Next Toppers

आरंभ BATCH

ACP

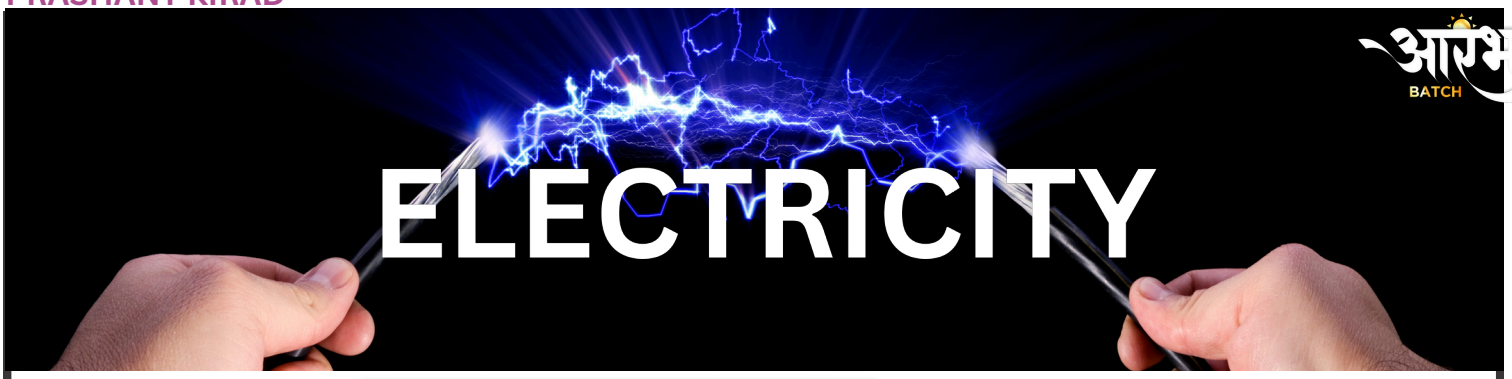
AARAMBH CHAPTERWISE PROBLEMS

Class-10th



ELECTRICITY

PRASHANT KIRAD



(Options acche se padhna)

VERY SHORT QUESTIONS (1 Mark)



(A) Multiple Choice Questions (MCQ's)

1. What is the SI unit of electric current? [CBSE 2015, 2018]
A. Ohm
B. Ampere
C. Volt
D. Coulomb

2. The resistance of a conductor is doubled. What happens to the current if voltage is constant? [2021 (Term 1)]
A. Halved
B. Doubled
C. Tripled
D. Remains same

3. Which of these obeys Ohm's law? [CBSE 2021]
A. Diode
B. Transistor
C. Nichrome wire
D. LED

4. Which combination of resistors gives the minimum resistance? [CBSE 2016, 2022]
A. Series
B. Parallel
C. Mixed
D. None

5. A 5 Ω and 10 Ω resistor are connected in parallel. What is the equivalent resistance?[CBSE 2017, 2020, 2022]
A. 15 Ω
B. 10 Ω
C. 5 Ω

D. 3.33 Ω

6. If 15 C of charge flows through a wire in 3 s, the current is:[CBSE 2015, 2017, 2021]
A. 5 A
B. 45 A
C. 0.2 A
D. 3 A

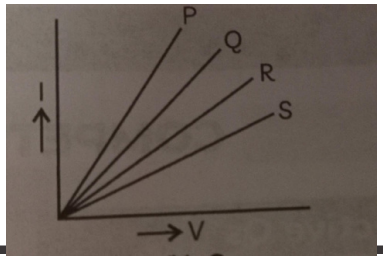
7. An electric iron of resistance 20 Ω draws a current of 5 A. What is the voltage?[CBSE 2015, 2019, 2022]
A. 100 V
B. 4 V
C. 25 V
D. 10 V

8. Which of the following correctly represents Ohm's law on a graph?[CBSE 2017, 2023]
A. V–I graph is a straight line passing through origin
B. V–I graph is curved
C. I–R graph is linear
D. R–V graph is linear

9. Two wires of equal length and material have cross-sectional areas in the ratio 1:2. What is the ratio of their resistances? [CBSE 2019, 2021]
A. 1:1
B. 2:1
C. 1:2
D. 2:4

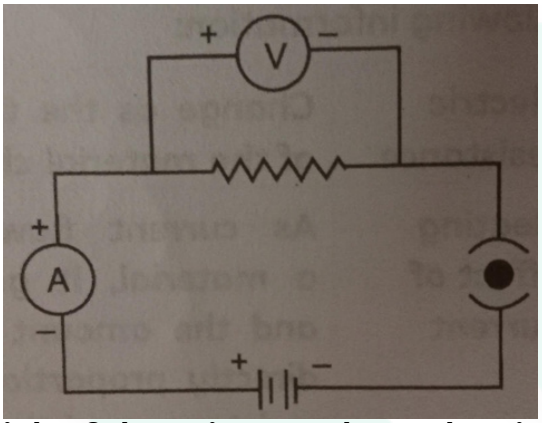
10. An electric bulb rated 220 V, 100 W is used for 5 hours daily. What is the energy consumed in one day?[CBSE 2014, 2023]
A. 0.5 kWh
B. 0.2 kWh
C. 1 kWh
D. 5 kWh

11. Snigdha made a V-I graph for the metallic wires P, Q, R and S at constant temperature as shown below. She assumed that all the four wires have same length and same diameter. Which one of the four wires has high resistivity?



A. P
B. Q
C. R
D. S

12. The picture shows an electric circuit.



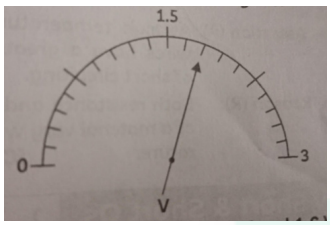
Which of these is true about the circuit?
(I) The circuit is open.
(II) The circuit has double batteries.
(III) The circuit has an ammeter and a voltmeter parallel to each other.
A.Only (I)
B. Only (II)
C. Only (III)
D. (I) and (III)

13. The hindrance presented by material of conductor to the smooth passing of electric current is known as:
A. Resistance
B. Conductance
C. Inductance
D. None of these

14. If the current 'I' through a resistor is increased by 100% (assuming that the temperature remains unchanged), the approximate increase in power dissipated will be
(a) 400 %
(b) 200 %
(c) 300 %
(d) 100 %

15. In case of four wires of same material, the resistance will be minimum if the diameter and length of the wire respectively are:
[CBSE 2023]
A. D/2 and L/4
B. D/4 and 4L

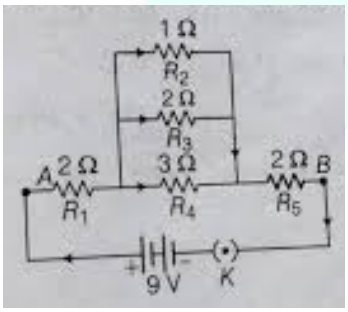
C. 2D and L
D. 4D and 4L

16. 

In the following diagram, the least count of the voltmeter and the reading shown by it is:[CBSE 2023]
A. 0.05 V and 1.6 V
B. 0.15 V and 1.6 V
C. 0.05 V and 1.8 V
D. 0.15 V and 1.8 V

17. The expressions that relate
(i) Q and t,
(ii) Q, I and t, and
(iii) Q, V and W respectively are (here the symbols have their usual meanings):(2023)
(a) (i) = Q/t (ii) W = V/Q
(b) (i) Q = I × t (ii) W = V × Q
(c) (i) Q = I/t (ii) W = WQ
(d) (i) = Q/t (ii) Q = VW

18. Find the equivalent resistance of the following circuit , also find the current and potential at each resistor .



(a) Equivalent resistance = 5.8 Ω, Current = 1.55 A
(b) Equivalent resistance = 6 Ω, Current = 1.5 A
(c) Equivalent resistance = 4.8 Ω, Current = 1.87 A
(d) Equivalent resistance = 5 Ω, Current = 1.8 A

(yaha Marks katate h)

Assertion and Reason type of QuestionS

19. Assertion: The resistance of a conductor is directly proportional to its length.
Reason: A longer conductor offers more opposition to the flow of electrons. [2019, 2021, 2023]

20. Assertion: Thick wires have less resistance than thin wires.
Reason: Resistance is inversely proportional to the square of the area of cross-section.[2018, 2020, 2024.]

21. Assertion: When two resistors are connected in parallel, the total resistance is less than the smallest resistance.
Reason: In parallel combination, the reciprocal of total resistance is the sum of reciprocals of individual resistances. [2021, 2023, 2024]

22. Assertion: A wire gets heated when electric current passes through it.
Reason: The electric energy is completely converted into kinetic energy. 2020, 2022

23. Assertion: In a series circuit, the current remains the same through all components.
Reason: In a series circuit, the total resistance is the sum of individual resistances. [2019, 2022]

24. Assertion: Fuse wire is made of low melting point material.
Reason: It melts and breaks the circuit when current exceeds a certain limit. [2018, 2019, 2022]

(ho jaayenge aaram se)

SHORT ANSWER TYPE QUESTIONS (2 and 3 Marks)

25. Define electric power. Write its SI unit. [2017, 2019, 2022]

26. Write the relation between 1 kWh and joules. [2016, 2018, 2023]

27. State Ohm's law. [2015, 2020, 2024]

28. Write the SI unit of electric charge and electric current. [2017, 2021]

29. Why are fuses made of tin and lead? [2016, 2019, 2023]

30. What is the commercial unit of electrical energy? How is it related to joules? [2018, 2021, 2024]

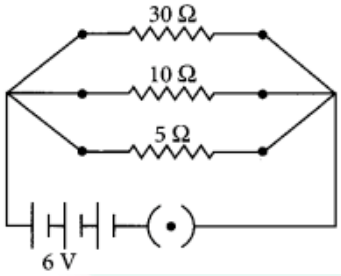
31. Define resistance. Write its SI unit. [2015, 2018, 2022]

32. Why do electric bulbs become hot when glowing? [2016, 2021, 2024]

33. Calculate the resistance of a metal wire of length 2m and area of cross section $1.55 \times 10_{6}$ m^2, if the resistivity of the metal be 2.8×10^{-8} Ωm. (Board Term I, 2013)

34. (a) A 6 Ω resistance wire is doubled on itself. Calculate the new resistance of the wire.
(b) Three 2 Ω resistors A, B and C are connected in such a way that the total resistance of the combination is 3 Ω. Show the arrangement of the three resistors and justify your answer. (2020)

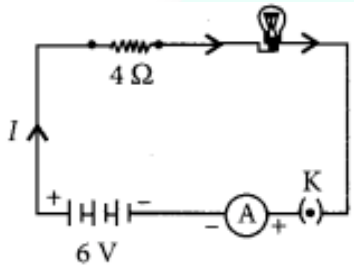
35. Two wires A and B are of equal length and have equal resistances. If the resistivity of A is more than that of B, which wire is thicker and why ? For the electric circuit given below calculate:



(i) current in each resistor
(ii) total current drawn from the battery, and
(iii) equivalent resistance of the circuit.

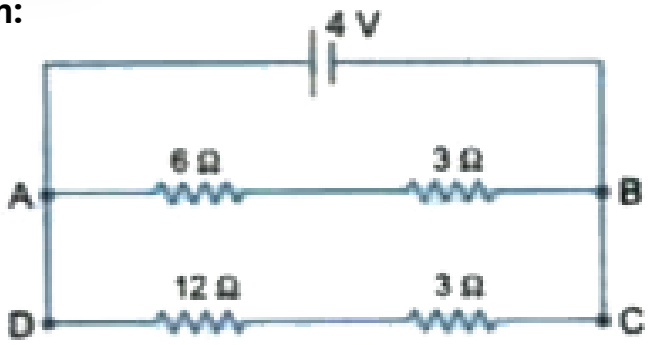
36. Two identical resistors, each of resistance 15 Ω, are connected in (i) series, and (ii) parallel, in turn to a battery of 6 V. Calculate the ratio of the power consumed in the combination of resistors in each case. (2020)

37. An electric lamp of resistance 20 Ω and a conductor of resistance 4 Ω. are connected to a 6 V battery as shown in the circuit. Calculate.

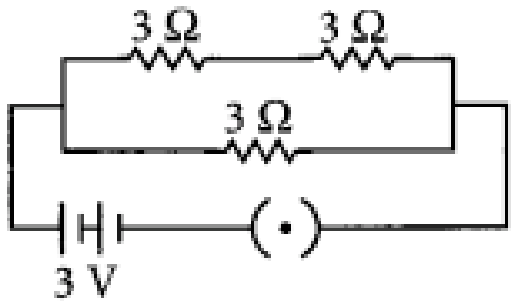


(a) the total resistance of the circuit
(b) the current through the circuit,
(c) the potential difference across the (i) electric lamp and (ii) conductor, and
(d) power of the lamp.

38. For the circuit shown in the given diagram:
What is the value of
(i) current through 6Ω resistor?
(ii) potential difference across 12Ω resistor?



39. Three resistors of 3 Ω each are connected to a battery of 3 V as shown. Calculate the current drawn from the battery. (Board Term I, 2017)



(pahle points socho firr likho)

LONG ANSWER TYPE QUESTIONS (5 Marks)

40. State Ohm's law. Describe an activity to verify it with a labelled diagram. [2016, 2019, 2021, 2023]

41. Derive the expression for equivalent resistance in parallel combination of three resistors. [2018, 2020, 2024]

42. What is Joule's law of heating? Derive the formula. Mention two applications. [2015, 2018, 2020, 2023]

43. Define resistivity. State the factors affecting it. Why are alloys used in heating devices? [2016, 2022]

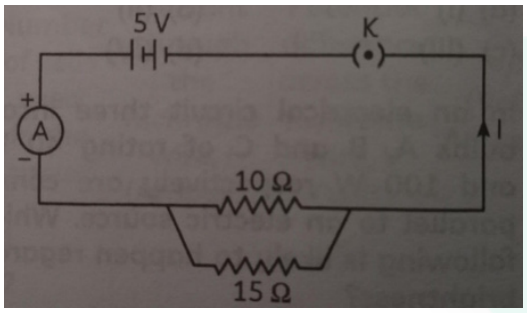
44. State the relation between power, voltage, current, and resistance. Derive formulas:
$P = VI$
$P = I^2R$
$P = V^2/R$
[2016, 2020, 2023]

45. What is a fuse? Explain its working. Why is it important in household circuits? [2018, 2022, 2024]

46. (i) Write the relation between resistance R and electrical resistivity ρ of the material of a conductor in the shape of cylinder of length l and area of cross-section A. Hence derive the SI unit of electrical resistivity.
(ii) The resistance of a metal wire of length 3 m is 60 Ω. If the area of the cross-section of the wire is 4×10^{-7} m², calculate the electrical resistivity of the wire.
(iii) State how would electrical resistivity be affected if the wire (of part "ii") is stretched so that its length is doubled. Justify your answer.

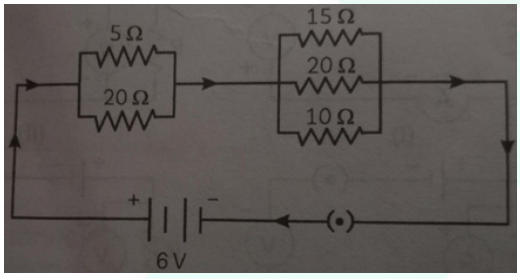
47. . Explain the difference between voltmeter and ammeter. Draw a circuit diagram showing correct placement of both.
[2017, 2019, 2021]

48. Study the following circuit and answer the questions that follows:
(A) State the type of combination of two resistors in the circuit.



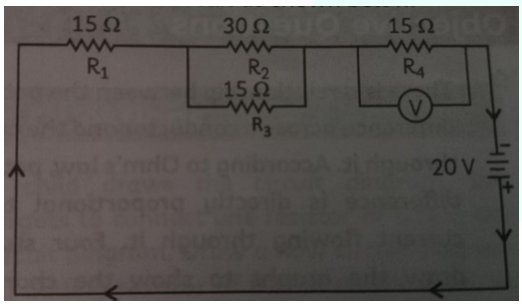
(B) How much current is flowing through
(i) 10Ω and (ii) 15Ω resistor?
(C) What is the ammeter reading?

49. (A) What is meant by the series combination and parallel combination of resistances?
(B) In the circuit diagram given below five resistances of 5 Ω, 20 Ω, 15 Ω, 20 Ω and 10 Ω, are connected as given in figure to a 6 V battery:



Calculate the total resistance in the circuit

50. Four resistors, a voltmeter and a battery are connected in a circuit as shown below:



(A) What is the net resistance in the circuit?
(B) How much potential difference will the voltmeter connected across the resistor measure?
(c) what is the power dissipated by the resistor R 1?
(D) if R3 is removed , will the net current in the circuit increase or decrease or remain the same ? justify your answer .

(pahle points socho firr likho)

Case Study/Source Based Question

51. A student performs an experiment to verify Ohm's Law. He connects three resistors of 2 Ω, 3 Ω, and 5 Ω in series with a battery, ammeter, and voltmeter. He notes that the current remains the same through all resistors, and the potential difference across each resistor is different.

He records the following data:

Resistor	Resistance (Ω)	Potential Difference (V)
--------	----------	----------
R_1	2	2
R_2	3	3
R_3	5	5

Questions:

1. **State Ohm's Law and its mathematical expression.**
2. **What is the total resistance of the circuit?**
3. **What is the total voltage applied across the series combination?**
4. **What is the current flowing through the circuit?**
5. **Why is the current same through all resistors in a series circuit?**

[2022, 2024]

52. Ravi's family uses the following electrical appliances at home:

Appliance	Power Rating	Usage Per Day
----------	----------	----------
Tube Light	40 W	5 hours
Fan	80 W	6 hours
Refrigerator	300 W	24 hours
TV	100 W	4 hours

1. **Calculate the total energy consumed by all appliances in one day.**
2. **Convert the answer into kWh.**
3. **If cost per unit is ₹6, find the total cost for 30 days.**
4. **Which appliance consumes the maximum power and why?**
5. **Suggest one way to reduce electricity consumption at home.**

[2021, 2023]

PK Special [KBC]



53. Why is the filament of an electric bulb made of tungsten, whereas the connecting wires are made of copper? Justify your answer based on material properties.

54. A wire is stretched so that its length becomes twice the original. Explain how this affects the resistance of the wire.

55. Give two technical reasons why it is not advisable to connect all household electrical appliances in series.

56. Two wires A and B have the same length and are made of the same material. Wire A is solid, while wire B is hollow. Which one will have a higher resistance and why?

57. Explain why the power delivered to a resistor is maximum when the resistance of the load is equal to the internal resistance of the source.

58. You are given two unknown resistors. When connected in series, the total resistance is 12 Ω, and when connected in parallel, the total resistance is 2.25 Ω. Calculate the resistance of each resistor.

Kitne Questions kar paaye?

SOLUTIONS

SOLUTIONS

MULTIPLE CHOICE QUESTIONS

1. **B**
2. **A**
3. **C**
4. **B**
5. **D**
6. **A**
7. **A**
8. **A**
9. **B**
10. **C**
11. **D**
12. **D**
13. **A**
14. **C**
15. **C**
16. **C**
17. **B**
18. **B**

ASSERTION AND REASON BASED QUESTIONS ANSWERS

19. A
20. A
21. A
22. C
23. A
24. A

SHORT ANSWERS QUESTIONS

25.Electric power is the rate at which electrical energy is consumed or produced in a circuit.
SI unit: Watt (W)

26.1 kilowatt hour (1 kWh) = 3.6×10^6 joules

27.Ohm's Law states that the current flowing through a conductor is directly proportional to the potential difference across its ends, provided the temperature remains constant.

SOLUTIONS

Formula: V=IRV = IRV=IR

28.SI unit of electric charge: Coulomb (C)
SI unit of electric current: Ampere (A)

29.Fuses are made of tin and lead because these metals have low melting points, so they melt easily and break the circuit when the current exceeds a safe limit, preventing damage.

30.Commercial unit of electrical energy: kilowatt-hour (kWh)
Relation to joules:
1 kWh = 3.6×10^6 J

31.Resistance is the property of a conductor that opposes the flow of electric current through it.
SI unit: Ohm (Ω)

32.Electric bulbs become hot when glowing because electric energy is converted into both light and heat energy due to the resistance of the filament (usually tungsten).

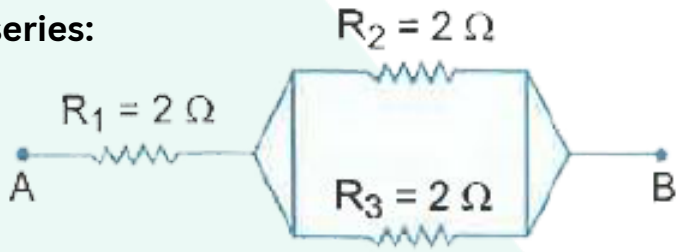
33. Length, L = 2 m
Area, A = 1.55×10^{-6} m^2
Resistivity, ρ = 2.8×10^{-8} Ω·m
Formula:
$R = \rho \times (L / A)$
Substitute the values:
$R = (2.8 \times 10^{-8} \times 2) / (1.55 \times 10^{-6})$
$R = (5.6 \times 10^{-8}) / (1.55 \times 10^{-6})$
$R \approx 0.0361\ \Omega$

34. (a) A 6 Ω resistance wire is doubled on itself.

- When a wire is doubled:
  - Length becomes half.
  - Area becomes double.
- Since $R \propto L/A$, the new resistance becomes:

SOLUTIONS

Since $R \propto L/A$, the new resistance becomes:
$R_{new} = R/4 = 6/4 = 1.5\,\Omega$
(b) Three $2\,\Omega$ resistors A, B, and C are connected such that the total resistance is $3\,\Omega$.
Let A and B be in parallel, and C in series:
A || B ⇒
$R_{AB} = (2 \times 2)/(2 + 2) = 4/4 = 1\,\Omega$
Now,
$R_{total} = R_{AB} + R_C = 1 + 2 = 3\,\Omega$



35. Two wires A and B have equal lengths and equal resistances.
Given: $\rho_a > \rho_\beta$
From formula:
$R = \rho \times (L/A) \Rightarrow A = \rho \times (L/R)$
Since R and L are constant,
$\Rightarrow A \propto \rho$
So, wire A has larger cross-sectional area than wire B.

(i) Current in each resistor using Ohm's Law:
- $I_1 = V_1 / R_1 = 6 / 30 = 0.2$ A
- $I_2 = V_2 / R_2 = 6 / 10 = 0.6$ A
- $I_3 = V_3 / R_3 = 6 / 5 = 1.2$ A

(ii) Total current drawn from battery:
$I_{total} = I_1 + I_2 + I_3$
$= 0.2 + 0.6 + 1.2 = 2.0$ A
(iii) Equivalent resistance (R_{eq}):
From Ohm's Law:
$V = I \times R_{eq}$
So,
$6 = 2 \times R_{eq}$
$\Rightarrow R_{eq} = 6 / 2 = 3\,\Omega$

36. $R_1 = R_2 = 15\,\Omega$
$V = 6$ V
Case (i): Series Combination
Equivalent resistance:
$R_s = R_1 + R_2 = 15 + 15 = 30\,\Omega$

SOLUTIONS

Power consumed:
$P_s = V^2 / R_s = (6)^2 / 30 = 36 / 30 = 1.2$ W
Case (ii): Parallel Combination
Equivalent resistance:
CopyEdit
$1 / R_p = 1 / R_1 + 1 / R_2$
$= 1 / 15 + 1 / 15$
$= 2 / 15$
$\Rightarrow R_p = 15 / 2 = 7.5\ \Omega$
Power consumed:
$P_p = V^2 / R_p = (6)^2 / 7.5 = 36 / 7.5 = 4.8$ W
Required Ratio
Ratio of power consumed:
yaml
CopyEdit
$P_s : P_p = 1.2 : 4.8 = 1 : 4$

37. Resistance of the lamp, $R_{lamp} = 20\ \Omega$
External resistance, $R_{ext} = 4\ \Omega$
Total voltage, $V = 6$ V

(a) Total resistance in the circuit:
$R = R_{lamp} + R_{ext} = 20 + 4 = 24\ \Omega$

(b) Current in the circuit:
$I = V / R = 6 / 24 = 0.25$ A

(c) Potential Differences:
(i) Across the electric lamp:
$V_{lamp} = (V / R) \times R_{lamp} = (6 / 24) \times 20 = 5$ V
(ii) Across the conductor:
$V_{conductor} = (V / R) \times R_{ext} = (6 / 24) \times 4 = 1$ V

(d) Power of the lamp:
$P = I^2 \times R_{lamp} = (0.25)^2 \times 20 = 1.25$ W

SOLUTIONS

38. Let the current through the circuit be I, which is divided into I_1 and I_2 in the arms AB and CD respectively. Then,

$I = I_1 + I_2$

In the arm AB, the total resistance is:

$R_1 = 6\ \Omega + 3\ \Omega = 9\ \Omega$

In the arm CD, the total resistance is:

$R_2 = 12\ \Omega + 3\ \Omega = 15\ \Omega$

(i) Current in the 6 Ω resistor:

$I_1 = V / R_1 = 4 / 9 = 0.44\ A$

(ii) Current through CD:

$I_2 = V / R_2 = 4 / 15 = 0.27\ A$

Potential difference across 12 Ω resistor:

$V_1 = I_2 \times 12 = 0.27 \times 12 = 3.24\ V$

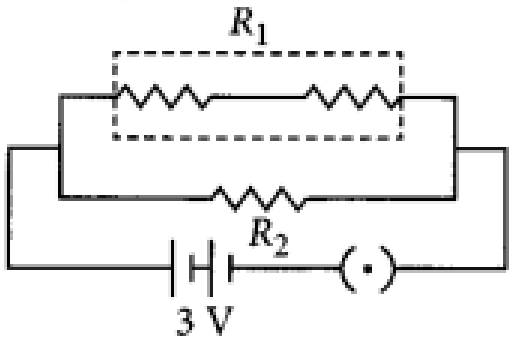
39. As given in circuit diagram, two 3 Ω resistors are connected in series to form R_1; so

$R_1 = 3\ \Omega + 3\ \Omega = 6\ \Omega$

And, R_1 and R_2 are in parallel combination, Hence, equivalent resistance of circuit (R_{eq}) given by

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\therefore \quad \frac{1}{R_{eq}} = \frac{1}{6} + \frac{1}{3} = \frac{1+2}{6} = \frac{3}{6} = \frac{1}{2}$$



LONG ANSWER QUESTIONS

SOLUTIONS

Ohm's Law:

At constant temperature, the current (I) flowing through a conductor is directly proportional to the potential difference (V) across its ends.

$V \propto I$

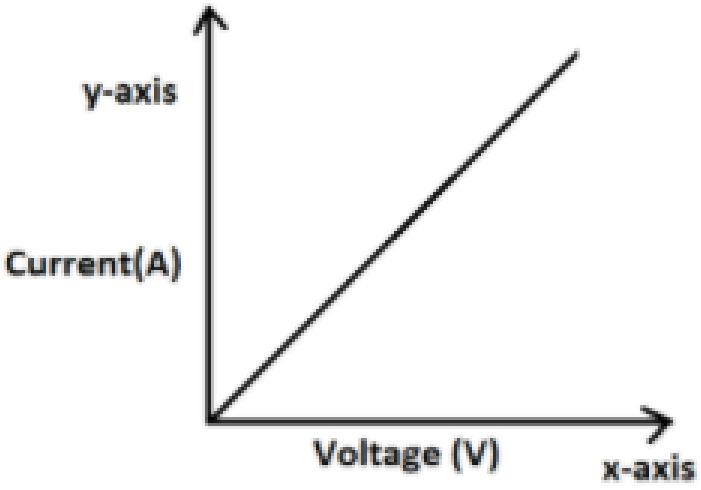
$\Rightarrow V = IR$, where R is the resistance of the conductor.

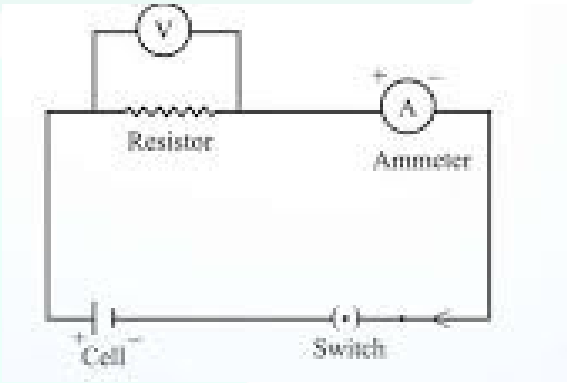
Activity to verify Ohm's Law:

Materials Required: Resistor, battery, key, rheostat, voltmeter, ammeter, connecting wires.

Procedure:

- **Connect the circuit as shown in the diagram.**
- **Keep the resistance constant using a fixed resistor.**
- **Vary the current using a rheostat and record values of V and I.**
- **Plot a graph of V vs I.**





41. Let R_1, R_2, R_3 be three resistors connected in parallel.

In parallel combination:

- **Potential difference across each resistor = V**
- **Currents: $I_1 = V/R_1$, $I_2 = V/R_2$, $I_3 = V/R_3$**

Total current:

$I = I_1 + I_2 + I_3 = V/R_1 + V/R_2 + V/R_3$

Let R_p be the equivalent resistance:

$I = V/R_p$

So,

$V/R_p = V/R_1 + V/R_2 + V/R_3$

Dividing both sides by V:

$1/R_p = 1/R_1 + 1/R_2 + 1/R_3$

SOLUTIONS

Joule's Law of Heating:
The heat produced in a resistor is directly proportional to:
Square of current (I^2)
Resistance (R)
Time (t)
Formula:
$H = I^2Rt$
Derivation:
Power, $P = VI$
From Ohm's Law: $V = IR$
$\Rightarrow P = I \times IR = I^2R$
Heat produced in time t:
$H = P \times t = I^2Rt$
Applications:
Electric heater, toaster, geyser.
Electric fuse (melts on heating to protect appliances).

43. Resistivity (ρ):
It is the resistance of a conductor of unit length and unit area of cross-section.
$\rho = RA / l$
SI Unit: ohm-metre (Ω·m)
Factors Affecting Resistivity:
Nature of material only (not length or area)
Temperature (resistivity increases with temperature)
Why Alloys in Heating Devices

- **High resistivity**
- **Do not oxidize or melt easily at high temperatures**
- **Example: Nichrome is used in heaters**

44. (i) $P = VI$ (Basic formula for electric power)
From Ohm's Law:
$V = IR$
(ii) $P = I \times V = I \times (IR) = I^2R$
(iii) $P = V \times I = V \times (V/R) = V^2 / R$

45. Fuse: A fuse is a safety device with a thin wire of low melting point and high resistance.
Working:

SOLUTIONS

Connected in series with live wire
If current exceeds safe limit, fuse wire melts due to excessive heating (I^2Rt)
This breaks the circuit and prevents damage Importance:

- Prevents fire, appliance damage, and electric shocks
- Protects the entire circuit from overload or short circuit

46. Resistivity Formula, Numerical and Stretching Concept
(i) Relation:
$R = \rho \times (l / A)$
$\Rightarrow \rho = R \times (A / l)$
SI unit of $\rho = \Omega \cdot m$
(ii) Given:
$R = 60\,\Omega$,
$l = 3\,m$,
$A = 4 \times 10^{-7}\,m^2$
$\rho = R \times (A / l)$
$= 60 \times (4 \times 10^{-7} / 3)$
$= 8 \times 10^{-6}\,\Omega \cdot m$
(iii) If wire is stretched to double its length:
New length, $l' = 2l$,
Volume is constant, so $A' = A / 2$
Then,
$R' = \rho \times (l' / A') = \rho \times (2l / (A / 2)) = \rho \times (4l / A) = 4R$
So resistance becomes 4 times, and since
$\rho = R \times A / l$,
if R increases 4×, A reduces to half, and l becomes 2×
$\Rightarrow \rho$ remains unchanged
Conclusion: Electrical resistivity remains constant as it depends only on the material.

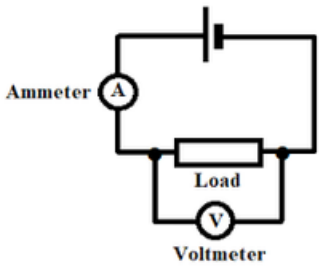
47. Voltmeter

- Used to measure potential difference (voltage VVV) across a component.
- Connected in parallel with the component.
- Has very high resistance to draw negligible current.

Ammeter

SOLUTIONS

Used to measure electric current III through a component.
Connected in series with the component.
Has very low resistance to avoid altering the current.



48. (a) Two resistors are in parallel combination.
(b) Current through
(i) 10 Ω → I = V R VR = 3 10 3 10 = 0.3A
(ii) 15 Ω → I = V R VR = 3 15 3 15 = 0.2A
(c) Ammeter reading = Total current flowing through the circuit = 0.5 A.

49. (A) Definitions:

- Series combination: resistors connected end-to-end; same current flows; total resistance = sum.
- Parallel combination: resistors connected across the same two points; same voltage; reciprocal sum

(B) To find total resistance in the circuit:
Let R_a be the value of total resistance in the first combination i.e., 5 Ω and 20 Ω.
Then,
$1/R_a = 1/R_1 + 1/R_2$
$1/R_a = 1/5 + 1/20$
$1/R_a = (4 + 1)/20 = 5/20$
$R_a = 4$
Let R_b be the value of resistance in the second combination.
Then,
$1/R_b = 1/R_3 + 1/R_4 + 1/R_5$
$1/R_b = 1/15 + 1/20 + 1/10$
$1/R_b = (4 + 3 + 6)/60 = 13/60$
$R_b = 60/13$ Ω
Total resistance across the circuit will be:
$R_a + R_b = 4$ Ω + 60/13 Ω
≈ 8.6 Ω

SOLUTIONS

50. (A) The net resistance is:

$R_1 + (1/R_2 + 1/R_3)^{-1} + R_4$
$= 15 + 10 + 15 = 40\ \Omega$

(B) Voltage drop across R_4 = Net current × R_4
Net current =
V / R = 20 / 40 = 0.5 A
Voltage drop across
$R_4 = 0.5 \times 15 = 7.5$ V
(C) Power dissipated by the resistor R_1 is given by:
$P = V^2 / R$ or $P = I^2 \times R$
therefore,
$P = I^2R_1$
Power $=(0.5)^2 \times 15 = 3.75$ W
(D) Net current will decrease because R_3 is connected in parallel, and removing it will increase the net resistance in the circuit, thereby reducing the net current.

CASE STUDY BASED ANSWERS

51. 1.Ohm's Law:
It states that the current flowing through a conductor is directly proportional to the potential difference across its ends, provided physical conditions like temperature remain constant.
Mathematical expression:
$V = I \times R$
2. Total resistance:
$R_{total} = R_1 + R_2 + R_3$
$= 2\,\Omega + 3\,\Omega + 5\,\Omega$
$= 10\,\Omega$
3. Total voltage applied:
$V_{total} = V_1 + V_2 + V_3$
$= 2\,V + 3\,V + 5\,V$
$= 10\,V$

SOLUTIONS

4. Current flowing through the circuit:
$I = V_{total} / R_{total}$
$= 10\,V / 10\,\Omega$
$= 1\,A$
5.In a series circuit, there is only one path for electric current. So, the same current flows through all the resistors.

52. 1. Total energy consumed in one day:
$E_{total} = E_1 + E_2 + E_3 + E_4$
$= 200 + 480 + 7200 + 400 = 8280\,Wh$
2. Convert to kWh:
$E_{total} = 8280\,Wh \div 1000 = 8.28\,kWh$
3. Cost for 30 days:
Total cost = 8.28 kWh/day × 30 days × ₹6/unit
= ₹1490.40
4. Appliance that consumes maximum power:
Refrigerator (300 W, used 24 h/day)
→ Consumes the highest energy because it runs continuously.
5. Suggestion to reduce electricity consumption:
Use LED bulbs instead of tube lights or turn off appliances when not in use.

PK SPECIAL [KBC]

53. The filament of an electric bulb is made of tungsten because it has a high melting point (~3380 °C) and can withstand high temperatures without melting.
The connecting wires are made of copper because it has low resistance and high conductivity, making it ideal for minimizing energy loss.

54. If the length of the wire is doubled and area remains the same,
new resistance $R' = \rho(2L)/A = 2R$.
So, resistance doubles

55. In a series circuit, if one appliance fails, the entire circuit stops working.
1. Each appliance gets the same current, which may not be suitable for all devices.

SOLUTIONS

56.Wire B (hollow) will have higher resistance because it has less cross-sectional area for current to flow compared to the solid wire A.

57.According to maximum power transfer theorem, power delivered is maximum when load resistance = internal resistance of the source. This ensures maximum energy transfer without excess loss in the source.

58.Let resistances be R_1 and R_2.

Given: $R_1 + R_2 = 12\ \Omega$ and $(R_1 \times R_2)/(R_1 + R_2) = 2.25\ \Omega$

$\Rightarrow (R_1 \times R_2)/12 = 2.25$

$\Rightarrow R_1 \times R_2 = 27$

Now, solving:

$R_1 + R_2 = 12$ and $R_1 \times R_2 = 27$

Roots of equation: $x^2 - 12x + 27 = 0$

Solving:

$x = 3\ \Omega$ and $9\ \Omega$

Resistances are $3\ \Omega$ and $9\ \Omega$.