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## PHYSICS

## BOOKS - PRADEEP PHYSICS (HINGLISH)

## ELECTRICITY

## Solved Problem

1. A conductor carries a current of 0.2 A . Find the amount of charge that will pass through the cross-section of the conductor in 30 s. How many electrons will flow in this time interval if the charge on one electron is $1.6 \times 10^{-19} C$ ?
A. $1.5 \times 10^{19}$
B. $3.9 \times 10^{19}$
C. $6.75 \times 10^{19}$
D. $3.75 \times 10^{19}$

## Answer: D

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2. The filament of an electric lamp draws a current of $0.4 A$ which lights for 3 hours. Calculate the amount of charge that flows through the circuit.
A. 1320 C
B. 4320 C
C. 2000 C
D. None

## Answer: B

## D Watch Video Solution

3. An electric iron draws a current of 0.5 when voltage is

200 V . Calculate the amount of charge flowing through it in one hour.
4. Calculate the amount of work done to carry $4 C$ of charge from a point at 100 V to a point at 120 V .
A. 80 J
B. 100J
C. 5J
D. 120J

Answer: A

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5. What is the resistance of an electric arc lamb when hot,
if the lamp uses $20 A$ when connected to a 200 volt line?

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6. Calculate the potential difference required across a conductor of resistance $5 \Omega$ resistance. It draws a current of 0.3 A when glowing from a source of 3 V . Calculate the resistance of the bulb when glowing and explain the reason for the difference in resistance.

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7. A torch bulb when cold has $1 \Omega$ resistance. It draws a current of $0.3 A$ when glowing from a source of $3 V$.

Calculate the resistance of the bulb when glowing and explain the reason for the difference in resistance.
8. How much current does an electric heater draw from a 220 V line, If the resistance of the heater (when hot) is $50 \Omega ?$

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9. The resistance of a wire of length 80 cm and of uniform area of cross-section $0.025 \mathrm{~cm}^{2}$, is found to be 1.50 ohm .

Calculate the resistivity of the wire.

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

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11. Two copper wires $A$ and $B$ of length 30 m and 10 m have radii 2 cm and 1 cm respectively. Compare the resistances of the two wires. Which will have less resistance ?

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12. Suppose a 6 -volt battery is connected across lamp whose resistance is $20 \Omega$ through a variable resistor as shown in (Fig. 3.11). If the current in the circuit is $0.25 A$,
calculate the value of the resistance from the resistor which must be used ?


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13. In the circuit diagram given in (a), suppose the resistors $R_{1}, R_{2}$ and $R_{3}$ have values $5 \Omega, 10 \Omega$ and $30 \Omega$ respectively, which have been connected to a battery of 12 V . Calculate
(a) the current through each resistor,
(b) the total current in the circuit, and
(c) the total circuiot resistance.

## - View Text Solution

14. 

$R_{1}=10 \Omega, R_{2}=40 \Omega$ and $R_{3}=30 \Omega, R_{4}=20 \Omega, R_{5}=60 \Omega$
and a 12 V battery is connected to the arrangement,
calculate.
(a) the total resistance and
(b) the total current flowing in the circuit.


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15. When two resistors of resistances $R_{1}$ and $R_{2}$ are connected in parallel, the net resistance is $3 \Omega$. When connected in series, its value is $16 \Omega$. Calculate the values of $R_{1}$ and $R_{2}$.
16. Calculate the equivalent of the network across the points $A$ and $B$ shown in

## D Watch Video Solution

17. Three resistors are connected as shown in the diagram.


Though the resistor 5 ohm, a current of 1 ampere is
flowing.
(i) What is the current through the other two resistors?
(ii) What is the p.d. across $A B$ and across $A C$ ?
(iii) What is the total resistance?

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18. A 24 volt battery is connected to the arrangement of resistances shown in (Fig.) Calculate
(i) the total effective resistance of the circuit,
(ii) the total current flowing in the circuit.

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

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20. For the combination of resistors shown in (fig.)
(a) find the equivalent resistance between
(i) C and D and
(ii) A and B.

21. An electric bulb is rated at $200 \mathrm{~V}-100 \mathrm{~W}$. What is its resistance ? Five such bulbs burn for four hours. What is the electrical energy consumed ? Calculate the cost if the rate is 50 paise per unit.

## - Watch Video Solution

22. A torch bulbs is rated at 2.5 V and 750 mA . Calculate its
(i) power
(ii) its resistance and
(iii) the energy consumed if the bulb is lighted for 4hour.
23. A $6 V-12 W$ lamp is connected in series with a source of 12 V supply. Calculate the value of the resistance $R$ for the proper working of the lamp. What is the current flowing through the circuit?

## - Watch Video Solution

24. Two coils of resistances $3 \Omega$ and $6 \Omega$ are connected in series across a battery of emf12V. Find the electrical energy consumed in 1 minute in each resistance when these are connected in series.
B. $320 \mathrm{~J}, 640 \mathrm{~J}$
C. $320 \mathrm{~J}, 320 \mathrm{~J}$
D. None of these

Answer: B

## D Watch Video Solution

25. Two bulbs $A$ and $B$ are rated $100 W-120 \mathrm{~V}$ and $10 \mathrm{~W}-120 \mathrm{~V}$ respectively. They are connected across a 120 V source in series. Which will consume more energy ?
26. What does an electric circuit mean ?

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2. Define the unit of current.

## - Watch Video Solution

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

- Watch Video Solution

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

## D Watch Video Solution

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

## D Watch Video Solution

6. How much energy is given to each coulomb of charge passing through a $6 V$ battery ?
A. 60 J
B. 10 J
C. 12 J
D. 6 J

Answer: D

## D Watch Video Solution

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

- Watch Video Solution

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

## D Watch Video Solution

9. Let the resistance of an electrical component remain constant while the potential difference across the two ends of the component decreases to half its former value.

What change will occur in the current through it ?
10. Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal ?

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11. Use the data in Table 3.1 to answer the following :
(a) Which among iron and mercury is a better conductor?
(b) Which material is the best conductor ?

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12. Draw a schematic diagram of a circuit consisting of a battery of three cells of $2 V$ each, a 5 ohm resistor, an 8
ohm resistor, and a 12 ohm resistor, and a plug key, all connected it series.

## - Watch Video Solution

13. Redraw the circuit of $Q .12$, putting in an ammeter to measure the current through the resistors and a voltmeter to measure the voltage across the 12 ohm resistor. What would be the readings in the ammeter and the voltmeter?

## - Watch Video Solution

14. Judge the equivalent resistance when the following are connected in parallel.
(a) $1 \Omega$ and $10^{6} \Omega$
(b) $1 \Omega$ and $10^{8} \Omega$ and $10^{6} \Omega$.

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

## - Watch Video Solution

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

- Watch Video Solution

17. How can three resistors of resistances $2 \Omega, 3 \Omega$, and $6 \Omega$
be connected to give a total resistance of
(a) $4 \Omega$
(b) $1 \Omega$ ?

- Watch Video Solution

18. What is :
(a) the highest
(b) the lowest total resistances that can be secured by combinations of four coils of resistances $4 \Omega, 8 \Omega, 12 \Omega, 24 \Omega$ ?
A. $50 \mathrm{ohm}, 4 \mathrm{ohm}$
B. 48 ohm, 2 ohm
C. 48 ohm, 8 ohm
D. None of the above

## Answer: B

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

## - Watch Video Solution

20. Compute the heat generated while transferring 96000 coulombs of charge in one hour through a potential difference of 50 V .

## D Watch Video Solution

21. An electric iron of resistance $20 \Omega$ takes a current of 5 A .

Calculate the heat developed in $30 s$.
22. What determines the rate at which energy is delivered by a current?

## - Watch Video Solution

23. An electric motor takes $5 A$ from a 220 V line.

Determine the power and energy consumed in $2 h$.
A. 7920348 J
B. 7120000 J
C. 7020000 J
D. 7920000 J

## - Watch Video Solution

## Ncert Exercise

1. A piece of wire of resistance $R$ is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is $R^{\prime}$, then the ratio $R / R^{\prime}$ is :
A. $1 / 25$
B. $1 / 5$
C. 5
D. 25

Answer: D

## - Watch Video Solution

2. Which of the following terms does not represent electrical power in a circuit :
A. $I^{2} R$
B. $I R^{2}$
C. $V I$
D. $V^{2} / R$

## Watch Video Solution

3. An electric bulb is rated 220 V and 100 W . When it is operated on 110 V , the power consumed will be :
A. 100 W
B. 75 W
C. 50 W
D. 25 W

## Answer: D

## - Watch Video Solution

4. Two conducting wires of the same material and of equal length and equal diameters are first connected in series and then in parallel in an electric circuit. The ratio of the heat produced in series and parallel combinations would be :
A. $1: 2$
B. 2:1
C. 1: 4
D. $4: 1$

## Answer:

5. How is voltmeter connected in the circuit to measure potential difference between two points?
A. Parallel Connection
B. Series Connection
C. Both
D. nONE

## Answer: A

## - Watch Video Solution

6. A copper wire has a diameter of 0.5 mm and a resistivity of $1.6 \times 10^{-6}$ ohm cm . How much of this wire would be
required to make a 10 ohm coil ? How much does the resistance change if the diameter is doubled ?
A. 122.7 and $1 / 4$
B. 130 and $1 / 2$
C. 120 and $1 / 5$
D. None of these

## Answer: A

## - Watch Video Solution

7. The value of current, $I$, flowing in a given resistor for the corresponding values of potential difference, $V$, across the resistor are given below :
$I$ (ampere)
$\begin{array}{llll}0.5 & 1.0 & 2.0 & 3.0\end{array}$
4.0
$\begin{array}{llllll}V \text { (volt) } & 1.6 & 3.4 & 6.7 & 10.2 & 13.2\end{array}$

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

## D Watch Video Solution

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

## - Watch Video Solution

9. A battery of $9 v$ is connected in series with resistors of $0.2 \Omega, 0.3 \Omega, 0.4 \Omega, 0.5 \Omega$ and $12 \Omega$. How much current would flow through the $12 \Omega$ resistor ?
A. 0.67 A
B. 2.3 A
C. 4.7 A
D. 0.5 A

Answer: A

## D Watch Video Solution

10. How many $176 \Omega$ resistors (in parallel) are required to carry 5 A in 220 V line ?
11. Show how you would connect thre resistors, each of resistance $6 \Omega$, so that the combination has a resistance of
(i) $9 \Omega$
(ii) $2 \Omega$.

## D Watch Video Solution

12. Several electric bulbs designed to be used on a 220 V
electric supply line, are rated $10 W$. How many lamps can be connected in parallel with each other across the two wires of 220 V line if the maximum allowable current is 5 A ?
A. 100
B. 200
C. 110
D. 120

Answer: C

## D Watch Video Solution

13. A hot plate of an electric oven connected to a 220 V
lines has two resistance coils $A$ and $B$, each of $24 \Omega$ resistance, which may be used separately, in series or in parallel. What are the currents in the three cases ?
A. 10.2 A, 20 A, 19 A
B. 9.2 A, 4.6 A, 18.3 A
C. $7.4 \mathrm{~A}, 50 \mathrm{~A}, 29 \mathrm{~A}$
D. None of these

Answer: B

## - Watch Video Solution

14. Compare the power used in the $2 \Omega$ resistor in each of the following circuits :
(i) a $6 V$ battery in series with $1 \Omega$ and $2 \Omega$ resistors, and
(ii) a $4 V$ battery in parallel with $12 \Omega$ and $2 \Omega$ resistors.
A. $P 1 / P 2=2$
B. $\mathrm{P} 1 / \mathrm{P} 2=3$
C. $\mathrm{P} 1 / \mathrm{P} 2=1$

## D. None

## Answer: C

## - Watch Video Solution

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

## - Watch Video Solution

16. Which uses more energy, $a 250 W$ TV set in $1 h$ or a

1200 W toaster in 10 minutes?
17. An electric heater of resistance $8 \Omega$ draws $15 A$ from the service mains for 2 hours. Calculate the rate at which heat is developed in the heater.
A. $1500 \frac{\mathrm{~J}}{\mathrm{~s}}$
B. $2000 \frac{\mathrm{~J}}{\mathrm{~s}}$
C. $1000 \frac{\mathrm{~J}}{\mathrm{~s}}$
D. $1800 \frac{\mathrm{~J}}{\mathrm{~s}}$

Answer: D
18. Explain the following :
(a) Why is tungsten used almost axclusively for filament of incandescent lamp?
(b) Why are the conductors of electric heating devices, such as toaster and electric irons, made of an alloy rather than a pure metal ?
(c) Why is the series arrangement not used for domestic circuits?
(d) How does the resistance of a wire vary with its crosssectional area?
(e ) Why are copper and aluminimum wires usually employed for electricity transmission.

## - Watch Video Solution

## Exemplar Short Answer

1. A child has drawn the electric circuit to study Ohm's law as shown in (Fig. 3.42). His teacher told him that the circuit diagram needs correction. Study the circuit diagram and redraw it after making all corrections.

2. Three $2 \Omega$ reistors , $A, B$ and $C$, are connected as shown in (Fig. 3.44). Each of them dissipates energy and can withstand a maximum current that can flow through the three resistors ?


## - Watch Video Solution

3. Should the resistance of an ammeter be low or high ?

Give reason.

## D Watch Video Solution

4. Draw a circuit diagram of an electric circuit containing a cell, a key, an ammeter, a resistance of $2 \Omega$ in series with a combination of two resistors ( $4 \Omega$ each) in parallel and a voltmeter across the parallel combination. Will the potential difference across the $2 \Omega$ resistor be the same as that across the parallel combination of $4 \Omega$ resistors ? Give reason.

## D Watch Video Solution

5. How does use of a fuse-wire protect electrical appliances ?
6. What is electrical resistivity ? In a series electrical circuit comprising a resistor made up of a matallic wire, the ammeter reads $5 A$. The reading of the ammeter decreases to half when the length of the wire is doubled. Why?

## D Watch Video Solution

7. What is the commercial unit of electrical energy ?

Represent it in terms of joules.

## - Watch Video Solution

8. (a) A current of $1 A$ flows in a series curcuit containing an electric lamp and a conductor of $5 \Omega$ when connected
to a 10 V battery. Calculate the resistance of the electric lamp.
(b) Now if a resistance of $10 \Omega$ is connected in parallel with this series combination, what change (if any) in current flowing through $5 \Omega$ conductor and potential difference across the lamp will take place ? Give reason.

## D Watch Video Solution

9. Why is parallel arrangement used in domestic wiring ?

## D Watch Video Solution

10. $B_{1}, B_{2}$ and $B_{3}$ are three identical bulbs connected as
shown in (fig. 3.46). When all the three bulbs glow, a
current of $3 A$ is recorded by the ammeter $A$.
(i) What happens to the glow of the other two bulbs when the bulb $B_{1}$ gets fused ?
(ii) What happens to the readings of $A_{1}, A_{2}, A_{3}$ and $A$ when the bulb $B_{2}$ gets fused ?
(iii) How much power is dissipated in the circuit when all the three bulbs glow together?


## Exemplar Long Answer

1. Three incandecent bulbs of $100 W$ each are connected in
series in an electric circuit. In another circuit another set
of three bulbs of the same wattage are connected in parallel to the same source.
(a) Will the bulbs in the two circuits glow with the same brightness ? Justify your answer.
(b) Now let one bulb in both the circuits get fused. Will the rest of the bulbs continue to glow in each circuit ?

Give reason.
2. State Ohm's law ? How can it be verified experimentally ? Does it hold good under all conditions ? Comment.

## - Watch Video Solution

3. How will you infer with the help of an experiment that the same current flows through every paet of the circuit containing three resistances in series connected to a battery?

## - Watch Video Solution

4. How will you conclude that the same potential difference (voltage) exists across three resistors
connected in a parallel arrangement to a battery ?

## D Watch Video Solution

5. What is Joule's heating effect ? How can it be demonstrated experimentally ? List its four applications in daily life.

## D Watch Video Solution

6. Find out the folowing in the electric circuit given in (Fig.
(a) Effective resistance of two $8 \Omega$ resistors in the combination
(b) Current flowing through $4 \Omega$ resistor
(c) Potential difference across $4 \Omega$ resistance
(d) Power dissipated in $4 \Omega$ resistor
(e) Difference in ammeter readings, if any.


## - Watch Video Solution

Additional Very Short Answer

1. What is meant by quantization of charge ?

## -

2. What is an electric current ? Give its $S I$ unit.

## - Watch Video Solution

3. What is represented by Joule/coulomb ?
A. Power
B. Electrical Energy
C. Electric Current
D. Electric Potential

Answer: D
4. A charge of $2 C$ moves between two plates, maintained at a pd of $1 V$. What is the energy acquired by the charge?
A. 5 J
B. 2 J
C. 12 J
D. None

## Answer: B

## D Watch Video Solution

5. Why are copper wires used as connected wires ?
6. A wire of resistivity $\rho$ is stretched to double its length.

What is its new resistivity?

## D Watch Video Solution

7. How many times (roughly) is the resistivity of an insulator greater than a metal ?

## D Watch Video Solution

8. What is the resistance of a connecting wire ?
9. What is the resistance of an ammeter ?

D Watch Video Solution
10. What is the resistance of a voltmeter ?

## D Watch Video Solution

11. Which has more resistance : 100 W bulb or 60 W bulb ?

## D Watch Video Solution

12. Which material is the best conductor of electricity at
13. What is the resistance of an air gap ?

## - Watch Video Solution

14. Why are conductors different from insulators ?

## - Watch Video Solution

15. Is drift speed of electrons in a conductor carrying current the same as the speed of current ?
16. What sets the electrons into motion in an electric circuit?

D Watch Video Solution
17. Why are filaments of incandescent lamps made of thin tungsten wire?

D Watch Video Solution
18. Which are the metals that are generally used :
(i) in electric circuits and as transmission lines?
19. Graphs between electric current and potential difference across two conductors $A$ and $B$ are as shown in (Fig. 3.49). Which of the two conductors has more resistance ?

20. Why is resistance more in series combination of resistors?

## - Watch Video Solution

21. Why is resistance less in parallel combination of resistors?

- Watch Video Solution

22. How will you join three resistances, each of $2 \Omega$ so that the effective resistance is $3 \Omega$ ?
23. On what factors does the resistivity of a material depend?

## - Watch Video Solution

24. What happens to the current in a circuit if its resistance is doubled ?

## - Watch Video Solution

25. What happens to the resistance of a circuit if the current through it is doubled ?
26. What happens it the pd across a resistance is doubled ?

- Watch Video Solution

27. How does the resistance of a wire depend upon its radius?

- Watch Video Solution

28. How does the resistance of a wire depend on its length ?
29. How does the resistance of a metallic wire depend on its temperature ?

## - Watch Video Solution

30. Two wires are of the same length, same radius, but one of them is of them is of copper and the other is of iron. Which will have more resistance?

## - Watch Video Solution

31. Find the potential difference required to pass a current of $0.2 A$ in a wire of resistance $20 \Omega$.
32. An electric bulbs draws 1.2 A current at 6.0 V . Find the resistance of the bulb.

## - Watch Video Solution

33. Which will have a higher resistivity : a conductor or an insulator?

## - Watch Video Solution

34. Two wires of same material and same length have radii
$r_{1}$ and $r_{2}$ respectively. Compare their resistances.
35. Name a substance whose resistance decrease with temperature.

## - Watch Video Solution

36. Name a substance whose resistance almost remains
unchanged by increase of temperature.

## - Watch Video Solution

37. Distinguish between kilowatt and kilowatt hour.
38. Name two special characteristics of a heater coil.

## D Watch Video Solution

39. A $60 W$ bulb carries a current $0.5 A$. Find the charge that passes through it in 2 hour.

## D Watch Video Solution

40. Calculate the current through a lamp of $25 W$ operating at 200 V .

## - Watch Video Solution

41. If $r_{1}, r_{2}$ and $r_{3}$ are three resistors connected in series in a circuit and $I$ is the current through the circuit, what is the current flowing through each resistor ?

## - Watch Video Solution

42. Which combination of resistors is used to decrease current in a circuit ?

## - Watch Video Solution

43. What is the pd across each resistor in a series circuit ?

## - Watch Video Solution

44. The power rating of an appliance is $100 \mathrm{~W}-250 \mathrm{~V}$. What does it signify ?

## - Watch Video Solution

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

## - Watch Video Solution

46. Is Joule heating always desirable?

## - Watch Video Solution

47. Why are the coils of electric toasters made of an alloy than a pure metal ?

## - Watch Video Solution

## Additional Short Answer

1. Under what conditions is Ohm's law applicable ?

## - Watch Video Solution

2. Two wires are of the same material but of different
lengths and areas of cross-section. Will their resistivities be same or different?
3. Why are filaments of incandescent lamps made of thin tungsten wire?

## D Watch Video Solution

4. Why is nichrome used as a heating element ?

## - Watch Video Solution

5. What is the difference between a resistor and resistance?

W/atah M/idan Cnlıtinn
6. Why are constantan and manganin used for making standard resistances ?

## - Watch Video Solution

7. Why is lead-tin alloy used for making fuse ?

## - Watch Video Solution

8. What are superconductors?
9. (a) What is common between charge and mass ?
(b) We know that mass varies with velocity. Does charge also vary with velocity ?

## - Watch Video Solution

10. (a) What are two physical quantities to which electric potential is analogous to ?
(b) To which process is the flow of current in a conductor analogous to ?
11. (a) What do you mean by the term load in an electric circuit?
(b) Which of the two loads in an electric circuit bigger than the other:
(i) fluorescent tube
(ii) a 100 W incandescent lamp ?

## D Watch Video Solution

12. (a) Which is more conducting : silver or gold ?
(b) Which is a better insulator : glass or ebonite ?
13. (a) Of which material is a fuse-wire made of ?
(b) Of which material is the element of an electric heater made of ?

- Watch Video Solution

14. (a) Whose resistivity increases more with temperature : of an alloy or of its constituent metals ?
(b) Name a material whose resistivity becomes zero at a particular temperature ?
15. A wire having a resistance of $18 \Omega$ is cut into three equal parts. What is the equivalent resistance if these three parts are joined in parallel ?

## - Watch Video Solution

16. What is the ratio of equivalent resistance of series combination of $n$ equal resistance to the equivalent resistance in parallel combination of these $n$ resistances ?

## - Watch Video Solution

17. A given wire is stretched to double its length. How will its resistance change?

## D Watch Video Solution

18. A wire of $3 \Omega$ resistance and 10 cm length is stretched
to 30 cm length. Assuming that it has uniform crosssection, what will be its new resistance?

## D Watch Video Solution

19. (a) When is the pd for all the resistors in a circuit the same and is equal to applied pd ?
(b) When is the current through all the resistors in a circuit the same and is equal to the total current in the circuit?
20. (a) How does the current divide itself in a parallel combination of resistors?
(b) How does the pd divide itself in a series combination of resistors ?

## - Watch Video Solution

21. (a) How is heat produced in a conductor by an electric current?
(b) What are the factors on which heat produced due to a current flowing through a conductor depend ?
22. (a) Are electrons consumed in a electric circuit when a current flows through it ?
(b) What actually is consumed in an electric circuit when current flows through it ?

## - Watch Video Solution

23. (a) How does an incandescent bulb work?
(b) Why is the resistance of bulb much less when it is not glowing ?
24. (a) Why does resistance increase in a series combination of resistors?
(b) Why does resistance decrease in a parallel combination of resistors?

## - Watch Video Solution

25. (a) If a number of bulbs of different wattages are joined in parallel, which bulb will glow with maximum brigthness?
(b) Which bulb will glow with maximum brightness in case bulbs of different wattages are joined in series ?
26. What do you mean by electric potential difference ? How is it measured ? Define its $S I$ unit.

## - Watch Video Solution

27. State Ohm's law ? How can it be verified experimentally
? Does it hold good under all conditions ? Comment.

## - Watch Video Solution

28. What do you mean by electrical resistance ? How does it arise ? Give its $S I$ unit.
29. What is electrical resistivity ? How does it depend om temperature. Give its $S I$ unit.

## D Watch Video Solution

30. Classify materials on the basis of their resistivities.

## D Watch Video Solution

31. Find an expression for the equivalent resistance of three resistors joined in series.

## D Watch Video Solution

32. Find an expression for equivalent resistance of three resistors joined in parallel.

## D Watch Video Solution

33. Derive an expression for electric energy in terms of potential difference, current and the time for which current flows through a conductor.

## - Watch Video Solution

34. What is electric power ? Derive an expression for the same. Give its $S I$ unit.
35. What do you understand by the rating of an electric appliance ?

## D Watch Video Solution

36. Discuss briefly three applications of heating effect of current.

- Watch Video Solution

Additional Long Answer

1. What is Ohm's law ? How is it represented graphically ?

Derive an expression for the resultant resistance of a series combination of resistors.

## - Watch Video Solution

2. State Ohm's law. Derive an expression for the equivalent resistance of a number of resistances in parallel.

## D Watch Video Solution

3. Discuss series and parallel combinations of resistors with their salient features.
4. What is electric energy and electric power. Derive their expressions and define their units

## - Watch Video Solution

## Based On Practical

1. The current flowing through a conductor and the potential difference across its two ends are as per reading of the ammeter and the voltmeter shown in (Fig. 3.50).

Find the resistance of the conductor.


## D Watch Video Solution

2. In a given ammeter, a student sees that needle indicates

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

## D Watch Video Solution

3. The value of current, $I$, flowing in a given resistor for the corresponding values of potential difference, $V$, across the resistor are given below :
$\begin{array}{llllll}I \text { (ampere) } & 0.5 & 1.0 & 2.0 & 3.0 & 4.0\end{array}$
$\begin{array}{lllllll}V \text { (volt) } & 1.6 & 3.4 & 6.7 & 10.2 & 13.2\end{array}$

Polt a graph between V and I and calculate the resistance of the resistor.

## D Watch Video Solution

4. In the circuit shown in (fig. 3.51), find the current recorded by ammeter (A).


## - Watch Video Solution

5. Four resistances, each of $10 \Omega$, are connected to form a square as shown in (Fig. 3.52), find the equivalent
resistance between the opposite corners $A$ and $C$.


## - Watch Video Solution

6. Four resistances, each of $10 \Omega$, are connected to form a square as shown in (Fig. 3.52), find the equivalent resistance between two points on any one side (AB).

## - Watch Video Solution

7. A wire of resistance ( $1 \Omega$ ) is divided into two halves and both halves are connected in parallel. Find the new resistance.

## - Watch Video Solution

8. The $V-I$ graphs of parallel and series combinations of two metallic resistors are shown in (Fig. 3.53). Which
graph represents the parallel combinations ?


## - Watch Video Solution

9. The following apparatus is available in a laboratory :

Battery : adjustable from 0 to 4.5 V
Resistors : $3 \Omega$ and $6 \Omega$

Ammeters : $A_{1}$ of range 0 to 3 A , least count $0.1 A$
$A_{2}$ of range 0 to 1 A , least count $0.05 A$

Voltmeters : $V_{1}$ of range 0 to 10 V , least count 0.5 V
$V_{2}$ of range 0 to 5 V , least count 0.1 V
Which is the best combination of votmeter and ammeter
for finding the equivalent resistance of the resistors in series?

## - Watch Video Solution

10. The following pieces of apparatus are available in a laboratory:

Battery: adjustable from 0 to 6 V
Resistors : $3 \Omega$ and $6 \Omega$
Ammeters : $A_{1}$ of range 0 to 5 A , least count 0.25 A
$A_{2}$ of range 0 to 3 A , least count $0.1 A$
Voltmeters : $V_{1}$ of range 0 to 10 V , least count 0.5 V
$v_{2}$ of range 0 to 5 V , least count 0.1 V
For the experiment to find the equivalent resistance of the parallel combination of the two given resistors, which is the best choice?

## - Watch Video Solution

## Higher Order Thinking

1. Drift speed is the term used to describe the flow of current through a conductor. Does it represent the speed of the current or its strength ?

## Watch Video Solution

2. Tap water conducts electricity whereas distilled water does not. Why ?

## - Watch Video Solution

3. The electrical resistivities of a few materials are given in ohm.metre. Which of these materials can be used for making an element of a heating device ?
(A) $6.84 \times 10^{-8}$
(B) $1.60 \times 10^{-8}$
(C) $1.00 \times 10^{-4}$
(D) $2.50 \times 10^{12}$
(E) $4.40 \times 10^{-5}$
(F) $2.30 \times 10^{17}$.
4. Two wires $A$ and $B$ are of equal lengths, different cross-sectional areas and made of the same metal.
(a) (i) Name the property which is same for both the wires.
(ii) Name the property which is the different for both the wires
(b) I fthe resistance of wire $A$ is four times the resistance of wire $B$, calculate
(i) the ratio of the cross-sectional area of the wires.
(ii) the ratio of the radii of the wires.

- Watch Video Solution

5. Two students perform experiments on series and parallel combinations of two given resistors $R_{1}$ and $R_{2}$ and plot the following V-I graphs [Fig. 5.24.]. Which of the graphs is/are correctly labeled in terms of the words 'series' and 'parallel'? Justify your answer.

(a)

(b)

## D Watch Video Solution

6. Two electric circuits $I$ and $I I$ are shown in (Fig. 3.55). In circuit $I$, the key $K$ is closed whereas in circuit $I I$, the key
is open. Compare the currents $I$ and circuit $I I$.


## - Watch Video Solution

7. The electric power consumed by a device may be calculated by using either of the two expressions : $P=I^{2} R$ or $P=V^{2} / R$. The first expression indicates that it is directly proportional to $R$ whereas the second expression indicates inverse proportionality. How can the seemingly different dependence of $P$ on $R$ in these expressions be explained ?

## Value Based Question

1. In ancient times when lightning was the privilege of 'devine beings', a question - 'how much does lightning cost ?' would have been regarded as a sin. Today, electricity is a commodity that can be measured and priced like any other. The potential of a lightning discharge is 25 million volts and the maximum intensity of the current rating is 200,000 amperes.
(a) What is the power of the discharge ?
(b) What is the energy spent in the lightning if it lasts for
$0.001 s ?$
(c) What is the approximate cost of a lightning discharge
(d) What message did nature convey to the man through
lightning?

## - Watch Video Solution

2. If you were asked to think of electricity, many favourable and unfavourable images come to your mind.
(i) Name the favourable images.
(ii) What are the unfavourable images ?
(iii) What is common to all these images ?

## - Watch Video Solution

3. Our nervous system is electrical in nature and is highly sensitive to external current. Electrical shock occours due to flow of current through the body when a voltage is imerssed on it.
(i) To prevent injury, the important quantity to control is current and not voltage. Comment.
(ii) What are the approximate values of electric current that :
(a) stop breaking.
(b) cause ventricular fibrillations and.
(c) cause series burns ?
(iii) A bird can roost on a high-voltage wire without being eletrocuted, How is a bird different from a man in this respect?
4. Tranditional methods for estimating body-fat percentage involve the use of buoyancy tanks or calipers to pinch the flesh. We now adopt a different technique, called BIA.
(i) What is $B I A$ ?
(ii) What promise does it hold in medical science?

## Problem For Practice

1. $n$ electrons flow through a cross-section of a conductor
in time $t$. If the charge on an electron is $e$, write an
expression for the current in the conductor.

## D Watch Video Solution

2. $0.5 C$ charge passes through a cross-section of a conductor in $5 s$. Find the current.

## D Watch Video Solution

3. A polythene piece rubbed with wool is found to have negative charge of $3 \times 10^{-7} C$. Estimate the number of electrons transferred.

## - Watch Video Solution

4. Calculate the current in a wire if 1500 C charge is passed through it in 5 minutes.

## - Watch Video Solution

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

## - Watch Video Solution

6. How much work is done in moving a charge of $2 C$ across two points having a potential difference of 12 V ?
7. An incandescent lamp of resistance $80 \Omega$ draws a current of 0.75 A . Find the line voltage.

## - Watch Video Solution

8. A current of $0.2 A$ flows through a conductor of resistance $4.5 \Omega$. Calculate the potential difference at the ends of the conductor.

## - Watch Video Solution

9. A bulb of resistance $400 \Omega$ is connected to 220 V mains.

Calculate the magnitude of current.
10. An electric heater draws a current of $5 A$ when connected to 220 V mains. Calculate the resistance of its filament.

## - Watch Video Solution

11. (a) How much current will an electric bulb draw from a 220 V source, if the resistance of the bulb filament is $1200 \Omega$ ?
(b) How much current will an electric heater draw from a 220 V source, if the resistance of the heater coil is $100 \Omega$ ?
12. The potential difference between the terminals of an electric heater is 60 V when it draws a current of 4 A from the source. What current will the heater draw if the potential difference is increased to 120 V ?

## - Watch Video Solution

13. A $4 \Omega$ wire is doubled on it. Calculate the new resistance of the wire.

## - Watch Video Solution

14. When a potential difference of $2 V$ is applied across
the ends of a wire of $5 m$ length, a current of $1 A$ is found
to flow through it. Calculate
(i) the resistance per unit length of the wire,
(ii) the resistance of $2 m$ length of the wire.
(iii) the resistance across the ends of the wire if it doubled on itself.

## D Watch Video Solution

15. What should be the length of a nichrome wire of resistance $4.5 \Omega$, if the length of a similar wire is 60 cm and resistance $2.5 \Omega$ ?

## D Watch Video Solution

16. A negligibly small current is passes through a wire of length $15 m$ and of uniform cross-section $6.0 \times 10 \%-7 m^{2}$ and its resistance is measured to be 5.0 . What is the resistivity of the material at the temperature of the experiment?

## - Watch Video Solution

17. A metal wire of resistivity $64 \times 10^{-6}$ ohm cm and length 198 cm has a resistance of $7 \Omega$. Calculate its radius.
18. Calculate the resistivity of the material of a wire 1.0 m long, 0.4 mm in diameter and having a resistance of $2.0 \Omega$.

## - Watch Video Solution

19. The resistivity os copper is $1.76 \times 10^{-8}$ ohm m . The radius of the wire is 1 mm . Calculate the length of a telegraph wire needed for having a resistance of $10.5 \Omega$.

## - Watch Video Solution

20. A resistance wire made from German silver has a resistance of $4.25 \Omega$. Calculate the resistance of another wire, made from the same material, such that its length
increases by 4 times and area of cross-section decrease by
3 times.

## - Watch Video Solution

21. Resistance of a metal wire of length 1 m is $26 \Omega$ at $20^{\circ} \mathrm{C}$. If the diameter of the wire is 0.3 mm , what will be the resistivity of the metal at that temperature ? Using Table 1.1, predict the material of the wire.

## - Watch Video Solution

22. Calculate the amount of charge that would flow in 2 hours through the element of an electric bulb drawing a current of $0.25 A$.

## - Watch Video Solution

23. A cylinder of a material is 10 cm long and has a crosssection of $2 \mathrm{~cm}^{2}$. If its resistance along the length be $20 \Omega$, what will be its resistivity in numbers and units ?

## - Watch Video Solution

24. A piece of wire of resistance $20 \Omega$ is drawn so that its length is increased to twice is original length. Calculate resistance of the wire in the new situation.

## - Watch Video Solution

25. Calculate the area of cross-section of a wire if its length is $.0 m$, its resistance is $23 \Omega$ and the resistivity of the material is $1.84 \times 10^{-6} \Omega \mathrm{~m}$.

## - Watch Video Solution

26. An electric lamp, whose resistance is $20 \Omega$ and a conductor of $4 \Omega$ resistance are connected to a 6 V battery as shown in (Fig. 3.18) Calculate.
(a) the total resistance of the circuit,
(b) the current through the circuit, and
(c) the potential difference across the electric lamp and
the conductor.


## - Watch Video Solution

27. Three resistors of $2 \Omega, 3 \Omega$ and $4 \Omega$ are connected in
(a) series
(b) parallel.

Find the equivalent resistance in each case.
28. Calculate the equivalent resistance between the points
$A$ and $B$ in the circuits shown in (Fig. 3.19)
(a) and (Fig. 3.19) (b).

(a)

(b)

## - Watch Video Solution

29. Three resistors, each of $2 \Omega$, are connected together so that their total resistance is $3 \Omega$. Draw a diagram to show this arrangement and check it by calculation.
30. A combination consists of three resistors in series.

Four similar sets are connected in parallel. If the resistance of each resistor is $2 \Omega$, find the resistance of this combination.

## - Watch Video Solution

31. A circuit consists of $1 \Omega$ wire in series with a parallel arrangement of $6 \Omega$ and $3 \Omega$ wires. Calculate total resistance of the circuit.
32. Calculate the effective resistances between the points
$A$ and $B$ in the networks shown in (Fig. 3.20)
(a) and (Fig. 3.20)(b).


## D Watch Video Solution

33. Two resistors $4 \Omega$ and $6 \Omega$ connected in parallel. The combination is connected across a 6 V battery of negligible resistance. Calculate
(a) the current through the battery
(b) current through each resistor.

## - Watch Video Solution

34. Carefully study the circuit diagram shown and calculate the value of $x$.

A. 14.3 ohm
B. 11.3 ohm
C. 12 ohm

## Answer: B

## - Watch Video Solution

35. Three resistors of $6 \Omega, 2 \Omega$ and $x$ are connected in series to a cell of emf 1.5 V . The current registered is
$(1 / 6) A$. Calculate the value of $x$.

## - Watch Video Solution

36. Calculate the equivalent resistances between the points $A$ and $B$ of the circuits shown in (fig. 2.33)(b).


## D Watch Video Solution

37. A parallel combination of three resistors takes a current of 7.5 A from a 30 V supply. If the two resistors are $10 \Omega$ and $12 \Omega$, find third one.
38. A wire whose resistance is $80 \Omega$ is cut into three pieces of equal lengths which are then arranged in parallel. Calculate the resistance of the combination.

## - Watch Video Solution

39. Five resistors, each $3 \Omega$, are connected as shown in (fig.
3.23). Calculate the resistance between the points
(a) A and b
between the point $C$ and $D$.


## - Watch Video Solution

40. A electric iron consumes energy at the rate of
(a) $840 W$ when heating is at the maximum rate and
(b) $360 W$ when the heating is at the minimum. The
voltage is 220 V What are the current and the resistance in each case?

## - Watch Video Solution

41. A torch bulb of $3 V$ draws a current of $0.4 A$. If the bulb is switched on for 5 minutes, calculate the energy released by the bulb.

## - Watch Video Solution

42. An electric heater a current of $5 A$ and its element has
a resistance of $50 \Omega$. If the heater is switched on for 5 minutes, calculate the energy released in kilojoules.
43. An electric room heater has a resistance of $25 \Omega$ and operates at 220 V for 12 minutes. Calculate heat energy dissipated by it in kilojoules.

## - Watch Video Solution

44. Calculate the total power of 5 fans if each of them draws a current of 0.8 A at a potential difference of 220 V .

## - Watch Video Solution

45. An electric bulb of resistance $400 \Omega$, draws a current of
0.5 A . Calculate the power of the bulb and the potential
difference at its ends.

## D Watch Video Solution

46. A soldering rod iron draws an energy of 45000 J in 4 minutes when the current flowing through its element is $6 A$. Calculate the resistance of its heating element.

## D Watch Video Solution

47. An electric bulb is marked $250 W-200 V$. What information does it convey ? How many Joules of energy is consumed by this bulb in one hour ? How long will it take for the bulb to consume $1 k W h$ ?
48. 100 J of heat are produced each second in a $4 \Omega$ resistance. Find the potential difference across the resistor.

## - Watch Video Solution

49. An electric bulb is connected to a 220 V generator. The current is 0.50 A . What is the power of the bulb ?

## - Watch Video Solution

50. An electric refrigerator rated $400 W$ operates 8 hour//day. What is the cost of the energy to operate it for

30 days at Rs. 3.00perkWh ?

## D Watch Video Solution

51. Two bulbs of $100 W$ each and two coolers of $250 W$ each, work on an average 6 hours a day. If the energy costs Rs. $1.75 \operatorname{perkWh}$, calculate the monthly bill and the minimum fuse rating when power is supplied at 250 V .

## D Watch Video Solution

52. An electric kettle is rated at $230 \mathrm{~V}, 1000 \mathrm{~W}$. What is the resistance of its element ? What maximum current can pass through its element ?
53. Two bulbs $A$ and $B$ are rated
$100 \mathrm{~W}-120 \mathrm{~V}$ and $10 \mathrm{~W}-120 \mathrm{~V}$ respectively. They are connected across a 120 V source in series. Which will consume more energy ?

## - Watch Video Solution

54. Draw a circuit diagram of an electric circuit containing a cell, a key, an ammeter, a resistance of $4 \Omega$ in series with a combination of two resistors $(8 \Omega)$ in parallel and a voltmeter across the parallel combination. Each of them dissipate maximum energy and can withstand a maximum
power of $16 W$ without melting. Find the maximum current that can flow through the three resistors.

## - Watch Video Solution

55. A resistance of $10 \Omega$ is bent in the from of a closes circle. What is the effective resistance between the two at the ends of any diameter of this circle ?

## - Watch Video Solution

56. State which has a higher resistance : $a 50 W$ or $a 25 W$
lamp and how many times?
57. An electric geyser has the rating $2000 \mathrm{~W}-220 \mathrm{~V}$ marked on it. What should be the minimum current rating (in whole number) of the fuse-wire to be used ?

## - Watch Video Solution

58. Two resistors with resistances $10 \Omega$ and $15 \Omega$ are to be connected to a battery of emf12V so as to obtain :
(i) minimum current
(ii) maximum current. How will you connect the resistances in each case ? Calculate the strength of the total current in the circuit in the two cases.
59. What is the safest voltage you can put across a $98 \Omega-0.5 W$ resistor ?

## D Watch Video Solution

## Exemplar Multiple Choice

1. A cell, a resistor, a key and an ammeter are arranged as
shown in the circuit diagrams of (Fig. 3.37). The current

(ii)

(iII)
A. maximum in (i)
B. maximum in (ii)
C. maximum in (iii)
D. the same in all the cases

## Answer: D

## D Watch Video Solution

2. In the following circuits, (Fig. 3.38), heat produced in the resistor or combination of resistors connected to a 12 V battery will be :


A. same in all the cases
B. minimum in case (i)
C. maximum in case (ii)
D. maximum in case (iii)

## Answer: D

## - Watch Video Solution

3. Electrical resistivity of a given metallic wire depends upon:
A. its length
B. its thickness
C. its shape
D. nature of the material

## - Watch Video Solution

4. A current of $1 A$ is drawn by a filament of an electric bulb. Number of electrons passing through a crosssection of the filament in 16 seconds would be roughly :
A. $10^{20}$
B. $10^{10}$
C. $10^{18}$
D. $10^{23}$

## Answer: A

5. Identify the circuit, (Fig.) in which the electrical components have been properly connected.

A. (i)
B. (ii)
C. (iii)
D. (iv)

## - Watch Video Solution

6. What is the maximum resistance which can be made using five resistors each of $(1 / 5) \Omega$ ?
A. $(1 / 5) \Omega$
B. $10 \Omega$
C. $5 \Omega$
D. $1 \Omega$

Answer: D
7. What is the minimum resistance which can be made using five resistors each of $(1 / 5) \Omega$ ?
A. $(1 / 5) \Omega$
B. $(1 / 25) \Omega$
C. $(1 / 10) \Omega$
D. $25 \Omega$

Answer: B

## - Watch Video Solution

8. The proper representation of series combination of cells, (Fig. 3.40) for obtaining maximum potential is :

A. (i)
B. (ii)
C. (iii)
D. (iv)

## Answer: A

## D Watch Video Solution

9. Which of the following represents voltage ?
A. $\frac{\text { Work done }}{\text { Current } \times \text { Time }}$
B. Work done $\times$ Charge
c. $\frac{\text { Work done } \times \text { Time }}{\text { Current }}$
D. Work done $\times$ Charge $\times$ Time

Answer: A

## - Watch Video Solution

10. A cylindrical conductor of length $l$ and uniform area of cross-section $A$ has resistance $R$. Another conductor of length $2 l$ and resistance $R$ of the same material has area of cross-section :
A. $A / 2$
B. $3 A / 2$
C. $2 A$
D. $3 A$

Answer: C

## - Watch Video Solution

11. A student carries out an experiment and plots the $V-I$ graphs of three samples of nichrome wire with resistances $R_{1}, R_{2}$ and $R_{3}$ respectively, (Fig. 3.41). Which
of the following is true?

A. $R_{1}=R_{2}=R_{3}$
B. $R_{1}>R_{2}>R_{3}$
C. $R_{3}>R_{2}>R_{1}$
D. $R_{2}>R_{3}>R_{1}$

Answer: C
12. If the current $I$ through a resistor is increased by $100 \%$ (assume that temperature remains unchanged), the increase in power dissipated will be :
A. $100 \%$
B. $200 \%$
C. $300 \%$
D. $400 \%$

Answer: C

- Watch Video Solution

13. The resistivity does not change if :
A. the material is changed
B. the temperature is changed
C. the shape of the resistor is changed
D. both material and temperature are changed

## Answer: C

## - Watch Video Solution

14. In an electrical circuit three incandescent bulbs
$A, B$ and $C$ of rating $40 W, 60 W$ and 100 W respectively are connected in parallel to an electric source. Which of
the following is likely to happen regarding their brightness ?
A. Brightness if all the bulbs will be the same.
B. Brightness of bulb $A$ will be the maximum.
C. Brightness of bulb $B$ will be more than that of $A$.
D. Brightness of bulb $C$ will be less than that of $B$.

## Answer: C

## - Watch Video Solution

15. In an electrical circuit, two resistors of $2 \Omega$ and $4 \Omega$ respectively are connected in series to a 6 V battery. The heat dissipated by the $4 \Omega$ resistor in $5 s$ will be :
A. 5 J
B. 10 J
C. 20 J
D. 30 J

Answer: C

## D Watch Video Solution

16. An electric kettle consumes $1 k W$ of electric power when operated at 220 V . A fuse-wire of what rating must be used for it?
A. $1 A$
B. $2 A$
C. $4 A$
D. $5 A$

## Answer: D

## - Watch Video Solution

17. Two resistors of resistances $2 \Omega$ and $4 \Omega$ when connected to a battery will have :
A. same current flowing through them when connected in parallel
B. same current flowing through them when
connected in series
C. same potential difference across them when connected in series
D. different potential differences across them when connected in parallel.

## Answer: B

## D Watch Video Solution

18. Unit of electric power may also be expressed as :
A. volt ampere
B. kilowatt hour
C. watt second
D. Joule second

## Answer: A

## D Watch Video Solution

## Mock Test Sec A

1. There are two electric bulb :
(i) marked $60 \mathrm{~W}, 220 \mathrm{~V}$ and
(ii) marked $100 \mathrm{~W}, 220 \mathrm{~V}$

Which one of them has higher resistance?
2. Out of the two, a toaster of $1 k W$ and an electric heater of $2 k W$, which has a greater resistance?

- Watch Video Solution

3. An electric iron has a rating of $750 \mathrm{~W}, 220 \mathrm{~V}$. Calculate :
(i) current passing through it and
(ii) its resistance, when in use.

- Watch Video Solution

4. A wire 1.0 m long, 0.2 mm in diameter, has a resistance of $10 \Omega$. Calculate the resistivity of its material.

## D Watch Video Solution

5. What is an electric circuit ? Distinguish between an open and a closed circuit.

## D Watch Video Solution

6. Describe two conducting materials which are meant for specific uses.

Describe briefly the phenomenon of heat production by an electric current?

## - Watch Video Solution

7. Discuss electric energy and electric power. Give their units.

## - Watch Video Solution

8. What do you mean by rating of an electric appliance ?

Illustrate with an example.

## - Watch Video Solution

9. Two metallic wires $A$ and $B$ (of the same material) are connected in parallel. Wire $A$ has length $l$ and radius $r$,
wire $B$ has a length $3 l$ and radius $3 r$. Compute the ratio of the total resistance of parallel combination and the resistance of wire $A$.

## - Watch Video Solution

10. Calculate the equivalent resistance between the points
$A$ and $B$ in the combination of resistors shown in (Fig.
3.56).


- Watch Video Solution

11. If three resistors having resistances $2 \Omega, 3 \Omega$ and $5 \Omega$ are connected in parallel, then will the value of the total resistacne be less than $2 \Omega$, or greater than $2 \Omega$ or lie between $2 \Omega$ and $5 \Omega$ ? Explain.

## - Watch Video Solution

12. A piece of wire having resistance $R$ is cut into four equal parts.
(i) How will the resistance of each part combination compare with the original wire ?
13. A piece of wire of resistance $R$ is redrawn by pulling it until its length is doubled. Compare the new resistance with the original value.

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

## - Watch Video Solution

14. In the circuit diagram given in (Fig. 3.57), calculate :
(a) the current through each resistor
(b) the total current in the circuit
(c) the total effective resistance of the circuit.


## - Watch Video Solution

15. If you were asked to think of electricity, many favourable and unfavourable images come to your mind.
(i) Name the favourable images.
(ii) What are the unfavourable images ?
(iii) What is common to all these images ?
16. (a) Why a bird perched on a high voltage wire is not killed by the current?
(b) How many $176 \Omega$ resistors (in parallel) are required to carry a current of 5 A in 220 V line ?

## - Watch Video Solution

17. (a) Water boils in an electric kettle in 15 minutes after being swiched on. Using the same mains supply, should the length of the heating element be increased or decreased if the water is to boiled in 10 minutes? Why ?

Does Ohm's law hold good under all conditions?
18. (a) What is meant by saying that the potential difference two points is 1 volt ? Name a device that helps to measure the potential difference across a conductor.
(b) Why does the connecting cord of an electric heater not glow hot while the heating element does?
( c) Electrical resistivities of some substances at $20^{\circ} \mathrm{C}$ are given below :

Silver $1.60 \times 10^{-8} \Omega m$
Copper $1.62 \times 10^{-8} \Omega m$
Tungsten $5.20 \times 10^{-8} \Omega m$
Iron $10.0 \times 10^{-8} \Omega m$

Mercury $94.0 \times 10^{-8} \Omega m$

Nichrome $100 \times 10^{-6} \Omega m$.

Answer the following question in relation to them :
(i) Among silver and copper, which one is a better
conductor ? Why?
(ii) Which material would you advise to be used in electrical heating devices ? Why ?

## D Watch Video Solution

19. (a) Name an instrument that measures electric current in a curcuit. Define the unit of eletric current.
(b) What do the following symbols, (Fig. 3.58) mean in a circuit diagram?
(c) An electric circuit consisting of a $0.5 m$ long nichrome wire $X Y$, an ammeter, a voltmeter, four cells of 1.5 V each and a plug key was set up.
(i) Draw a diagram of this electric circuit to study the relation between the potential difference maintained
between the points ' X ' and ' Y ' and the electric current flowing through $X Y$.
(ii) Graph shown in (Fig. 3.59) was plotted $V$ and $I$ values.

What would be the values of $v / I$ ratios when the potential differences are $0.8 \mathrm{~V}, 1.2 \mathrm{~V}$ and 1.6 V respectively ? What conclusion do you draw from these values?
(i)

(ii) -(0)-

20. You are making a snack for you some friends to helpo you get ready for a full night of studing. You decide that coffee, toast and popcorn would be a good start. You turn on the toaster ( 900 W ), place some popcorn in the microwave ( 1200 W ), and turn it on. Because your apartment is an older building, the fuse ( 10 A rating) may blow when you turn on too many appliances at 220 V .
(i) Should you suggest the coffeemaker ( 600 W ) ?
(ii) Check the answer to part (i).
(iii) If not, suggest an alternative to start the coffeemaker.
(iv) Which human quality corresponds to blowing of the fuse ?
21. Three incandescent bulbs of 100 W each are connected in series in an electric circuit. In another circuit, another set of three bulbs of the same wattage are connected in parallel to the same source.
(a) Will the bulbs in the two circuits glow with the same brightness ? Justify your answer.
(b) Now let one bulb in both circuits get fused. Will the rest of the bulbs continue to glow in each circuit ? Give reason.
(a) In a household electric circuits, different appliances are connected in parallel to one another. Give two reasons for the same.
(b) An electrican puts a fuse of rating $5 A$ in that part of domestic electrical circuit in which electrical heater of
rating $1.5 k W, 220 \mathrm{~V}$ is operating. What iis likely to happen in this case and why ? What change, if any, needs to be made ?

## - Watch Video Solution

## Mock Test Sec B

1. Which one of the given four milliammeters shown in
(Fig. 3.60) would you use for measurement of current
flowing in a circuit?


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2. The rest positions of the needles in a miliammeter and voltmeter not in use are as shown in (Fig. 3.61)(a). When a
student uses these in his experiment, the readings of the needles are in the positions shown in (Fig. 3.61)(b). Find the corrected values of current and voltage in the experiment.

(a)

(b)

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3. To the terminals marked as $X$ and $Y$ in the given circuit, three students connect 4 cells of voltage 1.5 V each in three different manners (A),(B), (C) shown in (Fig. 3.62). Find the readings $\left(V_{A}, V_{B}, V_{C}\right)$ of the voltmeter, for
the three students.


To teminal $X$

(A)

To terminal X

(B)

To terminal $X$

(C)
4. To determine the equivalent resistance of two resistors when connected in series, a student arrnaged the circuit components as shown in (Fig. 3.63) But he did not succeed to achieve the objective. Which mistake has been committed by him in setting up the circuit?


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5. The following instruments are available in a laboratory :
(i) Milliammeter $A_{1}$ of range 0.300 mA and least count

## $10 m A$

Milliammeter $A_{2}$ of range 0.200 mA and least count $20 m A$

Voltmeter $V_{1}$ of range 0.3 V and least count 0.3 V
Which pair of instruments would be the best choice for carrying out the experiment to determine the equivalent resistance of two resistors connected in series ?

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6. For the circuits $A$ and $B$ shown in (Fig. 3.64), what would be the voltmeter readings ?

(A)

(B)

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