



## PHYSICS

### BOOKS - KUMAR PRAKASHAN

## ELECTRICITY

#### Questions And Answers

1. Give brief information about an electric charge. OR  
Write a short note on electric charge.



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2. What is a free electron? Explain conducting and nonconducting materials in terms of it.



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3. What is a switch ?



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4. What is an electric circuit?



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5. Define electric current. Explain the difference between electron current and conventional current.



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6. State the formula of an electric current and define its unit.



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7. If a number of electrons pass through the cross-section of a conductor in time  $t$ , what is the electric current flowing through it?



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8. State the smaller units of electric current.



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9. Name the instrument used to measure electric current.



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10. Write a short note on electric potential.



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**11.** Explain briefly about electric potential.

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**12.** Name the physical quantity responsible for a flow of electrons in a metal wire.

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**13.** Define electric potential difference. State the formula for it. Name and define the SI unit of

potential difference.



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**14.** Name the instrument used to measure electric potential difference.



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**15.** What is a circuit diagram ?



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**16.** Draw a labelled diagram of an electric circuit comprising a battery, electric bulb, ammeter and plug key (closed). Show the direction of the conventional current.



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**17.** State the Ohm's law. Explain how it is used to define the SI unit of resistance.



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**18.** State two factors on which the strength of an electric current in a given conductor depends?



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**19.** What is a variable resistance ? Give one example of it.



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**20.** Explain the cause of resistance in a conductor and differentiate between conductors and insulators.



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21. Name the substances used to make a conducting wire, resistive wire and resistor.



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22. What is electrical resistivity of a material ? State its SI unit and define it.



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**23.** Explain : .Electrical resistivity is a characteristic property of the material..



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**24.** State the factors on which the resistivity of a material depends.



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**25.** A conducting wire of length  $l$  has resistance  $R$ . If its length is increased to  $nl$  by stretching it uniformly, what would be the new resistance of wire ?

(Assume that there is no change in the volume of the wire when it is stretched.)



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**26.** Use the data in Table 2 to answer the following:

Which material is the best conductor ?



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**27.** State the law of combination of resistances in series and draw a circuit diagram containing three resistors connected in series.



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**28.** Give the law of combination of resistances in parallel and draw a circuit diagram containing three resistors connected in parallel.



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**29.** Explain the series combination of resistors and derive the formula of equivalent resistance.



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**30.** State the characteristics of the series combination of resistors.



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**31.** Explain the parallel combination of resistors and derive the formula of equivalent resistance.



**Watch Video Solution**

**32.** State the characteristics of the parallel combination of resistors.



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**33.** What will be the equivalent resistance of  $n$  resistors each having resistance  $R$  when connected in series and parallel separately?

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**34.** State the merits and demerits of a series combination of resistors.

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**35.** State the merits and demerits of a parallel combination of resistors.

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**36.** Why is a series arrangement not used for connecting domestic electrical appliances in a circuit ?

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**37.** Write the disadvantages of series circuits for domestic wiring.



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**38.** Give reasons why different electrical appliances in a domestic circuit are connected in parallel.



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**39.** Write the advantages of parallel circuits in domestic wiring.



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**40.** How is heat produced by an electric current?





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**41.** What is the heating effect of electric current?



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**42.** Explain electrical energy and derive its formula.

Obtain Joule's law of heating.



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**43.** Derive the formula of the heat energy produced in

the conductor because of electric current flows in it

for the relax time-interval  $t$ . Give its unit.



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**44.** State and explain the Joule's law of heating.



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**45.** Write the Joule's law of heating. State the factors on which heat generated in a conductor due to electric current depends.



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**46.** State various practical applications of heating effect of electric current in everyday life.



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**47.** Explain how the heating effect of electric current is utilized in an electric bulb (called incandescent lamp) to produce light.



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**48.** Write short note on .Electric fuse..



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**49.** What is an electric fuse? Explain its fabrication, function and use in electric circuit in detail.

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**50.** What is meant by electric power? Obtain a formula for it. State units of electric power.

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**51.** What is electric energy? What is its commercial (or practical) unit? Define it.



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52. Are electrons consumed in an electric circuit?



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## Questions And Answers Intext Questions

1. What does an electric circuit mean?



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2. Define the unit of current.



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3. Calculate the number of electrons constituting one coulomb of charge.



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4. Name a device that helps to maintain a potential difference across a conductor.



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5. What is meant by saying that the potential difference between two points is 1 V?

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6. How much energy is given to each coulomb of charge passing through a 6 V battery?

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7. On what factors does the resistance of a conductor depend ?

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8. Will current can flow more easily through a thick wire or a thin wire of the same material, when connected to the same source? Why?



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9. Let the resistance of an electrical component remain constant while the potential difference across the two ends of the component decreases to half of its former value. What change will occur in the current through it?



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**10.** Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal?

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**11.** Use the data in Table 2 to answer the following:  
Which is a better conductor, iron or mercury?

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**12.** Draw a schematic diagram of a circuit consisting of a battery of three cells of 2 V each, a  $5\Omega$  resistor,

an  $8\Omega$  resistor, and a  $12\Omega$  resistor, and a plug key, all connected in series.



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**13.** Redraw the circuit of 9.39, putting in an ammeter to measure the current through the resistors and a voltmeter to measure the potential difference across the  $12\Omega$  resistor. What would be the readings in the ammeter and the voltmeter ?



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14. Judge the equivalent resistance when the following are connected in parallel:

$1\Omega$  and  $10^6\Omega$



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15. Judge the equivalent resistance when the following are connected in parallel:

$1\Omega$ ,  $10^3\Omega$  and  $10^6\Omega$



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16. An electric lamp of  $100\Omega$ , a toaster of resistance  $50\Omega$ , and a water filter of resistance  $500\Omega$  are connected in parallel to a  $220\text{ V}$  source. What is the resistance of an electric iron connected to the same source that takes as much current as all three appliances and what is the current through it?



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17. What are the advantages of connecting electrical devices in parallel with the battery instead of connecting them in series?



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**18.** How can three resistor of resistances  $2\Omega$ ,  $3\Omega$  and  $6\Omega$  be connected to give a total resistance of  $4\Omega$



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**19.** How can three resistor of resistances  $2\Omega$ ,  $3\Omega$  and  $6\Omega$  be connected to give a total resistance of  $1\Omega$  ?



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**20.** What is (a) the highest, (b) the lowest total resistance that can be secured by combinations of four coils of resistances  $4\Omega$ ,  $8\Omega$ ,  $12\Omega$ ,  $24\Omega$  ?



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**21.** Why does the cord of an electric heater not glow while the heating element does?



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**22.** Compute the heat generated while transferring 96000 coulomb of charge in one hour through a

potential difference of 50 V.

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**23.** An electric iron of resistance 20 ohm takes a current of 5 A. Calculate the heat developed in 30 s.

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**24.** What determines the rate at which energy is delivered by a current?

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**25.** An electric motor takes 5 A from a 220 V line. Determine the power of the motor and the energy consumed in 2 h.



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## Questions And Answers Textbook Illustrations

**1.** A current of 0.5 A is drawn by a filament of an electric bulb for 10 minutes. Find the amount of electric charge that flows through the circuit.



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2. How much work is done in moving a charge of 2 C across two points having a potential difference 12 V ?



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3. How much current will an electric bulb draw from a 220 V source, if the resistance of the bulb filament is 1200  $\Omega$ ?



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4. How much current will an electric heater coil draw from a 220 V source, if the resistance of the heater

coil is  $100\ \Omega$ ?



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5. The potential difference between the terminals of an electric heater is  $60\text{ V}$  when it draws a current of  $4\text{ A}$  from the source. What current will the heater draw, if the potential difference is increased to  $120\text{ V}$  ?



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6. Resistance of a metal wire of length  $1\text{ m}$  is  $26\ \Omega$  at  $20^\circ\text{ C}$ . If the diameter of the wire is  $0.3\text{ mm}$ , what will be the resistivity of the metal at that

temperature ? Using Table 2 (on page 116), predict the material of the wire.



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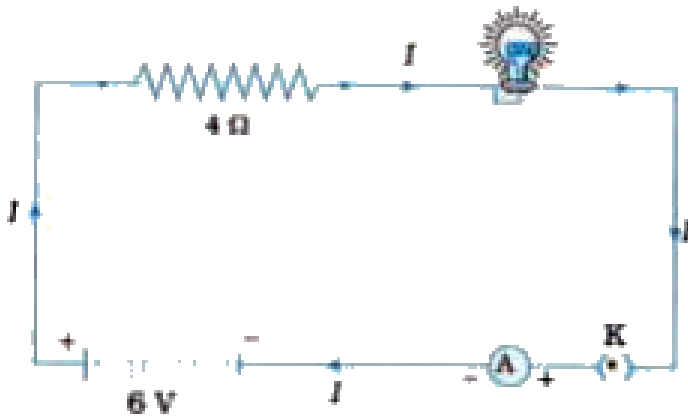
7. A wire of given material having length  $l$  and area of cross-section  $A$  has a resistance of  $4 \Omega$ . What would be the resistance of another wire of the same material having length  $\frac{1}{2}l$  and area of cross-section  $2A$  ?



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8. An electric lamp, whose resistance is  $20\ \Omega$ , and a conductor of  $4\ \Omega$  resistance are connected to a  $6\ \text{V}$  battery (see figure).

Calculate (a) the total resistance of the circuit, (b) the current through the circuit, and (c) the potential difference across the electric lamp and conductor.



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9. In the circuit diagram given in figure suppose the resistors  $R_1$ ,  $R_2$  and  $R_3$  have the values  $5\Omega$ ,  $10\Omega$ ,  $30\Omega$  respectively, which have been connected to a battery of 12V. Calculate (a) the current through each resistor, (b) the total current in the circuit, and (c) the total circuit resistance.



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10. If in figure,

$$R_1 = 10\Omega, R_2 = 40\Omega, R_3 = 30\Omega, R_4 = 20\Omega, R_5 = 60\Omega$$

a 12 V battery is connected to the arrangement.

Calculate ( a ) the total resistance in the circuit and ( b ) the total current flowing in the circuit.



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**11.** An electric iron consumes energy at a rate of 840 W, when heating is at the maximum rate and 360 W, when heating is at the minimum. The voltage is 220V. What are the current and the resistance in each case?



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**12.** 100 J of heat is produced in each second in a  $4 \Omega$  resistance. Find the potential difference across the

resistor.



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**13.** An electric bulb is connected to a 220 V generator.

The current is 0.50 A. What is the power of the bulb?



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**14.** An electric refrigerator rated 400 W operates 8

hours/day. What is the cost of the energy to operate

if for 30 days at Rs 3.00 per kWh ?



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## Questions And Answers More To Know

1. How does a metal conduct electricity ?



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## Textual Exercise

1. A piece of wire of resistance  $R$  is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is  $R_1$ , then the ratio  $\frac{R}{R_1}$  is .....

A.  $\frac{1}{25}$



B.  $\frac{1}{5}$

C. 5

D. 25

**Answer: D**



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2. Which of the following terms does not represent electrical power in a circuit?

A.  $I^2 R$

B.  $IR^2$

C.  $VI$

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

**Answer: B**



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3. An electric bulb is rated 220V and 100W. When it is operated on 110V the power consumed will be .....

.

A. 100W

B. 75W

C. 50W

D. 25W

**Answer: D**



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4. Two conducting wires of the same material and of equal lengths and equal diameters are first connected in series and then parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combinations would be-

A. 1 : 2

B. 2:1

C. 1:4

D. 4:1

**Answer: C**



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5. How is a voltmeter connected in the circuit to measure the potential difference between two points?



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6. A copper wire has diameter 0.5 mm and resistivity of  $1.6 \times 10^{-6} \Omega \text{ m}$ . What will be the length of this wire to make its resistance  $10 \Omega$ ? How much does the resistance change if the diameter is doubled?



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7. The values of current  $I$  flowing in for the corresponding values of potential difference  $V$  across the resistor are given below :

<b><math>I</math> (amperes)</b>	<b>0.5</b>	<b>1.0</b>	<b>2.0</b>	<b>3.0</b>	<b>4.0</b>
<b><math>V</math> (volts)</b>	<b>1.6</b>	<b>3.4</b>	<b>6.7</b>	<b>10.2</b>	<b>13.2</b>

Plot a graph between  $V$  and  $I$  and calculate the resistance of that resistor.

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8. When a 12V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of the resistance of the resistor.

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9. A battery of 9 V is connected in series with resistors of  $0.2\Omega$ ,  $0.3\Omega$ ,  $0.4\Omega$ ,  $0.5\Omega$  and  $12\Omega$  respectively. How much current would flow through the  $12\Omega$  resistor?

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**10.** How many 176 'Omega' resistors (in parallel) are required to carry 5 A on a 220V line?



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**11.** Show how you would connect three resistors, each of resistance  $6 \Omega$ , so that the combination has a resistance of (i)  $9 \Omega$ , (ii)  $4\Omega$ .



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**12.** Several electric bulbs designed to be used on a 220V electric supply line are rated 10 W. How many bulbs can be connected in parallel with each other across the two wires of 220V line if the maximum allowable current is 5 A ?



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**13.** A hot plate of an electric oven connected to a 220V line has two resistance coils A and B, each of  $24\Omega$  resistance, which may be used separately, in series, or in parallel. What are the currents in the three cases?



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**14.** Compare the power used in the  $2\Omega$  resistor in each of the following circuits:

a 6 V battery in series with  $1\Omega$  and  $2\Omega$  resistors

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**15.** Compare the power used in the  $2\Omega$  resistor in each of the following circuits:

a 4 V battery in parallel with  $12\Omega$  and  $2\Omega$  resistors

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**16.** Two lamps, one rated 100W at 220 V, and the other 60 W at 220 V are connected in parallel to electric mains supply. What current is drawn from the line if the supply voltage is 220V ?

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**17.** Which uses more energy, a 250W TV set in 1 h, or a 1200W toaster in 10 minutes?

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**18.** An electric heater of resistance 8 ohm draws 15A from the service mains for 2 hours. Calculate the rate at which heat is developed in the heater.



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**19.** Why is the tungsten used almost exclusively for filament of electric lamps? Explain.



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**20.** Why are the conductors of electric heating devices, such as bread-toasters and electric irons,

made of an alloy rather than a pure metal? Explain.



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**21.** Why is the series arrangement not used for domestic circuits? Explain.



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**22.** How does the resistance of a wire vary with its area of cross-section? Explain.



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23. Why are copper and aluminium wires usually employed for electricity transmission? Explain.



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## Additional Question And Answers Solve The Following Examples

1. 240 joules of work is done in moving 20coulomb electric charge from one pole to the other pole of a battery. Calculate the voltage of the battery.



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2. 5 V electric potential difference is applied between two ends of a conducting wire. If 600C of electric charge passes through it in 10minutes, calculate the resistance of the wire.



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3. Two copper wires A and B have the same mass. The resistance of wire A is  $0.5\Omega$  and the length of wire B is double that of wire A. Find the resistance of wire B.



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4. If the length of a given conducting wire is kept constant and its diameter is doubled, what will be the resistance of the new wire?



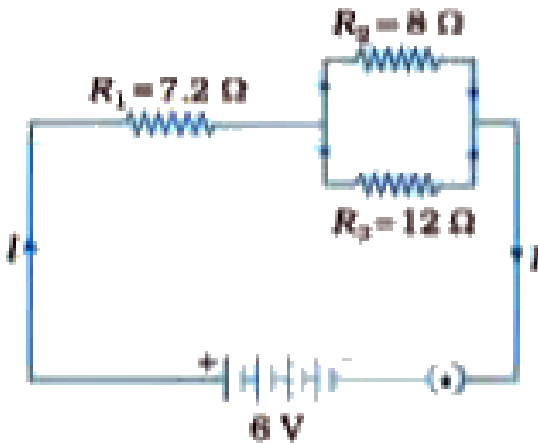
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5. Two resistors of  $1\text{ k}\Omega$  and  $200\Omega$  are connected in series with a  $12\text{V}$  battery. Calculate the current flowing in the circuit and the voltage developed across the  $200\Omega$  resistor.



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6. For the circuit shown in figure given below, calculate (a) the total resistance of the circuit. (b) the total current flowing in the circuit. (c) the voltage developed across the two ends of  $R_1$ .



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7. Two 60W bulbs are used for 4 hours everyday and five 100W bulbs are used for 5 hours everyday. How many units of electricity will be consumed in 30 days?



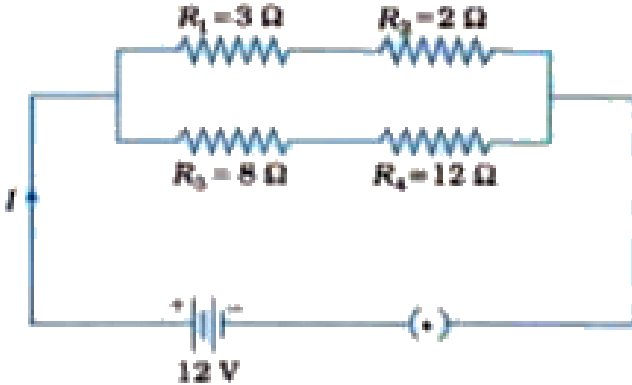
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8. 24W power is consumed by a bulb when it is connected with 12V battery. How much power will be consumed if it is connected with 6V battery?



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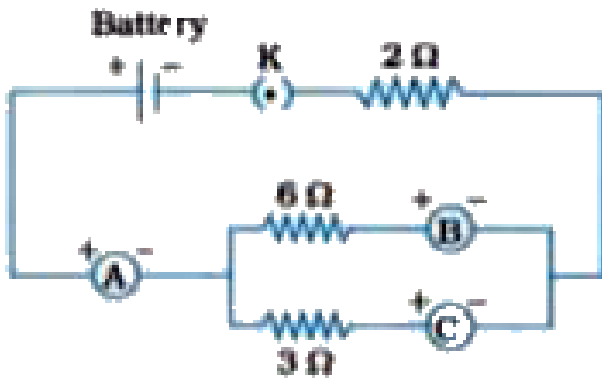
9. Find the equivalent resistance of the circuit shown in the following figure:



Also find the total current flowing in this circuit.

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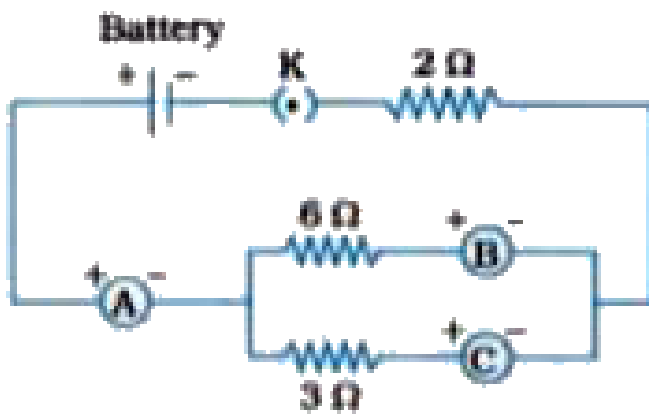
10. In the following circuit A, B and C are three ammeters. 0.5A current is shown by ammeter B.



Find the currents passing through ammeters A and C.

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**11.** In the following circuit A, B and C are three ammeters.  $0.5\text{A}$  current is shown by ammeter B.



Find the total resistance of the circuit.

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12. If an electric bulb gives light for 1 hour while carrying  $0.5\text{A}$  current, how much electric charge passes through it and how many electrons pass through it during this time?

$$(e = 1.6 \times 10^{-19}\text{C})$$

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**13.** An electric current of 64mA flows through a bulb for 10minutes. How many electrons pass through the bulb during this time? ( $e = 1.6 \times 10^{-19}C$ )



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**14.** In order to get a current of 0.5A in a circuit by connecting a bulb of resistance  $20\Omega$  with 12V battery, what should be the resistance to be connected in series? What will be the voltage drop across the bulb?



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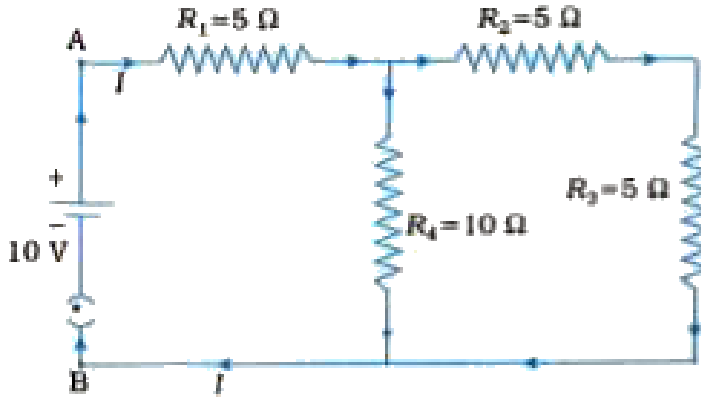
**15.** Three resistors are connected in parallel with a 30V battery. A current of 7.5A flows through the circuit. If two out of the three resistors are of  $10\Omega$  and  $12\Omega$ , determine the resistance of the third resistor.



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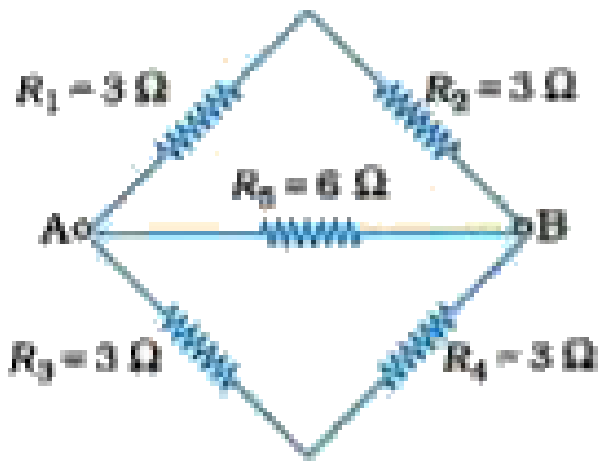
**16.** For the circuit shown in the following figure, determine the equivalent resistance between points A and B. Also find the current  $I$  flowing through the

circuit.



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17. Determine the equivalent resistance between point A and B in the following circuit:



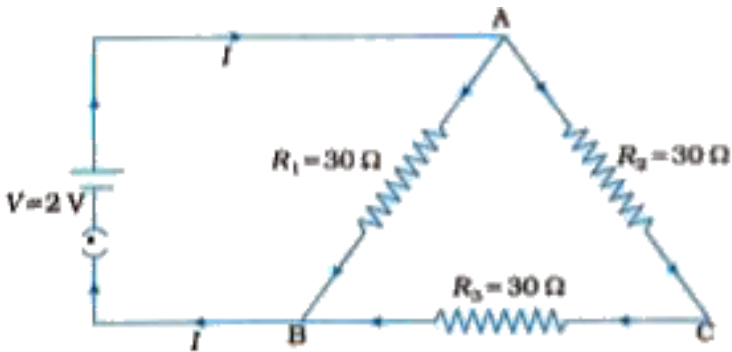
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**18.** In a house, if three bulbs of 100W, 60W and 40W respectively are used 2 hours per day, how many units of electrical energy will be consumed in 30 days?

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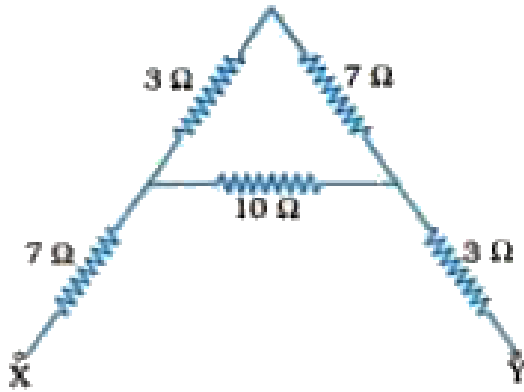


19. Find the electric current in the following circuit:



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20. Determine the equivalent resistance between points  $X$  and  $Y$  in the following circuit:



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21. An electric heater consumes 4.4 kW power when connected with a 220V line voltage.

Calculate the current flowing in the heater.

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**22.** An electric heater consumes 4.4 kW power when connected with a 220V line voltage.

Calculate the resistance of the heater.



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**23.** An electric heater consumes 4.4 kW power when connected with a 220V line voltage.

Calculate the energy consumed in 2hours.



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**Additional Question And Answers State At Least Three Points Of Difference Between The Following Terms**

# Quantities

## 1. Resistance and Resistivity



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## 2. Series combination of resistors and Parallel combination of resistors



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**Additional Question And Answers Give Scientific Reasons For The Following Statements**

1. It is not advisable to connect an electric bulb and electric heater in series.



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2. For domestic purposes, different electrical devices are connected in parallel instead of connecting them in series.



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3. Fairy decorative lights are always connected in parallel.



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4. In a tungsten electric-bulb, a coil of wire, rather than a straight wire, is used.

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[Additional Information](#)   [Question](#)   [And](#)   [Answers](#)   [Additional Information](#)

1. Electric current is flowing in a conductor. Can we say the conductor is charged ?

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## Objective Questions And Answers Answer The Following Questions In One Word Sentence

1. Name the scientist in whose honour the SI unit of electric current is named.



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2. Which type of electric force acts between the proton and the electron?



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3. Write the relation between the joule. coulomb and the volt.



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4. How is the device measuring electric current connected in the circuit?



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5. You are given aluminium wire and copper Wire having the same dimensions. Which wire will carry



more electric current if the applied potential difference is the same for the two wires?



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6. Name one electric appliance working on the principle of heating effect of electric current.



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7. If a resistive wire is uniformly stretched, what will be a change in its resistance?



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8. Name a physical quantity which can be expressed in Js.



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9. Name the particle responsible for flow of electric current in a metallic conductor.



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10. Which instrument is used to measure electric potential difference?



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11. Draw a symbol for variable resistor.



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12. How much energy in joule is consumed when 100 units electricity are used?



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13. Write the Ohm's law in the form of a formula.



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## Objective Questions And Answers Fill In The Blanks

1. Electric charge on ..... is taken negative.



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2. In a substance, the direction of conventional current is opposite to the direction of ..... current.



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3. Electric component, .....has symbol



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4. The SI unit of electric potential is ..... .

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5. In a circuit, a voltmeter is always connected ..... to the electrical component.

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6. When a battery is connected in a circuit, in the external circuit, electric current flows from the ..... terminal to the ..... terminal of the battery.



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7. The SI unit of electric power is ..... .



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8. According to Joule's law, heat energy produced in a resistor is directly proportional to the square of

..... .

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9. 1 unit (commercial unit of electric energy) = ..... J

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10. The equivalent resistance between points X and Y in the circuit shown in the following figure is .....



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11. The rate of consumption of electric energy with time is called .....

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12.  $1A = \dots\dots\dots\mu A$ .

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**Objective Questions And Answers State Whether The Following Statements Are True Or False**



1. The SI unit of electric current is the coulomb ?.



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2. To measure electric current, an ammeter is connected in series with a resistor, why?



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3.  $W=VQ$  , define?



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4. The current flowing through each resistor is the same when resistors having different resistances are connected in parallel.



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5. The equivalent resistance ( $R_s$ ) of a series combination of resistors is given by

$$\frac{1}{R_s} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$



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6. Nichrome wire is used to make resistors.



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7. When the temperature of a metallic substance increases up to a certain limit, its resistance decreases ?



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8. For two wires of the same material and having the same length, the resistance of the thicker wire is less than that of the other wire ?



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9. Electric charge is measured by using an ammeter ?



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10. Work can be expressed in coulomb-volt ?



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11. Two bulbs of 60W. 220V, when connected in series with a supply voltage of 220 V, light up with maximum intensity.



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## Objective Questions And Answers Match The Following

Column I	Column II	Column III
1. Electric current	a. $Vl$ b. $Q/t$	p. The volt /ampere
2. Electric potential difference	c. $W/Q$ d. $V/I$ e. $\forall It$	q. The joule r. The coulomb / second
3. Resistance		s. The joule /second
4. Electric energy		t. The volt
5. Electric power		

1.



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## 2. Match the columns

Column I	Column II	Column III
1. Copper	a. Insulator	p. It is used to make resistance.
2. Nichrome	b. Semi-conductor	q. It stops electric current.
3. Wood	c. Conductor	r. It is used to make conducting wire.
4. Silicon	d. Resistor	s. It is used to make electronic components.



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Column I	Column II
1.	a. Electric cell
2.	b. Voltmeter
3.	c. Variable resistor
4.	d. Two conducting wires are connected at a point.
5.	e. Open key
6.	f. Ammeter



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## Objective Questions And Answers Choose The Correct Option From Those Given Below Each Question

1. The SI unit of electric charge is the .....

A. ampere

B. volt

C. watt

D. coulomb

**Answer: D**



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2. How many electrons will be there in 1.6 C charge?

A.  $10^{17}$

B.  $10^{18}$



C.  $10^{19}$

D.  $10^{20}$

**Answer: C**



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**3.  $1\mu A = \dots\dots\dots mA$**

A.  $10^{-16}$

B.  $10^{-3}$

C.  $10^3$

D.  $10^{-3}mA$

**Answer: B**



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**4.** Which of the following materials has more number of free electrons in a given volume?

A. Copper

B. Glass

C. Rubber

D. Iron

**Answer: A**



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5. According to Ohm's law ...

A. the resistance increases with an increase in current.

B. the resistance increases with an increase in voltage.

C. the current increases with an increase in voltage.

D. both the resistance and current increase with an increase in voltage.

**Answer: C**



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6. The formula for electric current is ..... .

A.  $I = Qt$

B.  $I = \frac{Q}{t}$

C.  $I = \frac{t}{Q}$

D.  $I = W \cdot t$

**Answer: B**



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7. 2 A electric current is passed for 1 minute through a conducting wire. How much electric charge will pass through this wire?

- A. 2C
- B. 30C
- C. 60C
- D. 120C

**Answer: D**



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8. If 4.8A current is passed through an electrical appliance, the number of electrons passing through it in 1 second will be .....

A.  $0.33 \times 10^{19}$

B.  $3.3 \times 10^{19}$

C.  $3 \times 10^{19}$

D.  $4.8 \times 10^{19}$

**Answer: C**



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9. Which of the following formulae represents voltage?

A.  $\frac{\text{Work}}{\text{current} \times \text{time}}$

B.  $\frac{\text{Work} \times \text{time}}{\text{current}}$

C. Work  $\times$  electric charge

D. Work  $\times$  electric charge  $\times$  time

**Answer: A**



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10. The unit of electric potential difference is .....

A. J

B. J/C

C. JC

D. C/J

**Answer: B**



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**11.** If the work done to take 3 C electric charge from one point to another point is 15 J, what will be the potential difference between these two points?

A. 3V



B. 15V

C. 5V

D. 45 V

**Answer: C**



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**12.** The resistance of a conducting wire is  $10 \Omega$ . If a battery of 1.5 V is connected to it, the electric current flowing through it will be .....

A. 0.15 mA

B. 1.5 mA

C. 15 mA

D. 150 mA

**Answer: D**



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**13.** On which factors does the resistivity of a conducting wire depend?

A. The length of the wire

B. The area of cross-section of the wire

C. The volume of the wire

D. The material of the wire

**Answer: D**



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**14.** If five equal pieces of a resistance wire having  $5\Omega$  resistance are connected in parallel, their equivalent resistance will be .....

A.  $\frac{1}{5}\Omega$

B.  $1\Omega$

C.  $5\Omega$

D.  $25\Omega$

**Answer: A**



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**15.** The SI unit of resistivity is .....

A.  $\Omega$

B.  $\Omega m$

C.  $\frac{\Omega}{m}$

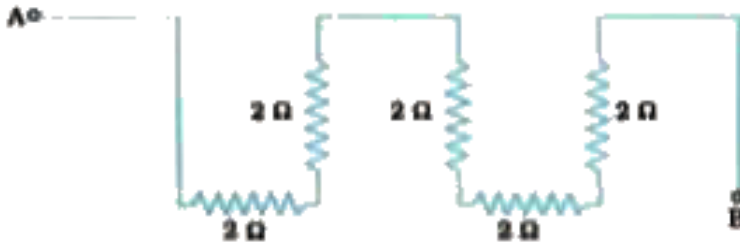
D.  $\frac{m}{\Omega}$

**Answer: C**



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16. What will be the equivalent resistance between points A and B of the following electric circuit?



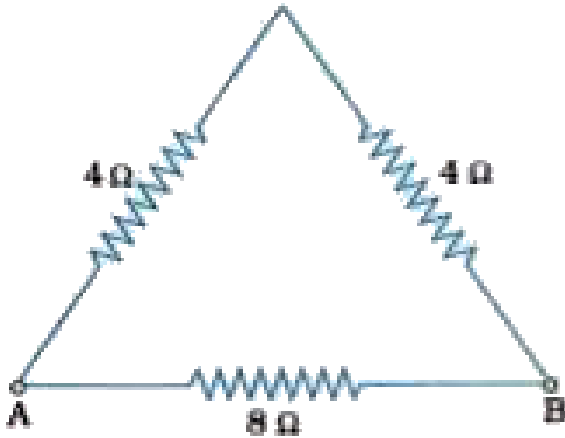
- A.  $1\ \Omega$
- B.  $2\ \Omega$
- C.  $5\ \Omega$
- D.  $10\ \Omega$

**Answer: D**



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17. The equivalent resistance between points A and B of the following electric circuit will be .....

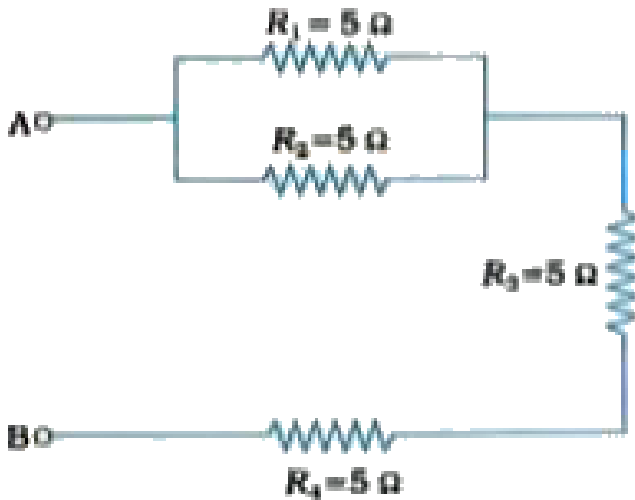


- A.  $4\Omega$
- B.  $8\Omega$
- C.  $2\Omega$
- D.  $16\Omega$

Answer: A

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18. The equivalent resistance between points A and B in the following electric circuit is .....



A.  $2.5\ \Omega$

B.  $5\Omega$

C.  $12.5\Omega$

D.  $20\Omega$

**Answer: C**



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**19.** Which physical quantity is expressed in kWh?

A. Work

B. Electric power

C. Electric current



## D. Electric potential

**Answer: A**



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20.1 kWh = ..... J

A.  $3.6 \times 10^6$

B.  $3.6 \times 10^3$

C.  $3.6 \times 10^{-6}$

D.  $3.6 \times 10^{-3}$

**Answer: A**



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21. An electric heater consumes 1.1 kW power when 220 V voltage is applied to it. The current flowing through it must be .....

A. 1.1 A

B. 2.2 A

C. 4A

D. 5A

**Answer: D**



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22. 1 A = ..... mA

A. 100

B.  $10^3$

C.  $10^{-3}$

D.  $10^{-6}$

**Answer: B**



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**23.** In an electric field, electric potential at a point is 10V. How much work has to be done to bring 0.5 C electric charge from infinite distance to that point?

A. 0.5J

B. 2 J

C. 5 J

D. 10J

**Answer: C**



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24. .... is the work done in moving a unit positive charge from point A to B in an electric field.

A. Electric potential at point A.

B. Electric potential at point B.

C. Electric potential difference between points A and B.

D. Electric current from point A to point B.

**Answer: C**



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25. In an electric field. electric potential at point A is 40 V and that at point B is 90 V. The work to be done in taking 2 C charge from point A to point B is .....

A. 25 J

B. 25 J

C. 90 J

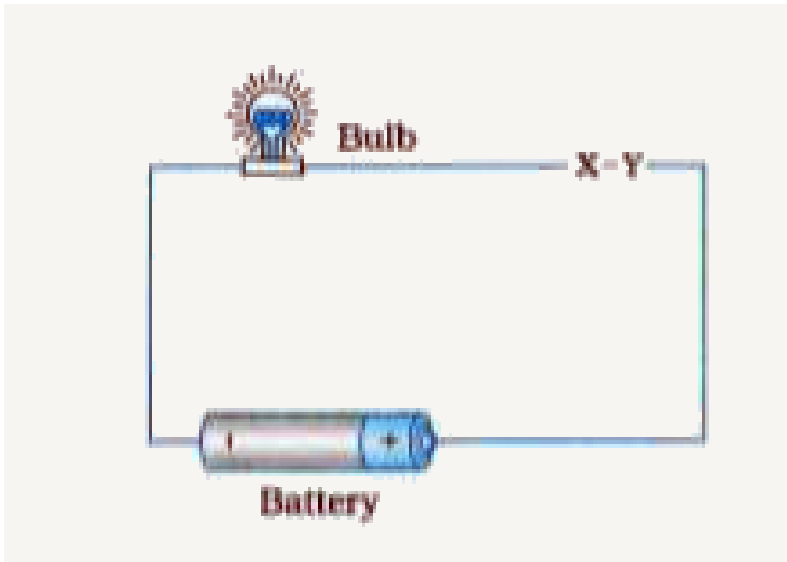
D. 100 J

**Answer: D**



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26. Sonika is working with the circuit shown in the following figure:



The circuit has two gaps: X and y. She has wires of five different materials - I, II, III, IV and V. She knows that the bulb will light up only when both gaps are filled with conducting materials.

She records her observations in a table. After completing the experiment, ink fell on the paper and

she lost entries in row 3.

No.	Material in X	Material in Y	Bulb (On/Off)
1	I	II	Off
2	I	IV	On
3			Off
4	III	V	On

Based on the rest of the information in the table, out of the following what could be the materials in row 3?

- A. II and III
- B. III and IV
- C. IV and V
- D. I and III



**Answer: A**



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27.  $\Omega m$ . is the SI unit of .....

A. resistance

B. resistivity

C. conductivity

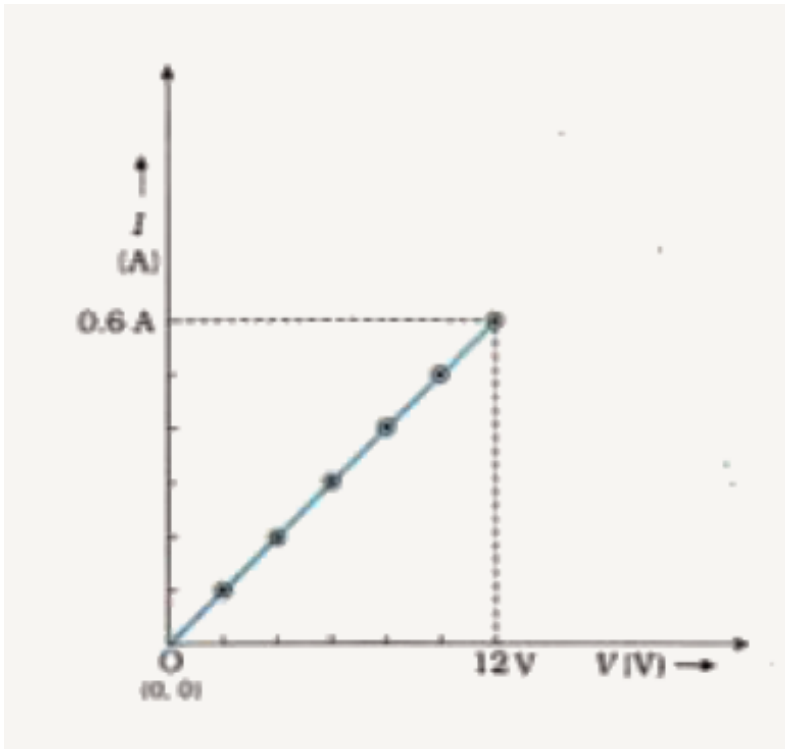
D. resistance per unit length

**Answer: B**



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28. I - V graph for a resistance Wire is shown in the figure given below:



What will be resistance of this wire?

A.  $50\Omega$

B.  $20\Omega$

C.  $7.2\Omega$

D.  $\frac{1}{120}\Omega$

**Answer: B**



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**29.** What will be the change in the resistivity of a resistance wire. When its length is doubled by stretching it uniformly ?

A. Will be doubled

B. Will be half

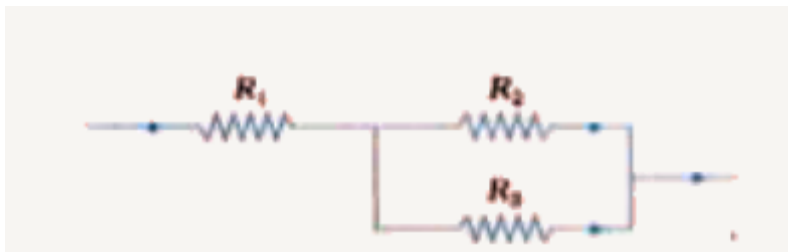
C. Will be one- fourth

D. Will not change

Answer: D

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30. Observe the circuit in, the following figure and select the correct statement:



A. Resistors with resistances  $R_1$  and  $R_2$  are .  
connected in series.

B. Resistors with resistances  $R_1$  and  $R_2$  are connected in parallel.

C. Resistors with resistances  $R_2$  and  $R_3$  are connected in series.

D. Resistors with resistances  $R_2$  and  $R_3$  are connected in parallel.

**Answer: D**



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**31.** Resistors with resistances  $5\Omega$ ,  $10\Omega$  and  $15\Omega$  are connected in parallel to each other. What will be the

equivalent resistance of the circuit?

- A. Less than  $5\ \Omega$
- B. More than  $15\ \Omega$
- C. More than  $30\ \Omega$
- D. Equal to  $30\ \Omega$

**Answer: A**



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**32.** The resistance of a wire is  $R$ . When this wire is stretched so that its length becomes double, its

cross-sectional area becomes half. What will be the resistance of this stretched wire?

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

B.  $R$

C.  $2R$

D.  $4R$

**Answer: D**



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**33.** When three resistors, each of resistance  $R$ , are connected in parallel, the equivalent resistance is

found out to be  $10\Omega$ . R must be .....

A.  $10\Omega$

B.  $20\Omega$

C.  $30\Omega$

D.  $5\Omega$

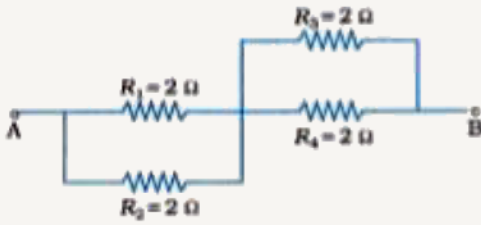
**Answer: C**



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**34.** In the following figure, what will be the equivalent resistance between points A and B?





A.  $1\ \Omega$

B.  $2\ \Omega$

C.  $4\ \Omega$

D.  $8\ \Omega$

**Answer: B**



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35. A wire having resistance  $20\ \Omega$  is bent in the form of a circle as shown in the following figure:



What will be the resistance between two end points A and B located on the diameter?

- A.  $5\ \Omega$
- B.  $10\ \Omega$
- C.  $20\ \Omega$
- D.  $40\ \Omega$

**Answer: A**



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**36.** Which of the following options is not the formula for heat energy (in joule) produced when a current is passed through a conductor?

A.  $H = I^2 R t$

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

C.  $H = I V t$

D.  $H = \frac{V^2}{I^2} t$

**Answer: D**



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**37.** Which option is correct for the following statements A and B?

Statement A: The current passing through each resistor is the same in a series combination of resistors.

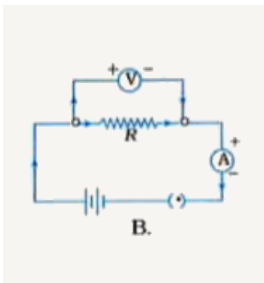
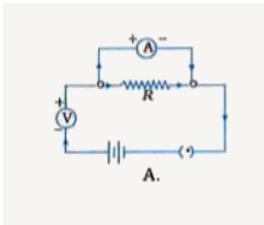
Statement B: The voltage between two ends of each resistor is the same in a parallel combination of resistors.

- A. Statement A is true but statement B is false.
- B. Statement A is false but statement B is true.
- C. Statement A and statement B both are true.
- D. Statement A and statement B both are false.

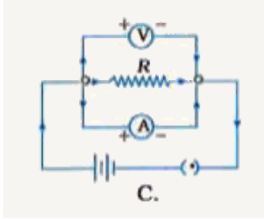
Answer: C

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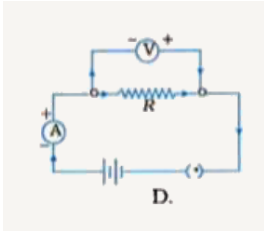
38. In which of the following circuits the voltmeter and ammeter are connected properly to verify the Ohm's law?



C.



D.



**Answer: B**

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**39.** Maximum 1 A current can pass through a bulb having resistance  $100 \Omega$ . What will be the power of this bulb?

A.  $10W$

B.  $100W$

C.  $1000W$

D.  $0.01W$

**Answer: B**



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**40.** Which of the following is not a unit of electric energy?

A. The watt-second

B. The kilowatt hour

C. The joule

D. The watt

**Answer: D**



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**41. Of which physical quantity is the unit, VA. ?**

A. Electric energy

B. Electric power

C. Heat energy



## D. Electric potential

**Answer: B**



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**42.** Which of the following circuit symbols is used to represent an electric cell?

A. 

B. 

C. 

D. 

**Answer: A**



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**43.** The resistance of 300 m long wire with cross-sectional area  $10^{-6}m^2$  and resistivity  $10^{-7}\Omega m$  is .....

A.  $30\Omega$

B.  $3\Omega$

C.  $0.3\Omega$

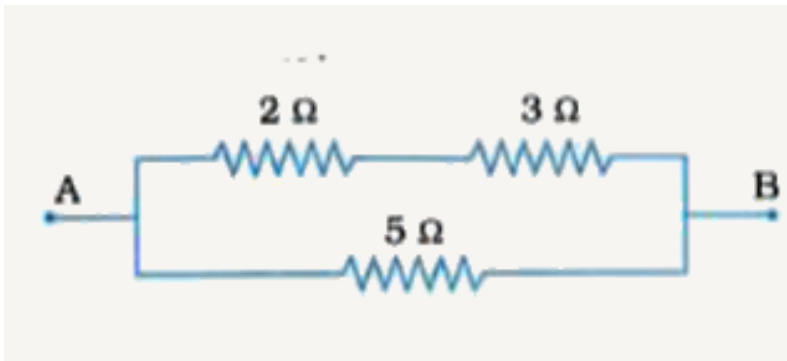
D.  $300\Omega$

**Answer: A**



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44. What will be the equivalent resistance of the following circuit?



A.  $10\ \Omega$

B.  $5\ \Omega$

C.  $2.5\ \Omega$

D.  $1\ \Omega$

**Answer: C**



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**45.** Three resistors of resistances  $2\Omega$ ,  $3\Omega$  and  $5\Omega$  are connected in series with 10 V battery. The voltage across  $2\Omega$  resistor will be .....

A.  $10V$

B.  $5V$

C.  $3V$

D.  $2V$

**Answer: D**



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46. An electric iron of power 2 kW is used for 3 hours.

At Rs 5 per unit, the electricity bill will be .....

A. Rs 45

B. Rs 30

C. Rs 15

D. Rs 10

**Answer: B**



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47. The working of electric fuse is based on the ...

A. chemical effect of electric current.

B. heating effect of electric current.

C. voltage regulation in the circuit.

D. current regulation in the circuit.

**Answer: B**



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48. Resistivity of a material depends on ..... of the material.

A. the length of the wire

B. the area of cross-section of the wire

C. the temperature

D. the volume of the wire

**Answer: C**



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**49.** When resistors of resistances  $R_1$  and  $R_2$  ( $R_2 < R_1$ ) are connected in parallel and the currents flowing through them are  $I_1$  and  $I_2$  respectively, then .....

A.  $I_1 = I_2$

B.  $I_1 > I_2$

C.  $I_1 < I_2$

D. nothing can be said about the currents

**Answer: C**



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50. When resistors of resistances  $R_1$  and  $R_2$  ( $R_2 > R_1$ ) are connected in series and the currents flowing through them are  $I_1$  and  $I_2$  respectively, then .....



A.  $I_1 = I_2$

B.  $I_1 > I_2$

C.  $I_1 < I_2$

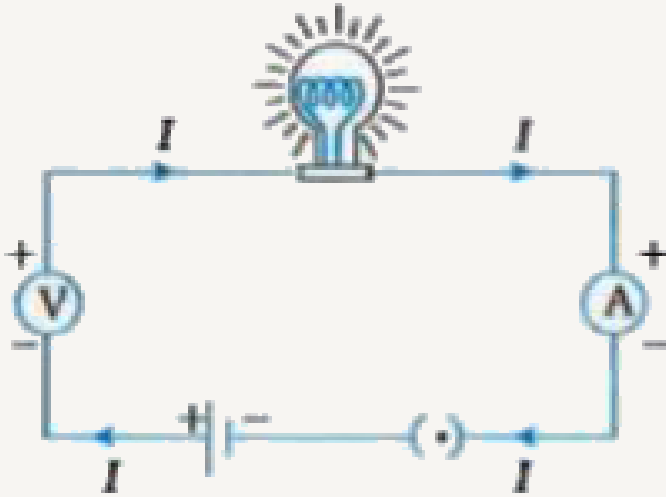
D. nothing can be said about the currents

**Answer: A**



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**51.** In the following circuit, which electric component is connected in a wrong manner?



A. Voltmeter

B. Ammeter

C. Plug key

D. Cell

**Answer: A**



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52.  $1\text{ C} = \dots\dots\dots \mu\text{C}$

A.  $10^{-6}$

B.  $10^{-3}$

C. 1

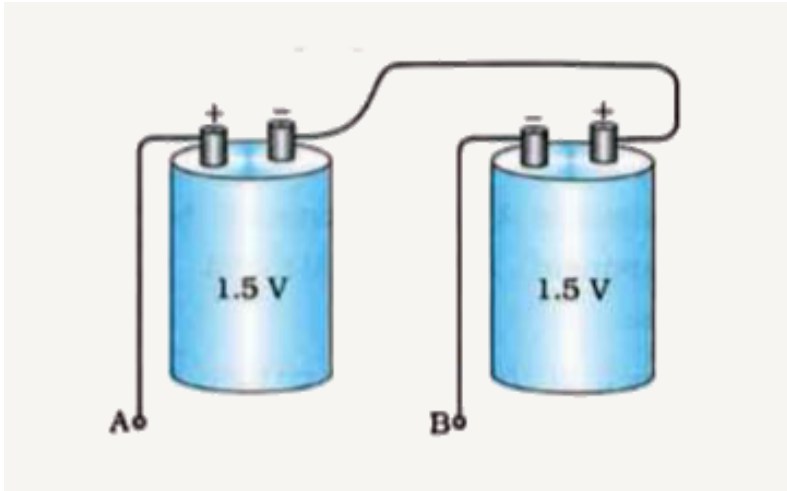
D.  $10^6$

**Answer: D**



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53. Connection of two cells of 1.5 V is shown in the following figure:



What is the voltage between the points A and B?

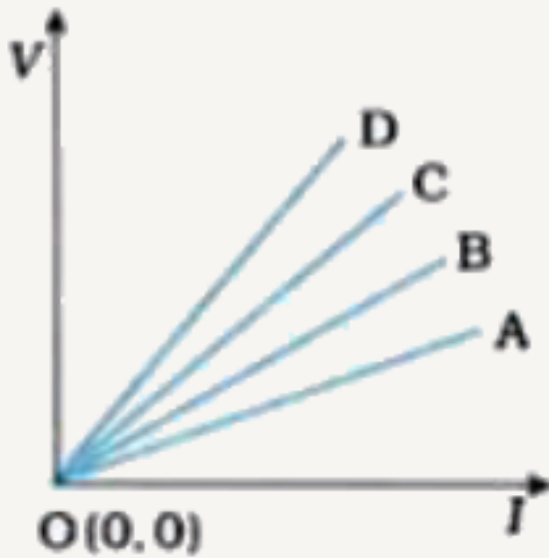
- A. 1.5 V
- B. 3 V
- C. 0.75 V
- D. 0 V

**Answer: B**



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**54.** The following figure shows the  $V - I$  graph for four different resistors:



Which resistor has the maximum resistance?

A. A

B. B

C. C

D. D

**Answer: D**



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55. A potential difference of 100 V is applied across an electric bulb marked 40 W. 200 V. The power consumed in the bulb is . . . . .

A. 100W

B. 40W

C. 20W

D. 10W

**Answer: D**

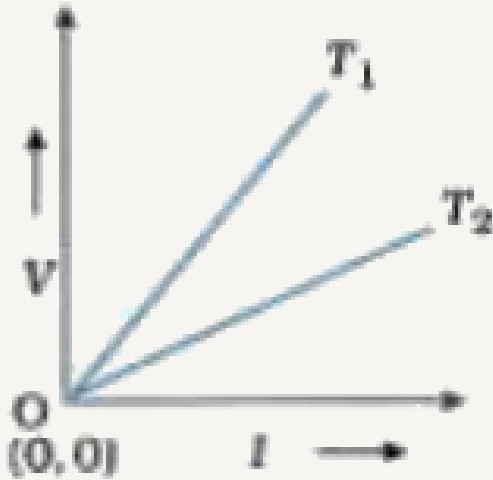


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## Objective Questions And Answers Answer The Following Questions As Directed Miscellaneous

1. The voltage - current (V-I) graphs for a metallic conductor at two different temperatures  $T_1$  and  $T_2$  are shown below:





At which temperature is the resistance higher?

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2. A wire of given length is doubled on itself and this process is repeated once again. By what factor does the resistance of the wire change?



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3. Through which of the following two wires, does the electric current flow more easily?

(a) A thick wire (b) a thin wire of the same material and of the same length when connected to the same source. State the reason.



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4. 400 J of heat is produced in 4 s in a 4.0ohm resistor. Find the potential difference across the resistor.



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5. What is the commercial unit of electrical energy?



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6. On what principle is an electric bulb based?



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7. In a circuit, two resistors of resistances  $5\Omega$  and  $10\Omega$  are connected in series. Compare the current passing through the two resistors.



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8. Write the relation between resistance  $R$  of the filament of a bulb, its power and a constant voltage  $V$  applied across it.



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9. Which of the following bulbs has more resistance?  
(a) A 220V, 100W bulb (b) a 220 V, 60 W bulb.



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**10.** Find the minimum resistance that can be made using five resistors, each of  $5\ \Omega$ .



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**11.** How does the resistance ( $R$ ) of a wire depend upon its radius ( $r$ )?



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**12.** An ammeter has a range ( $0 - 3A$ ) and there are 30 divisions on its scale. Calculate the least count of the ammeter.



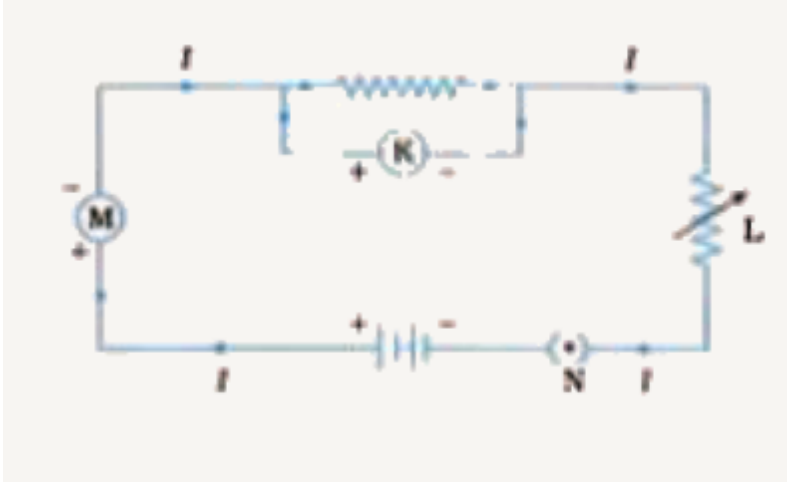
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**13.** In a voltmeter there are 20 divisions between 0 mark and 0.5 V mark. Calculate the least count of the voltmeter.



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**14.** To verify the Ohm's law a circuit diagram was drawn by a student as shown below:



What do K, L, M, N stand for?



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**15.** Four students connect 4 cells of 1.5 V each to get a battery of voltage 6 V. State the incorrect connection

/ connections. Justify your answer.



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**16.** Which of the following statements is correct?

(a) one volt is one joule per ampere.

(b) one volt is one joule per coulomb.



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**17.** Keeping the resistance constant, the potential difference applied across the ends of a component is halved. How does the current change?



**Watch Video Solution**

**18.** Keeping the potential difference constant, the resistance of a circuit is halved. How does the current change?



**Watch Video Solution**

**19.** A potential difference of 10 V is needed to make a current of 0.02 A flow through a wire. What potential difference is needed to make a current of 250 mA to flow through the same wire?



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**20.** A current of 200 mA flows through a 4 kOhm resistor. What is the potential difference across the resistor?



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**21.** The electrical resistivities of four materials A, B, C and D are given below:

$$A: 110 \times 10^{-8} \Omega m$$

$$B: 1.0 \times 10^{10} \Omega m$$

$$C: 10.0 \times 10^{-8} \Omega m$$

$$D: 2.3 \times 10^3 \Omega m$$

Which material is a (a) good conductor (b) resistor (c) insulator (d) semi-conductor?



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**22.** The equivalent resistance of a series combination of two resistors is '9 Omega' and the equivalent resistance of a parallel combination of the same two resistors is  $2\Omega$ . Find the resistances of the resistors.



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**23.** An electric lamp is labelled 12 V, 36 W. This indicates that it should be used with a 12 V supply. What other

information does the label provide?



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**24.** Name two devices whose working is based on the heating effect of electric current.



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**25.** Name the gases which are filled into the filament-type electric light bulbs.



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26. Why are the filament-type electric light bulbs not power efficient?



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27. Under what conditions is the Ohm's law applicable?



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28. Why is Nichrome used as a heating element?



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**29.** Why are Constantan and Manganin used for making standard resistors?

 [Watch Video Solution](#)

**30.** Why is lead-tin alloy used for making a fuse?

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**31.** What is the difference between a resistor  $\sim$  and resistance?

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**32.** What do you mean by the term load in an electric circuit?



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**33.** How does the current divide itself in a parallel combination of resistors?



**Watch Video Solution**

**34.** How does the potential difference divide itself in a series combination of resistors?



**Watch Video Solution**



**35.** How is heat produced in a conductor by an electric current?

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**36.** If a number of bulbs of different wattages are joined in parallel With a voltage source, which bulb will glow With maximum brightness?

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**37.** Which bulb will glow With maximum brightness in case bulbs of different wattages are joined in series With a voltage source?



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**38.** What can you say about the resistance of an ammeter?



**Watch Video Solution**

**39.** What can you say about the resistance of a voltmeter?



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40. How does the resistance of a metallic Wire depend on its temperature?



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41. Two wires have the same length, same radius but one of them is made of copper and the other is made of iron. Which Will have more resistance?



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**42.** Name a substance whose resistance decreases with temperature.



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**43.** Name a substance whose resistance almost remains unchanged With a change in temperature.



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**44.** Distinguish between the kilowatt and the kilowatt hour.



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45. Name two characteristics of a heater coil.



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46. The power-voltage rating of an electric appliance is 100 W- 250 V What does it signify?



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47. Why is much less heat generated in long electric cables than in the filament of an electric bulb?



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**48.** How much energy is consumed by 2 kW AC when used for 2 hour?

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**49.** A wire of resistivity  $\rho$  is pulled to double its length. What will be its new resistivity?

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**50.** How does the resistance of an ohmic conductor depend on the applied voltage?



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**51.** What causes the potential difference between the two terminals of a cell?



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**52.** Name and define the smallest commercial unit of electricity.



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**53.** If, the current  $I$ , through a resistor is increased by 100.% (assume that the temperature of the resistor remains unchanged), find the percentage increase in power dissipated.



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## Value Based Question With Answers

**1.** Medha observed that the tubelights in the corridor of her school were always switched on the whole day. She brought the matter to the notice of her class



teacher who talked to the Principal about it. The Principal took immediate action.

Medha helped this way to reduce air pollution.

Explain how.



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2. Medha observed that the tubelights in the corridor of her school were always switched on the whole day. She brought the matter to the notice of her class teacher who talked to the Principal about it. The Principal took immediate action.

What values do you learn from Medha in this episode?



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3. Medha observed that the tubelights in the corridor of her school were always switched on the whole day. She brought the matter to the notice of her class teacher who talked to the Principal about it. The Principal took immediate action.

What steps can the school take to get ~ electricity consumption reduced?



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4. Shalini is a student of class X. Her mother was preparing tea in an old electric kettle having metal case. When she switched on the electric kettle. she got a severe electric shock.

Shalini put off the main switch quickly and found that the connecting cord was torn, where her mother touched the metal case of the kettle. She also found that the red and black wires of the connecting cord were firmly connected to the two lower terminals of the power plug but the green wire of the cord was not connected to the upper terminal of the plug.

Shalini replaced the torn connecting cord and also connected the three wires of the cord firmly to the power plug terminals.

On the basis of the above passage, answer the following questions:

Why did Shalini switch off the main switch quickly?



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5. Shalini is a student of class X. Her mother was preparing tea in an old electric kettle having metal case. When she switched on the electric kettle. she got a severe electric shock.

Shalini put off the main switch quickly and found that the connecting cord was torn, where her mother touched the metal case of the kettle. She also found that the red and black wires of the connecting cord

were firmly connected to the two lower terminals of the power plug but the green wire of the cord was not connected to the upper terminal of the plug.

Shalini replaced the torn connecting cord and also connected the three wires of the cord firmly to the power plug terminals.

On the basis of the above passage, answer the following questions:

Which wire red, black or green, touched the metal case of electric kettle when Shalini's mother got electric shock?



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6. Shalini is a student of class X. Her mother was preparing tea in an old electric kettle having metal case. When she switched on the electric kettle. she got a severe electric shock.

Shalini put off the main switch quickly and found that the connecting cord was torn, where her mother touched the metal case of the kettle. She also found that the red and black wires of the connecting cord were firmly connected to the two lower terminals of the power plug but the green wire of the cord was not connected to the upper terminal of the plug.

Shalini replaced the torn connecting cord and also connected the three wires of the cord firmly to the power plug terminals.

On the basis of the above passage, answer the following questions:

What values are displayed by Shalini in this incident?



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7. Bharat was doing an experiment by using an ammeter. Suddenly, it fell from his hand and broke. He was afraid, that he might be scolded and threaten by his teacher. His classmate advised him not to tell the teacher, but he refused and told his teacher. On listening to him patiently, the teacher did not scold him and threaten as it was just an accident and used the opportunity to show the internal structure of the

ammeter to the whole class.

On the basis of above passage, answer the following questions:

What values do you learn from Bharat?



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8. Bharat was doing an experiment by using an ammeter. Suddenly, it fell from his hand and broke. He was afraid, that he might be scolded and threaten by his teacher. His classmate advised him not to tell the teacher, but he refused and told his teacher. On listening to him patiently, the teacher did not scold him and threaten as it was just an accident and used



the opportunity to show the internal structure of the ammeter to the whole class.

On the basis of above passage, answer the following questions:

What is the use of ammeter? How is it connected in the circuit?



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9. Bharat was doing an experiment by using an ammeter. Suddenly, it fell from his hand and broke. He was afraid, that he might be scolded and threaten by his teacher. His classmate advised him not to tell the teacher. but he refused and told his teacher. On

listening to him patiently, the teacher did not scold him and threaten as it was just an accident and used the opportunity to show the internal structure of the ammeter to the whole class.

On the basis of above passage, answer the following questions:

State the aim of any one experiment, where Bharat could have used the ammeter.



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**10.** Mitali's mother was cooking in the kitchen for guests. Mitali saw her mother had plugged in microwave, hot plate and food processor on the same

plug point. She immediately switched off the plug and removed all the plugs and re-plugged them in separate individual plugs.

What happens when we use too many electrical devices plugged in one power point?



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**11.** Mitali's mother was cooking in the kitchen for guests. Mitali saw her mother had plugged in microwave, hot plate and food processor on the same plug point. She immediately switched off the plug and removed all the plugs and re-plugged them in

separate individual plugs.

What is the power of a device?



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12. Mitali's mother was cooking in the kitchen for guests. Mitali saw her mother had plugged in microwave, hot plate and food processor on the same plug point. She immediately switched off the plug and removed all the plugs and re-plugged them in separate individual plugs.

What value did Mitali display in the above act?



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**13.** Vishva noticed in a dhaba around 50 bulbs, each of 100 W all were glowing. She calculated the cost of electricity consumed in one hour and told the dhaba owner to reduce the expenses and at the same time save electricity by using CFL bulbs instead of ordinary filament-type bulbs.

What would be the cost of electric energy if 50 bulbs, each of 100 W. are used for one hour? 1 unit costs Rs 5.



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**14.** Vishva noticed in a dhaba around 50 bulbs, each of 100 W all were glowing. She calculated the cost of electricity consumed in one hour and told the dhaba owner to reduce the expenses and at the same time save electricity by using CFL bulbs instead of ordinary filament-type bulbs.

What is a CFL?

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**15.** Vishva noticed in a dhaba around 50 bulbs, each of 100 W all were glowing. She calculated the cost of electricity consumed in one hour and told the dhaba

owner to reduce the expenses and at the same time save electricity by using CFL bulbs instead of ordinary filament-type bulbs.

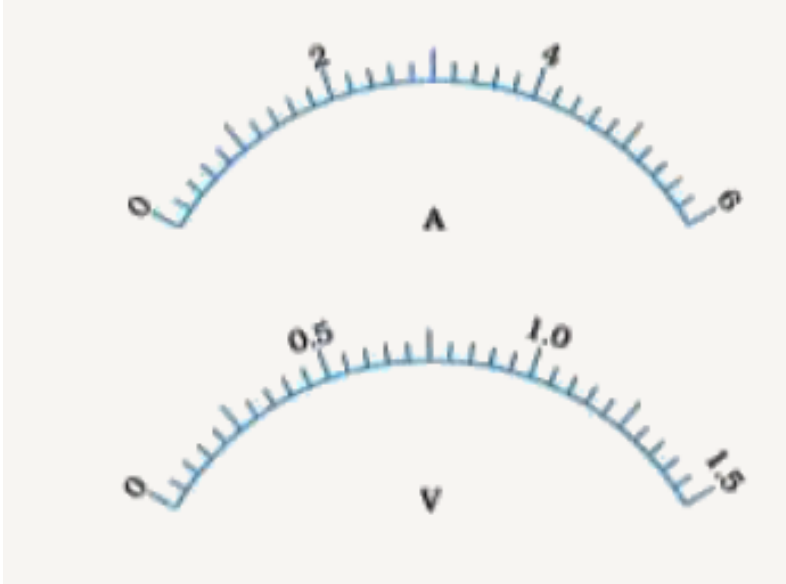
What value did Vishva display in the above case?



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## Practical Skill Based Question With Answers

1. The scales of an ammeter and a voltmeter are shown below:

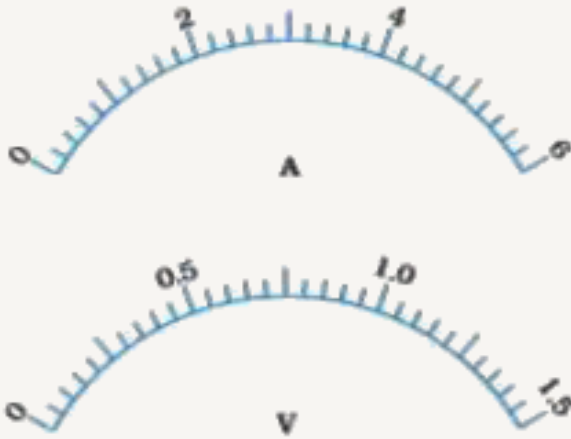


What is the range of the ammeter and the range of the voltmeter?

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2. The scales of an ammeter and a voltmeter are shown below:



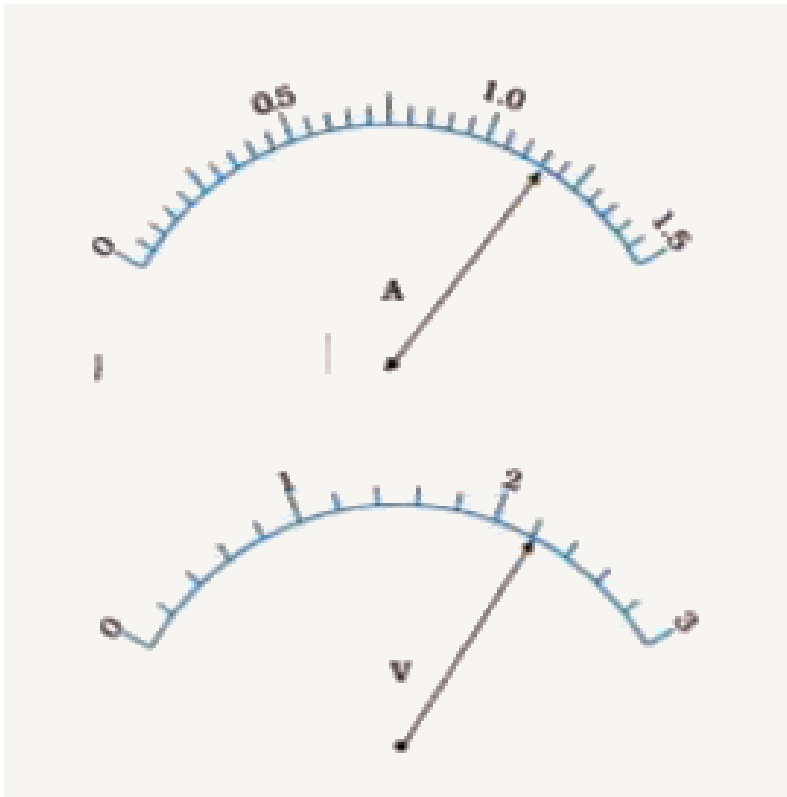


Find the least count of the ammeter and the voltmeter.

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3. See the figure given below and find the readings of ideal ammeter and ideal voltmeter.

(There is no zero error.)



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4. In a given ammeter, a student observes that the needle indicates 17 divisions in the ammeter when

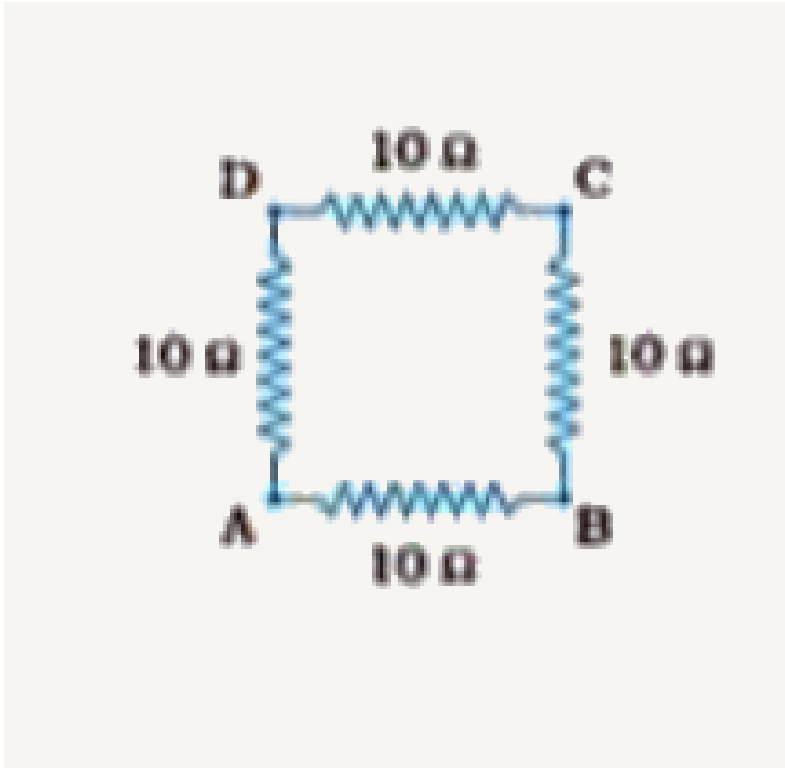
performing an experiment to verify Ohm's law. If the ammeter has 10 divisions between 0 and 0.5 A, then what is the value of 17 divisions?



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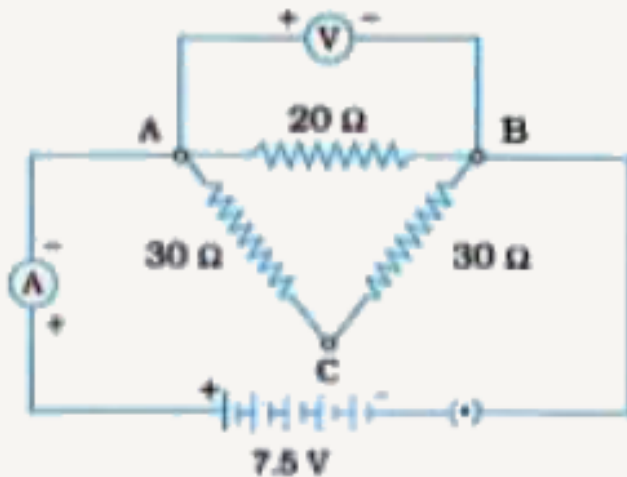
5. Four resistors, each of  $10\Omega$  are connected to form a square as shown in the given figure. Find the equivalent resistance between the opposite corner A

and C and between two points on anyone side (AB).



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6. In the circuit shown in figure given below and find the current recorded by the ammeter (A).



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7. Read the following information:

( 1 ) The resistivity of copper is lower than that of aluminium which in turn is lower than that of constantan.

( 2 ) Six wires labelled as A, B, C, D, E and F have been

designed as per the following parameters:

Wire	Length	Diameter	Material	Resistance
A	$l$	$2d$	Aluminium	$R_A$
B	$2l$	$d/2$	Constantan	$R_B$
C	$3l$	$d/2$	Constantan	$R_C$
D	$l/2$	$3d$	Copper	$R_D$
E	$2l$	$2d$	Aluminium	$R_E$
F	$l/2$	$4d$	Copper	$R_F$

Answer the following questions using the above data:

Which of the wires has maximum resistance and why?

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C	$3l$	$d/2$	Constantan	$R_C$
D	$l/2$	$3d$	Copper	$R_D$
E	$2l$	$2d$	Aluminium	$R_E$
F	$l/2$	$4d$	Copper	$R_F$

Answer the following questions using the above data:

Which of the wires has minimum resistance and why?

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9. Read the following information:

( 1 ) The resistivity of copper is lower than that of aluminium which in turn is lower than that of

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( 2) Six wires labelled as A, B, C, D, E and F have been designed as per the following parameters:

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C	$3l$	$d/2$	Constantan	$R_C$
D	$l/2$	$3d$	Copper	$R_D$
E	$2l$	$2d$	Aluminium	$R_E$
F	$l/2$	$4d$	Copper	$R_F$

Answer the following questions using the above data:

Arrange  $R_A$ ,  $R_B$  and  $R_C$  in ascending order of their values. Justify your answer.



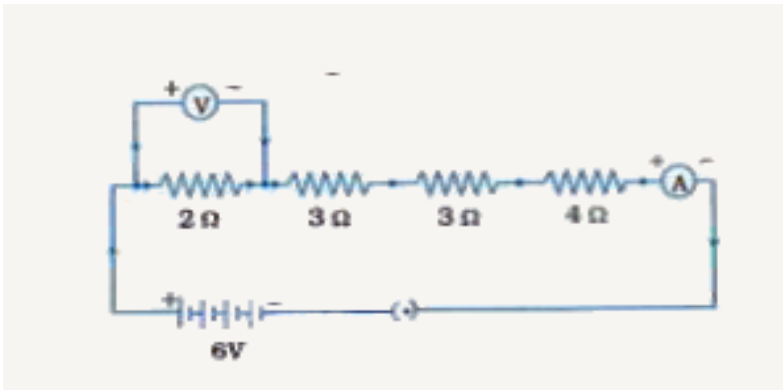
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10.  $n$  resistors, each of resistance  $R$  are first connected in series and then in parallel. What is the ratio of the total effective resistance of the circuit in the series to the parallel combination?

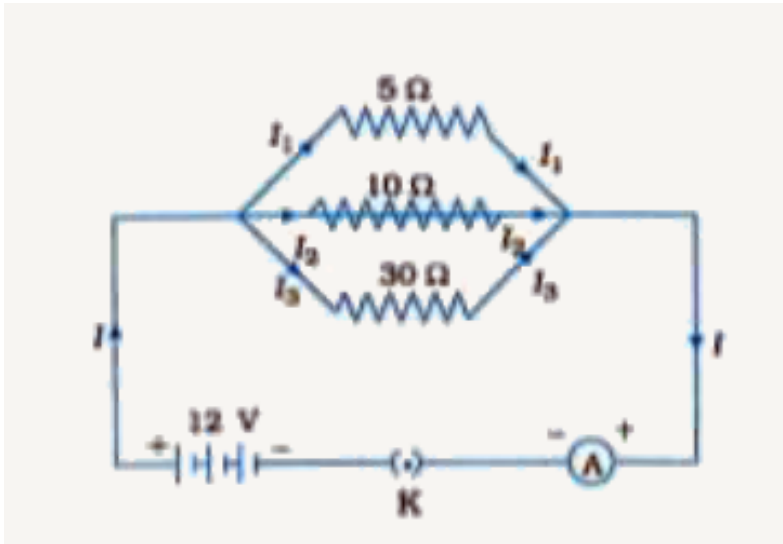
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11. Find out the readings of ammeter and voltmeter in the circuit given below:



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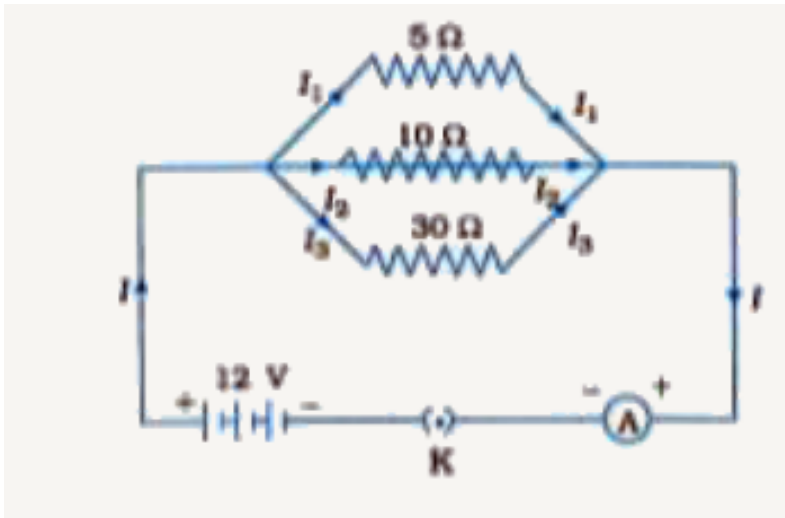
12. In the given circuit diagram, calculate:



the value of current through each resistor

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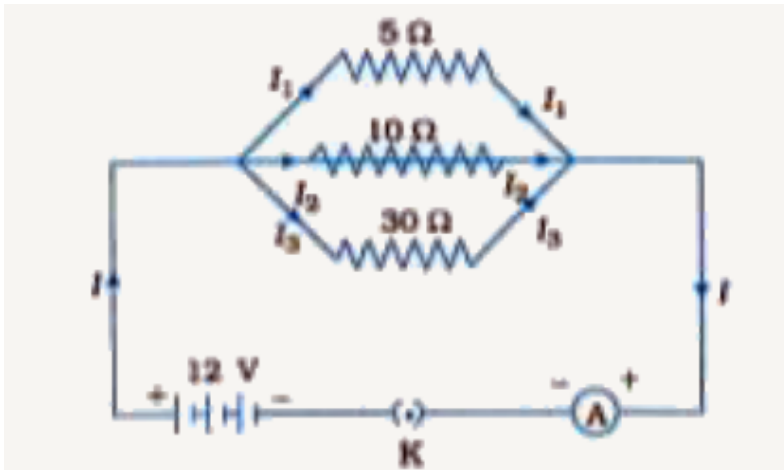
13. In the given circuit diagram, calculate:



the total current in the circuit

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14. In the given circuit diagram, calculate:



the total effective resistance of the circuit.

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15. Show four different ways in which three resistors of  $r$  ohm, each may be connected in a circuit. In which case is the equivalent resistance of the

combination:

( 1 ) Maximum?

( 2 ) Minimum?



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**16.** Find the current drawn from the battery by the network of four resistors shown in the figure.



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**17.** Find the equivalent resistance across the ends A and B of this circuit.



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**18.** Five resistors are connected in a circuit as shown. Find the ammeter reading when the circuit is closed.



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**19.** Draw a diagram of an electric circuit containing a cell, a key, an ammeter, a resistor of  $2\Omega$  in series with a combination of two resistors ( $4\Omega$  each) in parallel and a voltmeter across the parallel combination.

Will the potential difference across the  $2\Omega$  resistor be

the same as that across the parallel combination of  $4\Omega$  resistors ? Give the reason.



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**20.** A current of  $1\text{A}$  flows in a series circuit containing an electric lamp and a conductor of  $5\Omega$  connected to a  $10\text{V}$  battery. Calculate the resistance of the electric lamp.

Now if a resistance  $10\Omega$  is connected in parallel with this series combination, what change (if any) in current flowing through  $5\Omega$  conductor and potential difference across the lamp will take place ? Give the reason.



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