



PHYSICS

BOOKS - BETTER CHOICE PUBLICATION

ELECTRIC CURRENT, RESISTANCE AND E.M.F.

Very Short Answer Type Questions

1. The sequence of bands marked on a carbon resistor are white, blue, orange and silver.

Write the value of the resistance with tolerance?



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2. What is the SI unit of conductivity ?



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3. what happens to the resistance of a of a metal wire, when its temperature is reduced to Kelvin zero?



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4. A wire of resistivity ρ is stretched to double its length. Then its new resistivity will:



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5. What happens to the rest of energy in a light bulb whose efficiency is so low ?



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6. What is electrical resistivity of a material?

What is its unit?



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7. Of metal and alloy, which has greater value of temperature coefficient?



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8. Define electric power and unit of electric power



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9. What do you mean by temperature coefficient of resistance ?



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10. Define electric energy



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11. What is the order of resistivity of an insulator?



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12. What is ohmic device? Give one example.



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13. Define e.m.f of a cell. How can you compare the e.m.f of the cells using potentiometer.



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14. What is non-ohmic device? Give one example.



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15. How does conductivity of a semi conductor change with the rise in temperature ?



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16. Why are alloys used for making standard resistance coils?



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17. The conductivity of metals increases with:



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18. Why are alloys used for making standard resistance coils?



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19. Why are copper wires used as connecting wires?



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20. Constantan and manganin are used to make standard resistance because:



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21. Resistance of a conductor increases with the rise of temperature, because.



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22. Define

one ampere?



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**23. What is the resistance of an ideal
voltmeter and an ammeter?**



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24. For alloys the value of temperature Co-efficient of resistance is high.(True/False)



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25. What is the usually capacity of the fuse wire in the lien to feed lights and fuse?

A. both low resistance and low melting point

B. high resistance and low melting point

C. low resistance and high melting point

D. both high resistance and high melting point.

Answer: B



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26. The specific resistance of a conductor increases with

A. increase in temperature

B. increase in cross-sectional area

C. decrease in length

D. decrease in cross-sectional area

Answer: A



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27.1 kW h is equal to

A. $36 \times 10^5 J$

B. $36 \times 10^3 J$

C. $36 \times 10^{-5} J$

D. $3.6 \times 10^{-6} J$

Answer: A



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Short Answer Type Questions

1. Explain the effect of temperature on the resistivity of pure semiconductors.



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2. Difference between ohmic and non ohmic devices.



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3. A piece of copper and another of germanium are cooled from room temperature to 100 K. What will happen to their conductivities? Explain.

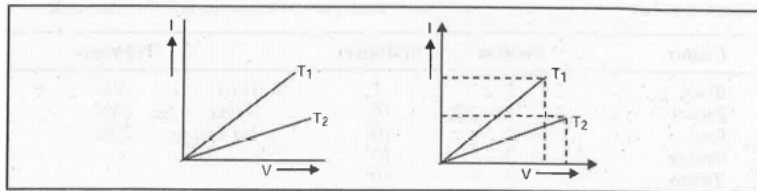




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4. V-I graph for a mettalic wire at two different temperatures T_1 and T_2 is as shown in figure.

WHich of the temperatures T_1 and T_2 is higher and why.



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5. On what factors does the internal resistance of the cell depend?



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6. Is a wire carrying current charged?



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7. What is non-ohmic device? Give one example.



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8. If the electron drift speed is so small and the electron's charge is small, how can we still obtain large amount of current in a conductor?



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9. A large number of free electrons are present in metals. Why is there ni current in the

absence of electric field across it?



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10. Standard resistance coils are made of which materials and why ?



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11. Discuss the effect of temperature on resistivity of metals.



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12. Why conducting wires are made of copper?



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13. What is the resistance of a conductor?

State the factors on which resistance of a conductor depends?



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14. What is the difference between e.m.f. and potential difference?



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15. What are ohmic and non-ohmic resistors?
Give one example of each.



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16. What is e.m.f. of a cell ? On what factors does its value depend ?



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17. Establish the relation between current and drift velocity?



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18. Define drift velocity of electricity and establish its relation with velocity of the electrons and the intensity of applied electric field.



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19. Obtain the condition for maximum current through a resistor, when a number of cells are connected in series.



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20. Define internal resistance of cell and find an expression for it.



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21. What is internal resistance of a cell? Derive an expression for it.



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22. What is internal resistance of a cell? Derive an expression for it.



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23. The internal resistance of a cell is the resistance of



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24. Derive expression for the total resistance of a circuit in which a few resistors are connected in parallel.



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25. Explain colour code for carbon resistors giving examples.



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1. Why are resistance connected in series ?



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2. What is drift velocity of electrons? How do you explain the flow of current in a conductor based on this?



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3. State Ohm's law and derive it from the basic ideas of drift velocity of electrons.



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4. Define drift velocity of electricity and establish its relation with velocity of the electrons and the intensity of applied electric field.



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5. The internal resistance of a cell is the resistance of



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6. Obtain the condition for maximum current through a resistor, when a number of cells are connected in parallel.



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7. Explain the effect of temperature on the resistivity of pure semiconductors.



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8. What is e.m.f. of a cell ? On what factors does its value depend ?



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Numerical Problems

1. A battery of emf 10 V and internal resistance 2Ω is connected to parallel combination of two identical resistors of resistance R. Current in the circuit is 0.5 A. What is the resistance of each resistor ? Find the terminal voltage of the battery.



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2. The value of the resistance is $100\Omega \pm 5\%$
Write the corresponding band colours of resistor.



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3. Three identical cells each of 2 V and unknown internal resistance are connected in parallel. This combination is connected to a 5 ohm resistor. If the terminal voltage across the cell is 1.5 volt, what is the internal resistance of each cell?



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4. A lamp rated 100 W at 220 V is connected to the mains electric supply. What current is drawn from the supply line if the voltage is 220V.



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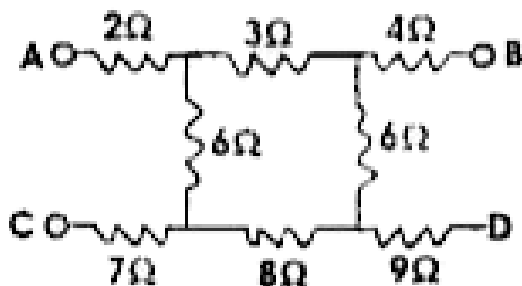
5. Five identical cells each of emf 2 V and internal resistance r are connected in parallel and the combination is connected to external resistance $R = 9\Omega$. If the terminal voltage

across the combination is 1.5 V, find the internal resistance of each cell.



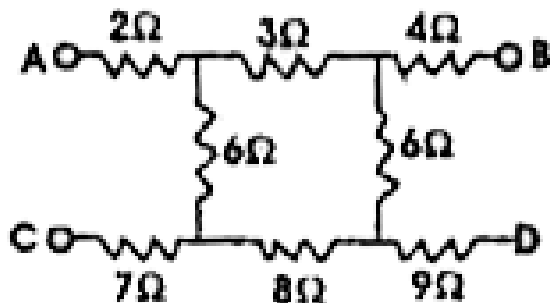
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6. Find the resistance between (a) point A and point B, and (b) point A and th point C of the network as shown below :



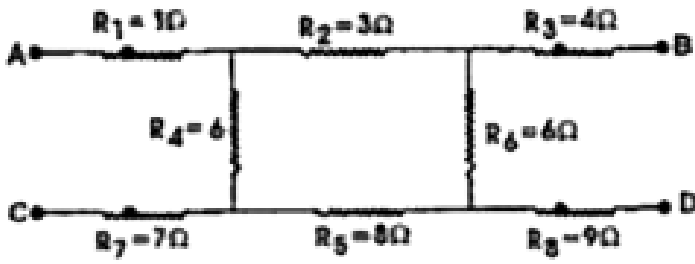
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7. Find the resistance between point C and point B of the network as shown below :



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8. Find the resistance between point A and point D of the network as shown below :



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9. Two resistors when connected together can produce maximum 25 ohm and minimum 6 ohm resistance. Find the The resistance of each resistor.

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10. Two resistors when connected together can produce maximum 40 ohm and minimum 10 ohm resistance. Find the resistance of each resistor.



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11. Two resistors when connected together can produce maximum 45 ohm and minimum 10 ohm resistance. Find the resistance of each resistor.



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12. Calculate the electrical conductivity of the material of a conductor of length 3m, area of cross section 0.2 mm^2 having a resistance of 2 ohm.



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13. A potential difference of 3V is applied across a conductor of resistance 1.5 Ω . Calculate the number of electrons flowing

through it in one second. Given charge on electron, $e = 1.6 \times 10^{-19} C$.



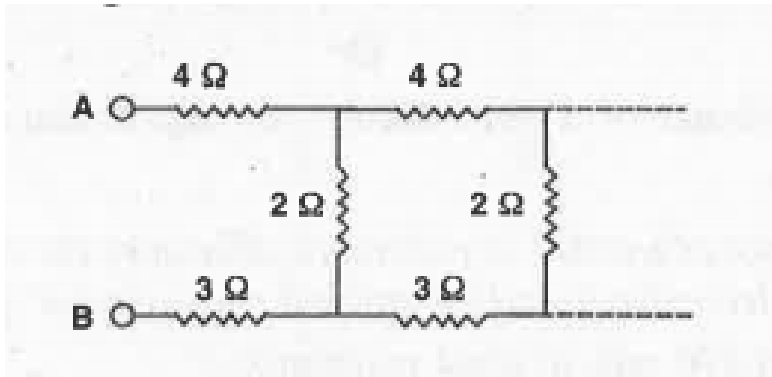
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14. Calculate the resistivity of the material of a wire 1.0 m long, 0.4 mm in diameter and having a resistance of 2.0 ohm.



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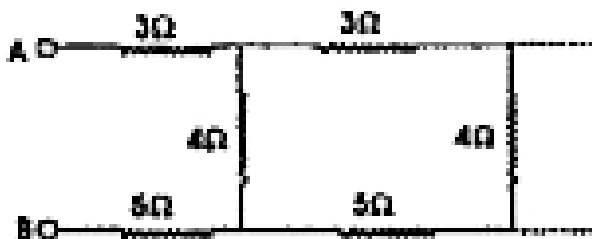
15. Determine the resistance between terminals A and B of the infinite network of resistances as shown in the figure below.



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16. Find the equivalent resistance between terminals A and B of the infinite network of

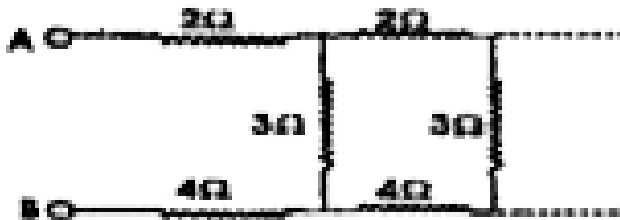
resistance as shown in the diagram below :



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17. Find the equivalent resistance of the circuit between terminals A and B as shown in

the figure below :



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18. Mangal's room heater is marked as $1,000\text{ W}$ - 200 V . Find the percentage change in the power of the heater, if the voltage drops to 160 V .



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19. Munish's room heater is marked as 2000 W - 200 V. Find the percentage | inte, change in the power of heater if voltage a pa drops to 180 V.



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20. Jagriti's room heater is marked as 1500 W- 250 V. Find the percentage in the power of heater if voltage drops to 160 volt.



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21. A battery of e.m.f. 10 V and internal resistance 4 ohm is connected to a parallel combination of two resistors of resistances 10 ohm and 15 ohm. Calculate the terminal voltage of the battery.



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22. A battery of em.f. 6 volt and internal resistance 0.4 ohm is connected to a parallel

combination of two resistors of resistances 9 ohm and 6 ohm. Calculate the terminal voltage of the battery.



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23. A battery of e.m.f. 9 volt. and internal resistance 6 ohm is connected to a parallel combination of two resistors of resistances 20 ohm and 30 ohm. Calculate the terminal voltage of the battery.



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24. A current of 5.0 A flows through an electric press of resistance 11Ω . Calculate the energy consumed by the press in 5 minutes.



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25. A lamp of 100 W works at 220 volt. What is its resistance and current capacity?



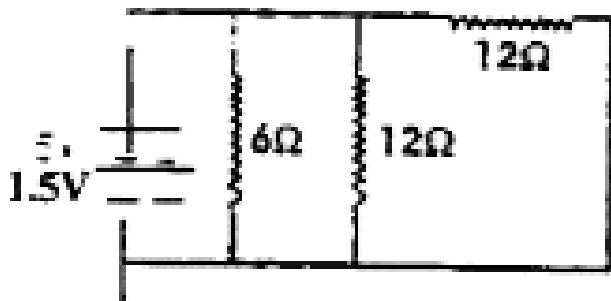
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26. 60 W-220 V bulb and 100 W-200 V bulb are connected in parallel to main supply. Which bulb will draw more current ?



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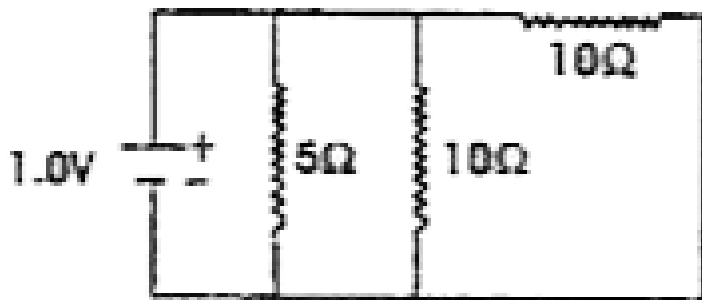
27. If the internal resistance of the cell is 3 ohm, find the current supplied by the cell in the circuit shown in figure.





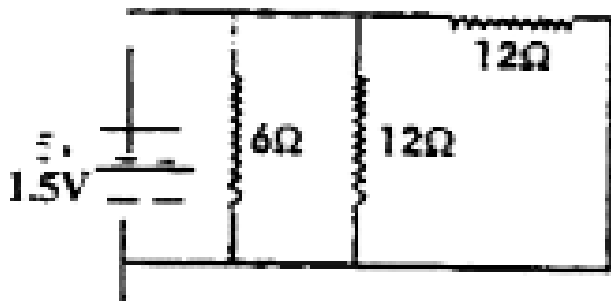
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28. If the internal resistance of the cell is 1.5 ohm, find the current supplied by the cell in the circuit shown in figure.



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29. If the internal resistance of the cell is 3 ohm, find the current supplied by the cell in the circuit shown in figure.



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30. What is resistance of carbon resistance on which colour of ring in sequence is black,

brown, black and gold ?



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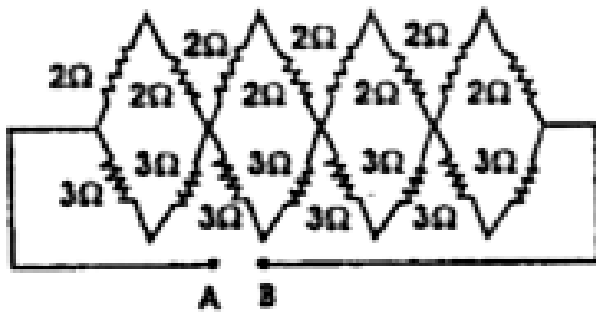
31. A carbon of $47k\Omega$ is to be marked with rings of different colours for its identification .

Write the sequence of colours.



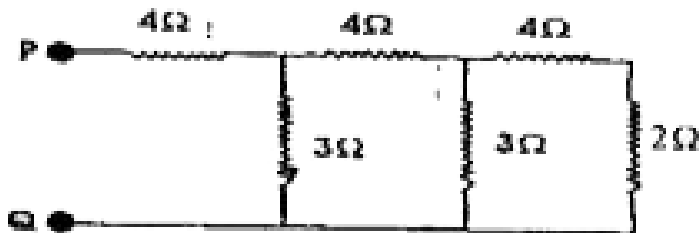
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32. Find the total resistance of the network shown in the figure given below :



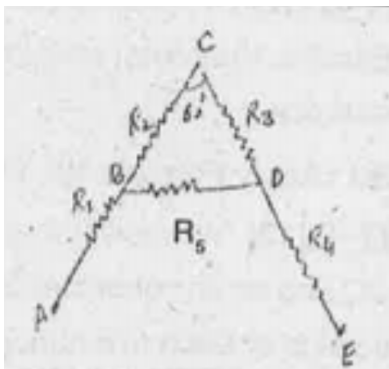
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33. Calculate the equivalent resistance between the points P and of the network shown in the figure given below :





34. A letter .A. consists of a uniform wire of resistance .A. one ohm per cm. The sides of the letter are each 20 cm long and crosspiece in the middle is 10cm long, while the apex angle is 60° . Find the resistance of the letter between two ends of the legs A. and E as shown in figure given below.





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35. What is the colour coding of strips on the carbon resistor of resistances $200\Omega \pm 10\%$?



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36. To produce 10^3 Joules of heat in 10 seconds, how much voltage should be applied to 100 ohm resistance ?



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37. A current of 5 ampere flows in a 10 ohm resistor. Calculate rate of heat energy produced in the resistor.



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38. A heater is rated as 220 volts, and 880 watts. What is the current drawn by the heater when connected to a 220 V a.c. mains ? Calculate the resistance of heater.



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39. A carbon resistor has three colors blue, yellow and red respectively. What will be the resistance?



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40. A carbon resistor has three colors blue, yellow and red respectively. What will be the resistance?



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41. The total resistance of two resistors, when connected in series is 9Ω and when connected in parallel, their total resistance becomes 2Ω . Find the value of each resistance.



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42. Two resistances are in the ratio of 1.4. If these are connected in parallel, their total resistance becomes 16Ω . Find the value of each resistance.



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43. The total resistance of two resistors, when connected in series is 9Ω and when connected in parallel, their total resistance comes 2Ω . Find the value of each resistance.



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44. How will you represent a resistance of $3,700\Omega \pm 10\%$ by colour code?



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45. 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 ohm.



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46. A negligible small current is passed through a wire of length 15 m and uniform cross section $6.0 \times 10^{-7} \text{ m}^2$ and its resistance

is measured to be 5.0Ω . What is the resistivity of the material?



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47. A wire of length 2.0 m, diameter 1.0 mm has $50 \times 10^{-3}\Omega$ (ohm) resistance. Calculate the resistivity of the material of the wire.



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48. A wire has a resistance of 10.5Ω at $21^\circ C$ and 16.4Ω at $147^\circ C$. The value of temperature coefficient of resistance is



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49. The resistance of a tungsten filament at $150^\circ C$ is 133Ω . What will be its resistance at $500^\circ C$? The temperature coefficient of resistance of tungsten at $0^\circ C$ is $0.0045^\circ C^{-1}$



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50. A silver wire has a resistance of 2.1Ω at $27.5^\circ C$, and a resistance of 2.7Ω at $100^\circ C$. Determine the temperature co-efficient of resistivity of silver.



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51. A parallel combination of three resistors takes a current of $5A$ from a $20V$ supply. If the two resistors are of 10 ohm and 8 ohm , find the value of third resistor.



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52. A parallel combination of 3 resistances takes a current of 7.5 A from a 30 V supply. If two resistances are 10Ω and 12Ω , find the third resistances.



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53. A series combination of three resistor takes a current of 2A from a 24 V supply. If the

resistors are in the ratio 1 : 2 : 3, find the values of the unknown resistors.



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54. A wire with an area of cross section as 10mm^2 has resistance of 5Ω when a potential difference across its ends is 25 V. Calculate the drift velocity of electrons. Given the number density of electron as 5×10^{20} electrons per cubic meter (em^{-3})



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Most Expected Questions

1. Define SI unit of resistance.



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2. What do you mean by critical velocity?



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3. What do you mean by relaxation time ?



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4. What is the SI unit of temperature ?



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5. Define the term mobility of charge carriers in a conductor. Write its SI unit.



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6. What do you mean by semiconductors?



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7. What is a thermistor? Write its three applications.



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8. What is the effect of rise in temperature on the conductivity of copper and silicon ?



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9. When do we connect the resistances in series and parallel ?



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10. Define resistivity of a material and discuss the factors on which it depends.



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11. What is electric fuse? Why is it important?



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12. Give the cause of random motion of electrons in a conductor.



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13. Is internal resistance a defect in the cell?



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14. Write three applications of a thermistor.



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