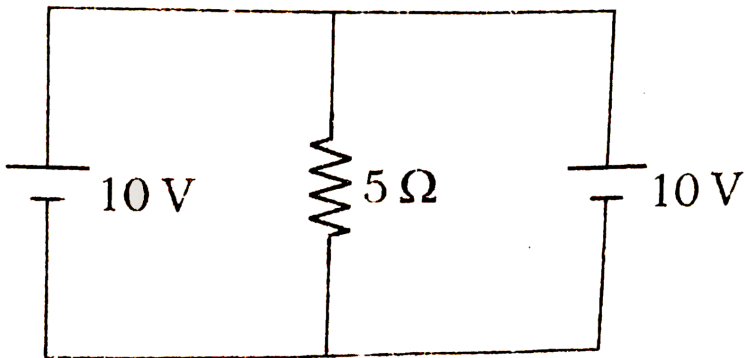
D. 2 A and 2 A

**Answer: D**



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**25.** Current through the  $5\Omega$  resistor is



A.  $2\text{ A}$

B.  $4\text{ A}$

C. zero

D. 1A

**Answer: A**



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**26.** A cell which has an emf 1.5 V is connected in series with an external resistance of  $10\Omega$ . If the potential difference across the cell is 1.25 V, then the internal resistance of the cell is (in  $\Omega$ )

A. 2

B. 0.25

C. 1.5

D. 0.3

**Answer: A**



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**27.** A piece of wire of resistance 4 ohm s is bent through  $180^\circ$  at its mid point and the

two halves are twisted together, then the resistance is

A.  $8\Omega$

B.  $1\Omega$

C.  $2\Omega$

D.  $5\Omega$

**Answer: B**



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**28.** A wire of resistance  $R$  is divided in 10 equal parts. These parts are connected in parallel, the equivalent resistance of such connection will be

A.  $0.01R$

B.  $0.1R$

C.  $10R$

D.  $100R$



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29. Three resistors each of 2 ohm are connected together in a triangular shape. The resistance between any two vertices will be

A.  $4/3\Omega$

B.  $3/4\Omega$

C.  $3\Omega$

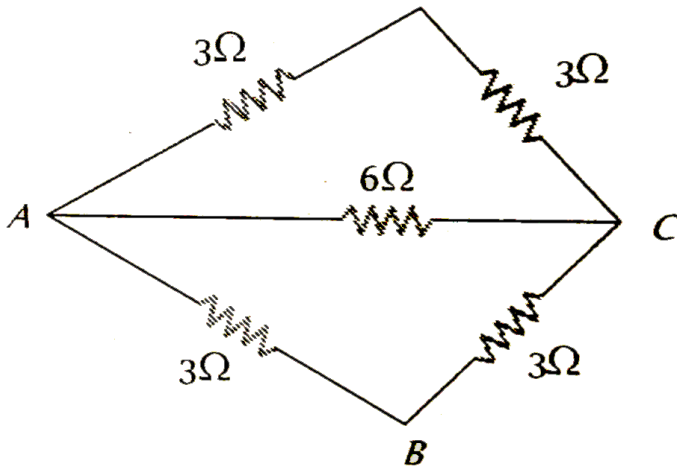
D.  $6\Omega$

**Answer: A**



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30. The effective resistance between the points A and B in the figure is



A.  $5\Omega$

B.  $2\Omega$

C.  $3\Omega$

D.  $4\Omega$

**Answer: B**



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**31.** Two resistances are joined in parallel whose resultant is  $6/8\text{ohm}$ . One of the resistance wire is broken and the effective resistance becomes  $2\Omega$  . Then the resistance in ohm of the wire that got broken was

A.  $3/5$

B. 2

C.  $\frac{6}{5}$

D. 3

**Answer: C**



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**32.** A wire of resistance  $9\Omega$  is broken in two parts. The length ratio being 1:2. The two pieces are connected in parallel. The net resistance will be

A.  $2\Omega$

B.  $3\Omega$

C.  $4\Omega$

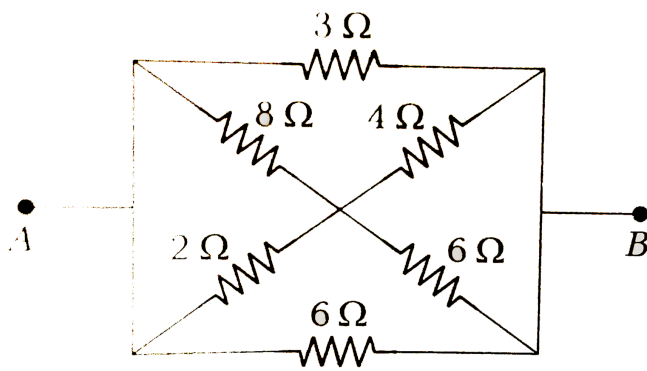
D.  $6\Omega$

**Answer: A**



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**33.** In the network shown, the equivalent resistance between A and B is



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

B.  $\frac{3}{4}\ \Omega$

C.  $\frac{24}{17}\ \Omega$

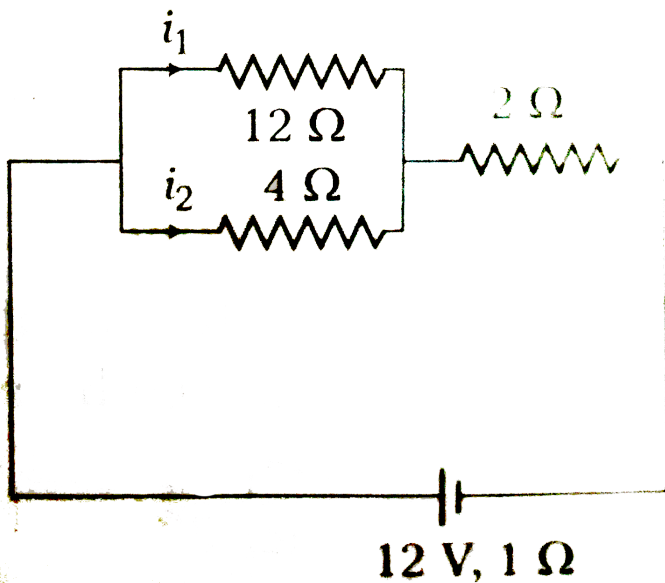
D.  $\frac{17}{24}\ \Omega$

**Answer: A**



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34. In the circuit shown, the currents  $i_1$  and  $i_2$  are



A.  $i_1 = 1.5A, i_2 = 0.5A$

B.  $i_1 = 0.5A, i_2 = 1.5A$

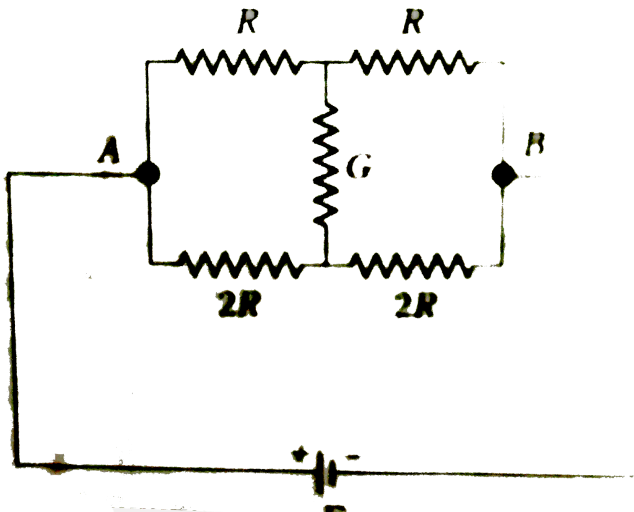
C.  $i_1 = 1A, i_2 = 3A$

**D.**  $i_1 = 3A, i_2 = 1A$

**Answer: B**



**35.** Consider the following statements regarding the network shown in the figure.





The equivalent resistance of the network between points A and B is independent of value of G.

The equivalent resistance of the network between points A and B is  $\frac{4}{3}R$ .

The current through G is zero.

Which of the above statements(s) is/are true?

A. (1) alone

B. (2) alone

C. Both (2) and (3)

D. (1), (2) and (3)

**Answer: D**



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**36.** To send 10% of the main current through a moving coil galvanometer of resistance  $99\Omega$ , the shunt required is –

A.  $9\Omega$

B.  $11\Omega$

C.  $10\Omega$

D.  $9.9\Omega$

**Answer: B**



**Watch Video Solution**

**37.** A 1250 W heater operates at 115V. What is the resistance of the heating coil?

A.  $1.6\Omega$

B.  $13.5\Omega$

C.  $1250\Omega$

D.  $10.6\Omega$

**Answer: D**



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**38.** The resistance of a wire at  $20^{\circ}C$  is  $20\Omega$  and at  $500^{\circ}C$  is  $60\Omega$ . At which temperature its resistance will be  $25\Omega$ ?

A.  $50^{\circ}C$

B.  $60^{\circ}C$

C.  $70^{\circ}C$

D.  $80^{\circ}C$

**Answer: D**



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**39.** A conducting wire of cross-sectional area  $1\text{cm}^2$  has  $3 \times 10^{23}$  charge carriers per  $\text{m}^3$ . If wire carries a current of  $24\text{mA}$ , then drift velocity of carriers is

A.  $5 \times 10^{-2}\text{ms}^{-1}$

B.  $0.5\text{ms}^{-1}$

C.  $5 \times 10^{-3}\text{ms}^{-1}$

D.  $5 \times 10^{-6} ms^{-1}$

**Answer: C**



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**40.** At room temperature, copper has free electron density of  $8.4 \times 10^{28} m^{-3}$ . The electron drift velocity in a copper conductor of cross - sectional area  $10^{-6} m^2$  and carrying a current of 5.4A, will be -

A.  $4ms^{-1}$

B.  $0.4ms^{-1}$

C.  $4cms^{-1}$

D.  $0.4mms^{-1}$

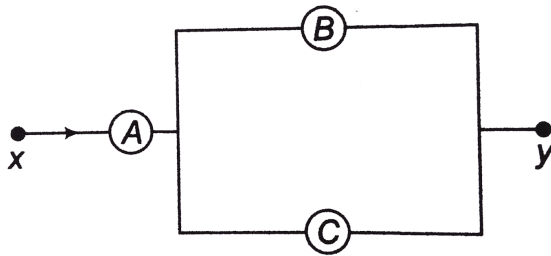
**Answer: D**



**Watch Video Solution**

**41.**  $A$ ,  $B$  and  $C$  are voltmeters of resistances  $R$ ,  $1.5R$  and  $3R$  respectively. When some potential difference is applied between  $x$  and  $y$  the voltmeter readings are  $V_A$ ,  $V_B$  and

$V_C$ , then



A.  $V_1 = V_2 = V_3$

B.  $V_1 < V_2 = V_3$

C.  $V_1 > V_2 > V_3$

D.  $V_1 > V_2 = V_3$

**Answer: A**



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**42.** A metal rod of the length 10cm and a rectangular cross-section of 1 cm  $\times$   $\frac{1}{2}$  cm is connected to a battery across opposite faces. The resistance will be

A. maximum when the battery is connected

across 1 cm  $\times$  ( $\frac{1}{2}$ ) cm faces

B. maximum when the battery is connected

across 10 cm  $\times$  (1) cm faces

C. maximum when the battery is connected

across 1 cm  $\times$  ( $\frac{1}{2}$ ) cm faces

D. same irrespective of the three faces

**Answer: A**



**Watch Video Solution**

**43.** Two cells of emfs approximately  $5V$  and  $10V$  are to be accurately compared using a potentiometer of length  $400\text{cm}$

A. The battery that runs the potentiometer should have voltage of  $8V$

- B. The battery of potentiometer can have a voltage of 15 V and R adjusted so that the potential drop across the wire slightly exceeds 10 V
- C. The first portion of 50 cm of wire itself should have a potential drop of 10 V
- D. Potentiometer is usually used for comparing resistances and not voltages

**Answer: B**



**Watch Video Solution**

**44.** The resistivity of a potentiometer wire is  $40 \times 10^{-8} \Omega - m$  and its area of cross section is  $8 \times 10^{-6} m^2$ . If 0.2 A current is flowing through the wire the potential gradient will be

A.  $10^{-2} V / m$

B.  $10^{-1} V / m$

C.  $3.2 \times 10^{-2} V / m$

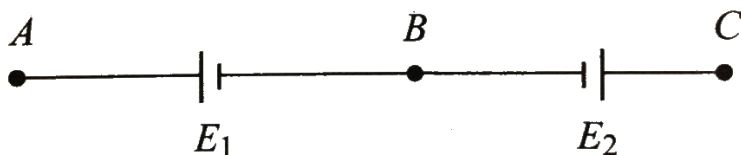
D.  $1 V / m$

**Answer: A**



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**45.** Two cells of emfs  $E_1$  and  $E_2$  ( $E_1 > E_2$ ) are connected as shows in Fig. 6.45.



When a potentiometer is connected between  $A$  and  $B$ , the balancing length of the potentiometer wire is  $300\text{cm}$ . On connecting the same potentiometer between  $A$  and  $C$ , the balancing length is  $100\text{cm}$ . The ratio  $E_1 / E_2$  is

A. 3:1

B. 1:3

C. 2:3

D. 3:2

**Answer: D**



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**46.** A voltmeter of resistance  $998\Omega$  is connected across a cell of emf 2 V and internal resistance  $2\Omega$ . Find the p.d. across the

voltmeter, that across the terminals of the cell and percentage error in the reading of the voltmeter.

A.  $1.99V$

B.  $3.5V$

C.  $5\text{ V}$

D.  $6\text{ V}$

**Answer: A**



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47. A wire of 50 cm long,  $1\text{mm}^2$  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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**48.** Three resistance  $P, Q, R$  each of  $2\Omega$  and an unknown resistance  $S$  form the four arms of a Wheatstone's bridge circuit. When a resistance of  $6\Omega$  is connected in parallel to  $S$  the bridge gets balanced. What is the value of  $S$ ?

A.  $2\Omega$

B.  $3\Omega$

C.  $6\Omega$

D.  $1\Omega$

**Answer: B**



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**49.** A 2 V battery, a  $990\Omega$  resistor and a potentiometer of 2 m length, all are connected in series of the resistance of potentiometer wire is  $10\Omega$ , then the potential gradient of the potentiometer wire is

A.  $0.05Vm^{-1}$

B.  $0.5Vm^{-1}$

C.  $0.01Vm^{-1}$

D.  $0.1Vm^{-1}$

**Answer: C**



**Watch Video Solution**

**50.** The electron with charge  $(q = 1.6 \times 10^{-19}C)$  moves in an orbit of radius  $5 \times 10^{-11}m$  with a speed of  $2.2 \times 10^6ms^{-1}$ , around an atom. The equivalent current is

A.  $1.12 \times 10^{-6} A$

B.  $1.12 \times 10^{-3} A$

C.  $1.12 \times 10^{-9} A$

D.  $1.12A$

**Answer: B**



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**51.** Two resistance wires on joining in parallel the resultant resistance is ohms  $\frac{6}{5}$  ohms. One

of the wire breaks, the effective resistance is 2 ohms . The resistance of the broken wire is

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

B.  $2\Omega$

C.  $\frac{6}{5}\Omega$

D.  $3\Omega$

**Answer: D**



**Watch Video Solution**

52. A potentiometer having the potential gradient of  $2\text{mV}/\text{cm}$  is used to measure the difference of potential across a resistance of  $10\text{ohm}$ . If a length of  $50\text{cm}$  of the potentiometer wire is required to get null point, the current passing through the  $10\text{ohm}$  resistor is (in  $\text{mA}$ )

A. 1

B. 2

C. 5

D. 10

**Answer: D**



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**53.** The  $n$  rows each containig  $m$  cells in series are joined parallel. Maximum current is taken from this combination across jan external resistance of  $3\Omega$  resistance. If the total number of cells used are 24 and internal resistance of each cell is  $0.5\Omega$  then

A.  $m = 8, n = 3$

B.  $m = 6, n = 4$

C.  $m = 12, n = 2$

D.  $m = 2, n = 12$

**Answer: C**



**Watch Video Solution**

**54.** A  $100V$  voltmeter of internal resistance  $20k\Omega$  in series with a high resistance  $R$  is



connected to a  $110V$  line. The voltmeter reads  $5V$ , the value of  $R$  is

A.  $210k\Omega$

B.  $315k\Omega$

C.  $420k\Omega$

D.  $440k\Omega$

**Answer: C**



**Watch Video Solution**

55. A cell supplies a current  $i_1$  through a resistance  $R_1$  and a current  $i_2$  through a resistance  $R_2$ . The internal resistance of this cell is

A.  $R_2 - R_1$

B.  $\frac{i_1 R_2 - i_2 R_1}{i_1 - i_2}$

C.  $\frac{i_2 R_2 - i_1 R_1}{i_1 - i_2}$

D.  $\left( \frac{i_1 + i_2}{i_1 - i_2} \right) \sqrt{R_1 R_2}$

**Answer: C**



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56. Out of five resistance of  $R\Omega$  each 3 are connected in parallel and are joined to the rest 2 in series. Find the resultant resistance.

A.  $(3/7)R\Omega$

B.  $(7/3)R\Omega$

C.  $(7/8)R\Omega$

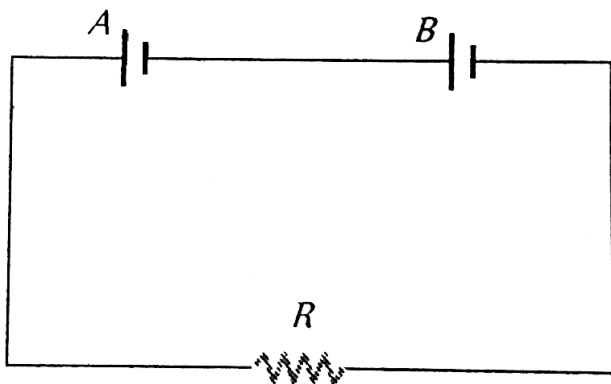
D.  $(8/7)R\Omega$

**Answer: B**





57. Two batteries A and B each of e.m.f. 2 V are connected in series to an external resistance  $R = 1 \text{ ohm}$ . If the internal resistance of battery A is 1.9 ohms and that of B is 0.9 ohm, what is the potential difference between the terminals of battery A



A. 2 V

B. 3.8 V

C. zero

D. 4.8 V

**Answer: C**



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**58.** For a cell of e.m.f. 2 V , a balance is obtained for 50 cm of the potentiometer wire. If the cell is shunted by a  $2\Omega$  resistor and the

balance is obtained across 40 cm of the wire,  
then the internal resistance of the cell is

A.  $0.25\Omega$

B.  $0.50\Omega$

C.  $0.80\Omega$

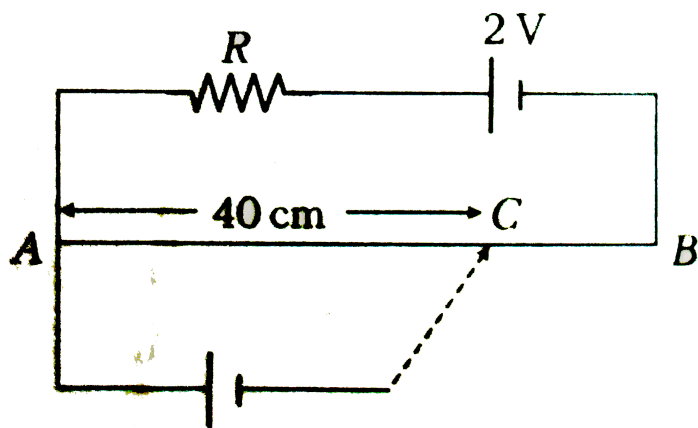
D.  $1.00\Omega$

**Answer: B**



**Watch Video Solution**

59. AB is a potentiometer wire of length 100 cm and its resistance is  $10\Omega$ . It is connected in series with a resistance  $R = 40\Omega$  and a battery of emf 2 V and negligible internal resistance. If a source of unknown emf  $E$  is balanced by 40 cm length of the potentiometer wire, the value of  $E$  is



A.  $0.8V$

B.  $1.6V$

C.  $0.08V$

D.  $0.16V$

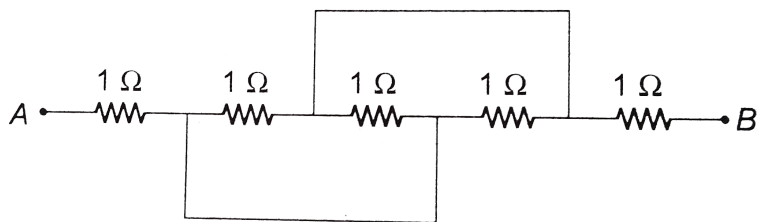
**Answer: D**



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**60.** Equivalent resistance between the points  $A$  and  $B$  (in  $\Omega$ )





A.  $\frac{1}{5}$

B.  $\frac{5}{4}$

C.  $\frac{7}{3}$

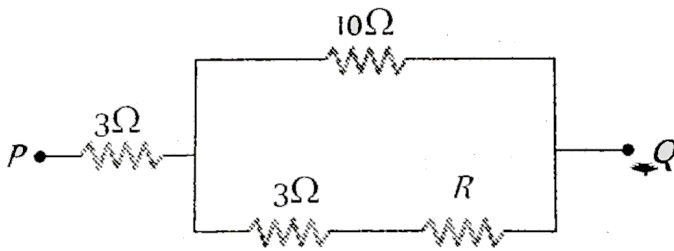
D.  $\frac{7}{2}$

**Answer: C**



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61. In the circuit shown here, what is the value of the unknown resistor  $R$  so that the total resistance of the circuit between points P and Q is also equal to  $R$



A.  $3\Omega$

B.  $\sqrt{39}\Omega$

C.  $\sqrt{69}\Omega$

D.  $10\Omega$

**Answer: C**



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**62.** Two wire of the same meta have same length, but their cross-sections are in the rati  $3:1$  . They are joined in series. The resistance of thicker wire is  $10\Omega$  . The total resistance of the combination will be

A.  $40\Omega$

B.  $\frac{40}{3}\Omega$

C.  $\frac{5}{2}\Omega$

D.  $100\Omega$

**Answer: A**



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

A.  $5:3:1$

B.  $\sqrt{125}:15:1$

C.  $1:15:125$

D.  $1:3:5$

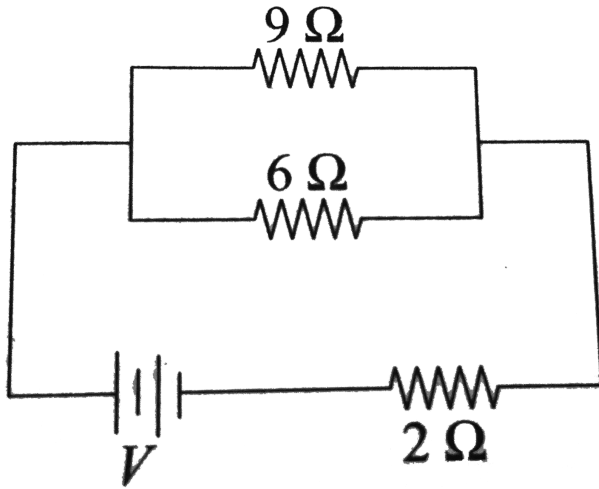
**Answer: C**



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**64.** If power dissipated in the  $9\Omega$  resistor in the resistor shown is  $36W$ , the potential

difference across the  $2\Omega$  resistor is



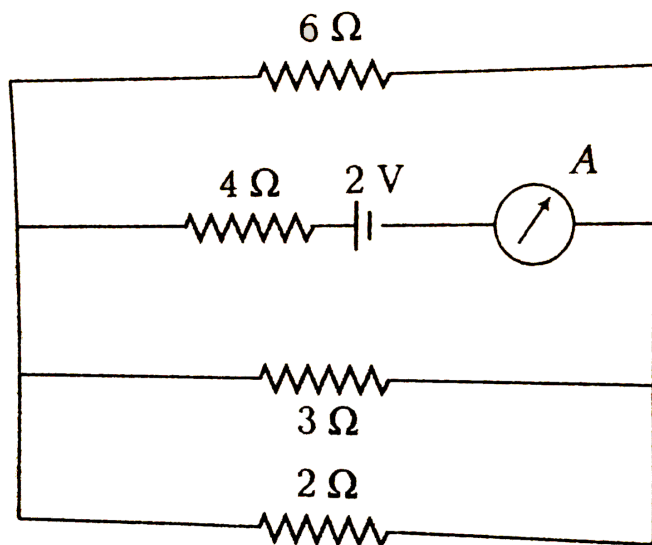
- A.  $8\text{ V}$
- B.  $10\text{ V}$
- C.  $2\text{ V}$
- D.  $4\text{ V}$

**Answer: B**



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65. The reading of the ammeter in the following figure will be



A.  $0.8\text{ A}$

B.  $0.6\text{ A}$

C. 0.4 A

D. 0.2 A

**Answer: C**



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**66.** A wire of length 100 cm is connected to a cell of emf 2 V and negligible internal resistance. The resistance of the wire is  $3\Omega$ . The additional resistance required to produce a potential drop of 1 milli volt per cm is



A.  $60\Omega$

B.  $47\Omega$

C.  $57\Omega$

D.  $35\Omega$

**Answer: C**



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**67.** Two uniform wires  $A$  and  $B$  are of the same total metal and have equal masses. The radius of wire  $A$  is twice that of wire  $B$ . The

total resistance of  $A$  and  $B$  when connected in parallel is

A.  $4\Omega$  when the resistance of wire  $A$  is

$4.25\Omega$

B.  $5\Omega$  when the resistnace of wire  $A$  is  $4\Omega$

C.  $4\Omega$  when the resistance of wire  $B$  is

$4.25\Omega$

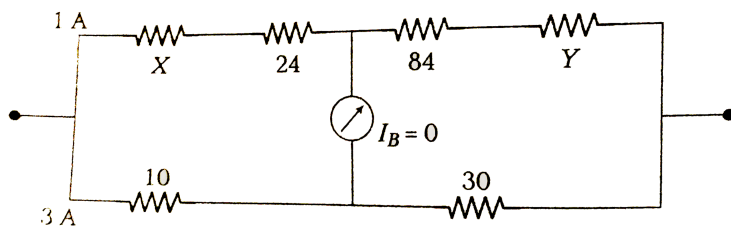
D.  $5\Omega$  when the resistance of wire  $B$  is  $4\Omega$

**Answer: A**



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**68.** In the given circuit, the resistances are given in ohm. The current through the  $10\Omega$  resistance is 3 A while that through the resistance X is 1 A. No current passes through the galvanometer. The values of the unknown resistances X and Y are respectively (in ohm)



A. 14 and 54

B. 12 and 6

C. 6 and 12

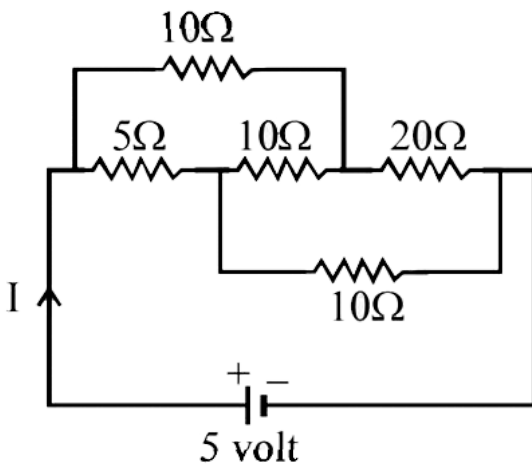
D. 6 and 6

**Answer: D**



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**69.** The current I drawn from the 5 volt source will be



A.  $0.33A$

B.  $0.5A$

C.  $0.67A$

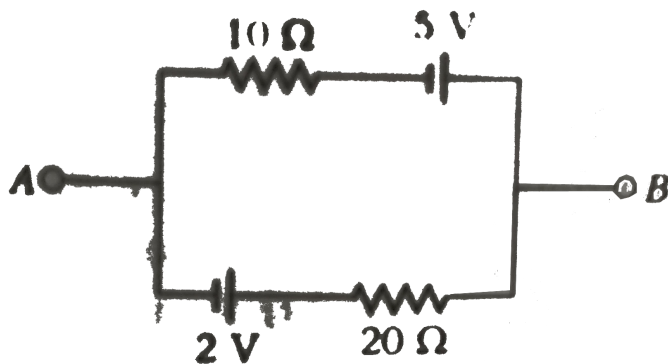
D.  $0.17A$

**Answer: B**



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70. The current in the given circuit is



A.  $0.3\text{ A}$

B.  $0.4\text{ A}$

C.  $0.1\text{ A}$

D.  $0.2\text{ A}$

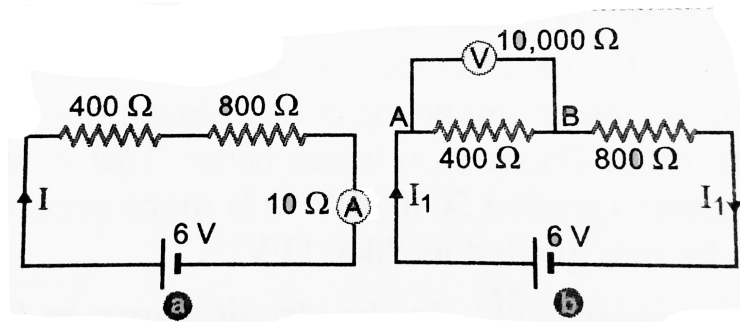
**Answer: C**



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71. Two resistors  $400\Omega$  and  $800\Omega$  are connected in series with a  $6V$  battery. It is desired to measure the current in the circuit. An ammeter of  $10\Omega$  resistance is used for this purpose figure. What will be the reading in the ammeter? Similarly, if a voltmeter of  $10,000\Omega$  resistance is used to measure the potential difference across the  $400\Omega$  resistor, what will

be the reading in the voltmeter?



A. 2 V

B. 1.95 V

C. 3.8 V

D. 4 V

**Answer: B**



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72. A battery of emf  $E$  has an internal resistance  $r$ . A variable resistance  $R$  is connected to the terminals of the battery. A current  $i$  is drawn from the battery.  $V$  is the terminal potential difference. If  $R$  alone is gradually reduced to zero, which of the following best describes  $i$  and  $V$ ?

A.  $i$  approaches zero,  $V$  approaches  $E$

B.  $i$  approaches  $\frac{E}{r}$ ,  $V$  approaches zero

C.  $i$  approaches  $\frac{E}{r}$ ,  $V$  approaches  $E$

D.  $i$  approaches infinity,  $\frac{E}{r}$ ,  $V$  approaches  $E$

**Answer: B**



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**73.** Two resistances are connected in the two gaps of a meter bridge. The balance point is  $20\text{cm}$  from the zero end. When a resistance  $15\Omega$  is connected in series with the smaller of two resistance, the null point shifts to  $40\text{cm}$ .

The smaller of the two resistance has the value.

A. 3

B. 6

C. 9

D. 12

**Answer: C**



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**74.** A battery of four cells in series, each having an emf of  $1.14\text{ V}$  and an internal resistance of  $2\Omega$  is to be used to charge a small  $2\text{ V}$  accumulator of negligible internal resistance. What is the charging current?

A.  $0.1\text{ A}$

B.  $0.2\text{ A}$

C.  $0.3\text{ A}$

D.  $0.45\text{ A}$

**Answer: C**



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**75.** The length of a wire of a potentiometer is 100 cm, and the e.m.f. of its standard cell is  $E$  volt. It is employed to measure the e.m.f. of a battery whose internal resistance is  $0.5\Omega$ . If the balance point is obtained at  $l = 30$  cm from the positive end, the e.m.f. of the battery is .

where  $i$  is the current in the potentiometer wire.

A.  $\frac{30E}{100.5}$

B.  $\frac{30E}{100 - 0.5}$

C.  $\frac{30(E - 0.5i)}{100}$ , where  $i$  is the current in

the potentiometer wire

D.  $\frac{30E}{100}$

**Answer: D**



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**76.** When a resistance of  $100\Omega$  is connected in series with a galvanometer of resistance  $R$ , then its range is  $V$ . To double its range, a

resistance of  $1000\Omega$  is connected in series.

Find the value of R.

A.  $700\Omega$

B.  $800\Omega$

C.  $900\Omega$

D.  $100\Omega$

**Answer: C**



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77. Two cells, having the same emf, are connected in series through an external resistance  $R$ . Cells have internal resistance  $r_1$  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.  $\sqrt{r_1 r_2}$

B.  $r_1 + r_2$

C.  $r_1 - r_2$

D.  $\frac{r_1 + r_2}{2}$



**Answer: C**



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**78.** Two wires of the same material but of different diameters carry the same current  $i$ . If the ratio of their diameters is  $2:1$ , then the corresponding ratio of their mean drift velocities will be

A.  $4:1$

B.  $1:1$

C. 1 : 2

D. 1 : 4

**Answer: D**



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**79.** Two bulbs consume same energy when operated at  $200V$  and  $300V$  , respectively . When these bulbs are connected in series across a dc source of  $500V$ , then

A. ratio of potential differences across them is  $3/2$

B. ratio of potential differences across them is  $9/4$

C. ratio of powers consumed across them is  $4/9$

D. ratio of powers consumed across them is  $2/3$

**Answer: C**



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**80.** A factory is served by a 220 V supply line. In a circuit protected by a fuse marked 10 A, the maximum number of 100 W lamps in parallel that can be turned on, is

A. 11

B. 22

C. 33

D. 66

**Answer: B**



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**81.** Two bulbs 60 W and 100 W designed for voltage 220 V are connected in series across 220 V source. The net power dissipated is

A. 37.5 W

B. 75W

C. 80W

D. 40 W

**Answer: A**



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**82.** A tap supplies water at  $22^{\circ}C$ , a man takes 1 L of water per min at  $37^{\circ}C$  from the geyser. The power of geyser is

A. 525 W

B. 1050 W

C. 1775 W

D. 2100 W

**Answer: B**



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**83.** The mean free path of electrons in a metal is  $4 \times 10^{-8} m$ . The electric field which can give on an average  $2eV$  energy to an electron in the metal will be in the units  $V/m$

A.  $8 \times 10^7$

B.  $5 \times 10^{-11}$

C.  $8 \times 10^{-11}$

D.  $5 \times 10^7$

**Answer: D**



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**84.** You are given two resistances  $R_1$  and  $R_2$ . By using them singly, in series and in parallel, you can obtain four resistances of  $1.5\Omega$ ,  $2\Omega$ ,  $6\Omega$  and  $8\Omega$ . The value of  $R_1$  and  $R_2$  are

A.  $1\Omega$ ,  $7\Omega$

B.  $1.5\Omega$ ,  $6.5\Omega$



C.  $3\Omega$ ,  $5\Omega$

D.  $2\Omega$ ,  $6\Omega$

**Answer: D**



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**85.** A potentiometer having the potential gradient of  $2mV/cm$  is used to measure the difference of potential across a resistance of  $10ohm$ . If a length of  $50cm$  of the potentiometer wire is required to get null

point, the current passing through the  $10\Omega$  resistor is (in  $mA$ )

A. 1

B. 2

C. 5

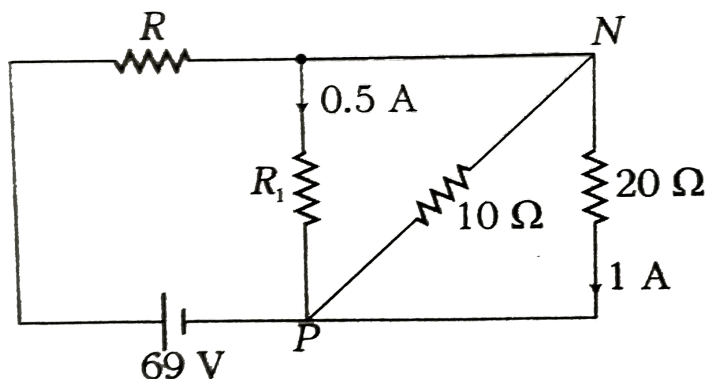
D. 10

**Answer: D**



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86. In the circuit shown in the figure,



A. The current through NP is 0.5 A

B. The value of  $R_1 = 40\ \Omega$

C. The value of  $R = 14\ \Omega$

D. The potential difference across  $R = 49\text{ V}$

**Answer: B::C::D**



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**87.** A galvanometer of resistance  $50\Omega$  is connected to a battery of  $3V$  along with resistance of  $2950\Omega$  in series. A full scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this deflection to 20 division the above series resistance should be

A.  $4450\Omega$

B.  $5050\Omega$

C.  $5550\ \Omega$

D.  $6050\ \Omega$

**Answer: A**



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**88.** When a galvanometer is shunted by resistance  $S$ , then its current capacity increases  $n$  times. If the same galvanometer is shunted by another resistance  $S'$ , then its current capacity will increase by  $n'$  is given by

A.  $\frac{(n+1)S}{S'}$

B.  $\frac{S(n-1) + S'}{S'}$

C.  $\frac{n+S}{S'}$

D.  $\frac{S(n-1) - S'}{S'}$

**Answer: B**



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**89.** The tungsten filaments of two electric bulbs are of the same length. If one of them

gives 25 W power and the other 60 W power,  
then

- A. Both the filaments are of same thickness
- B. 25 W bulb has thicker filament
- C. 60 W bulb has thicker filament
- D. Both the filaments have same cross-sectional area

**Answer: C**



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90. Three unequal resistor in parallel are equivalent to a resistance 1 ohm If two of them are in the ratio 1:2 and if no resistance value is fractional the largest of three resistance in ohm is

A. 4

B. 6

C. 8

D. 12

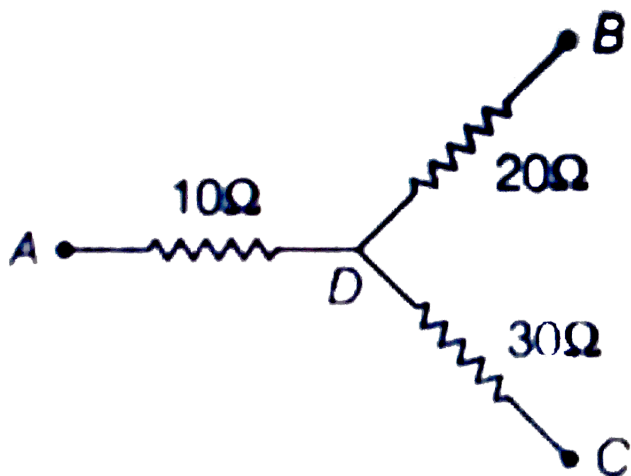
**Answer: B**





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91. In the network shown, points A, B and C have potentials of 70 V, zero and 10V respectively



A. the point D will be at a potential of 60 V

B. the point D will be at a potential of 20 V

C. currents in the pathes AD, DB and DC are  
in the ratio of 1 : 2 : 3

D. current in the paths AB, DB and DC are in  
the ratio of 3 : 2 : 1

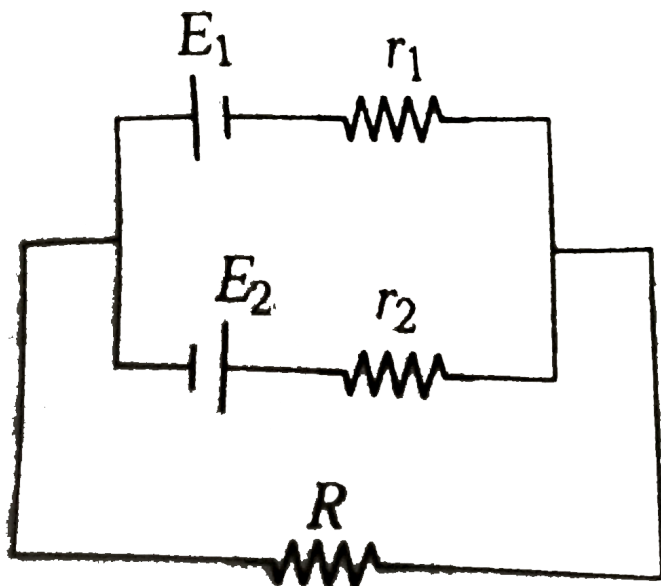
**Answer: C**



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92. The current in the resistance  $R$  will be zero

if



A.  $E_1 r_1 = E_2 r_2$

B.  $\frac{E_1}{r_1} = \frac{E_2}{r_2}$

C.  $(E_1 + E_2) r_1 = E_1 r_1$

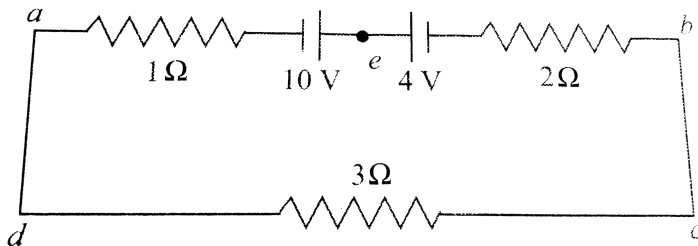
$$D. (E_1 - E_2)r_1 = E_2r_1$$

**Answer: B**



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**93.** In the circuit shown in fig. the magnitudes and the direction of the flow of current, respectively, would be



A.  $\frac{7}{3}A$  from a to e

B.  $\frac{7}{3}A$  from b to e

C.  $1A$  from b to e

D.  $1A$  from a to e

**Answer: D**



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**94.** Consider a current carrying wire (current  $I$ ) in the shape of a circle. Note that as the current progresses along the wire, the

direction of  $\vec{J}$  (current density) changes in an exact manner, while the current  $I$  remains unaffected. The agent that is essentially responsible for is

A. source of emf

B. electric field produced by charges accumulated on the surface of wire

C. the charges just behind a given segment of wire which push them just the right way by repulsion

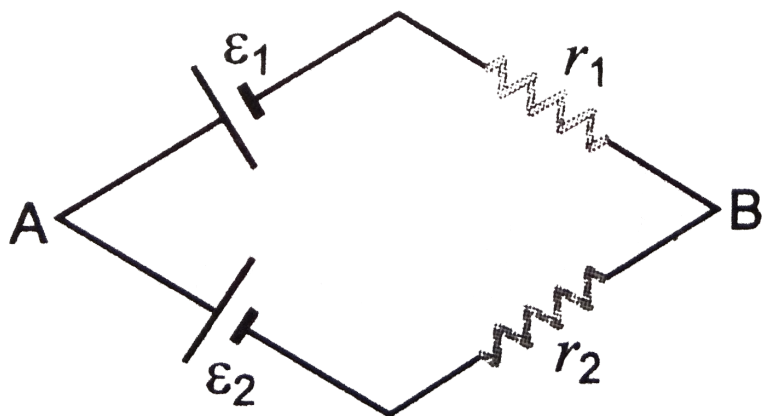
D. the charges ahead

**Answer: B**



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**95.** Two batteries of emf  $\varepsilon_1$  and  $\varepsilon_2$  ( $\varepsilon_2 > \varepsilon_1$ ) and internal resistances  $r_1$  and  $r_2$  respectively are connected in parallel as shown in Fig. 2 (EP).1.



A. Two equivalent emf  $\varepsilon_{eq}$  of the cells is

between  $\varepsilon_1$  and  $\varepsilon_2$ , i. e. ,  $\varepsilon_1 < \varepsilon_{eq} < \varepsilon_2$

B. The equivalent emf  $\varepsilon_{eq}$  is smaller than  $\varepsilon_1$

C. The  $\varepsilon_{eq}$  is given by  $\varepsilon_{eq} = \varepsilon_1 + \varepsilon_2$  always

D.  $\varepsilon_{eq}$  is independent of internal

resistances  $r_1$  and  $r_2$

**Answer: A**



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**96.** A resistance  $R$  is to be measured using a meter bridge. Student chooses the standard resistance  $S$  to be  $100\Omega$ . He finds the null point at  $l_1 = 2.9\text{cm}$ . He is told to attempt to improve the accuracy. Which of the following is a useful way?

A. He should measure  $l_1$  more accurately

B. He should change  $S$  to  $1000\Omega$  and repeat the experiment

C. He should change  $S$  to  $3\Omega$  and repeat the experiment

D. He should given up hope of a more accurate measurement with a meter bridge

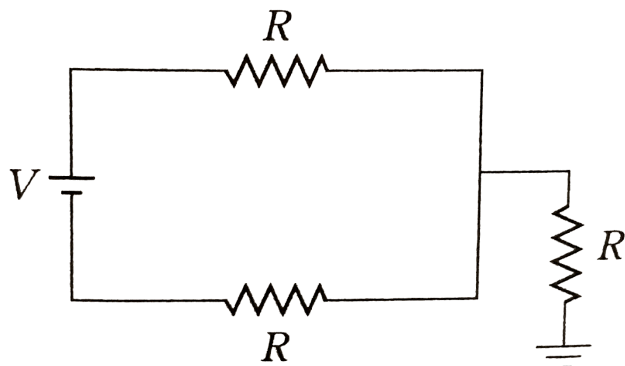
**Answer: C**



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97. The current drawn from the battery shown

in the figure is  $I =$



A.  $\frac{V}{R}$

B.  $\frac{V}{2R}$

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

D.  $\frac{3V}{2R}$

**Answer: B**



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**98.** Two nonideal batteries are connected in parallel. Consider the following statements:

(A) The equivalent emf is smaller than either of the two emfs.

(B) The equivalent internal resistance is smaller than either of the two internal resistances.

A. a) Both A and B are correct

B. b) A is correct but B is wrong

C. c) B is correct but A is wrong

D. d) Both A and B are incorrect

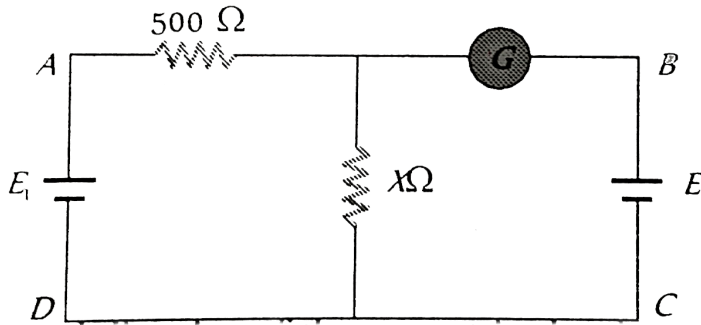
**Answer: C**



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**99.** In the adjoining circuit, the battery  $E_1$  has an e.m.f me of 12 volt and zero internal resistance while the battery E has an e.m.f me

of 2 volt . If the galvanometer  $G$  reads zero, then the value of the resistance  $X$  in ohm is



A. 250

B. 100

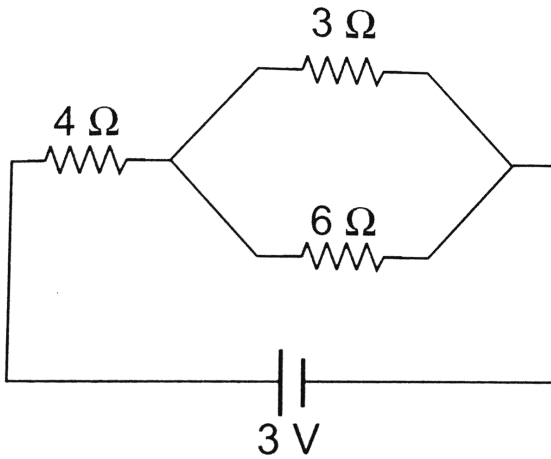
C. 50

D. 200

**Answer: B**

**100.** The potential drop across the  $3\Omega$  resistor is

is



A.  $1\text{ V}$

B.  $1.5\text{ V}$

C. 2 V

D. 3 V

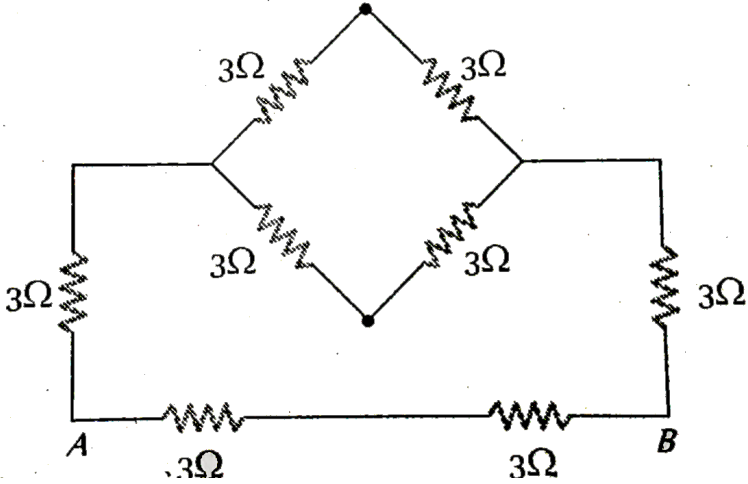
**Answer: A**



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**101.** Equivalent resistance between A and B will be





A.  $2\Omega$

B.  $18\Omega$

C.  $6\Omega$

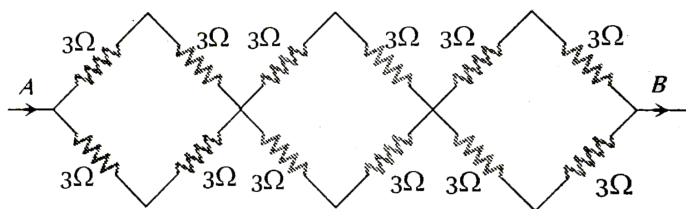
D.  $3.6\Omega$

**Answer: D**



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**102.** In the network of resistors shown in the adjoining figure, the equivalent resistance between A and B is



A.  $54 \Omega$

B.  $18 \Omega$

C.  $36 \Omega$

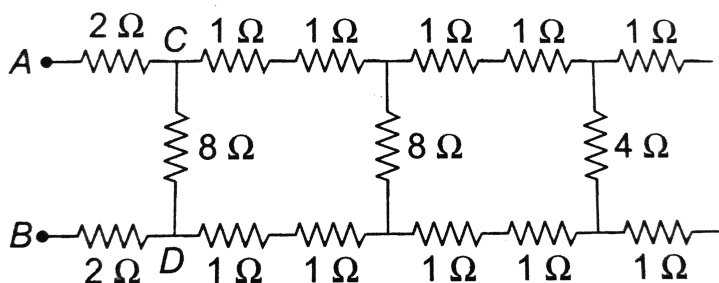
D.  $9 \Omega$

Answer: D



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103. In the figure shown, the total resistance between  $A$  and  $B$  is



A.  $12\ \Omega$

B.  $4\ \Omega$

C.  $6\ \Omega$

D.  $8\ \Omega$

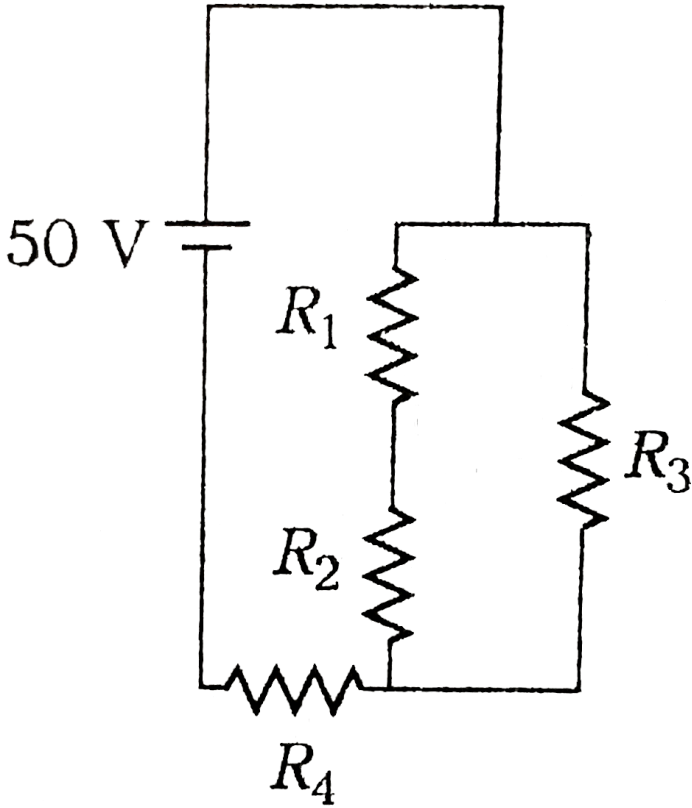
**Answer: D**



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**104.** The potential difference in volt across the resistance  $R_3$  in the circuit shown in figure, is

$(R_1 = 15\Omega, R_2 = 15\Omega, R_3 = 30\Omega, R_4 = 35\Omega)$



A. 5

B. 7.5

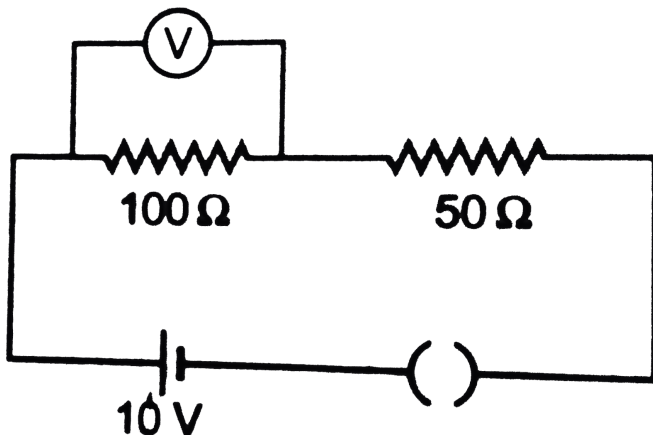
C. 15

D. 12.5

**Answer: C**

 **Watch Video Solution**

**105.** In the given circuit, the voltmeter records 5 V. The resistance of the voltmeter in  $\Omega$  is



A. 200

B. 100

C. 10

D. 50

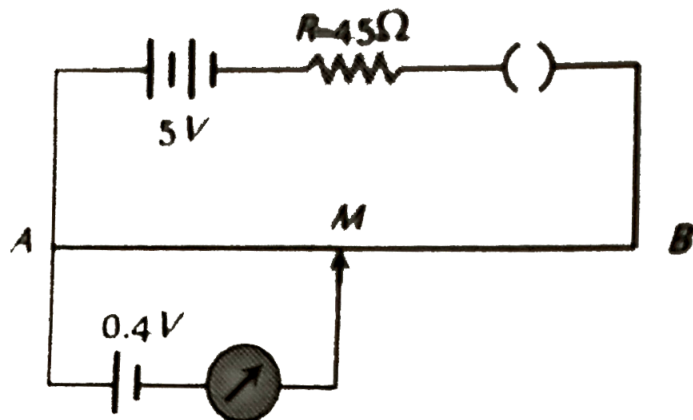
**Answer: B**



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**106.** In given figure, the potentiometer wire AB has a resistance of  $5\Omega$  and length 10 m . The

balancing length AM for the emf of 0.4 V is



A. 0.4m

B. 4 m

C. 0.8 m

D. 8 m

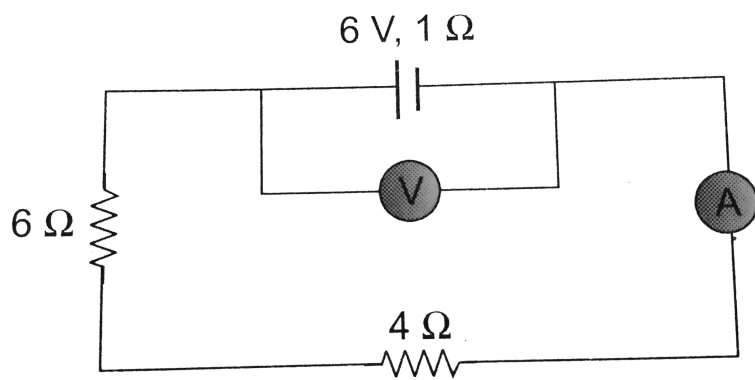
**Answer: D**





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**107.** In the circuit shown here, the readings of the ammeter and voltmeter are



A.  $6\text{ A}, 60\text{ V}$

B.  $0.6\text{ A}, 6\text{ V}$

C.  $6\text{ A}, 6\text{ V}$

D.  $6/11\text{ A}$ ,  $60/11\text{ V}$

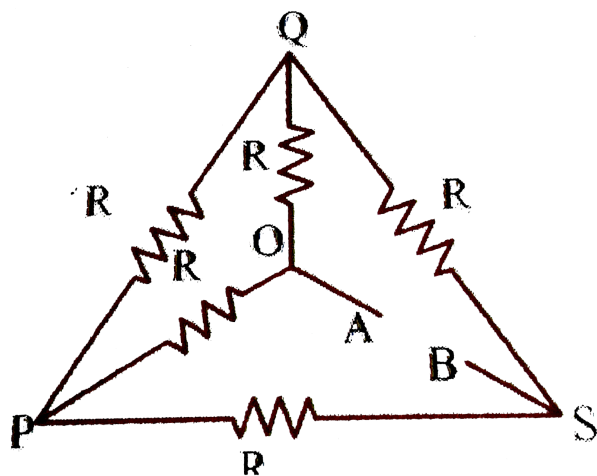
**Answer: D**



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**108.** If each of the resistance in the network in figure  $R$ ,  
the equivalent resistance between terminals  $A$

and  $B$  is



A.  $R$

B.  $5R$

C.  $3R$

D.  $6R$

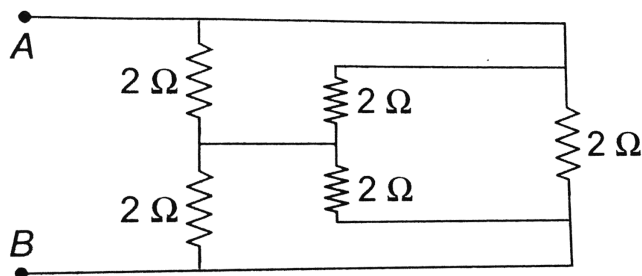
**Answer: A**



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**109.** Find the equivalent resistance across  $AB$

:



A.  $1\ \Omega$

B.  $2\ \Omega$

C.  $3\ \Omega$

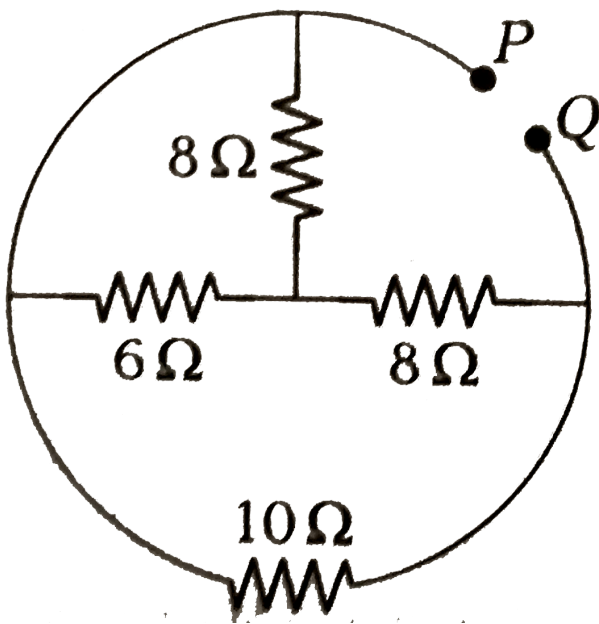
D.  $4\Omega$

**Answer: A**



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**110.** The equivalent resistance between P and Q in the figure is approximately



A.  $6\ \Omega$

B.  $5.333\ \Omega$

C.  $7.5\ \Omega$

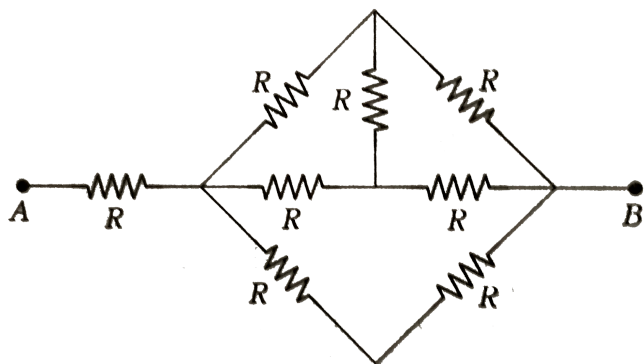
D.  $20\ \Omega$

**Answer: B**



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111. In the given network of resistances, the effective resistance between A and B is



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

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

C.  $5R$

D.  $8R$

**Answer: A**



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**112.** A source of e.m.f.  $E = 15V$  and having negligible internal resistance is connected to a variable resistance so that the current in the circuit increases with time as  $i = 1.2t + 3$ . Then, the total charge that will flow in first five second will be



A. 10 C

B. 20 C

C. 30 C

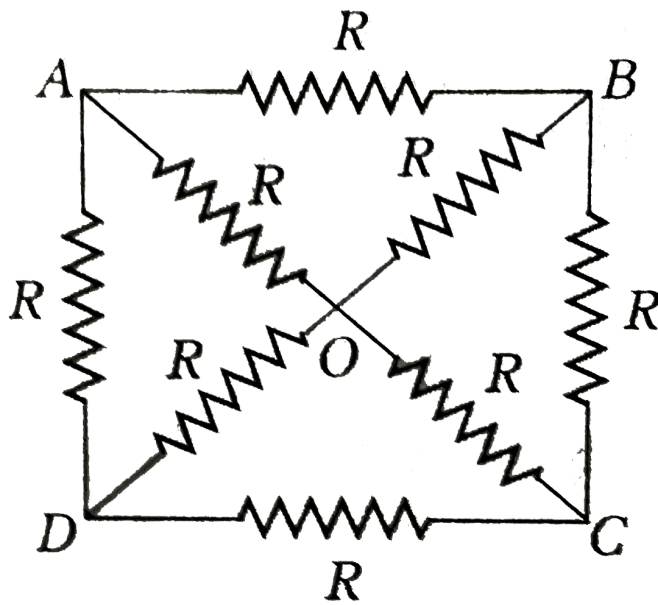
D. 40 C

**Answer: C**



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**113.** The effective resistance between points A and C for the network shown figure is



A.  $\frac{2}{3}R$

B.  $\frac{3}{2}R$

C.  $2R$

D.  $\frac{1}{2R}$

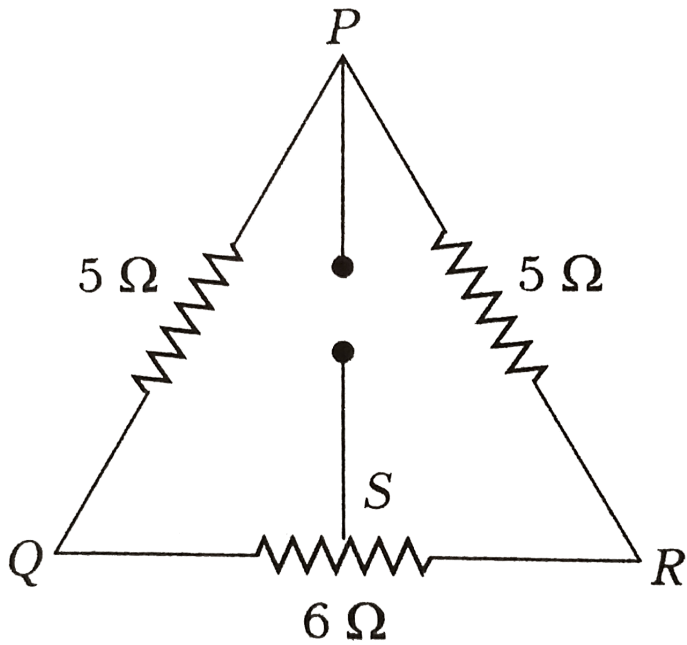
**Answer: A**



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**114.** Three resistances  $5\Omega$ ,  $5\Omega$  and  $6\Omega$  are connected as shown in figure. If the point S divides the resistance  $6\Omega$  into two equal halves, the resistance between points P and S

is



A.  $11\ \Omega$

B.  $8\ \Omega$

C.  $6\ \Omega$

D.  $4\ \Omega$



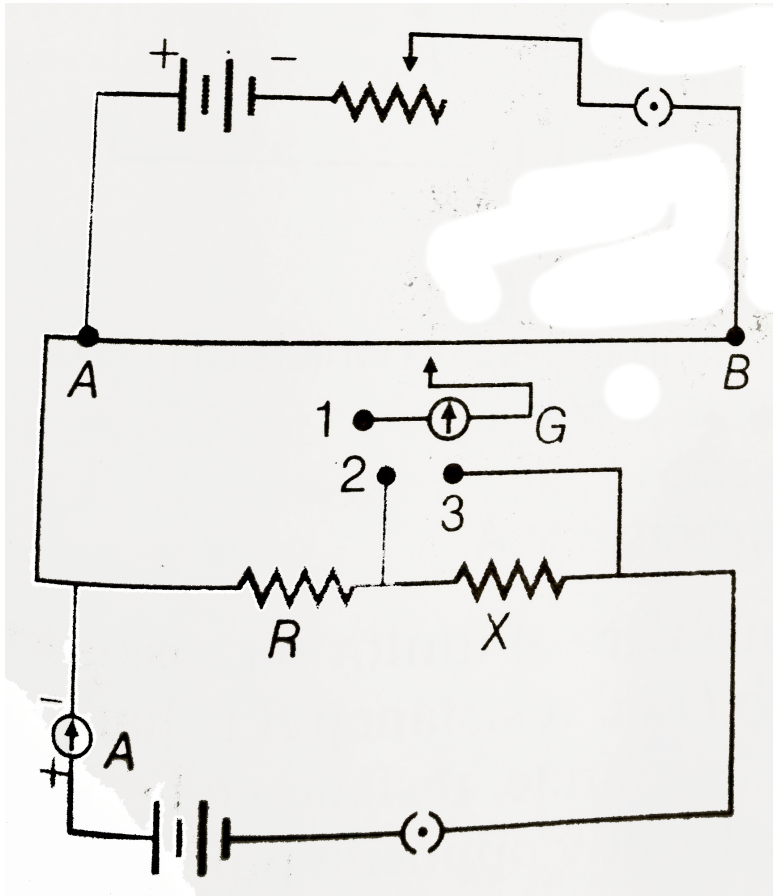
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**115.** A potentiometer circuit is set up as shown.

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  $kl_2$

D.  $kl_1$  and  $kl_2$

**Answer: B**



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**116.** An electric immersion heater of  $1.08kW$  is immersed in water . After it has reaches a temperature of  $100^{\circ}C$  , how much time will be required to produce  $100g$  of steam?

A. 50 s

B. 420 s

C. 105 s

D. 105 s

**Answer: D**



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**117.** A moving coil galvanometer is converted into an ammeter reads upto  $0.03A$  by connecting a shunt of resistance  $4r$  across it and ammeter reads up  $0.06A$ , when a shunt of



resistance  $r$  is used. What is the maximum current which can be sent through this galvanometer if no shunt is used ?

A.  $0.01A$

B.  $0.02A$

C.  $0.03A$

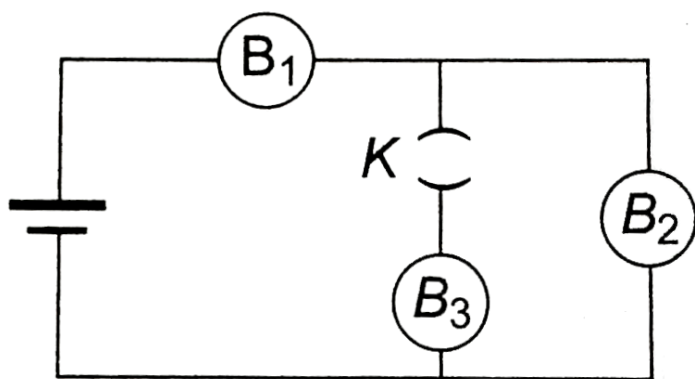
D.  $0.04A$

**Answer: B**



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118.  $B_1$ ,  $B_2$  and  $B_3$  are the three identical bulbs connected to a battery of steady emf with key  $K$  closed. What happens to the brightness of the bulbs  $B_1$  and  $B_2$  when the key is opened?



A. Brightness of the bulb  $B_1$  increases and that of  $B_2$  decreases

B. Brightness of the bulbs  $B_1$  and  $B_2$

increases

C. Brightness of the bulb  $B_1$  decreases and

$B_2$  increases

D. Brightness of the bulbs  $B_1$  and  $B_2$

decreases

**Answer: C**



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**119.** The scale of a galvanometer of resistance  $100\text{ohms}$  contains 25 divisions. It gives a defelction of one division on passing a current of  $4 \times 10^{-4}$  amperes. The resistance in ohms to be added to it, so that it may become a voltmeter of range 2.5 volts is

A. 150

B. 170

C. 110

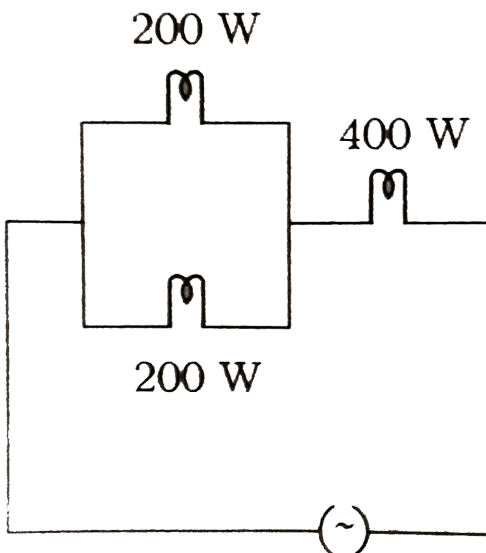
D. 220

**Answer: A**



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**120.** Three electric bulbs of 200 W, 200 W and 400 W are connected as shown in figure. The resultant power of the combination is



A. 800 W

B. 400 W

C. 200 W

D. 600 W

**Answer: A**



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**121.** Two electric bulbs rated 50 W and 100 V are glowing at full power, when used in parallel with a battery of emf 120 V and

internal resistance  $10\ \Omega$ . The maximum number of bulbs that can be connected in the circuit when glowing at full power, is

A. a) 6

B. b) 4

C. c) 2

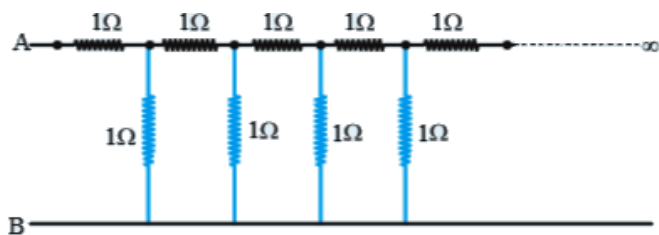
D. d) 8

**Answer: B**



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122. The equivalent resistance between points A and B of an infinite network of resistance, each of  $1\Omega$  connected as shown is`



A. infinite

B.  $2\Omega$

C.  $\frac{1 + \sqrt{5}}{2}\Omega$

D. zero

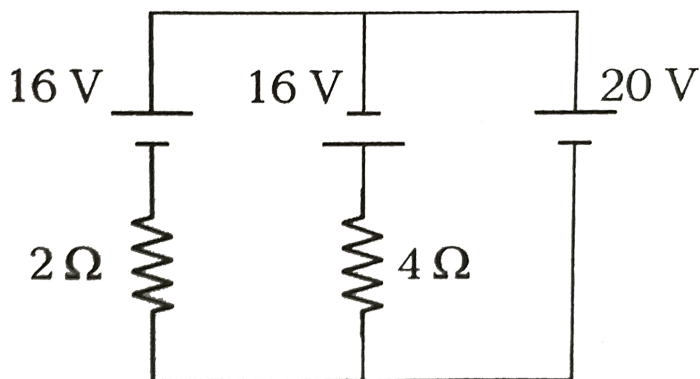
**Answer: C**





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**123.** In the given figure, the current through the 20 V battery is



A.  $11A$

B.  $12A$

C.  $7A$

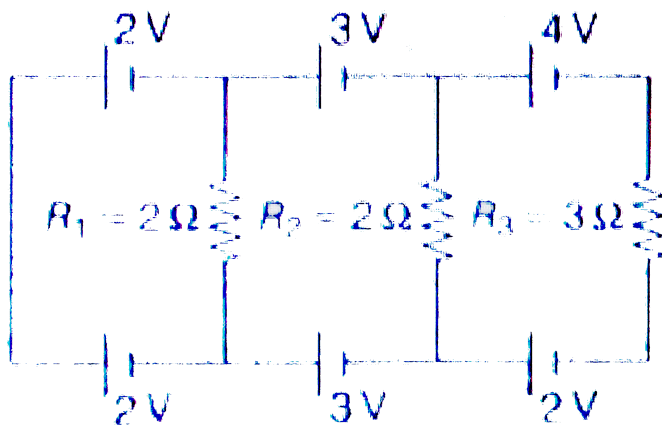
D.  $14A$

**Answer: A**



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**124.** the current in resistance  $R_3$  in the given circuit is  $\frac{2}{x}A$ . Find the value of  $x$ .



A.  $1A$

B.  $2/3A$

C.  $0.25A$

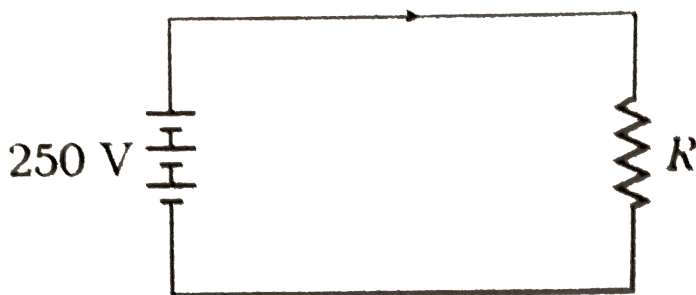
D.  $0.50A$

**Answer: B**



**125.** In the circuit shown in figure, the resistance  $R$  has a value that depends on the current. Specifically  $R$  is  $20\ \Omega$  when  $i$  is zero and the amount of increase in resistance is numerically equal to one-half of the current.

What is the value of current  $I$  in circuit?



A. 15 A

B. 10A

C. 20 A

D. 5A

**Answer: B**



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**126.** The charge flowing in a conductor varies with times as  $Q = at - bt^2$ . Then, the current

A. reaches a maximum and then decreases

B. falls to zero after  $t = \frac{a}{2b}$

C. changes at a rate of  $(-2b)$

D. Both (b) and (c)

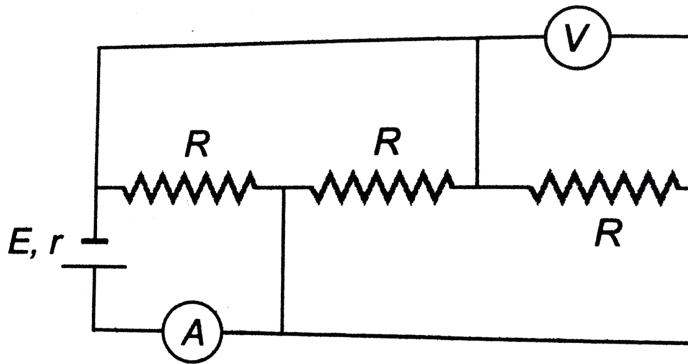
**Answer: B**



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**127.** In the circuit shown in figure ammeter and voltmeter are ideal. If  $E = 4V$ ,  $R = 9\Omega$  and  $r = 1\Omega$  then readings of ammeter and

voltmeter are



A. 1 A, 3 V

B. 2 A, 3 V

C. 3 A, 4 V

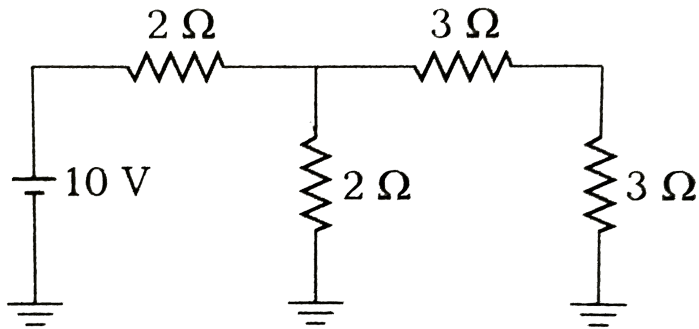
D. 4 A, 4 V

**Answer: A**



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**128.** In the circuit shown, the current in  $3\Omega$  resistance is



A.  $1A$

B.  $\frac{1}{7}A$

C.  $\frac{5}{7}A$

D.  $\frac{15}{7}A$



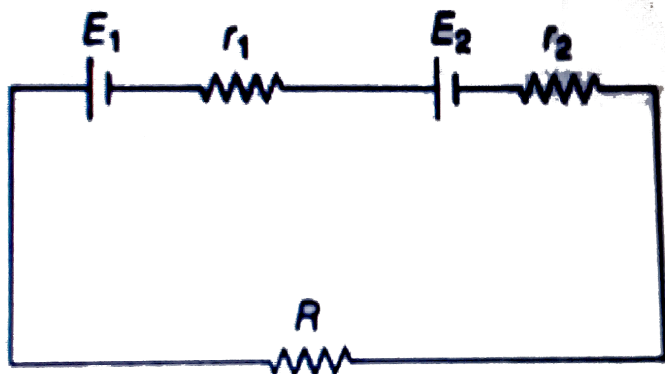
**Answer: C**



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**129.** Under what conditions current passing through the resistance  $R$  can be increased by short circuiting the battery of emf  $E_2$ . The internal resistances of the two batteries are  $r_1$

and  $r_2$  respectively



A.  $E_2 r_1 > E_1 (R + r_2)$

B.  $E_1 r_2 < E_2 (R + r_1)$

C.  $E_2 r_2 < E_1 (R + r_2)$

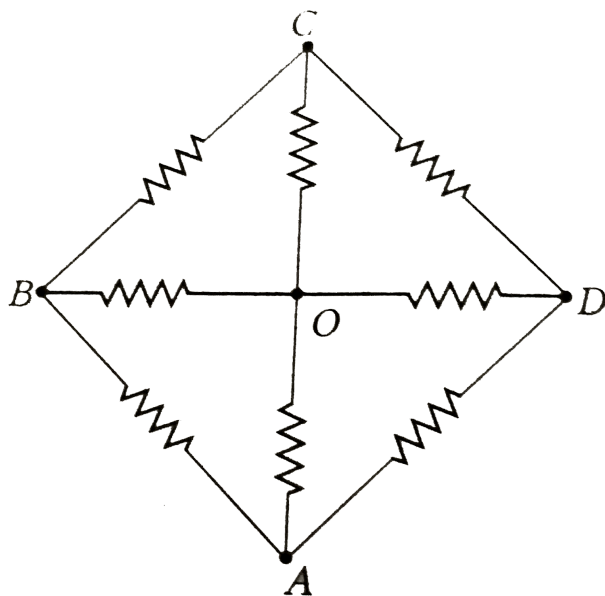
D.  $E_1 r_2 > E_2 (R + r_1)$

**Answer: D**



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**130.** In the arrangement shown, the magnitude of each resistance is  $1\Omega$ . The equivalent resistance between O and A is given by



A.  $\frac{14}{13}\Omega$

B. B.  $\frac{7}{15}\Omega$

C. C.  $\frac{2}{3}\Omega$

D. D.  $\frac{5}{6}\Omega$

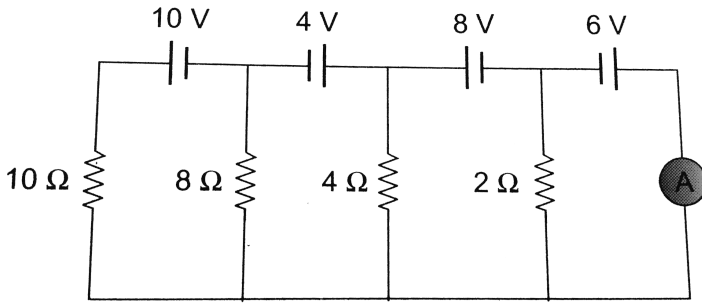
**Answer: B**



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**131.** Find the reading of the ideal ammeter connected in the given circuit. Assume that

the cells have negligible internal resistance.



A.  $0.8A$

B.  $0.25A$

C.  $1.95A$

D.  $1.0A$

**Answer: C**



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**132.** A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10-divisions per milliampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance in ohms needed to be connected in series with the coil will be -

A. 99995

B. 9995

C.  $10^3$

D.  $10^5$

**Answer: B**



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**133.** It takes 16 min to boil some water in an electric kettle. Due to some defect it becomes necessary to remove 10% turns of the heating coil of the kettle . After repairs , how much time will it take to boil the same mass of water ?

A. 17.7 min

B. 14.4 min

C. 20.9 min

D. 13.9 min

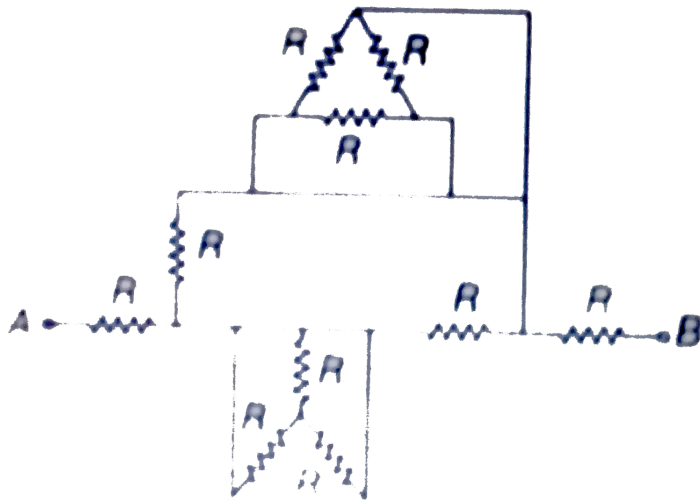
**Answer: B**



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**134.** Equivalent resistance between points A and B is  $0.5xR$ . Find value of  $x$ .





A.  $3R$

B.  $4R$

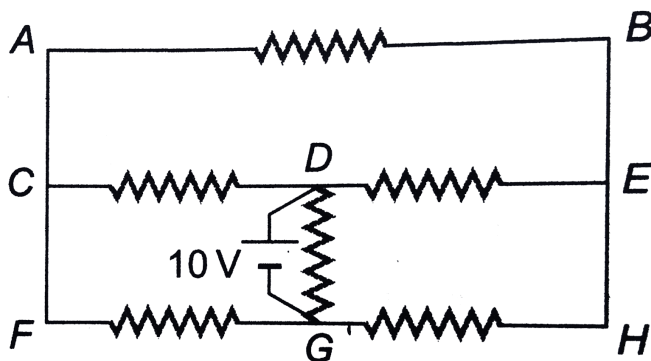
C.  $\frac{5R}{2}$

D.  $\frac{7R}{2}$

**Answer: C**



**135.** All resistance shown in the circuit are  $2\Omega$  each. The current in the resistance between  $D$  and  $E$  is



A.  $5\text{ A}$

B.  $2.5\text{ A}$

C. 1A

D. 7.5A

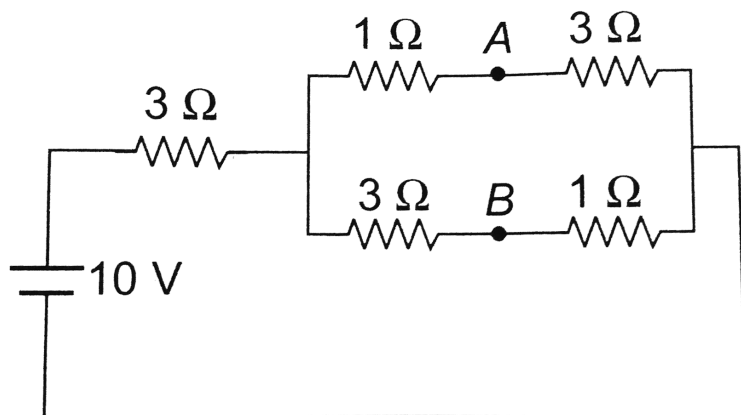
**Answer: B**



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**136.** A battery of e.m.f.  $10V$  is connected to resistance as shown in figure. The potential difference  $V_A - V_B$  between the point  $A$  and

$B$  is



A.  $-2V$

B.  $2V$

C.  $5V$

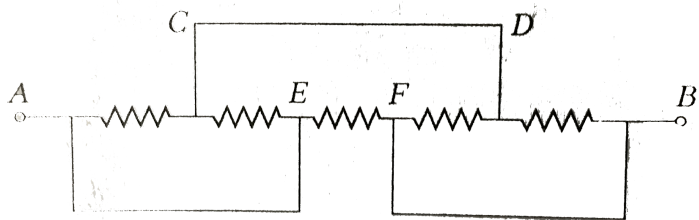
D.  $\frac{20}{11}V$

**Answer: B**



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137. If  $V_A - V_B = V_0$  and the value of each resistance is  $R$ , then



I. net resistance between AB is  $\frac{R}{2}$

II. Net resistance between AB is  $\frac{3R}{5}$

III. Current through CD is  $\frac{V_0}{R}$

IV. current through EF is  $\frac{2V_0}{3R}$

Which of the option/options are correct?

- A. I and II
- B. I and III
- C. Only I
- D. All of these

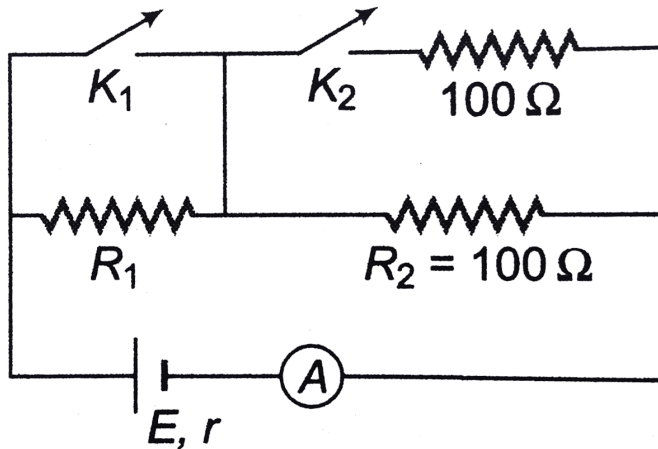
**Answer: B**



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**138.** In the circuit shown, keys  $K_1$  and  $K_2$  both are closed the ammeter reads  $I_0$ . But when  $K_1$  is open and  $K_2$  is closed, the ammeter reads

$I_0/2$ . Assuming that ammeter resistance is much less than  $R_2$ , the values of  $r$  and  $R_1$  is Omega are



A. 100,50

B. 50,100

C. 0,100

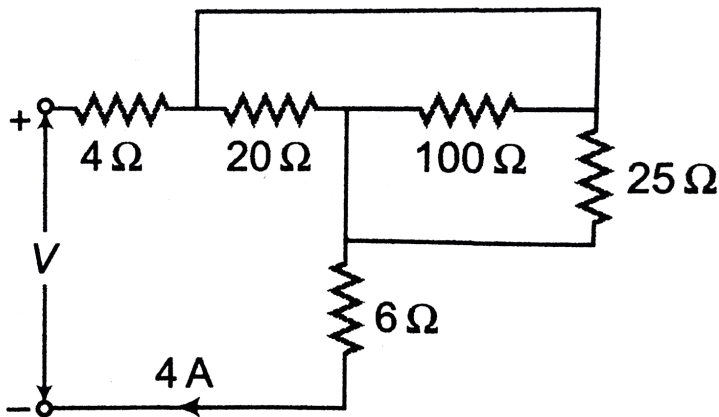
D. 0,50

Answer: D



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139. In the circuit shown in figure ,  $V$  must be



A.  $50\text{ V}$

B.  $80\text{ V}$



C. 100 V

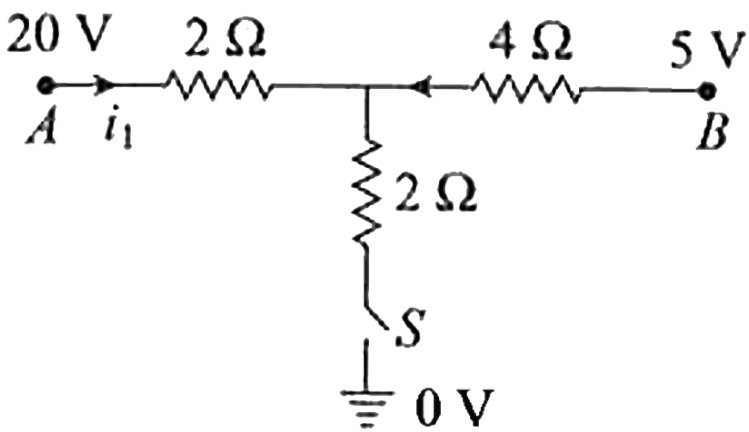
D. 1290 V

**Answer: B**



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**140.** As the switch S is closed in the circuit shown in figure, current passed through it is



A.  $4.5\text{ A}$

B.  $6.0\text{ A}$

C.  $3.0\text{ A}$

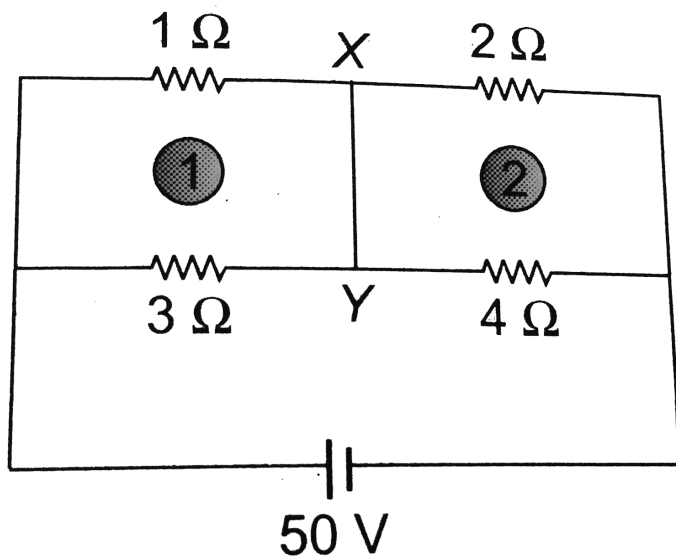
D. zero

**Answer: A**



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**141.** Current through XY of circuit shown is



A. 1A

B. 4A

C. 2A

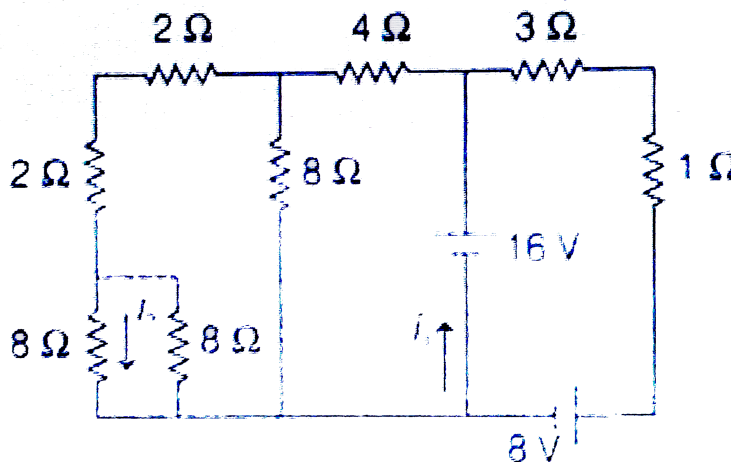
D. 3A

Answer: C



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142. In the circuit shown in figure ,find the ratio of currents  $i_1 / i_2$ .



A. 2

B. 8

C. 0.5

D. 4

**Answer: B**



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**B. Assertion and reason**

1. Assertion :  $V = iR$  is Ohm's law.

Reason :  $V - I$  graph is always a straight line passing through origin.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

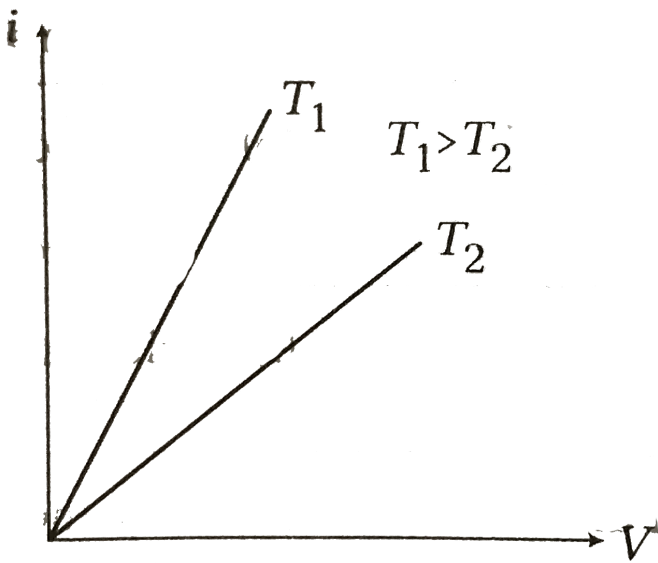
D. If Assertion is false but Reason is true.

**Answer: C**



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2. Assertion : Current versus potential difference (i-V) graph for a conductor at two different temperatures  $T_1$  and  $T_2$  is shown in figure. Hence  $T_1 > T_2$ .



Reason : Resistance of a conductor increases with rise in temperature.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.



B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: D**



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**3. Assertion :** If a current flows through a wire of non-uniform cross-section, potential difference per unit length of wire is same throughout the length of wire.

**Reason :** Current through the wire is same at all cross-sections.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: D**



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4. Assertion : In our houses when we start switching on different light buttons, main current goes on increasing.

Reason : Different connections in houses are in parallel. When we start switching on different light buttons, then net resistance of the circuit decreases. Therefore, main current increases.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: A**



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5. Assertion : If a current is flowing through a conducting wire of non-uniform cross-section, drift speed and resistance both will increase at a section where cross-sectional area is less.

Reason : Current density at such sections is more where cross-sectional area is less.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: B**



**Watch Video Solution**

**6. Assertion :** Kilovol-ampere (kVA) and kilowatt-hour have the same dimensions.

**Reason :** Both are the units of energy.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.



D. If both Assertion and Reason are false.

**Answer: D**



**Watch Video Solution**

**7. Assertion :** If by mistake, a voltmeter is connected in series, then circuit will burn.

**Reason :** Current will drastically decrease in the circuit.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: D**



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**8. Assertion :** Resistance of an ammeter is less than the resistance of a milliammeter.

**Reason :** Value of shunt required in case of ammeter is more than a milliammeter.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of

Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: B**



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**9. Assertion :** A resistance wire is broken into four pices and all are connected in parallel. Then, net resistance becomes  $\frac{1}{16}$  times.

Reason : In parallel net resistance is less than the smallest value of individual resistance.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: B**



**Watch Video Solution**

**10. Assertion :** Potential difference across the terminals of a battery is always less than the emf of the battery.

**Reason :** During discharging of a battery potential difference across to terminals of a battery is

$$V = E - ir$$

$$\therefore V < E$$

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: D**



**Watch Video Solution**

**11. Assertion :** Inside a conductor, electrons have no motion in the absence of some potential difference across it.

**Reason :** In the absence of potential difference no electrostatic force will act on the electrons inside the conductor.

A. a.If both Assertion and Reason are true and Reason is the correct explanation of Assertion.



B. b .If both Assertion and Reason are true  
and Reason is not correct explanation of  
Assertion.

C. c.If Assertion is true but Reason is false.

D. d. If both Assertion and Reason are false.

**Answer: D**



**Watch Video Solution**

**12. Assertion :** Current between two points in an electrical always flows from higher potential to lower potential.

**Reason :** During charging of a battery current inside the battery flows negative terminal to positive terminal.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true  
and Reason is not correct explanation of  
Assertion.

C. If both Assertion and Reason are false.

D. If Assertion is true but Reason is false.

**Answer: D**



**Watch Video Solution**

**13. Assertion :** In case of potentiometer experiment, if emfs of known and unknown both batteries are increased two times, then null point length will remain unchanged.

**Reason :** Null point length does not depend on emf of either of the two batteries.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: C**



**Watch Video Solution**

**14.** Assertion : In potentiometer experiment, null point cannot be obtained if emf of unknown battery is more than the emf of known battery.

Reason : By increasing the emf of known battery, null point length increases.

A. A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. C.If Assertion is true but Reason is false.

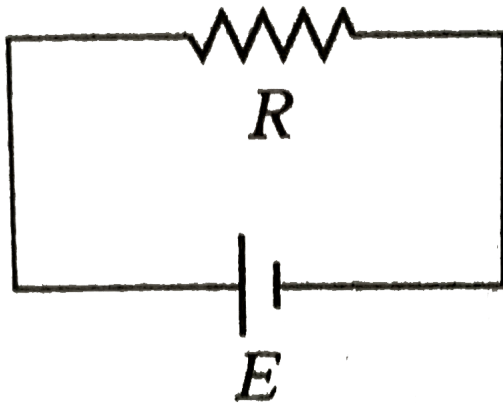
D. D. If Assertion is false but Reason is true.

**Answer: C**



**Watch Video Solution**

**15. Assertion :** In the circuit shown in figure, battery is ideal. If a resistance  $R_0$  is connected in parallel with  $R$ , then power across  $R$  will increase.



**Reason :** Current drawn from the battery will increase.



A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: D**



**Watch Video Solution**

**16. Assertion :** Two 60 W bulbs are first connected in series and then in parallel with same battery. Total power produced in second case will become four times. Rated voltage is same for two bulbs.

**Reason :** In series total power produced will be 30 W and in parallel 120 W.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

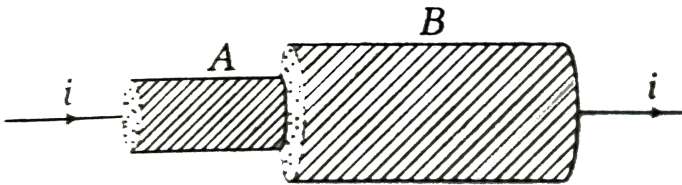
D. If Assertion is false but Reason is true.

**Answer: A**



**Watch Video Solution**

17. Assertion : Two resistance wires shown in figure are of same material. They have equal length. More heat is generated in wire A.



Reason : In series  $H \propto R$  and resistance of wire A is more.

A. If both Assertion and Reason are true  
and Reason is the correct explanation of  
Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: A**



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**18.** Assertion : Two identical bulbs when connected across a battery, produce a total power  $P$ . When they are connected across the same battery in series total power consumed will be  $\frac{P}{4}$ .

Reason : In parallel,  $P = P_1 + P_2$  and in series  $P = \frac{P_1 P_2}{P_1 + P_2}$

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true and Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

**Answer: A**



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**Match the columns**

1. Rated power of a bulb at  $V$  voltage is  $P$ . Now, same voltage  $V$  is applied in all conditions mentioned in Column I. Match this Column I with Column II in which actual total power consumed is given.

Column I		Column II
A. Two bulbs are connected in parallel.	(p)	$P$
B. Two bulbs are connected in series.	(q)	$2P$
C. Two bulbs are connected in parallel and one bulb in series with this combination.	(r)	$\frac{P}{2}$
D. A group of two-two bulbs in parallel are mutually connected in series.	(s)	None



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2. In the part of circuit shown in figure, match the following two columns for  $V_{AB}$



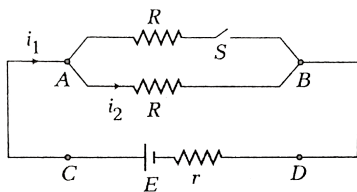
Column I	Column II
A. If $i = 5\text{ A}$	(p) $V_{AB} = 0\text{ V}$
B. If $i = -5\text{ A}$	(q) $V_{AB} = 10\text{ V}$
C. If $i = 0$	(r) $V_{AB} = 20\text{ V}$
D. If points A and B are connected by a conducting wire	(s) $V_{AB} = -10\text{ V}$



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3. In the circuit diagram shown in figure match the following two columns when switch S is

closed.



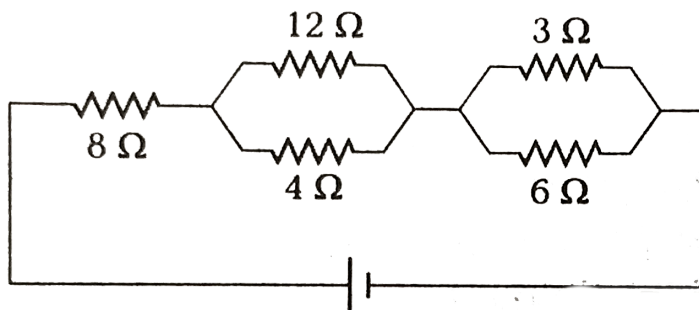
Column I	Column II
A. Current ( $i_1$ )	(p) will increase
B. Current ( $i_2$ )	(q) will decrease
C. Potential difference across A and B	(r) will remain same
D. Potential difference across C and D	(s) may increase or decrease. It will depend on value of $r$



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4. In the circuit diagram shown in figure, potential difference across  $3\Omega$  resistance is 20

V. Then, match the following two columns.



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## Medical entrances gallery

1. A potentiometer wire is  $100\text{cm}$  long and a constant potential difference is maintained across it. Two cells are connected in series first

to support one another and then in opposite direction. The balance points are obtained at  $50\text{cm}$  and  $10\text{cm}$  from the positive end of the wire in the two cases. The ratio of emfs is:

A. 5 : 4

B. 3 : 4

C. 3 : 2

D. 5 : 1

**Answer: C**



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2. The charge flowing through a resistance  $R$  varies with time  $t$  as  $Q = at - bt^2$ . The total heat produced in  $R$  is

A.  $\frac{a^3 R}{3b}$

B.  $\frac{a^3 R}{2b}$

C.  $\frac{a^3 R}{b}$

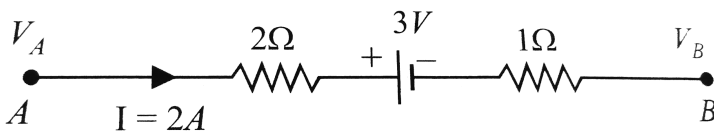
D.  $\frac{a^3 R}{6b}$

**Answer: D**



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3. The potential difference ( $V_A - V_B$ ) between the point  $A$  and  $B$  in the given figure is



A.  $-3V$

B.  $+3V$

C.  $+6V$

D.  $+9V$

**Answer: D**



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4. A filament bulb (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.  $230\Omega$

B.  $46\Omega$

C.  $26\Omega$

D. D  $13\Omega$

**Answer: C**



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5. A potentiometer wire has length  $4m$  and resistance  $8\Omega$ . The resistance that must be connected in series with the wire and an accumulator of e.m.f.  $2V$ , so as to get a potential gradient  $1mV$  per cm on the wire is

A.  $32\Omega$



B.  $40\Omega$

C.  $44\Omega$

D.  $48\Omega$

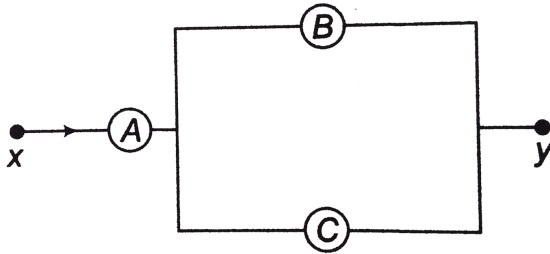
**Answer: A**



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6.  $A$ ,  $B$  and  $C$  are voltmeters of resistances  $R$ ,  $1.5R$  and  $3R$  respectively. When some potential difference is applied between  $x$  and  $y$  the voltmeter readings are  $V_A$ ,  $V_B$  and

$V_C$ , then



A.  $V_A = V_B = V_C$

B.  $V_A \neq V_B = V_C$

C.  $V_A = V_B \neq V_C$

D.  $V_A \neq V_B \neq V_C$

**Answer: A**



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7. A cross a metallic conductor of non-uniform cross-section, a constant potential difference is applied. The quantity which remain (s) constant along the conductor is

A. current density

B. current

C. drift velocity

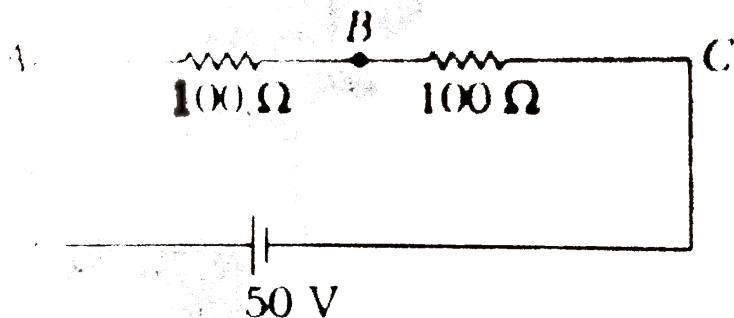
D. electric field

**Answer: B**



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8. Consider the diagram shown below.



A Voltmeter of resistance  $150\Omega$  is connected across A and B. The potential drop across B and C measured by voltmeter is

A. 29

B. 27 V

C. 31 V

D. 30 V

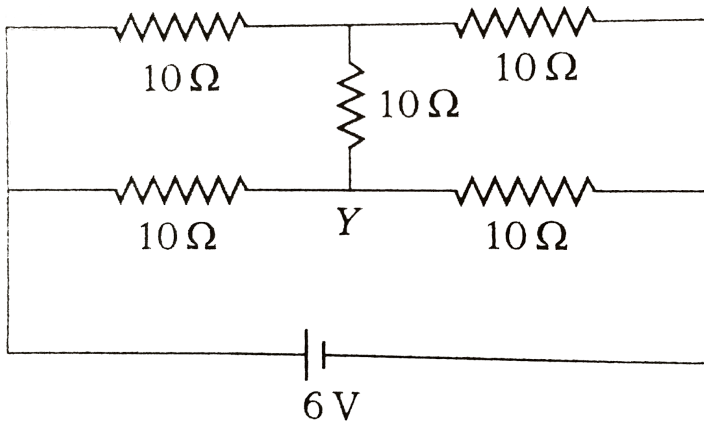
**Answer: C**



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9. Each resistor shown in the figure has a resistance of  $10\Omega$  and the battery has the emf 6 V. What will be the current supplied by the

battery ?



A.  $0.6A$

B.  $1.2A$

C.  $1.8A$

D.  $0.3A$

**Answer: A**





10. A  $1\Omega$  resistance in series with an ammeter is balanced by 75 cm of potentiometer wire. A standard cell of emf 1.02 V is balanced by 50 cm. The ammeter shows a reading of 1.5 A. Then the error in ammeter reading is:

A.  $0.03A$

B.  $3A$

C.  $1.3A$

D.  $0.3A$

**Answer: A**



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**11.** The range of voltmeter is 10 V and its internal resistance is  $50\Omega$ . To convert it to voltmeter of range 15 V, how much resistance is to be added ?

A. Add  $25\Omega$  resistor in parallel

B. Add  $25\Omega$  resistor in series

C. Add  $125\Omega$  resistor in parallel



D. Add  $125\Omega$  resistor in series

**Answer: B**



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**12. Identify the wrong statement.**

A. Charge is a vector quantity

B. Current is a scalar quantity

C. Charge can be quantity

D. Charge is additive in nature

**Answer: A**



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**13.** When the rate of flow of charge through a metallic conductor of non-uniform cross-section is uniform, then the quantity that remains constant along the conductor is

- A. current density
- B. electric field
- C. electric potential

D. current

**Answer: D**



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**14.** The resistance of a carbon resistor of colour code Red-Red Green Silver is (in  $k\Omega$ )

A.  $2200 \pm 5 \%$

B.  $2200 \pm 10 \%$

C.  $220 \pm 10 \%$

D.  $220 \pm 5 \%$

**Answer: B**



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**15.** The slope of the graph showing the variation of potential difference  $V$  on X-axis and current Y-axis gives conductor

A. resistance

B. resistivity

C. reciprocal of resistance

D. conductivity

**Answer: C**



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**16.** Two wires of the same dimensions but resistivities  $p_1$  and  $p_2$  are connected in series.

The equivalent resistivity of the combination is

A.  $p_1 + p_2$

B.  $\frac{p_1 + p_2}{2}$

C.  $\sqrt{p_1 p_2}$

D.  $\frac{p_1 p_2}{p_1 + p_2}$

**Answer: A**



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17. A galvanometer of resistance  $50\Omega$  is connected to a battery of 8 V along with a resistance of  $3950\Omega$  in series. A full scale deflection of 30 divisions is obtained in the

galvanometer. In order to reduce this deflection to 15 divisions, the resistance in series should be ....  $\Omega$ .

A. 1950

B. 7900

C. 2000

D. 7950

**Answer: D**



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**18.** Choose the correct statement.

A. Kirchhoff's first law of electricity is based on conservation of charge while the second law is based on conservation of energy

B. Kirchhoff's first law of electricity is based on conservation of energy while the second law is based on conservation of charge



C. Kirchhoff's both laws are based on conservation of charge

D. Kirchhoff's both laws are based on conservation of energy

**Answer: A**



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**19.** A metal plate weighting 750g is to be electroplated with 0.05% of its weight of silver. If a current of 0.8A is used. Find the time

needed for depositing the required weight of silver.  $E. C. E.$  of silver is  $11.18 \times 10^{-7} kgC^{-1}$ .

A. 5 min 32 s

B. 6 min 37 s

C. 4 min 16 s

D. 6 min 10 s

**Answer: B**



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20. A DC ammeter has resistance  $0.1\Omega$  and its current ranges  $0 - 100A$ . If the range is to be extended to  $0 - 500$ , then the following shunt resistance will be required

A.  $0.010\Omega$

B.  $0.011\Omega$

C.  $0.025\Omega$

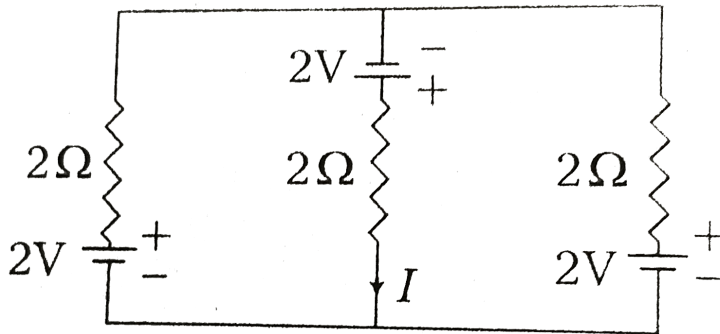
D.  $0.25\Omega$

**Answer: C**



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21. The current  $I$  shown in the circuit is



A.  $1.33\text{A}$

B. zero

C.  $2\text{A}$

D.  $1\text{A}$

**Answer: A**



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**22.** A metal wire of circular cross-section has a resistance  $R_1$ . The wire is now stretched without breaking, so that its length is doubled and the density is assumed to remain the same. If the resistance of the wire now becomes  $R_2$ , then  $R_2 : R_1$  is

**A. 1 : 1**

B. 1 : 2

C. 4 : 1

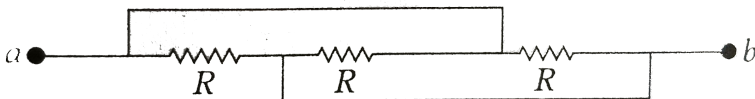
D. 1 : 4

**Answer: C**



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**23.** Consider the combination of resistor,



The equivalent resistance between  $a$  and  $b$  is

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

B.  $\frac{2R}{3}$

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

D.  $3R$

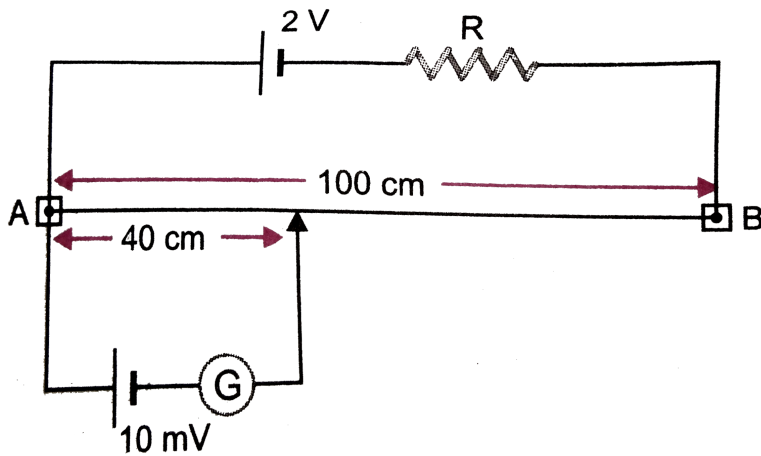
**Answer: C**



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**24.** A potentiometer wire of length  $100\text{cm}$  having a resistance of  $10\Omega$  is connected in series with a resistance  $R$  and a cell of emf  $2V$

of negligible internal resistance. A source of emf



of  $10\text{ mV}$  is balanced against a length of  $40\text{ cm}$  of the potentiometer wire. What is the value of resistance  $R$  ?

A.  $760\Omega$

B.  $640\Omega$



C.  $790\Omega$

D.  $840\Omega$

**Answer: C**



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**25.** Three resistances  $2\Omega$ ,  $3\Omega$  and  $4\Omega$  are connected in parallel. The ratio of currents passing through them when a potential difference is applied across its ends will be

A. 5: 4: 3

B. 6: 3: 2

C. 4: 3: 2

D. 6: 4: 3

**Answer: D**



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**26.** Four identical cells of emf  $\varepsilon$  and internal resistance  $r$  are to be connected in series. Suppose, if one of the cell is connected

wrongly, then the equivalent emf and effective internal resistance of the combination is

A.  $2E$  and  $4r$

B.  $4E$  and  $4r$

C.  $2E$  and  $2r$

D.  $4E$  and  $2r$

**Answer: A**



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27. In the circuit shown alongside, the ammeter and the voltmeter readings are 3A and 6V, respectively. Then, the value of the resistance R is



A.  $< 2\Omega$

B.  $2\Omega$

C.  $> 2\Omega$

D.  $gr2\Omega$

**Answer: B**



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**28.** The resistance of a bulb filament is  $100\Omega$  at a temperature of  $100^{\circ}C$ . If its temperature coefficient of resistance be  $0.005 \text{ per } ^{\circ}C$ , its resistance will become  $200\Omega$  at a temperature of

A.  $500^{\circ}C$

B.  $300^{\circ}C$

C.  $200^{\circ}C$

D.  $400^{\circ}C$

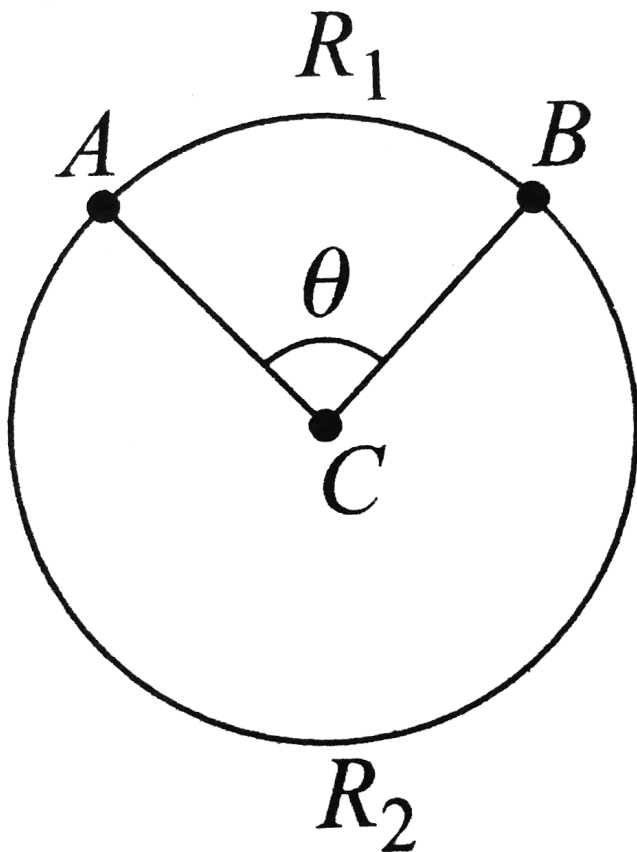
**Answer: B**



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**29.** In a uniform ring of resistance  $R$  there are two points  $A$  and  $B$  such that  $\angle ACB = \theta$ , where  $C$  is the centre of the ring. The

equivalent resistance between  $A$  and  $B$  is



A.  $\frac{R(2\pi - \theta)}{4\pi}$

B.  $\frac{R\theta}{2\pi}$

C.  $R\left(1 - \frac{\theta}{2\pi}\right)$

D.  $\frac{R}{4\pi^2}(2\pi - \theta)\theta$

**Answer: D**



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**30.** The dimensions of mobility of charge carriers are

A.  $[M^{-2}T^2A]$

B.  $[M^{-1}T^2A]$

C.  $M^{-2}T^3A]$



D.  $[M^{-1}T^3A]$

**Answer: B**



**Watch Video Solution**

**31.** The temperature coefficient of resistance of an alloy used for making resistor is

- A. small and positive
- B. small and negative
- C. large and positive

D. large and negative

**Answer: A**



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**32.** A wire of resistance  $4\Omega$  is stretched to twice its original length. In the process of stretching, its area of cross-section gets halved. Now, the resistance of the wire is

A.  $8\Omega$

B.  $16\Omega$

C.  $1\Omega$

D.  $4\Omega$

**Answer: B**



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**33.** A carbon film resistor has colour code green, black, violet, gold. The value of the resistor is

A.  $50M\Omega$

B.  $500M\Omega$

C.  $500 \pm 5 \% M\Omega$

D.  $500 \pm 10 \% M\Omega$

**Answer: C**



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**34.** A uniform wire of resistance  $9\Omega$  is joined end-to-end to form a circle. Then, the

resistance of the circular wire between any two diametrically points is

A.  $6\Omega$

B.  $3\Omega$

C.  $\frac{9}{4}\Omega$

D.  $\frac{3}{2}\Omega$

**Answer: C**



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**35.** The equivalent resistance of two resistor connected in series is  $6\Omega$  and their equivalent resistance is  $\frac{4}{3}\Omega$ . What are the values of resistances ?

A.  $4\Omega$ ,  $6\Omega$

B.  $8\Omega$ ,  $1\Omega$

C.  $4\Omega$ ,  $2\Omega$

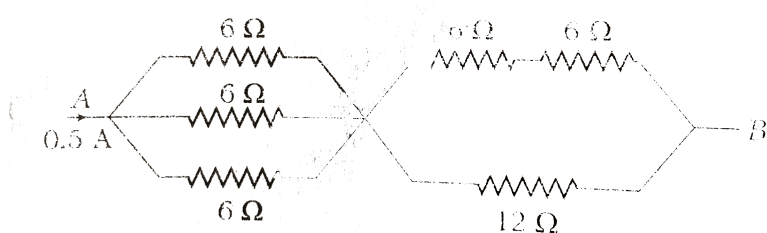
D.  $6\Omega$ ,  $2\Omega$

**Answer: C**



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**36.** Six resistance are connected as shown in figure. If total current flowing is  $0.5\text{ A}$ , then the potrential difference  $V_A - V_B$  is



A.  $8\text{ V}$

B.  $6\text{ V}$

C.  $2\text{ V}$

D.  $4\text{ V}$

**Answer: D**



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**37.** Four cells, each of emf  $E$  and internal resistance  $r$ , are connected in series across an external resistance  $R$ . By mistake one of the cells is connected in reverse. Then, the current in the external circuit is

A.  $\frac{2E}{4r + R}$

B.  $\frac{3E}{4r + R}$



C.  $\frac{3E}{3r + R}$

D.  $\frac{2E}{3r + R}$

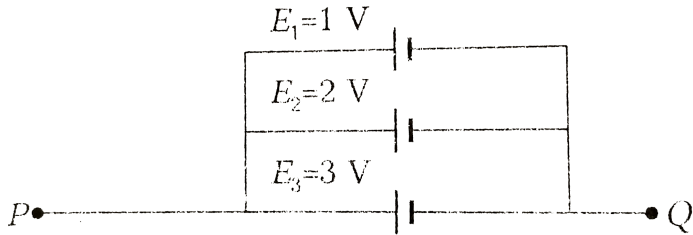
**Answer: A**



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**38.** A circuit consists of three batteries of emf  $E_1 = 1V$ ,  $E_2 = 2V$  and  $E_3 = 3V$  and internal resistance  $1\Omega$ ,  $2\Omega$  and  $1\Omega$  respectively which are connected in parallel as shown in figure. The potential difference between

points P and Q is



A.  $1.0\text{V}$

B.  $2.0\text{V}$

C.  $2.2\text{V}$

D.  $3.0\text{V}$

**Answer: B**



**Watch Video Solution**

**39.** Two resistors of resistances  $2\Omega$  and  $6\Omega$  are connected in parallel. This combination is then connected to a battery of emf 2 V and internal resistance  $0.5\Omega$ . What is the current flowing through the battery ?

A.  $4A$

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

C.  $\frac{4}{17}A$

D.  $1A$

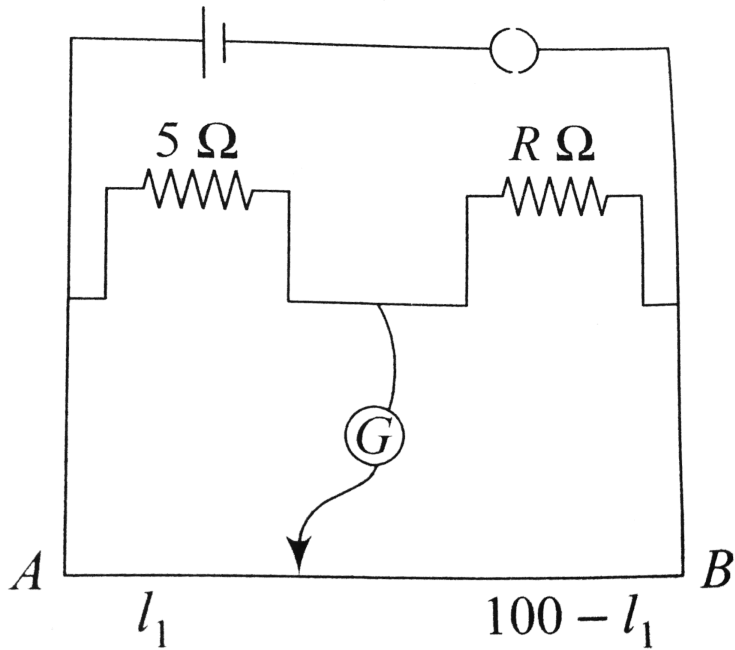
**Answer: D**



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**40.** The resistance in the two arms of the meter bridge are  $5\Omega$  and  $R\Omega$ , respectively. When the resistance  $R$  is shunted with an equal resistance, the new balance point is  $1.6l_1$ .

The resistance  $R$  is



A.  $10\ \Omega$

B.  $15\ \Omega$

C.  $20\ \Omega$

D.  $25\ \Omega$

**Answer: B**



**Watch Video Solution**

**41.** 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 itself 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.  $0.25\Omega$

B.  $9.5\Omega$

C.  $0.5\Omega$

D.  $0.75\Omega$

**Answer: C**



**Watch Video Solution**

42. In a ammeter  $0.2\%$  of main current passes through the galvanometer. If resistance of galvanometer is  $G$ , the resistance of ammeter will be

A.  $\frac{1}{499}G$

B.  $\frac{499}{500}G$

C.  $\frac{1}{500}G$

D.  $\frac{500}{499}G$

**Answer: A**



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**43.** In a Wheatstone's bridge, three resistances P,Q and R connected in the three arms and the fourth arm is formed by two resistances  $S_1$  and  $S_2$  connected in parallel. The condition for the bridge to be balanced will be

A.  $\frac{R(s_1 + s_2)}{s_1 s_2}$

B.  $\frac{s_1 s_2}{R(s_1 + s_2)}$

C.  $\frac{Rs_1 s_2}{(s_1 + s_2)}$

D.  $\frac{(s_1 + s_2)}{Rs_1 s_2}$

**Answer: A**



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**44.** An electron in potentiometer experiences a force  $2.4 \times 10^{-19} N$ . The length of potentiometer wire is 6m. The emf of the battery connected across the wire is (electronic charge  $= 1.6 \times 10^{-19} C$ )

A. 6 V

B. 9 V

C. 12 V

D. 15 V

**Answer: B**



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**45.** A galvanometer having internal resistance  $10\Omega$  required  $0.01\text{ A}$  for a full scale deflection. To convert this galvanometer to a voltmeter of full scale deflection at  $120\text{ V}$ , we need to connect a resistance of

- A.  $11990\ \Omega$  in series
- B.  $11990\Omega$  in parallel
- C.  $12010\Omega$  in series
- D.  $12010\Omega$  in parallel

**Answer: B**



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**46.** In potentiometer experiment, a cell of emf  $1.25V$  gives balancing length of 30 cm. If the cell is replaced by another cell, then balancing

length is found to be 40 cm. What is the emf of second cell ?

A.  $\cong 1.5V$

B.  $\cong 1.67V$

C.  $\cong 1.47V$

D.  $\cong 1.37V$

**Answer: B**



**Watch Video Solution**

**47.** Potentiometer measures the potential difference more accurately than a voltmeter, because

A. it does not draw current from external circuit

B. it draws a heavy current from external circuit

C. it has a wire of high resistance

D. it has a low resistance

**Answer: A**



**Watch Video Solution**

**48.** In a potentiometer experiment the balancing with a cell is at length 240 cm. On shunting the cell with a resistance of  $2\Omega$ , the balancing length becomes 120 cm. The internal resistance of the cell is

A.  $1\Omega$

B.  $0.5\Omega$

C.  $4\Omega$

D.  $2\Omega$

**Answer: D**



**Watch Video Solution**

**49.** A galvanometer has a coil of resistance  $100\Omega$  and gives a full-scale deflection for  $30mA$  current. If it is to work as a voltmeter of  $30V$  range, the resistance required to be added will be



A.  $500\Omega$

B.  $900\Omega$

C.  $1000\Omega$

D.  $1800\Omega$

**Answer: B**



**Watch Video Solution**

**50.** In an electroplating experiment, mg of silver is deposited when 4 A of current flows

for 2 min. The amount of silver (in g) deposited by 6 A of current for 40 s will be

A.  $4m$

B.  $\frac{m}{2}$

C.  $2m$

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

**Answer: B**



**Watch Video Solution**

51. A wire of resistance  $4\Omega$  is stretched to twice its original length. The resistance of stretched wire would be

A.  $2\Omega$

B.  $4\Omega$

C.  $8\Omega$

D.  $16\Omega$

**Answer: D**



**Watch Video Solution**

52. The internal resistance of a  $2.1\text{V}$  cell which gives a current  $0.2\text{A}$  through a resistance of  $10\Omega$

A.  $0.2\Omega$

B.  $0.5\Omega$

C.  $0.8\Omega$

D.  $1.0\Omega$

**Answer: B**



**Watch Video Solution**

**53.** The resistance of the four arms  $P$ ,  $Q$ ,  $R$  and  $S$  in a Wheatstone's bridge are  $10\Omega$ ,  $30\Omega$  and  $90\Omega$  respectively. The e.m.f. and internal resistance of the cell are  $7V$  and  $5\Omega$  respectively. If the galvanometer resistance is  $50\Omega$ , the current drawn for the cell will be

A.  $1.0A$

B.  $0.2A$

C.  $0.1A$

D.  $2.0A$

**Answer: B**



**Watch Video Solution**

**54.** An electron revolves in a circle at the rate of  $10^{19}$  rounds per second. The equivalent current is ( $e = 1.6 \times 10^{-19}C$ )

A.  $1.0A$

B.  $1.6A$

C.  $2.0A$

D.  $2.6A$

**Answer: B**



**Watch Video Solution**

**55.** A silver wire of radius  $0.1cm$  carries a current of  $2A$ . If the charge density in silver is  $5.86 \times 10^{28}m^{-3}$ , then the drift velocity is

A.  $0.2 \times 10^{-3}ms^{-1}$

B.  $0.4 \times 10^{-4} ms^{-1}$

C.  $0.68 \times 10^{-4} ms^{-1}$

D.  $7 \times 10^{-4} ms^{-1}$

**Answer: C**



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**56.** A 1m long wire of diameter  $0.31mm$  has a resistance of  $4.2\Omega$ . If it is replaced by another wire of same material of length  $1.5m$  and



diameter  $0.155\text{mm}$ , then the resistance of wire is

A.  $25.2\Omega$

B.  $0.6\Omega$

C.  $26.7\Omega$

D.  $0.8\Omega$

**Answer: A**



**Watch Video Solution**

57. 24 cells of emf  $1.5V$  each having internal resistance of  $1\ \text{ohm}$  are connected to an external resistance of  $1.5\ \text{ohms}$ . To get maximum current,

A. all cells are connected in series combination

B. all cells are connected in parallel combination

C. 4 cells in each row are connected in series and 6 such rows are connected in

parallel

D. 6 cells in each row are connected in series and 4 such rows are connected in parallel

**Answer: D**



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**58.** The temperature coefficient of resistance of the material of a wire is  $0.00125^{\circ}C^{-1}$ . Its

resistance at  $27^{\circ}C$  is  $1\Omega$ . At what temperature will its resistance be  $2\Omega$  ?

A. 1154 K

B. 1100 K

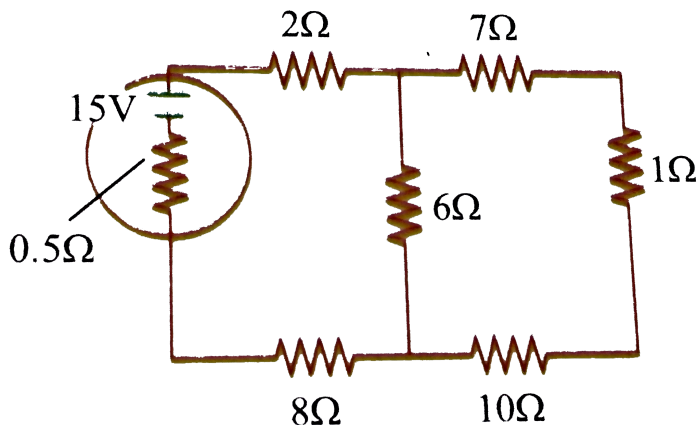
C. 1400 K

D. 1127 K

**Answer: D**



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59.

The emf of a cell  $E$  is  $15\text{ V}$  as shown in the figure with an internal resistance of  $0.5\Omega$ . Then the value of the current drawn from the cell is

A.  $3\text{ A}$

B.  $2\text{ A}$

C.  $5\text{ A}$

D.  $1A$

**Answer: D**



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**60.** Copper and carbon wires are connected in series and the combined resistor is kept at  $0^{\circ}C$ . Assuming the combined resistance does not vary with temperature the ratio of the resistances of carbon and copper wires at  $0^{\circ}C$  is (Temperature coefficient of resistivity

of copper and carbon respectively are

$$4 \times \frac{10^{-3}}{^{\circ}C} \quad \text{and} \quad -0.5 \times \frac{10^{-3}}{^{\circ}C}$$

A. 4

B. 8

C. 6

D. 2

**Answer: B**



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61. Three conductors draw respectively currents of 1 A, 2 A and 4 A when connected in turn across a battery. If they are connected in series across the same battery, the current drawn will be

A.  $\frac{2}{7} A$

B.  $\frac{3}{7} A$

C.  $\frac{4}{7} A$

D.  $\frac{5}{7} A$

**Answer: A**





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

A.  $1 : 3 : 5$

B.  $5 : 3 : 1$

C.  $1 : 15 : 125$

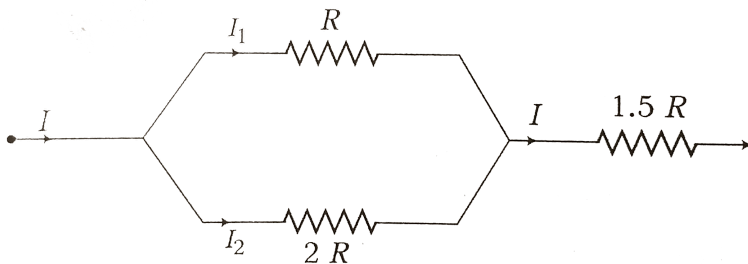
D.  $125 : 15 : 1$

**Answer: D**



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**63.** In the circuit diagram, heat produces in  $R$ ,  $2R$  and  $1.5R$  are in the ratio of



**A. 4 : 2 : 3**

**B. 8 : 4 : 27**

C. 2: 4: 3

D. 27: 8: 4

**Answer: B**



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**64.** Which one of the following electrical meter has the smallest resistance ?

A. Ammeter

B. Milliammeter

C. Galvanometer

D. Voltmeter

**Answer: A**



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**65.** Two wires of the same material having equal area of cross-section have  $L$  and  $2L$ . Their respective resistances are in the ratio

A.  $2:1$

B. 1 : 1

C. 1 : 2

D. 1 : 3

**Answer: C**



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**66.** Two bulbs 60 W and 100 W designed for voltage 220 V are connected in series across 220 V source. The net power dissipated is

A. 80 W

B. 160 W

C. 37.5 W

D. 60 W

**Answer: C**



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**67.** The drift speed of electrons in copper wire of diameter and length  $l$  is  $v$ . If the potential

difference across the wire is doubled, then the new drift speed becomes

A.  $v$

B.  $2v$

C.  $3v$

D.  $v/2$

**Answer: B**



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**68.** A potentiometer wire of length 10 m and resistance  $10\Omega$  per meter is connected in series with a resistance box and a 2 volt battery. If a potential difference of 100 mV is balanced across the whole length of potentiometer wire, then the resistance introduced in the resistance box will be

A.  $1900\Omega$

B.  $900\Omega$

C.  $190\Omega$



D.  $90\Omega$

**Answer: C**



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**69.** If a wire is stretched to four times its length, then the specific resistance of the wire will

A. become 4 times

B. become  $\frac{1}{4}$  times

C. become 16 times

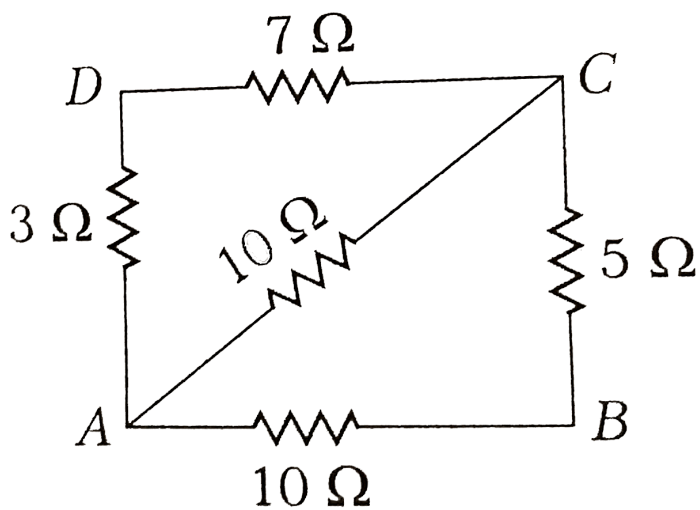
D. remain the same

**Answer: D**



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**70.** For the circuit shown in figure given below,  
the equivalent resistance points A and B is



A.  $10\ \Omega$

B.  $5\ \Omega$

C.  $\frac{10}{3}\ \Omega$

D.  $2\ \Omega$

**Answer: C**



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71. Two resistors of  $6\Omega$  and  $9\Omega$  are connected in series to a 120 V source. The power consumed by the  $6\Omega$  resistor is

A. 384 W

B. 616 W

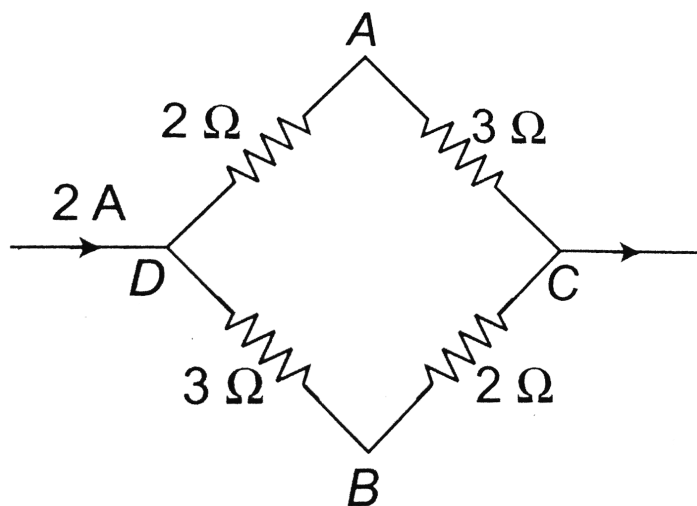
C. 1500 W

D. 1800 W

**Answer: A**



72. A current of  $2A$  flows in a system of conductor as shown. The potential difference  $(V_A - V_B)$



A.  $+1V$

B.  $-1V$

C.  $+2V$

D.  $-2V$

**Answer: A**



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**73.** A cell sends a current through a resistance  $R_1$  for time  $t$ , next the same cell sends current through another resistance  $R_2$  for the time  $t$ . If the same amount of heat is developed in

both the resistance then find the internal resistance of the cell

A.  $r = \sqrt{R_1 + R_2}$

B.  $r = \sqrt{R_1 \times R_2}$

C.  $r = \frac{R_1 + R_2}{2}$

D.  $r = \frac{1}{R_1} + \frac{1}{R_2}$

**Answer: B**



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74. When a current of  $(2.5 \pm 0.5)$  ampere flows through a wire, it develops a potential difference of  $(20 \pm 1)$  volt, the resistance of the wire is

A.  $(8 \pm 2)\Omega$

B.  $(8 \pm 1.6)\Omega$

C.  $(8 \pm 1.5)\Omega$

D.  $(8 \pm 3)\Omega$

**Answer: A**



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

A. Parallel

B. Series

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

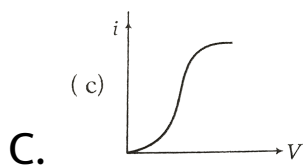
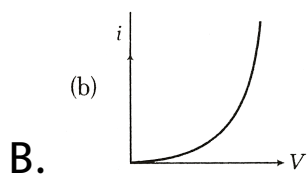
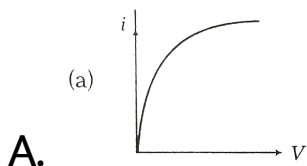
D. Mixed grouping

**Answer: C**



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**76.** The variation between  $V$ - $I$  has shown by graph for heating filament



D.



**Answer: A**



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**77.** Two bulbs when connected in parallel to a source take 60 W each, the power consumed, when they are connected in series with the same source is

**A. 15 W**

B. 30 W

C. 60 W

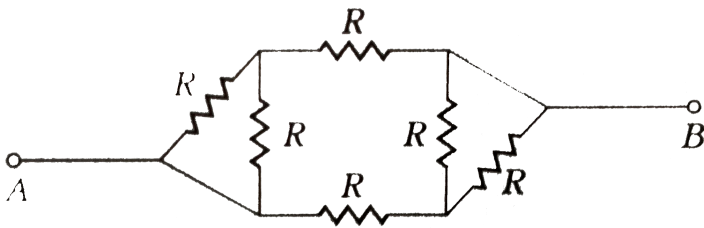
D. 120 W

**Answer: B**



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**78.** The equivalent resistance between A and B of network shown in figure is



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

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

C.  $6R$

D.  $2R$

**Answer: A**



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79. A galvanometer having resistance of  $50\Omega$  requires a current of  $100\mu A$  to give full scale deflection. How much resistance is required to convert it into an ammeter of range of  $10\text{ A}$  ?

A.  $5 \times 10^{-3}\Omega$  in series

B.  $5 \times 10^{-4}\Omega$  in parallel

C.  $10^5\Omega$  in series

D.  $10^5\Omega$  in parallel

**Answer: B**



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**80.** Two cells when connected in series are balanced on  $8m$  on a potentiometer. If cells are connected with polarities of one the cell is reversed, they balance on  $2m$ . The ratio of e.m.f.'s of the two cells is

A. 3:4

B. 4:3

C. 3:5

D. 5:3

**Answer: D**

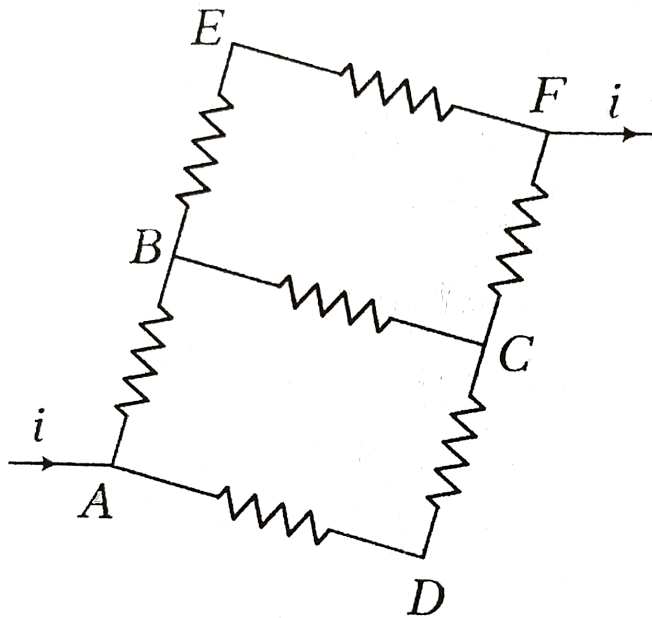


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**81.** In the given circuit diagram if each resistance is of  $10\Omega$ , then the current in arm



AD will be



- A.  $\frac{i}{5}$
- B.  $\frac{2i}{5}$
- C.  $\frac{3i}{5}$
- D.  $\frac{4i}{5}$

**Answer: B**



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**82.** When the current  $i$  is flowing through a conductor, the drift velocity is  $v$ . If  $2i$  current is flowed through the same metal but having double the area of cross-section, then the drift velocity will be

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

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

C.  $v$

D.  $4v$

**Answer: C**



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**83.** A wire has a resistance of 12 ohm . It is bent in the form of equilateral triangle. The effective resistance between any two corners of the triangle is

A.  $6\Omega$

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

C.  $9\Omega$

D.  $12\Omega$

**Answer: B**

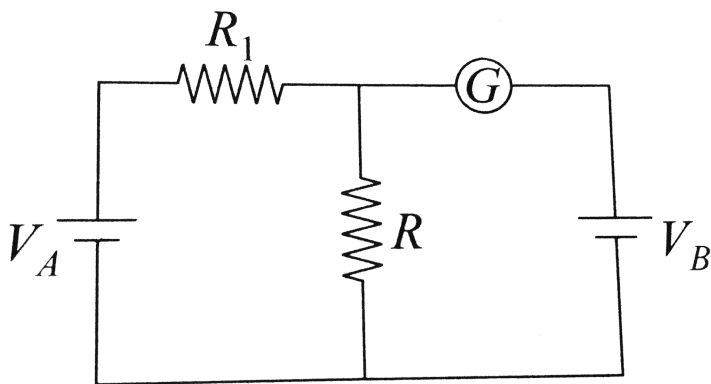


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**84.** In the circuit shown the cells  $A$  and  $B$  have negligible resistance. For

$V_A = 12V$ ,  $R_1 = 500\Omega$  and  $R = 100\Omega$ , the

galvanometer ( $G$ ) shows no deflection. The value of  $V_B$  is



- A. 4 V
- B. 2 V
- C. 12 V
- D. 6 V

**Answer: B**



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**85.** A milli voltmeter of 25 milli volt range is to be converted into an ammeter of 25 ampere range. The value (in ohm) of necessary shunt will be

A. 0.001

B. 0.01

C. 1

D. 0.05

**Answer: A**



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**86.** If voltage across a bulb rated 220 volt-100 watt drops by 2.5 % of its value, the percentage of the rated value by which the power would decrease is

A. 20 %

B. 2.5 %

C. 5 %

D. 10 %

**Answer: C**



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**87.**  $6\Omega$  and  $12\Omega$  resistors are connected in parallel. This combination is connected in series with 10 V battery and  $6\Omega$  resistor. What is the potential difference between the terminals of the  $12\Omega$  resistor ?

A. 4 V



B. 16 V

C. 2

D. 8 V

**Answer: A**



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**88.** A voltmeter of range 2 V and resistance  $300\Omega$  cannot be converted into ammeter of range

A.  $1A$

B.  $1mA$

C.  $100mA$

D.  $10mA$

**Answer: B**



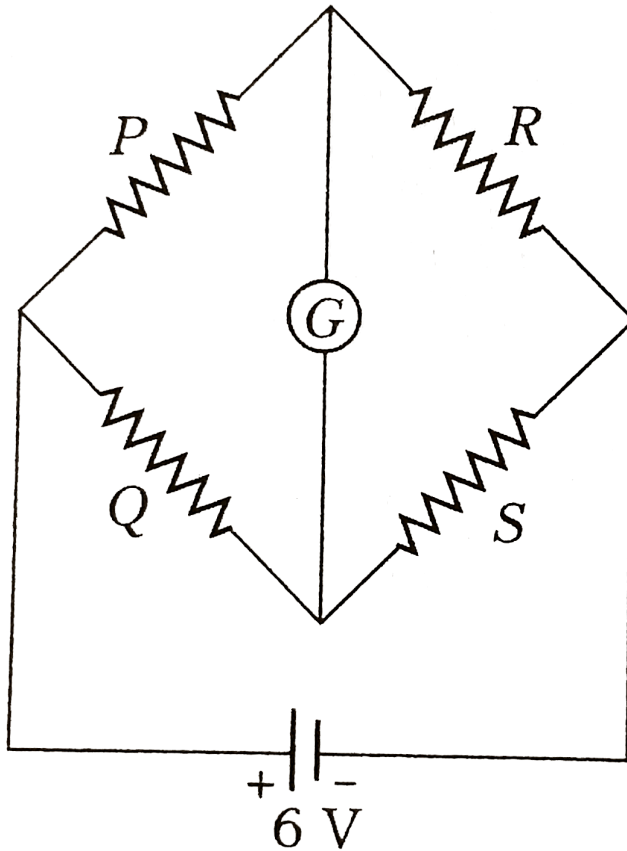
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**89.** In the Wheatstone network given,

$P = 10\Omega$ ,  $Q = 20\Omega$ ,  $R = 15\Omega$ ,  $S = 30\Omega$ , the

current passing through the battery (of

negligible internal resistance)



A.  $0.36A$

B. zero

C.  $0.18A$

D.  $0.72A$

**Answer: A**



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**90.** A current of 5 ampere is passing through a metallic wire of cross-sectional area  $4 \times 10^{-6} m^2$ . If the density of the charge-carriers in the wire is  $5 \times 10^{26} m^{-3}$ , find the drift speed of the electrons.

A.  $1 \times 10^2 ms^{-1}$

B.  $1.56 \times 10^{-2} ms^{-1}$

C.  $1.56 \times 10^{-3} ms^{-1}$

D.  $1 \times 10^{-2} ms^{-1}$

**Answer: B**

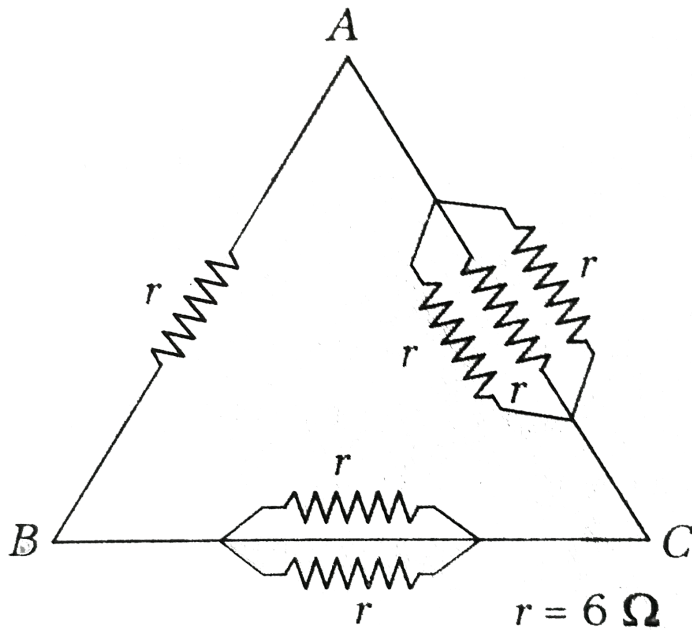


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**91.** Six resistance each of value  $r = 5\Omega$  are connected between points A, B and C as shown in figure. If  $R_1$ ,  $R_2$  and  $R_3$  are the net resistance between A and B, between B and C

and between A and C respectively, then

$R_1 : R_2 : R_3$  will be equal to



A. 6 : 3 : 2

B. 1 : 2 : 3

C. 5 : 4 : 3

D. 4 : 3 : 2

**Answer: C**



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**92.** Charge passing through a conductor of cross-section area  $A = 0.3m^2$  is given by  $q = 3t^2 + 5t + 2$  in coulomb, where  $t$  is second. What is the value of drift velocity at  $t = 2$  s ? (Given,  $n = 2 \times 10^{25} / m^3$ )

A.  $0.77 \times 10^{-5} m / s$

B.  $1.77 \times 10^{-5} m / s$

C.  $2.08 \times 10^{-5} m / s$

D.  $0.57 \times 10^5 m / s$

**Answer: B**



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**93.** Charge passing through a conductor of cross-section area  $A = 0.3m^2$  is given by  $q = 3t^2 + 5t + 2$  in coluomb, where t is



second. What is the value of drift velocity at

$t = 2s$  ? (Given,  $n = 2 \times 10^{25} / m^3$ )

A.  $0.77 \times 10^{-5} m / s$

B.  $1.77 \times 10^{-5} m / s$

C.  $2.08 \times 10^{-5} m / s$

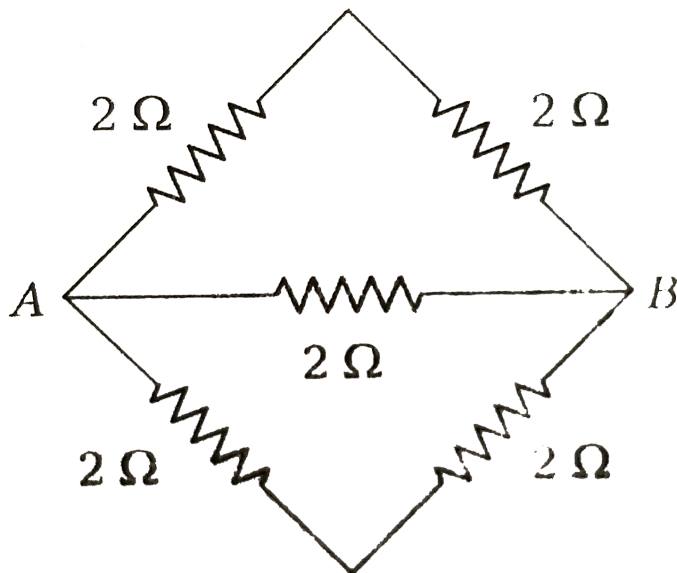
D.  $0.57 \times 10^{-5} m / s$

**Answer: B**



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94. In the circuit shown, the potential difference between x and y will be



- A. zero
- B. 120 V
- C. 60 V

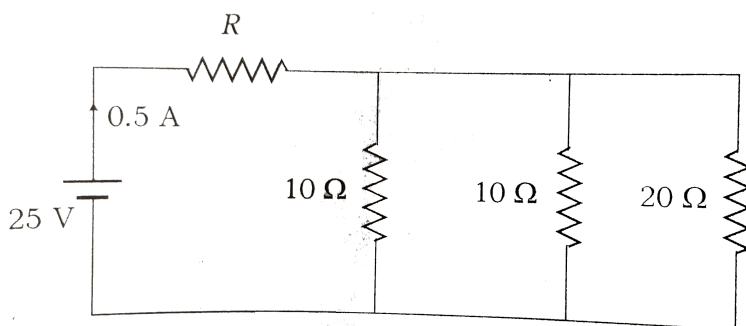
D. 20 V

**Answer: B**



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**95.** For the circuit shown in figure,



A. resistance  $R = 46\ \Omega$

B. current through  $20\Omega$  resistance is  $0.1A$

C. potential difference across the middle resistance is  $2\text{ V}$

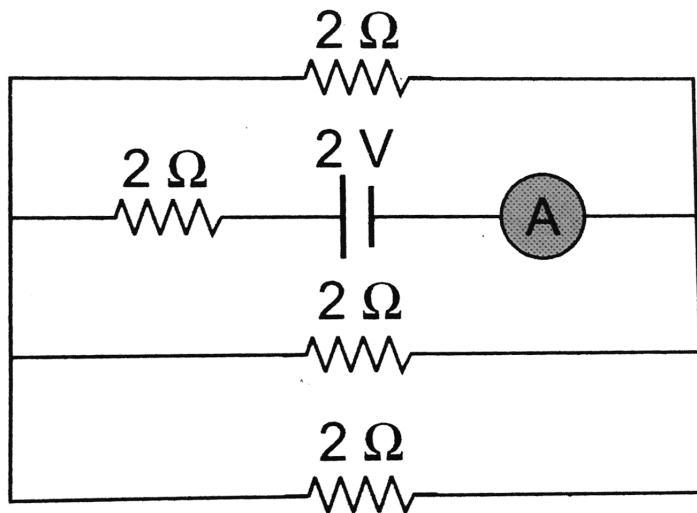
D. All of the above are true

**Answer: D**



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**96.** The reading of the ammeter as per figure shown is



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

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

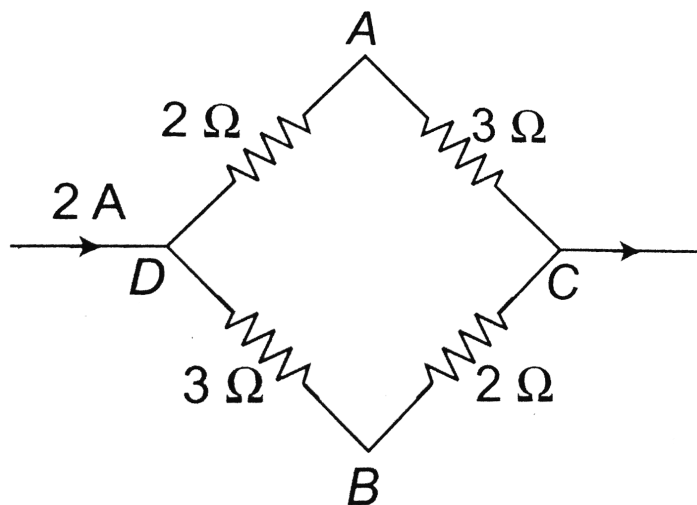
C.  $\frac{1}{8}A$

D.  $2A$

**Answer: B**



97. A current of  $2A$  flows in a system of conductor as shown. The potential difference  $(V_A - V_B)$



A.  $-1V$

B.  $+1V$

C.  $-2V$

D.  $+2V$

**Answer: B**



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