PHYSICS

BOOKS - ZEN PHYSICS (KANNADA ENGLISH)

ELECTRICITY

Questions Section In Text Questions

1. What does an electric circuit mean?

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2. Define the unit of current.

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3. Calculate the number of electrons constituting one coulomb of c.harge. (charge on 1 electron =1.6×10^{-19} C)

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

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

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

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

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

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

value. What change will occur in the current through it?

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

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11. Use the data in table 12.2 to answer the following

a] Which among iron and mercury is 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 $5\Omega, 8\Omega$ and 12Ω and a plug key, all connected in series.

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13. Redraw the circuit of question 1, putting in an ammeter to measure the current through the resistors and a voltmeter to measure potential difference across the 12 Ω resistor. What would be the readings in the ammeter and the voltmeter?

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14. Judge the equivalent resistance when the following are connected in parallel $\rightarrow$ a. 1Ω and $10^6\Omega$. b. 1Ω and $10^3\Omega$ and $10^6\Omega$.

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15. An electric lamp of 100Ω , a toaster of resistance 50Ω, and a water filter of resistance 500Ω 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 and what is the current through it?

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

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

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18. What are [i] the highest and [ii] the lowest total resistances which can be secured by combinations of four coils of resistances $4\Omega, 8\Omega, 12\Omega$ and 24Ω?

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

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

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21. An electric iron of resistance 20Ω takes a current of 5 A. Calculate the heat developed in 30 sec.

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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 of the motor and the energy consumed in 2 h.

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Questions Section Textual Exercise

1. A piece of wire resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R' then the ratio R/R' is

A. I/25

B. I/5

C. 5

D. 25

Answer: D

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

A. I^2R

B. IR^2

C. VI

D. $V^{2/R}$

Answer: B

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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

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

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: C

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

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6. A copper wire has diameter 0.5mm and resistivity of $1.6 \times 10^{-8} \Omega$m. what will be the length of this wire to make its resistance 10Ω? How much does the resistance change if the diameter is doubled ?

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7. The values of current I flowing in a given resistor for the corresponding values or potential difference V across the resistor are

given below

I (amperes)	0.5	1.0	2.0	3.0	4.0
V (volts)	1.6	3.4	6.7	10.2	13.2

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

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

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9. A battery of 9V is connected in series with resistors of $0.2\Omega, 3\Omega, 0.4\Omega$ and 12Ω respectively. How much current would flow through the 12Ω resistors ?

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

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11. Show how you would connect three resistors, each of resistance 6Ω so that combination has a resistance of

(i) 9Ω (ii) 4Ω

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12. Several electric bulbs designed to he 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 220V line of the maximum allowable current is 5A ?

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

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14. Compare the power used in the 2Ω resistors in each of th following circuits :

(i) a 6V battery in series with 1Ω and 2Ω resistor, and

(ii) a 4 V battery in parallel with 12Ω and 2Ω resistors.

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15. Two lamps, one rated 100 W at 220 V, and the other 60 W at 220 V, are connected in parallel to electric mains supply. What current

is drawn from the line if the supply voltage is 220 V?

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16. Which uses more energy, a 250 W TV set in 1 hr, or a 1200 W toaster in 10 minutes?

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17. An electric heater of resistance 8Ω draws 15 A from the service mains 2 hours. Calculate the

rate at which heat is developed in the heater.

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18. Explain the following.

a] Why is tungsten used almost exclusively for filament of electric lamps?

b] Why are the conductors of electric heating devices, such as bread-toasters 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 area of cross-section?

e] Why are copper and aluminum wires usually employed for electricity transmission?

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19. A piece of wire resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R' then the ratio R/R' is

A. I/25

B. I/5

C. 5

D. 25

Answer: D

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

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D. $V^{2/R}$

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B. 75 W

C. 50 W

D. 25 W

Answer: D

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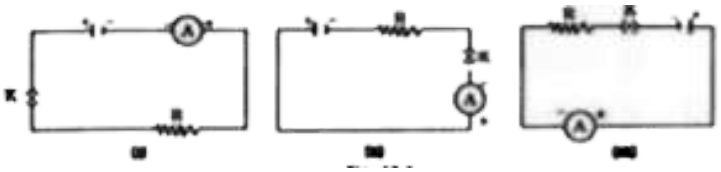
Zen Additional Questions Section Multiple Choice Questions

1. A cell, a resistor, a key and ammeter are arranged as shown in the circuit diagrams. The current recorded in the ammeter will be



A. maximum in [i]

B. maximum in [ii]

C. maximum in [iii]

D. the same in all the cases

Answer: B

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2. Electrical resistivity of a given metallic wire depends upon

A. its length

B. its thickness

C. its shaps

D. nature of the material

Answer: D

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3. What is the maximum resistance which can be made using five resistors each of $1/5\Omega$?

A. $1/5\Omega$

B. 10Ω

C. 5Ω

D. 1Ω

Answer: D

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4. 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. 25Ω

Answer: B

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5. Which of the following represents voltage?

A. Work done/Current $\times$ Time

B. Work done/Charge

C. Work done $\times$ Time/Current

D. Work done Charge Time

Answer: A

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6. Unit of electric power may also be expressed as

A. volt ampere

B. kilowatt hour

C. watt second

D. joule second

Answer: A

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7. Which of the following statements does not represent Ohm's law?

A. current/potential difference = constant

B. potential difference/current = constant

C. potential difference = current $\times$ resistance

D. current = resistance $\times$ potential difference.

Answer: D

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8. Two resistances of 100 Ω and zero ohm are connected in parallel. The overall resistance will be

A. 100 Ω

B. 50 Ω

C. 25 Ω

D. zero ohm

Answer: A

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9. Three resistors 2 Ω, 3Ω and 4Ω are connected so that the equivalent resistance is 9Ω. The resistors are connected

A. all in series

B. all in parallel

C. 2Ω and 3Ω in parallel and the combination in series with 4Ω

D. 2Ω and 3Ω in series and the combination in parallel to 4Ω

Answer: A

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10. When a current 'I' flows through a resistance 'R' for time 't' the electrical energy spent is given by

A. IRt

B. I^2Rt

C. IR^2t

D. I^2R/t

Answer: B

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11. When a fuse is rated 8 A, it means

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B. it has a resistance of 8Ω

C. it will work only if current is 8 A

D. it will melt if current exceeds 8 A

Answer: D

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12. The work done in moving a unit positive charge across two points in an electric circuit is a measure of

A. Current

B. potential difference

C. resistance

D. power

Answer: B

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13. The potential at a point is 20 V. The work done to bring a charge of 0.5 C from infinity to this point will be

A. 20 J

B. 10 J

C. 5 J

D. 40 J

Answer: B

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14. The free electrons of a metal

A. do not collide with each other

B. are free to escape through the surface

C. are free to fall into the nuclei

D. are free to move anywhere in the metal

Answer: D

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15. The path of a free electron in a metal is

A. Parabolic

B. Circular

C. a straight line

D. zig zag

Answer: D

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16. When there is an electric current passing through a wire, the particles moving are

A. Electrons

B. Protons

C. Atoms

D. Ions

Answer: A

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B. 30 Ω

C. 810 Ω

D. 10 Ω

Answer: D

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B. Platinum

C. Mercury

D. Carbon

Answer: D

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20. Two electric bulbs have resistances in the ratio 1 : 2. If they are joined in series, the energy consumed in them are in the ratio

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Answer: B

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21. Among the following statements.

1. A discharge lamp uses a discharge tube which is filled with a gas at a very low pressure.

2. Always white light is emitted independent of gas taken in the lamp.

A. Only 1 is true

B. Only 2 is true

C. Both 1 and 2 are true

D. Both 1 and 2 are false.

Answer: A

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22. Among identical spheres A and B having charges as – 5 and - 16 C

A. $-16C$ is at higher potential

B. Both are at equal potential

C. It cannot be said

D. $-5C$ is at higher potential

Answer: A

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23. Keeping the potential difference constant, the resistance of a circuit is doubled. The current will become

A. Double

B. Half

C. One-fourth

D. Four times

Answer: B

24. The resistance of a conductor is 27Ω. If it is cut into three equal parts and connected in parallel, then its total resistance is

A. 6Ω

B. 3Ω

C. 9Ω

D. 27Ω

Answer: B

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25. A piece of metallic wire of resistance R is cut into 3 equal parts. These parts are then connected in parallel. If the total resistance of

this combination is R', then the value of R : R' is

A. $1:3$

B. $9:1$

C. $1:9$

D. $3:1$

Answer: B

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26. An electric kettle for use on a 230 V supply is rated at 3000 W. For safe working, the cable connected to it should be able to carry at least:

A. 2A

B. 5A

C. 10A

D. 15A

Answer: D

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27. At a given time, a house is supplied with 100 A at 220 V. How many 75 W, 220 V light bulbs could be switched on in the house at the same time [if they are all connected in parallel]?

A. 93

B. 193

C. 293

D. 393

Answer: C

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28. If the potential difference between the ends of a fixed resistor is halved, the electric power will become:

A. Double

B. Half

C. Four times

D. One-fourth

Answer: D

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29. The heat produced in a wire of resistance 'X' when a current 'Y' flows through it in time 'Z' is given by

A. $X^2 \times Y \times Z$

B. $X \times Z \times Y^2$

C. $Y \times Z \times X$

D. $Y \times X \times X$

Answer: B

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30. If the current flowing through a fixed resistor is halved, the heat produced in it will become:

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B. $2:1$

C. $4:1$

D. $1:1$

Answer: B

Watch Video Solution

51. Among the following statements.

1. A discharge lamp uses a discharge tube which is filled with a gas at a very low pressure.

2. Always white light is emitted independent of gas taken in the lamp.

A. Only 1 is true

B. Only 2 is true

C. Both 1 and 2 are true

D. Both 1 and 2 are false.

Answer: A

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B. $X \times Z \times Y^2$

C. $Y \times Z \times X$

D. $Y \times X \times X$

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60. If the current flowing through a fixed resistor is halved, the heat produced in it will become:

A. Double

B. One-half

C. One-fourth

D. Four times

Answer: C

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Zen Additional Questions Section Very Short Answer Type Questions

1. What is meant by saying that the electric potential at a point is Ivolt?

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2. How much work is done when one coulomb charge moves against a potential difference is I volt?

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3. What is the SI unit of electric current?

Watch Video Solution

4. Compare how an ammeter and a voltmeter are connected in a circuit.

Watch Video Solution

5. What is the current in a circuit if the charge passing through each point is 20 C in 40 s?

Watch Video Solution

6. Name the unit of electrical resistance and give its symbol.

Watch Video Solution

7. A resistance of 20 ohms has a current of 2 amperes flowing in it. What potential difference is there between its ends?

Watch Video Solution

8. A current of 5 amperes flows through a wire whose ends are at a potential difference of 3 volts. Calculate the resistance of wire.

Watch Video Solution

9. Give the law of combination of resistances in series.

Watch Video Solution

10. State the law of combination of resistances in parallel.

 Watch Video Solution

11. Two resistances x and y are connected

i] in parallel and,

ii] in series. In which case the resultant resistance will be the less than either of the individual resistance?

 Watch Video Solution

12. What is the SI unit of [i] electric energy, and [ii] electric power?

Watch Video Solution

13. Explain why, filament type electric bulbs are not power efficient.

Watch Video Solution

14. Resistance of an incandescent filament of a bulb is comparatively much more than that when it is at room temperature. Why?

Watch Video Solution

15. What happens to the other bulbs in series circuit, if one bulb blows off?

Watch Video Solution

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

Watch Video Solution

17. State the relationship between 1 ampere and 1 coulomb.

Watch Video Solution

18. State the relationship between 1 volt and 1 joule.

Watch Video Solution

19. Would electrons move from higher potentials to lower potentials or vice-versa?

Watch Video Solution

20. Why is a voltmeter connected in parallel across a circuit element?

Watch Video Solution

21. What is the SI unit of potential difference ? Name the device used to measure the potential difference.

Watch Video Solution

22. What is meant by saying that the electric potential at a point is Ivolt?

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Watch Video Solution

42. What is the SI unit of potential difference ? Name the device used to measure the potential difference.

Watch Video Solution

Zen Additional Questions Section Short Answer Type 1 Questions

1. What is nichrome? State its one use.

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2. Which has more resistance:

a] A long piece of nichrome wire or a short one?

b] A thick piece of nichrome wire or a thin piece?

Watch Video Solution

3. What is the meaning of the symbol kWh? Which quantity does it represent?

Watch Video Solution

4. Calculate the amount of charge flowing in a wire if it draws a current of 2 A in 10 minutes.

Watch Video Solution

5. What happens to resistance of a conductor if area of cross section is doubled?

6. Why closed path is required for the flow of current?

7. Draw the V-I graph for ohmic and non-ohmic conductors.

 Watch Video Solution

8. A wire of resistivity p is pulled to double its length. What will be its new resistivity?

 Watch Video Solution

9. List in a tabular form two differences between a voltmeter and an ammeter.

Watch Video Solution

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

Watch Video Solution

11. What is the need of using combination of resistance in electrical circuits? Define equivalent resistance.

Watch Video Solution

12. What is heating effect of current? Mention any two of its applications.

Watch Video Solution

13. Define the term electric power. Write an expression for it.

Watch Video Solution

14. Draw the diagram of an electric circuit in which the resistors R_1, R_2 and R_3 are connected in parallel including an ammeter and a voltmeter and mark the direction of the current.

Watch Video Solution

15. An electric refrigerator rated 400 W is used for 8 hours a day. An electric iron box rated 750 W is used for 2 hours a day. Calculate the cost of using these appliances for 30 days, if the cost of I kWh is Rs 3/-.

Watch Video Solution

16. A bulb is marked 220 V and 40 W. Calculate the current flowing through the bulb and its resistance.

Watch Video Solution

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

Watch Video Solution

18. According to Joule's iaw of heating, mention the factors on which heat produccd in a resistor depends.

According to this law write the formula used talculate the heat produced.

Watch Video Solution

19. The resistivity of manganese wire of length 1 m is $1.84 \times 10^{-6} \Omega m$ at $20^{\circ} C$. If the diameter of the wire is $3 \times 10^{-4} m$, what will be the resistance of the wire at that temperature?

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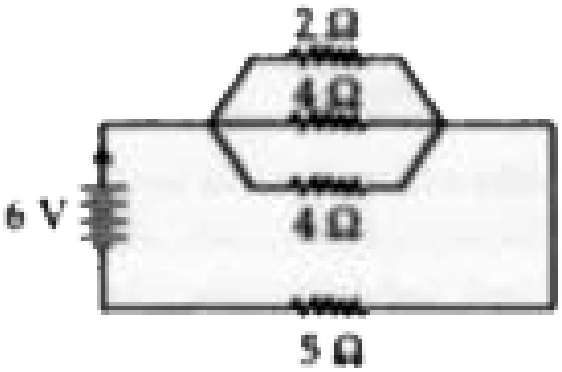
20. Observe the given circuit:



Calculate the total resistance in the circuit and the total current flowing in the circuit.

Watch Video Solution

21. What is nichrome? State its one use.

Watch Video Solution

22. Which has more resistance:

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Watch Video Solution

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Watch Video Solution

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Watch Video Solution

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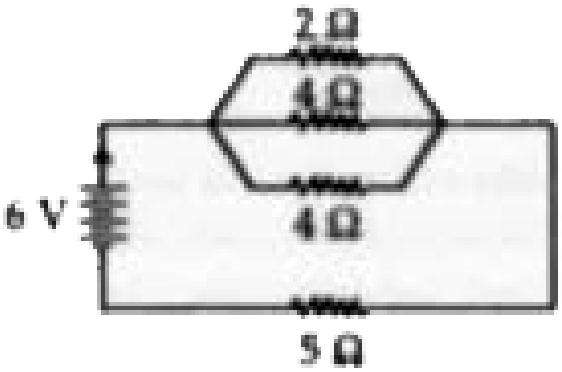

Calculate the total resistance in the circuit and the total current flowing in the circuit.

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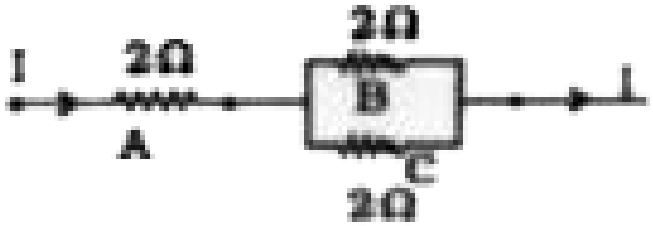
Zen Additional Questions Section Short Answer Type 2 Questions

1. Three 2Ω resistors, A, B and C, are connected as shown in figure. Each of them dissipates energy and can withstand a maximum power of 18 W without melting. Find the maximum current that can flow through the three resistors?



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

Watch Video Solution

3. A current of 1 ampere flows in a series circuit containing an electric lamp and a conductor of 5Ω when connected to a 10 V battery. Calculate the resistance of the electric lamp. Now if a resistance of 10Ω is connected in parallel with this series combination, what change [if any] in current flowing through 5Ω conductor and potential difference across the lamp will take place? Give reason.

Watch Video Solution

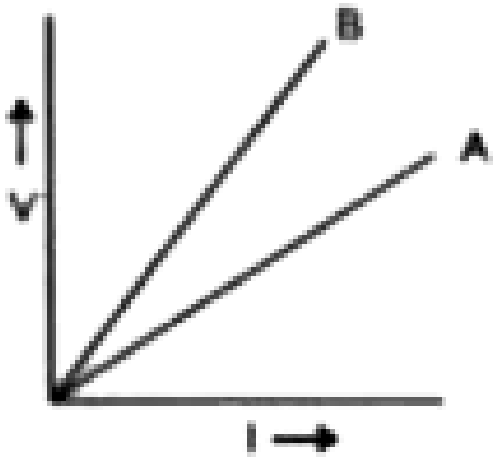
4. Draw a schematic circuit diagram consisting a battery, a plug key, an ammeter and a bulb all connected in series with the bulb. Also show a voltmeter across the bulb.

Watch Video Solution

5. Why is an ammeter always connected in series in a circuit? What change do you observe in the reading of an ammeter if it is connected in parallel in a circuit?

Watch Video Solution

6. Two V-I graphs are drawn individually for two resistors and their combination. Out of A and B which one represents the graph for parallel combination? Give reason for your answer.



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7. Show four different ways in which three resistors of Rohm each may be connected in a circuit. In which case is the equivalent resistance of the combination.

i] Maximum

ii] Minimum

Watch Video Solution

8. Two wires of equal length, one of copper and the other of manganin [an alloy] have the

same thickness. Which one can be used for

i] electrical transmission lines

ii] electrical heating devices? Why?

Watch Video Solution

9. If Three resistors of $6\Omega, 9\Omega$ and 21Ω are connected in series to a 12 V battery, find

a] The total resistance of the circuit.

b] The current flowing through the circuit.

c] The potential difference across the 21Ω resistor.

Watch Video Solution

10. Two resistances when connected in parallel give resultant value of 2Ω, when connected in series the value becomes 9Ω. Calculate the value of each resistance.

Watch Video Solution

11. i] Define electric potential difference. How is ammeter connected in an electric circuit ?

ii] Explain the application of heating effect of

electric current E in an electric bulb and the fuse used in an electric circuit.

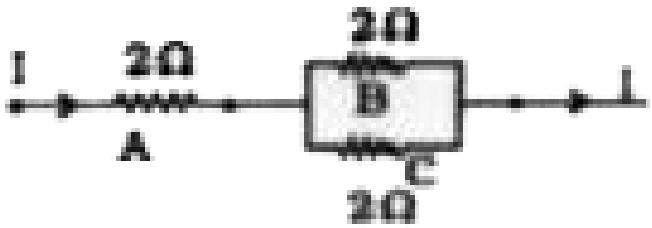
Watch Video Solution

12. i] State Ohm's law

ii] Explain the factors on which the resistance of a conductor depends.

Watch Video Solution

13. Three 2Ω resistors, A, B and C, are connected as shown in figure. Each of them dissipates energy and can withstand a maximum power of 18 W without melting. Find the maximum current that can flow through the three resistors?



Watch Video Solution

14. Draw a circuit diagram of an electric circuit containing a cell, a key, an ammeter, a resistor of 2Ω in series with a combination of two resistors [4Ω each] in parallel and a voltmeter across the parallel combination. Will the potential difference across the 2Ω resistor be the same as that across the parallel combination of 4Ω resistors? Give reason.

Watch Video Solution

15. A current of 1 ampere flows in a series circuit containing an electric lamp and a conductor of 5Ω when connected to a 10 V battery. Calculate the resistance of the electric lamp. Now if a resistance of 10Ω is connected in parallel with this series combination, what change [if any] in current flowing through 5Ω conductor and potential difference across the lamp will take place? Give reason.

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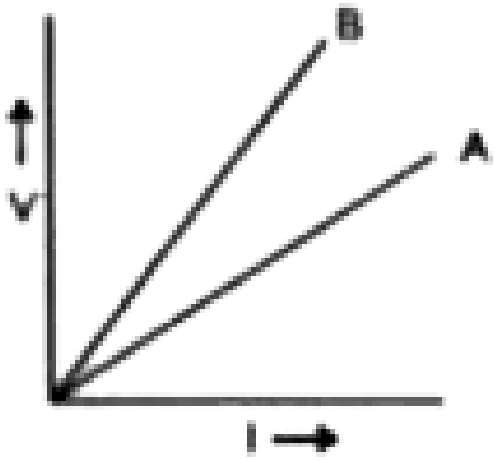

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ii] Minimum

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Watch Video Solution

21. If Three resistors of $6\Omega, 9\Omega$ and 21Ω are connected in series to a 12 V battery, find

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b] The current flowing through the circuit.

c] The potential difference across the 21Ω resistor.

Watch Video Solution

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Watch Video Solution

23. i] Define electric potential difference. How is ammeter connected in an electric circuit ?

ii] Explain the application of heating effect of

electric current E in an electric bulb and the fuse used in an electric circuit.

Watch Video Solution

24. i] State Ohm's law

ii] Explain the factors on which the resistance of a conductor depends.

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Zen Additional Questions Section Long Answer Questions

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

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2. What is electrical resistivity of a material? What is its unit? Describe an experiment to study the factors on which the resistance of conducting wire depends.

Watch Video Solution

3. How will you infer with the help of an experiment that the same current flows through every part 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?

Watch Video Solution

5. a] Obtain an expression for the equivalent resistance of three resistors connected in series. Also write the expressions for current and voltage in the circuit.

b] Mention any two advantages of connecting resistors in series.

Watch Video Solution

6. a] Derive an expression for the equivalent resistance of three resistors RI, R2 and R3 connected in a parallel.

b] Fuse of 3 A, 5 A and 10 A are available, calculate and select the fuse for operating electric iron of I kW power at 220 V line.

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7. a] What is the function of fuse in an electric circuit?

b] What would be the rating of the fuse for an electric kettle which is operated at 220V and consumes 500W power?

c] How is the SI unit of electric energy related to its commerical unit?

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8. a] State Ohm's law. Write it in the form of equation and give graphical representation for it.

b] An electric oven rated at 500W is connected

to a 220V line and used for 2 hours daily. Calculate the cost of electric energy per month at the rate of Rs. 5 per kWh.

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9. What is meant by resistance of conductor? Name and define its Sl unit. List the factors by which the resistance of a wire is affected. What happens if

i] its length is doubled

ii] its radius is doubled?

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10. A household uses the following electrical appliances:

i] Refrigerator of rating 400 W for 10 h each day.

ii] Two electric fans of rating 80 W each for 6 h daily.

iii] Six tube lights of 18 W each for 6 h daily.

Calculate the energy consumed per day by each of these appliances in kWh.

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11. i] List the differences between electrical resistance and resistivity of conductor.

ii] A copper wire of resistivity $1.63 \times 10^{-8} \Omega - m$ has cross section area of $10.3 \times 10^{-4} cm^2$. Calculate the length of the wire required to make a 20Ω coil.

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12. i] Heating elements of electrical heating devices is made up of an alloy rather than a

pure metal. Give two reasons.

ii] Four resistors of 2Ω each are joined end to end to form a square. Calculate the equivalent resistance of the combination between two adjacent corners?

Watch Video Solution

13. Obtain an expression for the heat produced in a conductor when a voltage V is applied across it. Heating effect of electric

current is desirable as well as undesirable. Explain this statement.

Watch Video Solution

14. Compare the power used in the 2Ω resistor in each of the following circuits:

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ii] a 4 V battery in parallel with 12Ω and 2Ω resistors.

Watch Video Solution

15. a] Define electric resistance of a conductor.

b] List the factors on which resistance of a conductor depends.

c] Resistance of a metal wire of length 1 m is $104\Omega \text{ at } 20^{\circ}C$. If the diameter of the wire is 0.15 mm, find the resistivity of the metal at this temperature.

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