PHYSICS

BOOKS - SELINA PHYSICS (ENGLISH)

CURRENT ELECTRICITY

Examples

1. Fig. shows I-V graph for two conductors A and B.

Which conductor is ohmic ?

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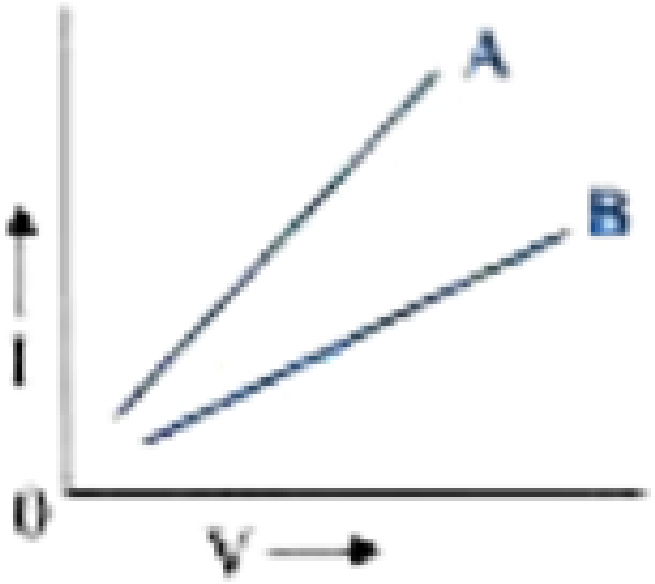
2. Fig. shows I-V graph for two conductors A and B.



Which conductor has more resistance ? Give reason to you r answer.

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3. Fig. shows V-I graphs experimentally obtained in different cases. Select the graphs for ohmic and non-ohmic resistors.

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4. Calculate the potential difference required across a conductor of resistance 5 Ω to pass a current of 1.5 A through it.

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5. An electric gadget draws a current 200 mA from a battery of 12 V. Find its resistance.

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6. A torch bulb when cold has a resistance 1 Ω. It draws a current 300 mA, when glowing from a source of potential differences 3 V. Calculate the resistance of the bulb when glowing and explain the reason for the difference in resistance.

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7. Calculate the resistance of 1 km long copper wire of radius 1 mm. (Resistivity of copper is $1.72 \times 10^{-8} \Omega m$).

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8. When a potential difference of 2 volt is applied across the ends of a wire of 5 m length, a current of 1 A flows through it.

Calculate :

the resistance per unit length of the wire,

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9. When a potential difference of 2 volt is applied across the ends of a wire of 5 m length, a current of 1 A flows through it. Calculate :

the resistance of 2 m length of the wire,

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10. When a potential difference of 2 volt is applied across the ends of a wire of 5 m length, a current of 1 A flows through it. Calculate :

the resistance across the ends of the wire if it is doubled on itself.

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11. A high resistance voltmeter measures the potential difference across a battery to be 9-0 V. On connecting a 24 2 resistor across the

terminals of the battery, the voltmeter reads 7.2 V. Calculate the internal resistance of the battery.

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12. A battery of voltage 12 V sends a current of 400 mA to an appliance. After a long continuous use, the current drops to 320 mA and the appliance does not operate. Find :

the resistance of the appliance,

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13. A battery of voltage 12 V sends a current of 400 mA to an appliance. After a long continuous use, the current drops to 320 mA and the appliance does not operate. Find :

the terminal voltage of the battery when the appliance stops operating,

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14. A battery of voltage 12 V sends a current of 400 mA to an appliance. After a long

continuous use, the current drops to 320 mA and the appliance does not operate. Find :

the voltage drop,

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15. A battery of voltage 12 V sends a current of 400 mA to an appliance. After a long continuous use, the current drops to 320 mA and the appliance does not operate. Find :

the internal resistance of the battery.

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16. A cell supplies a current of 2 A when it is connected to a 5Ω resistance and supplies a current of 1.2 A, if it is connected to a resistance of 9 Ω. Find the e.m.f and internal resistance of the cell.

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17. Three resistors of $2\Omega, 3\Omega$ and 4Ω are connected in

series

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18. Three resistors of $2\Omega, 3\Omega$ and 4Ω are connected in

parallel. Draw the arrangement and find the equivalent resistance in each case.

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19. What resistance must be connected to a 15 Ω resistance to provide an effective resistance

of 6Ω ?

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20. Three resistors of 6 Ω, 3Ω and 2Ω are connected together so that the total resistance is greater than 6 Ω, but less than 8 Ω. Draw a diagram to show this arrangement and calculate its total resistance.

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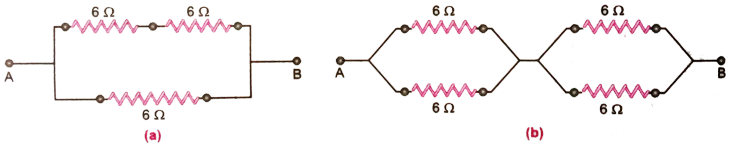
21. Calculate the equivalent resistance between the points A and B in the circuit shown in Fig. (a)



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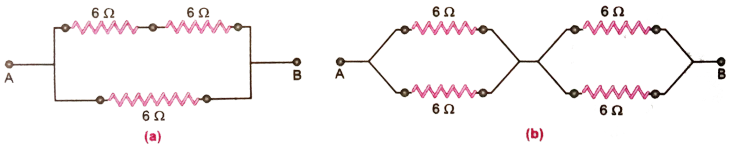
22. In the circuit shown in Fig. (b) calculate the equivalent resistance between the points A

and B.



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23. Four resistances of 2.0 Ω each are joined end to end, to form a square ABCD. Calculate the equivalent resistance of the combination between any two adjacent corners

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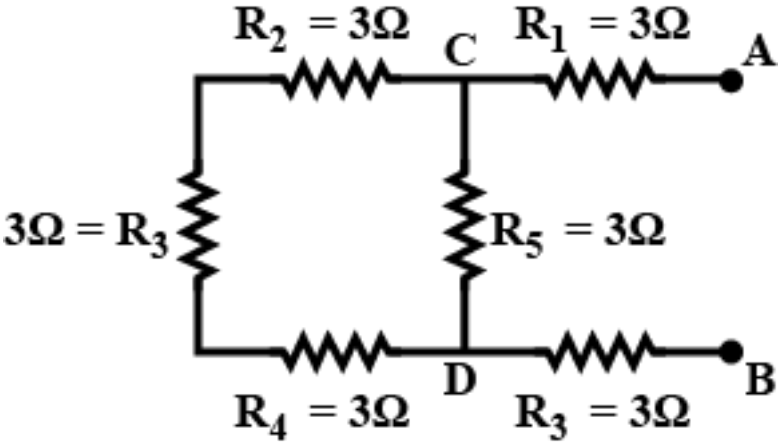
24. For the combination of resistors shown in Fig. find the equivalent resistance between the points

C and D



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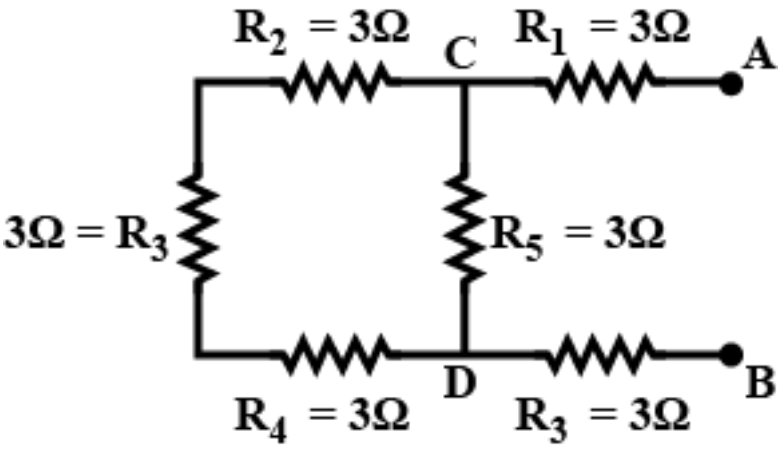
25. For the combination of resistors shown in Fig. find the equivalent resistance between the points

A and B



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26. Two resistors of 4 Ω and 6 Ω are connected in parallel. The combination is connected across a 6 V battery of negligible resistance. (i) Draw a circuit diagram. (ii) Calculate : (a) the total resistance of the circuit,

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27. Two resistors of 4 Ω and 6 Ω are connected in parallel. The combination is connected across a 6 V battery of negligible resistance. (i)

Draw a circuit diagram. (ii) Calculate :the current through the battery

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28. Two resistors of 4 Ω and 6 Ω are connected in parallel. The combination is connected across a 6 V battery of negligible resistance. (i) Draw a circuit diagram. (ii) Calculate :the current through each resistor

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29. The circuit diagram shown in Fig includes a 6 V battery, an ammeter A, a fixed resistor R_I of 2Ω and a resistance wire R_2 connected between the terminals A and B. The resistance of the battery and ammeter may be neglected. Calculate the ammeter readings when the wire R_2 is of

0.20 m length and of resistance 4Ω.

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30. The circuit diagram shown in Fig includes a 6 V battery, an ammeter A, a fixed resistor R_I of 2Ω and a resistance wire R_2 connected between the terminals A and B. The resistance of the battery and ammeter may be neglected. Calculate the ammeter readings when the wire R_2 is of

0.40 m length and of the same thickness and

material as in case (a).

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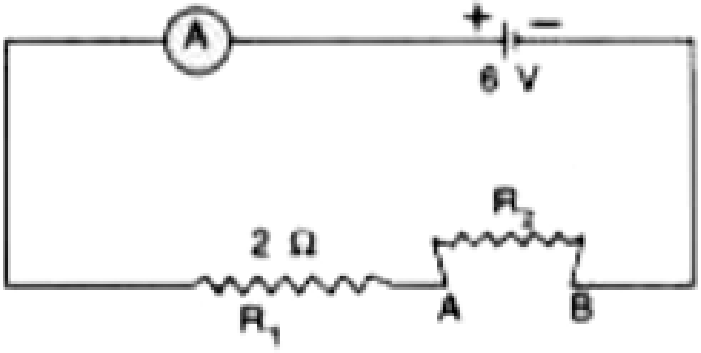
31. The circuit diagram shown in Fig includes a 6 V battery, an ammeter A, a fixed resistor R_I of 2Ω and a resistance wire R_2 connected between the terminals A and B. The resistance

of the battery and ammeter may be neglected.

Calculate the ammeter readings when the wire R_2 is of

0.20 m length and of area of cross section double than that in case (a).



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32. Three resistors $8\Omega, 12\Omega$ and 6Ω are connected to a 12 V battery as shown in Fig. below.

the current through the 8 Ω resistor,

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33. Three resistors $8\Omega, 12\Omega$ and 6Ω are connected to a 12 V battery as shown in Fig. below.

the potential difference across the parallel combination of 6 Ω and 12 Ω resistors,

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34. Three resistors $8\Omega, 12\Omega$ and 6Ω are connected to a 12 V battery as shown in Fig. below.

the current through the 6Ω resistor.

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35. A cell of e.m.f. 1.5 V, internal resistance 1 Ω is connected to the resistors of 4 Ω and 20Ω in series. Draw a circuit diagram and calculate : the current in the circuit,

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36. A cell of e.m.f. 1.5 V, internal resistance 1 Ω is connected to the resistors of 4 Ω and 20Ω in series. Draw a circuit diagram and calculate : the p.d. across each resistor

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37. A cell of e.m.f. 1.5 V, internal resistance 1 Ω is connected to the resistors of 4 Ω and 20Ω in series. Draw a circuit diagram and calculate : the p.d. across each resistor

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38. A cell of e.m.f. 1.5 V, internal resistance 1 Ω is connected to the resistors of 4 Ω and 20Ω

in series. Draw a circuit diagram and calculate : the voltage drop when the current is flowing.

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39. Fig. ahead shows a battery of e.m.f. 9 V and internal resistance 0:6 Ω, connected to three resistors A, B and C. Calculate : (a) the combined resistance of B and C, (b) the total resistance of A, B and C, (c) the total resistance of the circuit, (d) the current in each resistor A, B and C, (e) the potential drop across the

internal resistance, (f) the potential difference across the resistor B, and (g) the terminal voltage of the cell.

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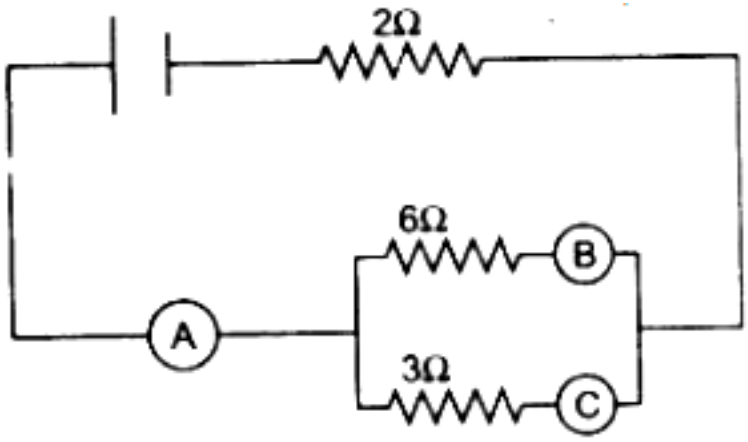
40. In the diagram given below in Fig. A, B and C are three ammeters each of negligible resistance. The ammeter B reads 0-5 A. Calculate:

the readings of the ammeters A and C,



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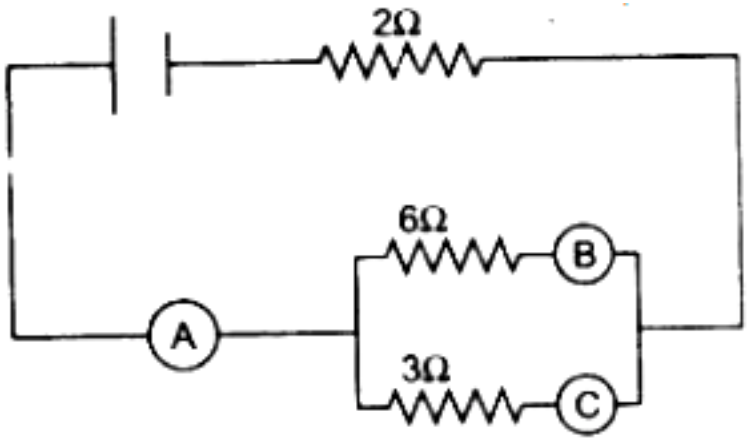
41. In the diagram given below in Fig. A, B and C are three ammeters each of negligible resistance. The ammeter B reads 0-5 A. Calculate:

the total resistance of the circuit,



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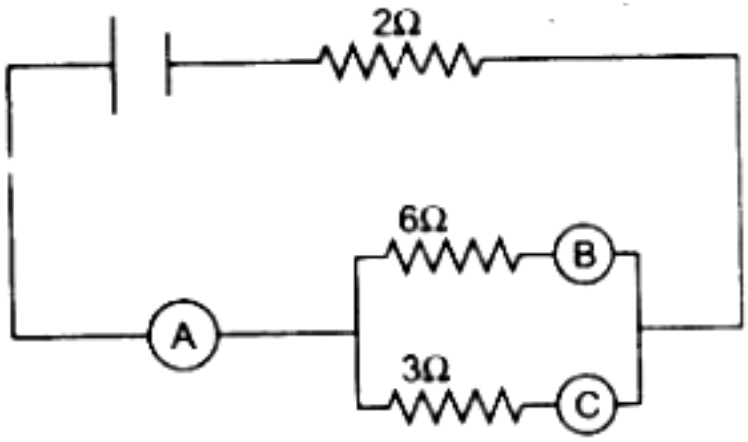
42. In the diagram given below in Fig. A, B and C are three ammeters each of negligible resistance. The ammeter B reads 0-5 A. Calculate:

the e.m.f. of the cell.



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43. A voltage source sends a current 2-5 A to a resistor of 20 Ω connected across it for 5 minutes. Calculate : (i) the p.d. of the source, (ii) the electrical energy supplied by the

source, and (iii) the heat in cal, produced in the resistor.

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44. The current through tungsten filament lamp connected to a 12 V accumulator of negligible resistance is 3.0 A. Calculate :

the resistance of the filament,

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45. The current through tungsten filament lamp connected to a 12 V accumulator of negligible resistance is 3.0 A. Calculate :

the power of the lamp,

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46. The current through tungsten filament lamp connected to a 12 V accumulator of negligible resistance is 3.0 A. Calculate :

the electrical energy in kWh consumed in 5 hours

47. An electric kettle is rated at 230 V, 1000 W. What is the resistance of its element when in use ?

48. An electric kettle is rated at 230 V, 1000 W. What is the safe value of current that can pass through its element ?

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49. A 6 V, 12 W lamp is connected in series with a resistor R and a source of voltage 12 V. What is the purpose of the resistor R?

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50. A 6 V, 12 W lamp is connected in series with a resistor R and a source of voltage 12 V.

Calculate the value of the resistor R, for the proper working of the lamp.

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51. A 6 V, 12 W lamp is connected in series with a resistor R and a source of voltage 12 V.

What is the current flowing through the circuit?

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52. Two resistors R_1 and R_2 of resistance 3 Ω and 6 Ωrespectively are connected in parallel across a battery of p.d. 12 V. Draw the circuit diagram. Calculate the electrical energy consumed in 1 minute in each resistance.

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53. Two coils of resistances $R_1 = 3\Omega$ and $R_2 = 6.\Omega$are connected in

series across a battery of p.d. 12 V. Draw the circuit diagram. Find :

the total electrical energy supplied by the battery in 1 minute.

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54. Two resistors R_1 and R_2 of resistance 3 Ω and 6 Ωrespectively are connected in parallel across a battery of p.d. 12 V. Draw the circuit diagram. Calculate the electrical energy consumed in 1 minute in each resistance.

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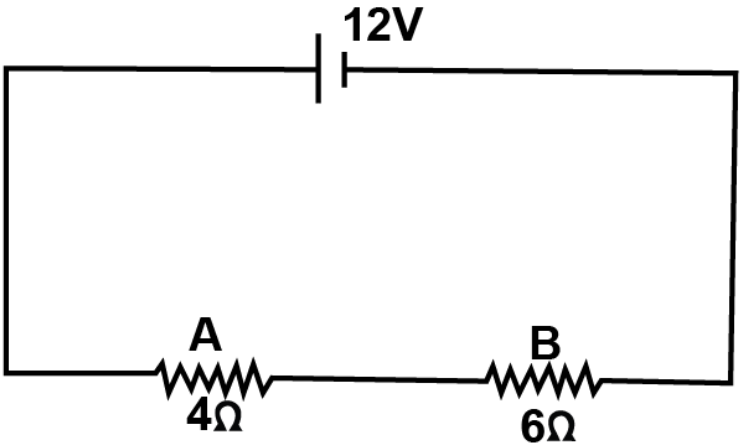
55. Fig. shows two resistors A of 4Ω and B of 6 Ω joined in series to a battery of e.m.f. 12 V and internal resistance 2 Ω . Calculate :



the current in circuit,

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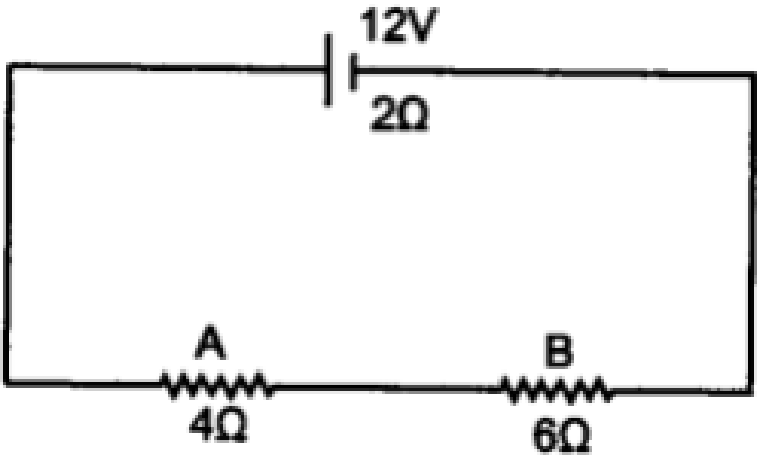
56. Fig. shows two resistors A of 4Ω and B of 6 Ω joined in series to a battery of e.m.f. 12 V and internal resistance 2 Ω . Calculate :



the terminal voltage of the battery,

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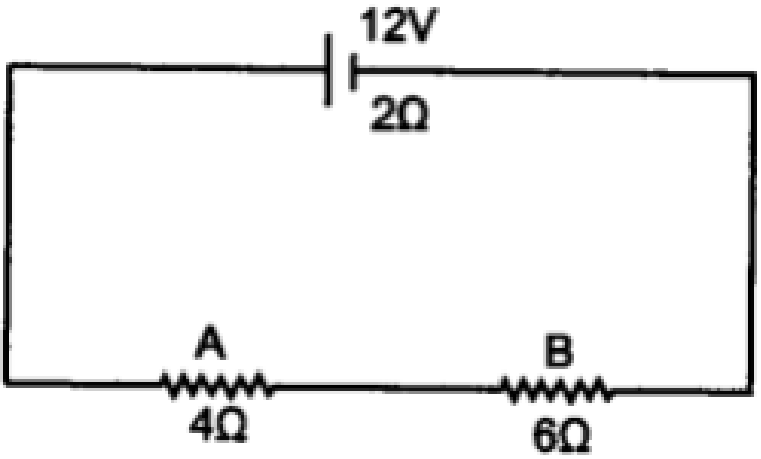
57. Fig. shows two resistors A of 4Ω and B of 6 Ω joined in series to a battery of e.m.f. 12 V and internal resistance 2 Ω . Calculate :



the p.d. across the resistor B,

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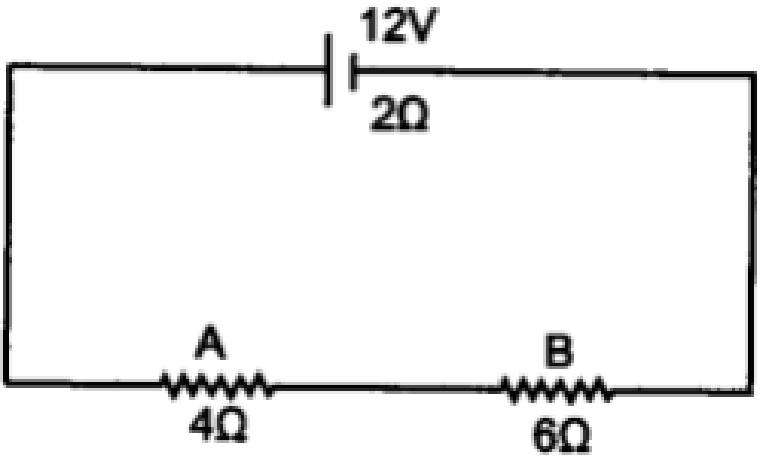
58. Fig. shows two resistors A of 4Ω and B of 6 Ω joined in series to a battery of e.m.f. 12 V and internal resistance 2 Ω . Calculate :



the electrical energy spent in 1 minute in resistor A

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59. Two bulbs A and B are rated 100 W, 120 V and 10 W, 120 V respectively. They are connected across a 120 V source in series. Calculate the current through each bulb.

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60. Two bulbs A and B are rated 100 W, 120 V and 10 W, 120 V respectively. They are connected across a 120 V source in series. Which bulb will consume more power ?

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61. Two bulbs A and B are rated 100 W, 120 V and 10 W, 120 V respectively. They are connected in parallel across a 120 V source. Find the current in each bulb.

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62. Two bulbs A and B are rated 100 W, 120 V and 10 W, 120 V respectively. They are

connected across a 120 V source in series.

Which bulb will consume more power ?

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63. An electric iron is rated "220 V, 1 kW'. Under normal working conditions, find :

the resistance of its heating element,

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64. An electric iron is rated "220 V, 1 kW'. Under normal working conditions, find :

the amount of current that will flow through the element,

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65. An electric iron is rated "220 V, 1 kW'. Under normal working conditions, find :

the amount of heat that will be produced in 5 minutes,

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66. An electric iron is rated "220 V, 1 kW'. Under normal working conditions, find :

the power consumed if the line voltage falls to 180 V.

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67. A geyser has a rating 2 kW, 240 V.

What is the electrical energy consumed by it in

(i) kWh, and (ii) joule if it is used for 90 minutes.

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68. A geyser has a rating 2 kVA, 240 V.

If the cost of electricity is Rs .4.50 per commercial unit, find the cost for 90 minutes.

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69. An electrical appliance is rated 1500 W, 250 V. This appliance is connected to mains of voltage 250 V. Calculate :

the current drawn,

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70. An electrical appliance is rated 1500 W, 250 V. This appliance is connected to mains of voltage 250 V. Calculate :

the electrical energy consumed in 60 hours,

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71. An electrical appliance is rated 1500 W, 250 V. This appliance is connected to mains of voltage 250 V for 60 hour. Calculate :

the cost of electrical energy consumed at a rate of 4.50 per kWh.

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72. Calculate the electrical energy in kWh consumed in a month, in a house using 2

bulbs of 100 W each and 2 fans of 60 W each, if the bulbs and fans are used for an average of 10 hours each day.

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73. If the cost per unit is 4.50, calculate in part (a) the amount of electric bill to be paid per month. and it is also given that power of each bulb is 100W and each fan is 60w and there is two bulbs and two fans in the house or each is used for 10 hr each day

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74. A heating coil is immersed in a calorimeter of heat capacity $50 J^{\circ} C^{-1}$ containing 1.0 kg of a liquid of specific heat capacity 450 J $kg^{-1} {}^{\circ} C^{-1}$. The temperature of liquid rises by 10°C when 2:0 A current is passed for 10 minutes. Find : (i) the resistance of the coil, (ii) the potential difference across the coil. State the assumption used in your calculations.

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Exercise 8 A

1. Define electric current. What is its SI unit?

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2. Define the term electric potential. State its S.I. unit.

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3. How is the electric potential difference between two points defined ? State its S.I. unit.

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4. Explain the statement 'the potential difference between two points is 1 volt'.

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5. State whether the current is a scalar or vector ? What does the direction of current convey ?

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6. State whether the potential is a scalar or vector ? What does the positive and negative sign of potential convey ?

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7. Define Resistance. Give its S.I. unit.

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8. Which particles are responsible for current in conductors?

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9. Explain the flow of current in a metallic wire on the basis of movement of the particles also

name that particle.

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10. What is the cause of resistance offered by the metallic wire in the flow of current through it?

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11. State Ohm's law and draw a neat labelled circuit diagram containing a battery, a key, a

voltmeter, an ammeter, a rheostat and an unknown resistance to verify it.

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12. Name and state the law which relates the potential difference and current in a conductor.

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13. Part (a): name and state the law which relates the potential difference and current in a conductor.

What is the necessary condition for a conductor to obey the law named above in part (a)?

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14. The relationship between the potential difference and the current in a conductor is

stated in the form of a law.

What does the slope of V-I graph for a conductor represent?

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15. Draw an 1-V graph for a linear resistor. What does its slope represent ?

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16. What is an ohmic resistor ? Give one example of an ohmic resistor. Draw a graph to show its currentvoltage relationship. How is the resistance of the resistor determined from this graph ?

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17. What is an ohmic resistor ? Give one example of an ohmic resistor. Draw a graph to show its currentvoltage relationship. How is

the resistance of the resistor determined from this graph ?

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18. Give two differences between an ohmic and non ohmic resistor.

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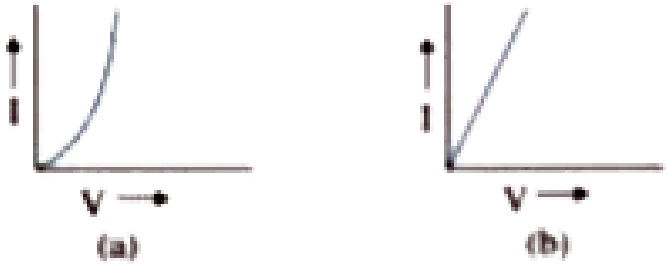
19. Fig. shows I-V curves for two resistors. Identify the ohmic and non-ohmic resistors.

Give a reason for your answer



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20. Draw a V-I graph for a conductor at two different temperatures. What conclusion do you draw from your graph for the variation of resistance of the conductor with temperature ?

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21. How does the resistance of a wire depend on its radius? Explain your answer.

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22. Two copper wires are of the same length, but one is thicker than the other.

(1) Which wire will have more resistance ?

(2) Which wire will have more specific resistance ?

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23. How does the resistance of a wire depend on its length ? Give a reason for your answer.

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24. How does the resistivity of a consuctor depend upon temperature and electrical consuctivity ?

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25. Two wires, one of copper and the other of iron, are of the same length and same radius. Which will have more resistance ? Give reason.

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26. Name three factors on which resistance of a given wire depends and state how it is affected by the factors stated by you.

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27. Define the term "specific resistance and state its S.I. unit.

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28. Write an expression connecting the resistance of a wire and specific resistance of its material. State the meaning of the symbols used.

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29. State the order of specific resistance of a metal,

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30. State the order of specific resistance of a semiconductor

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31. State the order of specific resistance of an insulator

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32. (a) Name two factors on which the specific resistance of a wire depends ?

(b) Two wires A and B are made of copper. The wire A is long and thin, while the wire B is short and thick. Which will have more specific resistance ?

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33. Name a substance of which the specific resistance remains almost unchanged by the increase in temperature.

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34. How does the specific resistance of a semi-conductor change with the increase in temperature ?

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35. How does (a) resistance, and (b) specific resistance of a wire depend on its (i) length, and (ii) radius?

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36. Name the material used for making connection wires. Give a reason for your answer.

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37. Why should a connection wire be thick ?

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38. Name a material which is used for making a standard resistor. Give a reason for your answer.

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39. Name the material used for making a fuse wire. Give a reason.

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40. Name the material used for filament of an electric bulb,

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41. Name the material used for heating element of a room heater.

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42. What is a superconductor ? Give one example of it.

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43. A substance has nearly zero resistance at a temperature of 1 K What is such a substance called?

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Exercise 8 A Multiple Choice Type

1. Which of the following is an ohmic resistance ?

A. LED

B. junction diode

C. filament of a bulb

D. nichrome wire.

Answer: D

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2. Name a substance whose resistance decreases with the increase in temperature.

A. copper

B. mercury

C. carbon

D. platinum

Answer: C

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Exercise 8 A Numericals

1. In a conductor, 6.25×10^{16} electrons flow from its end A to B in 2 s. Find the current

flowing through the conductor. $\left(e = 1.6 \times 10^{-19} C\right)$

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2. A current of 1.6 mA flows through a conductor. If charge on an electron is - 1.6×10^{-19} coulomb, find the number of electrons that will pass each second through the cross section of that conductor.

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3. Find the potential difference required to flow a current of 200 mA in a wire of resistance 20Ω.

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4. An electric bulb draws 1.2 A current at 6V. Find the resistance of the filament of the bulb while glowing

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5. A car bulb connected to a 12 volt battery draws 2 A current when glowing . What is the resistance of the filament of the bulb ? Will the resistance be more, same or less when the bulb is not glowing ?

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6. Calculate the current flowing through a wire of resistance 5 Ω connected to a battery of potential difference 3 V.

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7. In an experiment of verification of Ohm's law, following observations are obtained.

Potential difference V (in volt)	0·5	1·0	1·5	2·0	2·5
Current I (in ampere)	0·2	0·4	0·6	0·8	1·0

Draw a V-I graph and use this graph to find :

the potential difference V when the current / is 0-5 A,

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8. In an experiment of verification of Ohm's law, following observations are obtained.

Potential difference V (in volt)	0·5	1·0	1·5	2·0	2·5
Current I (in ampere)	0·2	0·4	0·6	0·8	1·0

Draw a V-I graph and use this graph to find :

the current / when the potential difference V is 0.75 V,

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9. In an experiment of verification of Ohm's law, following observations are obtained.

Potential difference V (in volt)	0·5	1·0	1·5	2·0	2·5
Current I (in ampere)	0·2	0·4	0·6	0·8	1·0

Draw a V-I graph and use this graph to find :

the resistance in circuit.

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10. Two wires of the same material and same length have radii 1 mm and 2 mm respectively. Compare :

their resistances,

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11. Two wires of the same material and same length have radii 1 mm and 2 mm respectively. Compare :

their specific resistance.

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12. A given wire of resistance 1 Ω is stretched to double its length. What will be its new resistance ?

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13. A wire of resistance 3 ohm and length 10 cm is stretched to length 30 cm. Assuming that it has a uniform cross section, what will be its new resistance ?

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14. A wire of resistance 9 ohm having length 30 cm is tripled on itself. What is its new resistance ?

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15. What length of copper wire of specific resistance $1.7 \times 10^{-8} \Omega$ m and radius 1 mm is required so that its resistance is 1Ω ?

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16. The filament of a bulb takes a current 100 mA when potential difference across it is 0-2 V. When the potential difference across it becomes 1.0 V, the current becomes 400 mA.

Calculate the resistance of the filament in each case and account for the difference.

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Exercise 8 B

1. Explain the meaning of the terms e.m.f., terminal voltage, and internal resistance of a cell.

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2. Distinguish between emf and terminal potential difference of a cell.

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3. Name two factors on which the internal resistance of a cell depends and state how does it depend on the factors stated by you.

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4. A cell of e.m.f. E and internal resistance r is used to send current to an external resistance R. Write expressions for (a) the total resistance of circuit, (b) the current drawn from the cell, (c) the p.d. across the cell, and (d) voltage drop inside the cell.

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5. A cell is sending current in an external circuit. How does the terminal voltage

compare with the e.m.f. of the cell ?

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6. A cell is sending current in an external circuit. How does the terminal voltage compare with the e.m.f. of the cell ?

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7. Explain why is the p.d. across the terminals of a cell more in an open circuit and reduced

in a closed circuit.

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8. Write the expressions for the equivalent resistance R of three resistors $R_1, R_2,$ and R_3 joined in (a) parallel, and (b) series.

Watch Video Solution

9. How would you connect two resistors in series ? Draw a diagram. Calculate the total equivalent resistance.

Watch Video Solution

10. Show by a diagram how two resistors R_1 and R_2 are joined in parallel. Obtain an expression for the total resistance of the combination.

Watch Video Solution

11. State how are the two resistors joined with a battery in each of the following cases when : same current flows in each resistor,

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12. State how are the two resistors joined with a battery in each of the following cases when : potential difference is same across each resistor,

Watch Video Solution

13. State how are the two resistors joined with a battery in each of the following cases when : equivalent resistance is less than either of the two resistances,

Watch Video Solution

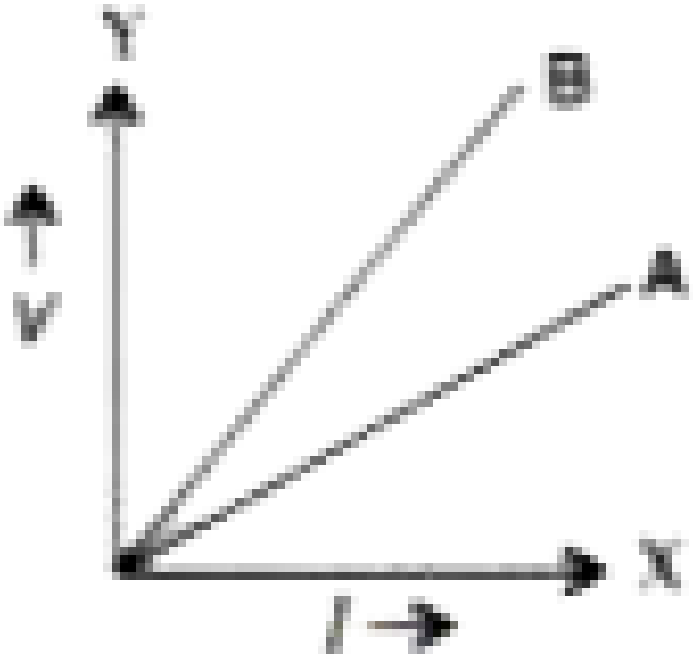
14. State how are the two resistors joined with a battery in each of the following cases when :

equivalent resistance is more than either of the two resistances.

Watch Video Solution

15. The V-I graph for a series combination and for a parallel combination of two resistors is 1 shown in Fig. Which of the V two, A or B, represents the parallel combination ? Give a

reason for your answer.



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Exercise 8 B Multiple Choice Type

1. In series combination of resistances :

A. p.d. is same across each resistance

B. total resistance is reduced

C. current is same in each resistance

D. all above are true.

Answer: C

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2. In parallel combination of resistances :

A. p.d. is same across each resistance

B. total resistance is increased

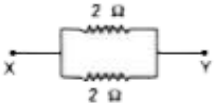
C. current is same in each resistance

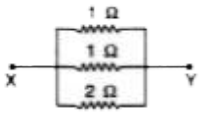
D. all above are true.

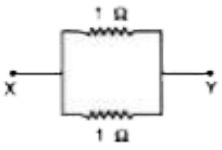
Answer: A

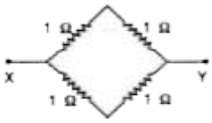
Watch Video Solution

3. Which of the following combinations have the same equivalent resistance between X and Y ?

A. 

B. 

C. 

D. 

Answer: A::D

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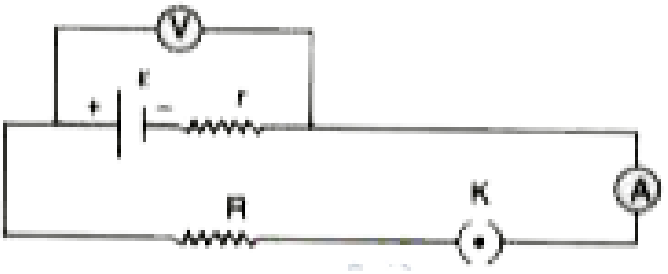
Exercise 8 B Numericals

1. The diagram in Fig. shows a cell of e.m.f. $\varepsilon = 2$ volt and internal resistance r = 1 ohm connected to an external resistance R = 4 ohm. The ammeter A measures the current in the circuit and the voltmeter V measures the terminal voltage across the cell. What will be the readings of the ammeter and voltmeter when

the key K is open



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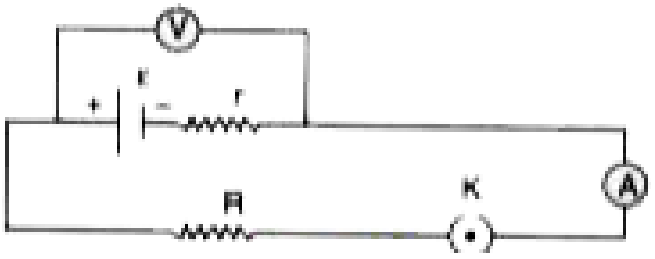
2. The diagram in Fig. shows a cell of e.m.f. $\varepsilon = 2$ volt and internal resistance r = 1 ohm connected to an external resistance R = 4 ohm. The ammeter A measures the current in the circuit and the voltmeter V measures the terminal voltage across the cell. What will be

the readings of the ammeter and voltmeter when

the key K is closed.



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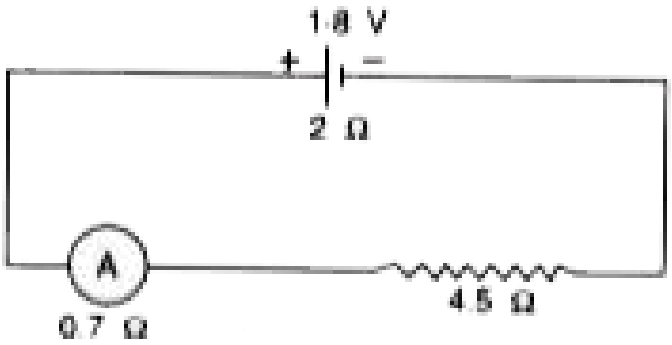
3. A battery of e.m.f 3 V supplies current through a circuit in which the resistance can be changed. A high resistance voltmeter is connected across the battery. When the

current is 1.5 A, the voltmeter reads 2.7 V. Find the internal resistance of the battery.

Watch Video Solution

4. A cell of e.m.f. 1.8 V and internal resistance 2 Ω is connected in series with an ammeter of resistance 0.7 Ω and a resistor of 4.5 Ω as shown in Fig.

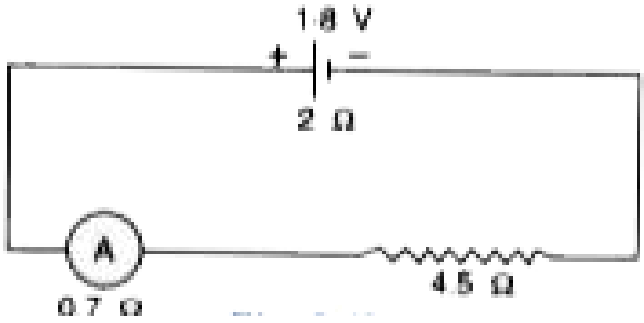


What would be the reading of the ammeter ?

Watch Video Solution

5. A cell of e.m.f. 1.8 V and internal resistance 2 Ω is connected in series with an ammeter of resistance 0.7 Ω and a resistor of 4.5 Ω as shown in Fig. What is the potential difference

across the terminals of the cell ?



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6. The music system draws a current of 400 mA when connected to a 12 V battery.

What is the resistance of the music system ?

Watch Video Solution

7. The music system draws a current of 400 mA when connected to a 12 V battery.

The music system if left playing for several hours and finally the battery voltage drops and the music system stops playing when the current drops to 320 mA. At what battery voltage does the music system stop playing ?

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8. A cell of e.m.f. ε and internal resistance r sends a current of 1.0 A when it is connected

to an external resistance of 1.9 Ω. But it sends a current of 0.5 A when it is connected to an resistance of 3.9Ω calculate the values of ε and r .

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9. Two resistors having resistance 4 Ω and 6 Ω are connected in parallel. Find their equivalent resistance.

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10. Four resistors each of resistance 2 Ω are connected in parallel. What is the effective resistance ?

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11. You have three resistors of values $2\Omega, 3\Omega$ and 5 Ω. How will you join them so that the total resistance is less than 1 Ω ? Draw a diagram and find the total resistance.

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12. Three resistors each of 2 Ω are connected together so that their total resistance is 3 Ω. Draw a diagram to show this arrangement and check it by calculation.

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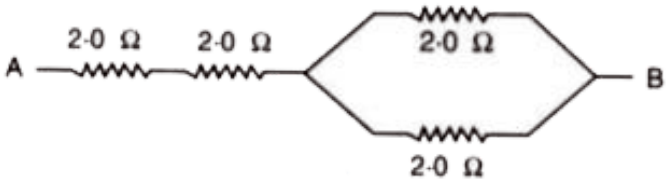
13. Calculate the equivalent resistance between the points A and B in Fig. if each

resistance is 2.0Ω



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14. A combination consists of three resistors in series. Four similar sets are connected in parallel. If the resistance of each resistor is 2 Ω , find the resistance of the combination.

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15. In the circuit shown below in Fig., calculate the value of x if the equivalent resistance between the points A and B is 4 Ω

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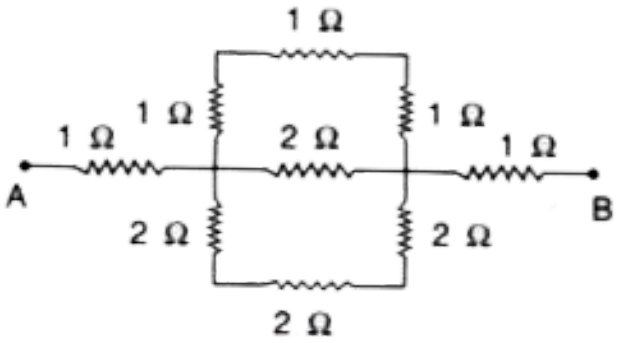
16. Calculate the effective resistance between the points A and B in the circuit shown in Fig.



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17. A uniform wire with a resistance of 27 Ω is divided into three equal pieces and then they are joined in parallel. Find the equivalent resistance of the parallel combination

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18. A circuit consists of a resistor of 1 ohm in series with a parallel arrangement of resistors of 6 ohm and 3 ohm. Calculate the total resistance of the circuit. Draw a diagram of the arrangment.

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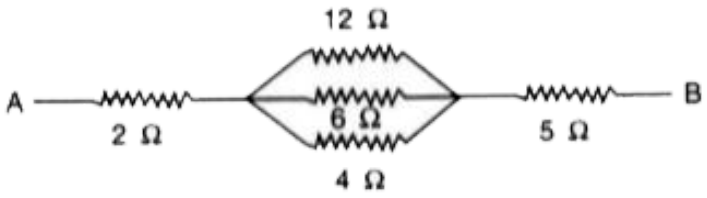
19. Calculate the effective resistance between the points A and B in the network shown

below in Fig.



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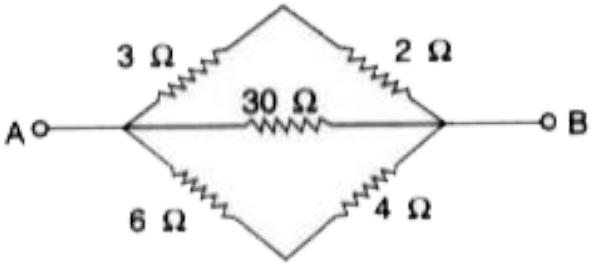
20. Calculate the equivalent resistance between the points A and B in Fig.



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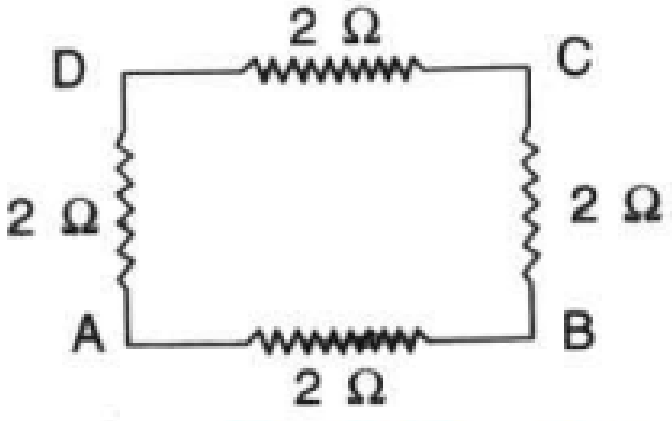
21. In the network shown in Fig., calculate the equivalent resistance between the points A and B,



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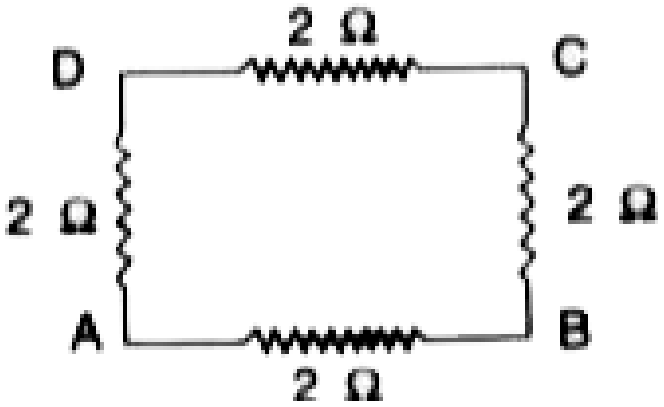
22. In the network shown in Fig., calculate the equivalent resistance between the points A and C.



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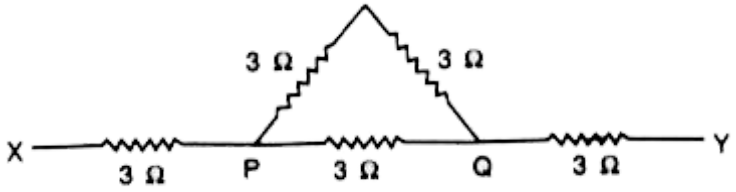
23. Five resistors, each of 3 Ω, are connected as shown in Fig . Calculate the resistance

between the points P and Q,



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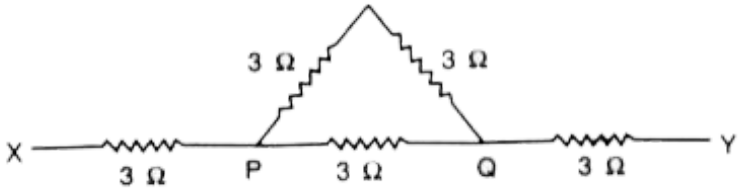
24. Five resistors, each of 3 Ω, are connected as shown in Fig . Calculate the resistance between the points X and Y.



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25. Two resistors of 2.092 and 3.0 22 are connected

in series. Find the effective resistance of combination .

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26. Two resistors of 2.0 92 and 3.0 22 are connected

in parallel, with a battery of 60 V and

negligible internal resistance. For each case draw a circuit diagram and calculate the current through the battery

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27. A resistor of 6 Ω is connected in series with another resistor of 4 Ω. A potential difference of 20 V is applied across the combination. Calculate :

the current in the circuit,

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28. A resistor of 6 Ω is connected in series with another resistor of 4 Ω. A potential difference of 20 V is applied across the combination. Calculate :

the potential difference across the 6 Ω resistor.

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29. Two resistors of resistance 4Ω and 6Ω are connected in parallel to a cell to draw current

0.5 A from the cell.

Calculate the current in each resistor.

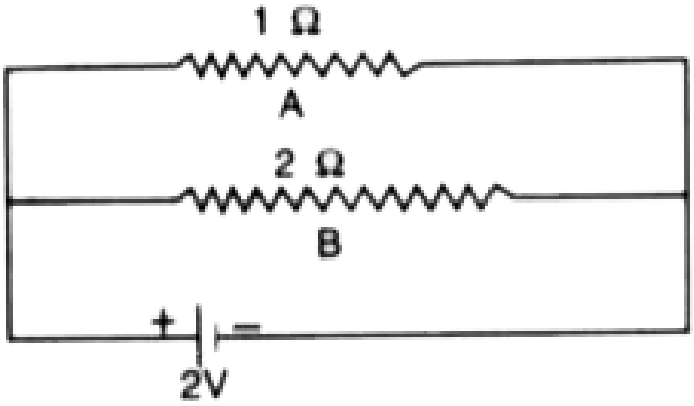
Watch Video Solution

30. Two resistors of 4Ω and 6Ω are connected in parallel to a cell to draw 0.5 A current from the cell.

Calculate the current in each resistor.

Watch Video Solution

31. Calculate the current flowing through each of the resistors A and B in the circuit shown in Fig.



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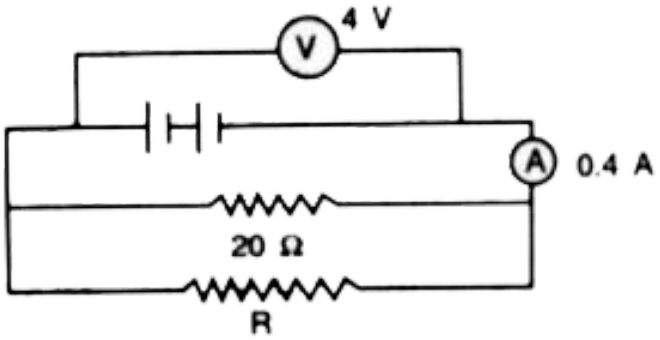
32. In Fig , calculate :

the total resistance of the circuit,



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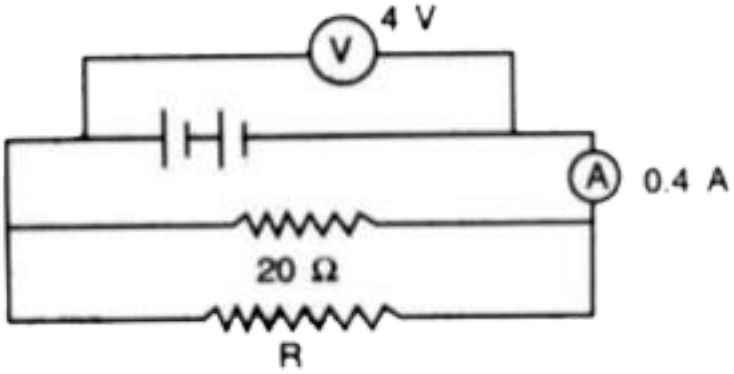
33. In Fig , calculate :

the value of R, and



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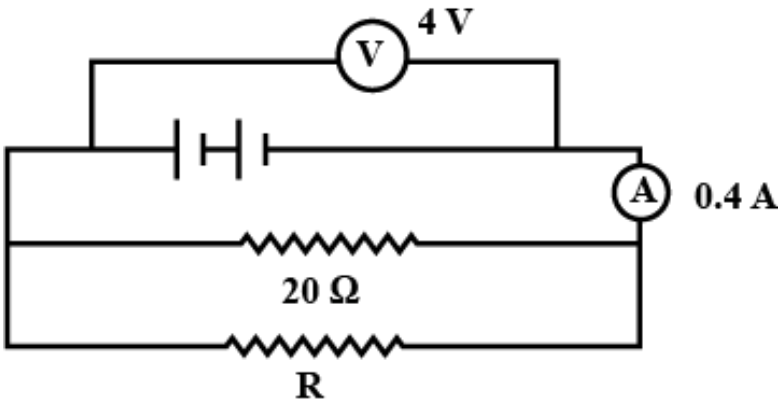
34. In Fig , calculate : the current flowing in R.



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35. A particular resistance wire has a resistance of 3.0 ohm per metre. Find :

The total resistance of three lengths of this wire each 1.5 m long, joined in parallel.

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36. A particular resistance wire has a resistance of 3.0 ohm per metre. Find :

The potential difference of the battery which gives a current of 2-0 A in each of the 1.5 m length when connected in parallel to the battery (assume that the resistance of battery is negligible).

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37. A particular resistance wire has a resistance of 3.0 ohm per metre. Find :

The resistance of 5 m length of a wire of the same material, but with twice the area of cross section.

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38. A cell supplies a current of 1.2 A through two resistors each of 2 Ω connected in

parallel. When the resistors are connected in series, it supplies a current of 0.4 A. Calculate : the internal resistance,

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39. A cell supplies a current of 1.2 A through two resistors each of 2 Ω connected in parallel. When the resistors are connected in series, it supplies a current of 0.4 A. Calculate : e.m.f. of the cell.

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40. A battery of e.m.f. 15 V and internal resistance 3Ω is connected to two resistors 3 Ω and 6 Ω connected in parallel. Find :

the current through the battery,

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41. A battery of e.m.f. 15 V and internal resistance 3Ω is connected to two resistors 3 Ω and 6 Ω connected in parallel. Find :

the p.d. between the terminals of the battery,

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42. A battery of e.m.f. 15 V and internal resistance 3Ω is connected to two resistors 3 Ω and 6 Ω connected in parallel. Find :

the current in 3 Ω resistor,

Watch Video Solution

43. A battery of e.m.f. 15 V and internal resistance 3Ω is connected to two resistors 3

Ω and 6 Ω connected in parallel. Find :

the current in 6 Ω resistor.

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44. The circuit diagram in Fig. shows three resistors $2\Omega, 4\Omega$and RΩ connected to a battery of e.m.f. 2 V and internal resistance 3 Ω . If current of 0.25 A flows through the circuit, find :

the p.d. across the 4 Ω resistor,

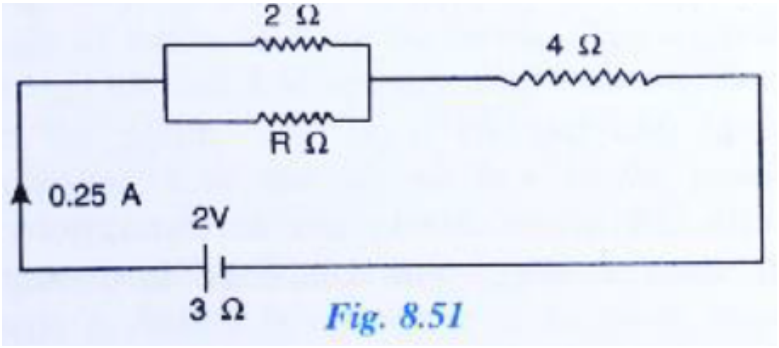

Fig. 8.51

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45. The circuit diagram in Fig. shows three resistors $2\Omega, 4\Omega$and RΩ connected to a battery of e.m.f. 2 V and internal resistance 3 Ω . If current of 0.25 A flows through the circuit, find :

the p.d. across the internal resistance of the cell,

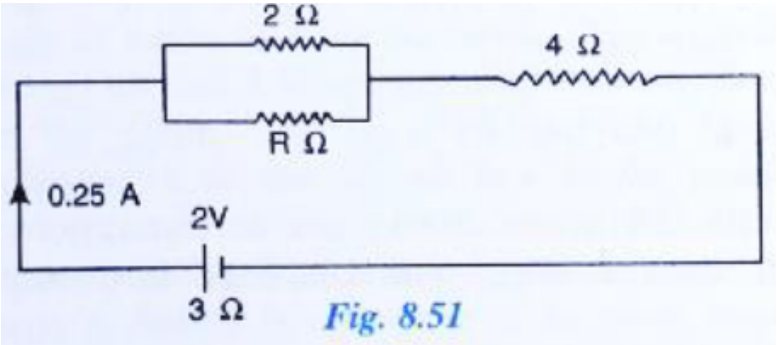

Fig. 8.51

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46. The circuit diagram in Fig. shows three resistors $2\Omega, 4\Omega$and RΩ connected to a battery of e.m.f. 2 V and internal resistance 3 Ω . If current of 0.25 A flows through the circuit,

find :

the p.d. across the R Ωor 2 Ω resistor,

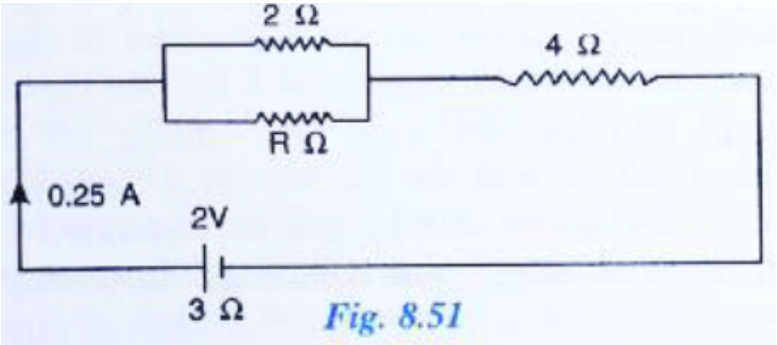

Fig. 8.51

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47. The circuit diagram in Fig. shows three resistors $2\Omega, 4\Omega$and RΩ connected to a battery of e.m.f. 2 V and internal resistance 3 Ω . If current of 0.25 A flows through the circuit,

find :

the value of R.

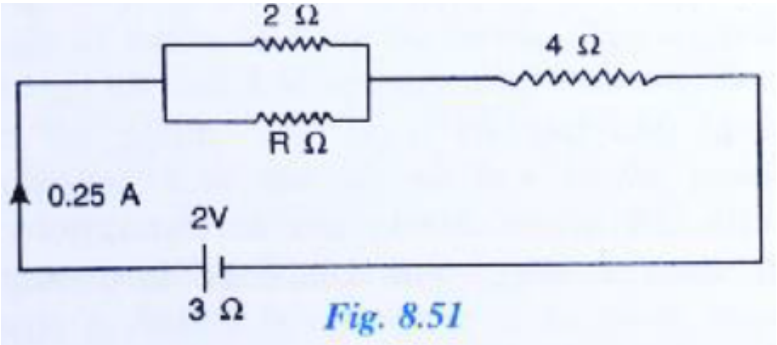

Fig. 8.51

Watch Video Solution

48. Three resistors of6.0Ω, 2.0Ω and 4.0Ω are joined to an ammeter A and a cell of e.m.f. 6-0 V as shown in Fig. Calculate :

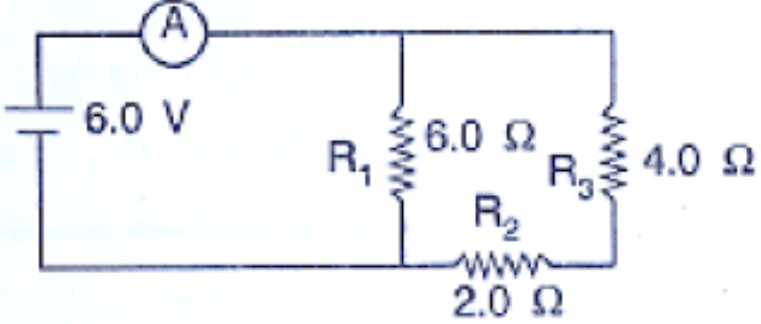

Fig. 8.52

the effective resistance of the circuit,

Watch Video Solution

49. Three resistors of6.0Ω, 2.0Ω and 4.0Ω are joined to an ammeter A and a cell of e.m.f. 6-0 V as shown in Fig. Calculate :

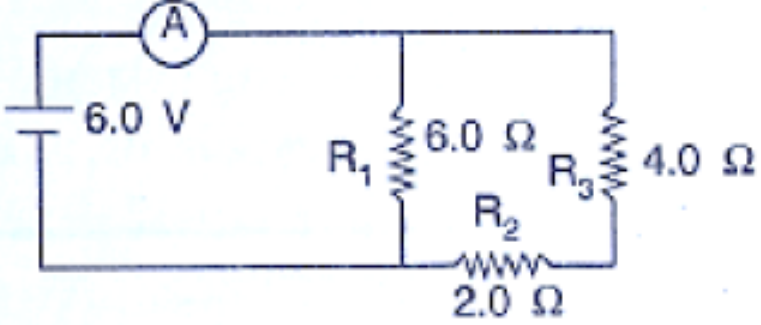

Fig. 8.52

the reading of ammeter.

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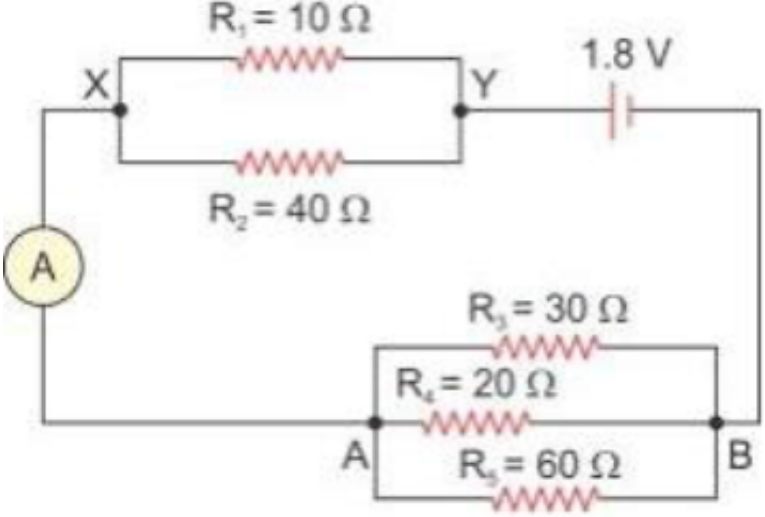
50. The diagram below in Fig. shows the arrangement of five different resistances connected to a battery of e.m.f. 1.8 V. Calculate :



the total resistance of the circuit,

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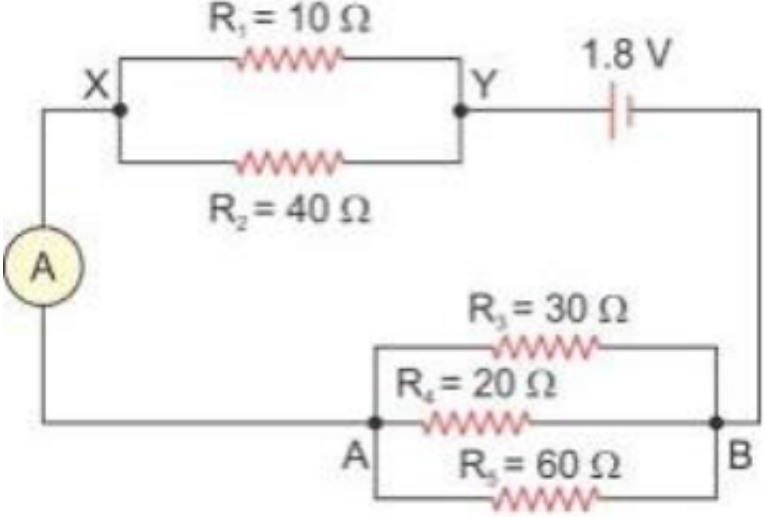
51. The diagram below in Fig. shows the arrangement of five different resistances connected to a battery of e.m.f. 1.8 V. Calculate

:



the reading of ammeter A.

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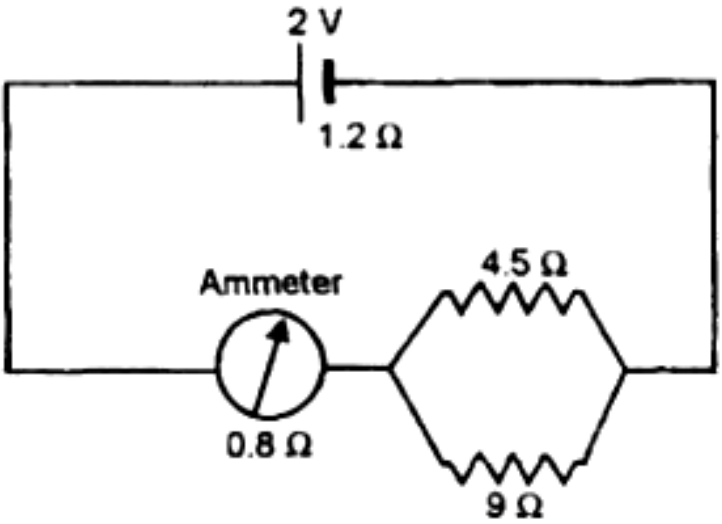
52. A cell of e.m.f. 2V and internal resistance 1.2.Ω is connected with an ammeter of resistance 0.8Ω and two resistors of 4.5 Ω and 9Ω as shown in the diagram below:



What would be the reading on the Ammeter?

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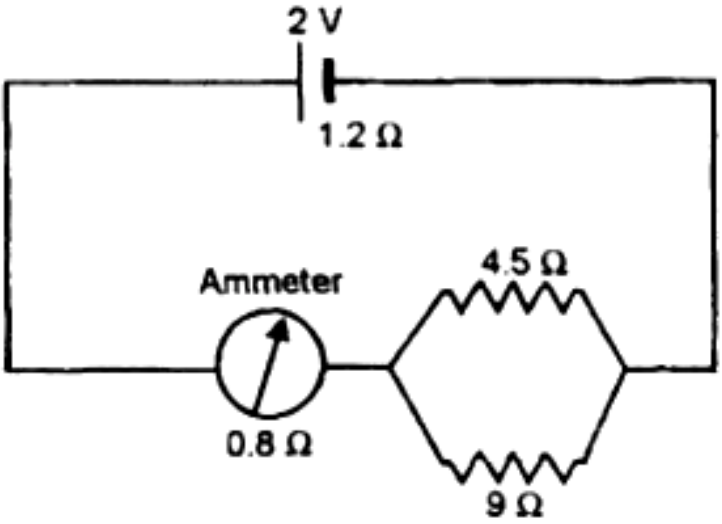
53. A cell of e.m.f. 2V and internal resistance 1.2.Ω is connected with an ammeter of resistance 0.8Ω and two resistors of 4.5 Ω and

9Ω as shown in the diagram below:



What is the potential difference across the terminals of the cell?

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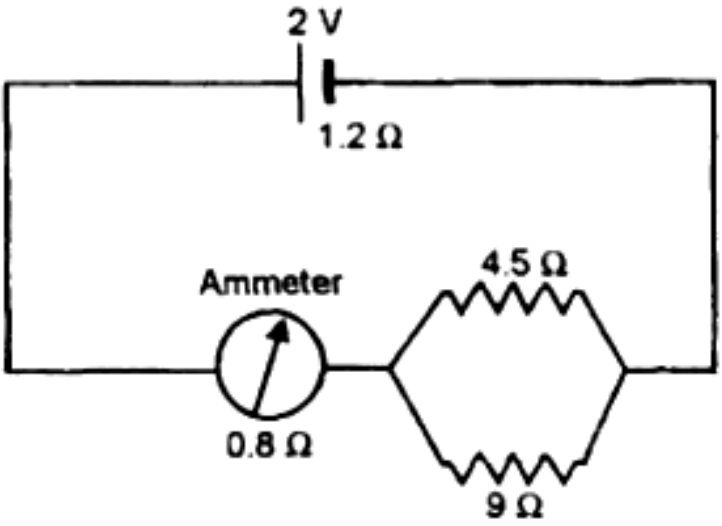
54. A cell of e.m.f. 2 V and internal resistance 1.2 Ω is connected to an ammeter of resistance 0.8 Ω and two resistors of 4.5 Ω and 9 Ω as shown in Fig.



find : the potential difference across the 4.5 Ω resistor.

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Exercise 8 C

1. Write an expression for the electrical energy spent in the flow of current through an electrical appliances in terms of I, R and t.

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2. Write an expression for the electrical power spent in flow of current through a conductor

in terms of

resistance and potential difference

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3. Write an expression for the electrical energy spent in the flow of current through an electrical appliances in terms of I, R and t.

Watch Video Solution

4. Electrical power P is given by the expression

$P = (Q \times V) \div$ time.

What do the symbols Q and V represent ?

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5. Electrical power P is given by the expression

$P = (Q \times V) \div$ time.

Express the power P in terms of current and resistance explaining the meaning of symbols used there in.

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6. Name the S.I. unit of electrical energy. How is it related to Wh?

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7. Explain the meaning of the statement 'the power of an appliance is 100 W'.

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8. State and define the S.I. unit of power.

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9. State and define the household unit of electricity.

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10. What is the voltage of the electricity that is generally supplied to a house?

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11. What is consumed using different electrical appliances, for which electricity bills are paid ?

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12. Name the quantity which is measured in

(a) kWh (b)kW (c)Wh (d)eV

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13. Define the term kilowatt-hour and state its value in S.I. unit.

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14. How do kilowatt and kilowatt-hour differ?

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15. Complete the following:

$$1kWh = \frac{1 \text{ volt} \times 1 \text{ ampere} \times \ldots..}{1000}$$

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16. Complete the following:

$1kWh = \ldots\ldots\ldots J$

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17. What do you mean by power rating of an electrical appliance ? How do you use it to calculate

the resistance of the appliance ?

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18. What do you mean by power rating of an electrical appliance ? How do you use it to calculate

the resistance of the appliance ?

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19. An electric bulb is marked 100 W, 250 V. What information does this convey?

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20. List the names of three electrical gadgets used in your house. Write their power, voltage rating and approximate time for which each one is used in a day. Hence find the electrical energy consumed by each in a month of 30 days.

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21. Two lamps, one rated 220 V, 50 W and the other rated 220 V, 100 W, are connected in series with mains of voltage 220 V. Explain why does the 50 W lamp consume more power.

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22. Name the factors on which the heat produced in a wire depends when current is passed in it, and state how does it depend on the factors stated by you.

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Exercise 8 C Multiple Choice Type

1. When a current I flows through a resistance R for time t, the electrical energy spent is :

A. IRt

B. I^2Rt

C. IR^2t

D. I^2R/t

Answer: B

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2. An electrical appliance has a rating 100 W, 120 V. The resistance of element of appliance when in use is :

A. 1.2Ω

B. 144Ω

C. 120Ω

D. 100Ω

Answer: B

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Exercise 8 C Numericals

1. An electric bulb of resistance 500 ohm draws current 0.4 A from the source. Calculate :

the power of bulb

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2. An electric bulb of resistance 500Ω, draws a current of 0.4 A. Calculate the power of the bulb and the potential difference at its end.

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3. A current of 2 A is passed through a coil of resistance 75 ohm for 2 minutes

How much heat energy is produced ?

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4. A current of 2 A is passed through a coil of resistance 75 ohm for 2 minutes

How much charge is passed through the resistance ?

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5. Calculate the current through a 60 W lamp rated for 250 V. If the line voltage falls to 200 V, how is the power consumed by the lamp affected ?

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6. An electric bulb is rated '100 W, 250 V'. How much current will the bulb draw if connected to a 250 V supply ?

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7. An electric bulb is rated "220 V, 100 W'. What is its resistance ?

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8. An electric bulb is rated "220 V, 100 W'.

What safe current can be passed through it?

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9. A bulb of power 40 W is used for 12.5 h each day for 30 days. Calculate the electrical energy consumed.

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10. An electric press is rated 750 W, 230 V'. Calculate the electrical energy consumed by the press in 16 hours.

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11. An electrical appliance having a resistance of 200 Ω is operated at 200 V. Calculate the energy consumed by the appliance in 5 minutes in joule

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12. An electrical appliance having a resistance of 200 Ω is operated at 200 V. Calculate the energy consumed by the appliance in 5 minutes

in kWh.

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13. A bulb rated 12 V, 24 W operates on a 12 volt battery for 20 minutes. Calculate :

the current flowing through it,

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14. A bulb rated 12 V, 24 W operates on a 12 volt battery for 20 minutes. Calculate :

the energy consumed.

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15. A current of 0.2 A flows through a wire whose ends are at a potential difference of 15

V. Calculate :

the resistance of the wire,

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16. A current of 0.2 A flows through a wire whose ends are at a potential difference of 15 V. Calculate :

the heat energy produced in 1 minute.

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17. What is the resistance, under normal working conditions, of an electric lamp rated 240 V, 60 W'? If two such lamps are connected in series across a 240 V mains supply, explain why each one appears less bright.

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18. Two bulbs are rated 60 W, 220 V' and '60 W, 110 V respectively. Calculate the ratio of their resistances.

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19. An electric bulb is rated 250 W, 230 V'. Calculate:

the energy consumed in one hour,

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20. An electric bulb is rated 250 W, 230 V'. Calculate:

the time in which the bulb will consume 1.0 kWh energy when connected to 230 V mains.

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21. Three heaters each rated *250 W, 100 V are connected in parallel to a 100 V supply. Calculate :

the total current taken from the supply,

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22. Three heaters each rated *250 W, 100 V are connected in parallel to a 100 V supply.

Calculate :

the resistance of each heater

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23. Three heaters each rated *250 W, 100 V are connected in parallel to a 100 V supply. Calculate :

the energy supplied in kWh to the three heaters in 5 hours.

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24. A bulb is connected to a battery of p.d. 4 V and internal resistance 2.5 Ω. A steady current of 0.5 A flows through the circuit. Calculate : the total energy supplied by the battery in 10 minutes,

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25. A bulb is connected to a battery of p.d. 4 V and internal resistance 2.5 Ω. A steady current of 0.5 A flows through the circuit. Calculate : the resistance of the bulb,

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26. A bulb is connected to a battery of p.d. 4 V and internal resistance 2.5 Ω. A steady current of 0.5 A flows through the circuit. Calculate :

the energy dissipated in the bulb in 10 minutes.

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27. Two resistors A and B of resistance 4 Ω and 6 Ω respectively are connected in parallel. The combination is connected across a 6 volt battery of negligible resistance. Calculate :

the power supplied by the battery,

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28. Two resistors A and B of resistance 4 Ω and 6 Ω respectively are connected in parallel. The combination is connected across a 6 volt

battery of negligible resistance. Calculate :

the power dissipated in each resistor.

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29. A battery of e.m.f. 15 V and internal resistance 2 Ω is connected to two resistors of resistances 4 ohm and 6 ohm joined in series. Find the electrical energy spent per minute in 6 ohm resistor.

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30. Water in an electric kettle connected to a 220 V supply takes 5 minutes to reach its boiling point. How long will it take if the supply voltage falls to 200 V ?

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31. An electric toaster draws current 8 A in a circuit with source of voltage 220 V. It is used for 2 h. Find the cost of operating the toaster if the cost of electrical energy is ₹ 4.50 per kWh.

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32. An electric iron is rated 220 V, 2 kW.

If the iron is used for 3h daily find the cost of running it for one week if it costs ₹ 4.25 per kWh.

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33. An electrical appliance is rated 1500 W, 250 V. This appliance is connected to mains of

voltage 250 V. Calculate :

the current drawn,

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34. A geyser is rated '1500 W, 250 V'. This geyser is connected to 250 V mains. Calculate :

the energy consumed in 50 hours

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35. A geyser is rated '1500 W, 250 V'. This geyser is connected to 250 V mains. Calculate : the cost of energy consumed at ₹ 4.20 per kWh for 50 hours.

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