PHYSICS

BOOKS - KUMAR PRAKASHAN KENDRA PHYSICS (GUJRATI ENGLISH)

CURRENT ELECTRICITY

Section A Questions Answers Introduction

1. Explain how current is formed. Give suitable example.

Watch Video Solution

2. By giving explanation of electric current, define current and its SI unit.

Watch Video Solution

3. How current is formed in conductors ?

Watch Video Solution

4. Why current is not formed in solid conductors in absence of electric field ?

Watch Video Solution

Watch Video Solution

5. Explain current formed in solid conductors in presence of external electric field.

Watch Video Solution

6. Write and explain Ohm's law.

Watch Video Solution

7. What is electrical resistance ? Its value depend on which factors ?

Watch Video Solution

8. What is resistivity ? Write its unit. On what factors do resistivity depend? (AU India - 2011)

Watch Video Solution

9. What is conductivity ? Its value depend on which factors ? Write its unit and dimension.

Watch Video Solution

10. What is conductivity ? Its value depend on which factors ? Write its unit and dimension.

Watch Video Solution

11. What is current density ? Derive Ohm's law in form of current density?

Watch Video Solution

12. Explain drift of electron and drift velocity. Derive equation of current in term of cross-section of

conductor.

Watch Video Solution

13. Obtain the equation of resistivity of metal .

Watch Video Solution

14. Why resistivity of metal decreases with increase in temperature..

Watch Video Solution

15. Explain mobility of conductor and derive equation of mobility.

Watch Video Solution

16. Derive equa1ion of mobility in terms of relaxation time (τ). Wrile its unit.

Watch Video Solution

17. Derive equation of mobility in terms of electric current.

Watch Video Solution

18. Write limitations of Ohm's law.

Watch Video Solution

19. Explain classification of material on basis of resistivity.

Watch Video Solution

20. Write information of resistors used in laboratory.

Watch Video Solution

21. Explain colour code to determine value of carbon film resistors,

Watch Video Solution

22. Find resistance value of carbon resistors shown below.

View Text Solution

23. How resistivity of material depend on temperature. Write empirical formula .

Watch Video Solution

24. Draw resistivity $\rightarrow$ temperature $(\rho \rightarrow T)$ graph for metals , alloys and semiconductor.

Watch Video Solution

25. Explain qualitative dependence of resistivity with temperature.

Watch Video Solution

Watch Video Solution

26. Explain electrical energy and power.

Watch Video Solution

27. Explain power produced in electrical circuit.

Watch Video Solution

28. For reduce in Ohmic loss transmission of electric power at very far distance of electric power is done at very high voltage ?

Watch Video Solution

29. Which device is used to transmit voltage over large distances?

Watch Video Solution

30. How resistors can be connected in different ways ?

Watch Video Solution

31. What is parallel connection of resistors ? Derive equation of equivalent resistance in parallel connection.

Watch Video Solution

32. Explain series connection of resistors. Derive equation of equivalent resistance (R_S).

Watch Video Solution

33. For three resistors of different value connected in series obtain equation of equivalent resistance. From this write equation of n resistors connected in series.

Watch Video Solution

34. What is parallel connection of resistors ? Derive equation of equivalent resistance in parallel connection.

Watch Video Solution

35. Obtain the expression for the equivalent resistance for 3 resistors connected in parallel and also write the expression of equivalent resistance for connection of' `n' resistors.

Watch Video Solution

36. For mixed connection shown in figure derive equation of equivalent resistance.

Watch Video Solution

37. Write difference between Series and Parallel connection of resistors.

Watch Video Solution

38. Explain cell, emf and internal resistance. Derive relation between potential difference emf and internal resistance.

Watch Video Solution

39. Why the combination of cell is done ? Write it's method

Watch Video Solution

40. What is called series connection of cell ? Derive equation of equivalent emf of two cell with emf ε_1 and ε_2 connected in series.

Watch Video Solution

41. What is parallel connections of cells? Derive the equivalent equation of parallel connections of two cells.

Watch Video Solution

42. Explain 'Mixed Connection' of cells and derive an expression for its equivalent emf and current.

Watch Video Solution

43. Define network, junction (branch point), loop.

Watch Video Solution

44. Write necessary facts to understand Kirchhoff's laws.

Watch Video Solution

45. Write and explain kirchhoff's first law (junction law).

Watch Video Solution

46. Write and explain Kirchhoff's second law (Loop rule).

Watch Video Solution

47. Write and explain Kirchhoff's second law (Loop rule).

Watch Video Solution

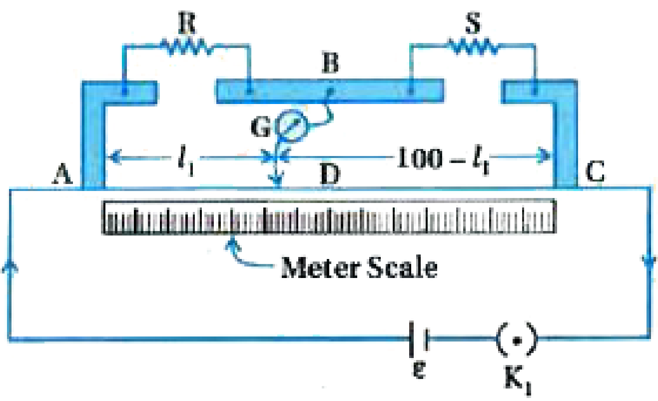
48. What is Wheatstonc hridge ? Explain its principle.

Watch Video Solution

49. Explain construction of meter bridge used in laboratory.

Watch Video Solution

50. Explain how value of unknown resistor can be obtained by using meter bridge.



Watch Video Solution

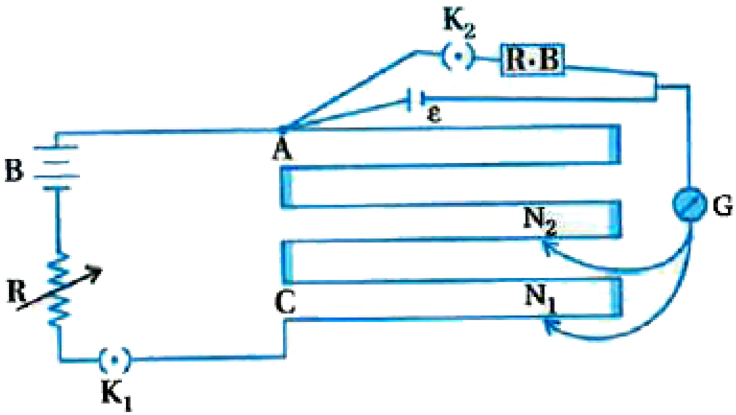
51. What is potentiometer ? Explain principle of potentiometer.

Watch Video Solution

52. Explain comparison of emf of two cell by using potentiometer with necessary diagiam.

Watch Video Solution

53. Explain method to measure internal resistance of cell by using potentiometer.



Watch Video Solution

Section A Try Yourself

1. What is reason behind producing electric force between two particles ?

Watch Video Solution

2. When current is produced?

Watch Video Solution

3. "In lightening in the sky, there is steady flow of charge" . - True or False ?

Watch Video Solution

4. Define electric current and write its SI unit.

Watch Video Solution

5. Define electric current when there is no steady flow of charge.

Watch Video Solution

6. What is direction of conventional current ?

Watch Video Solution

7. What is order of current flowing in nerves of our body?

Watch Video Solution

8. What is order of current flowing during lightening in the sky ?

Watch Video Solution

9. Due to what current is formed in conductors ?

Watch Video Solution

10. Due to what current is formed in electrolyte ?

Watch Video Solution

11. Why current is not formed in solid conductors in absence of electric field ?

Watch Video Solution

12. Write Ohm's law

Watch Video Solution

13. What is electrical resistance ? Its value depend on which factors ?

Watch Video Solution

14. What is resistivity ? Its value depend on which factors?

Watch Video Solution

15. What is conductivity ? Value of conductivity depend on which factor ?

Watch Video Solution

16. What is current density ? Derive Ohm's law in form of current density?

Watch Video Solution

17. What is current density ? Derive Ohm's law in form of current density?

Watch Video Solution

18. Whey average velocity of electron at time tis zero?

Watch Video Solution

19. What is relaxation time (τ) ?

Watch Video Solution

20. What is drift velocity (v_d)?

Watch Video Solution

21. Define mobility and write its SI unit.

Watch Video Solution

22. How is $V \rightarrow$ I graph of material following Ohm's law.

Watch Video Solution

23. " I $\rightarrow$ V relation is not always one-one function" - Explain.

Watch Video Solution

24. What is resistivity of perfect conductor?

Watch Video Solution

25. For which material with increase in temperature resistivity decrease ?

Watch Video Solution

26. How carbon film resisters are prepared ?

Watch Video Solution

27. If there are only three bands on carbon film resistors what will be its tolerance ?

Watch Video Solution

28. Write effect of temperature on metals and semiconductor.

Watch Video Solution

29. Write equation representing relation between resistivity and temperature.

Watch Video Solution

30. For metals temperature coefficient of resistivity is positive or negative ?

Watch Video Solution

31. Which material is used to prepare wire bound resistor ?

Watch Video Solution

32. Why resistivity of metal decreases with increase in temperature..

Watch Video Solution

33. Why resistivity of semiconductor decreases with increase in temperature ?

Watch Video Solution

34. What is series connection of resistors ?

Watch Video Solution

35. What is meant by parallel connection of resistors ? Derive equation of parallel reslstance.

Watch Video Solution

36. Write equation of equivalent resistance of n resistors connected in series.

Watch Video Solution

37. What is meant by parallel connection of resistors ? Derive equation of parallel reslstance.

Watch Video Solution

38. In which type of connection of resistors equivalent resistance will increase ?

Watch Video Solution

39. In which type of connection of resistors equivalent resistance will decrease ?

Watch Video Solution

40. In series connection of resistors current is equal or voltage?

Watch Video Solution

41. In parallel connection of resistors current is equal or vollage?

Watch Video Solution

42. 10 resistors of 5 Ω value are first connected in series then in parallel. What is ratio of equivalent resistance in both case ?

Watch Video Solution

43. When two resistors of R value connected in parallel what is equivalent resistance '?

Watch Video Solution

44. Electromotive force is actually not force. What do it represent ?

Watch Video Solution

45. For open circuit condition what is value of terminal voltage of cell ?

Watch Video Solution

46. Write direction of electric current in electrolyte.

Watch Video Solution

47. Write direction of electric current in electrolyte.

Watch Video Solution

48. For cell with non zero (finite) internal resistance write relation between terminal voltage and emf of cell.

Watch Video Solution

49. What is called as internal resistance of the cell ?

Watch Video Solution

50. When internal resistance of the cell can be neglected?

Watch Video Solution

51. When current drawn from the cell become maximum?

Watch Video Solution

52. In how many types combination of cells can be done?

Watch Video Solution

53. What is series connection of cell ?

Watch Video Solution

54. What is parallel connections of cells? Derive the equivalent equation of parallel connections of two cells.

Watch Video Solution

55. What is called series connection of cell ? Derive equation of equivalent emf of two cell with emf ε_1 and ε_2 connected in series.

Watch Video Solution

56. What is parallel connections of cells? Derive the equivalent equation of parallel connections of two cells.

Watch Video Solution

57. What will be ratio of equivalent emf of series connection of two cell and parallel connection of two cell.

Watch Video Solution

58. Kichhoff's junction role represents.......

Watch Video Solution

59. Write and explain Kirchhoff's second law (Loop rule).

Watch Video Solution

60. Kirchhoff's junction law represent conservation of which physical quantity ?

Watch Video Solution

61. Kirchhoff's loop law represent conservation of which physical quantity ?

Watch Video Solution

62. Why circuit given by Wheatstone is called Wheatstone bridge ?

Watch Video Solution

63. When Wheatstone bridge is said to be in balanced condition ?

Watch Video Solution

64. What is called as battery arm ?

Watch Video Solution

65. What is called as galvanometer arm ?

Watch Video Solution

66. What is value of current flowing through galvanometer in balanced condition of Wheatstone bridge ?

Watch Video Solution

67. Write principle of Wheatstone bridge.

Watch Video Solution

68. To find value of unknown resistance by using meter bridge why position of R and S is interchanged ?

Watch Video Solution

69. If null point of meter bridge is obtained at 50 cm what will be value of unknown resistor ?

Watch Video Solution

70. What is potentiometer ? Explain principle of potentiometer.

Watch Video Solution

71. What is potentiometer ? Explain principle of potentiometer.

Watch Video Solution

72. Define potential gradient and write its unit.

Watch Video Solution

73. Write equation to measure internal resistance of cell by using potentiometer.

Watch Video Solution

74. Write advantages of potentiometer.

Watch Video Solution

Section B Numericals Numerical From Textual Illustrations

1. (a) Esttimate the average drift speed of conduction electrons in a copper wite of cross-secttonal area $1.0 \times 10^{-7} m^2$ carrying a current of $1.5A$. Assume the each copper atom contrbutes roughly one conduction electron. The density of copper is $9.0 \times 10^3 kg/m^3$, and its atomic mass is $63.5u$. (b) Compare the drift speed obyained above with, (1) thermal speeds of copper atoms at ordinary temperaturtes. (ii) speed of propagation of electric field along the conductor which causes the drift motion.

Watch Video Solution

2. In Example 3.1. the electron drift speed is estimated to be only a few mm s^{-1} for currents in the range of a few amperes ? How then is current established almost the Instant a circuit is closed ?

Watch Video Solution

3. The electron drift arises due to the force experienced by electrons in the electric field Inside the conductor. But force should cause acceleration. Why then do the electrons acquire a steady average drift speed ?

Watch Video Solution

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

Watch Video Solution

5. When electrons drift in a metal from lower to higher potential, does it mean that all the 'free' electrons of the metal are moving in the same direction ?

Watch Video Solution

6. Are the paths of electrons straight lines between successive collisions (with the positive ions of the metal) in the (i) absence of electric field, (ii) presence of electric field ?

Watch Video Solution

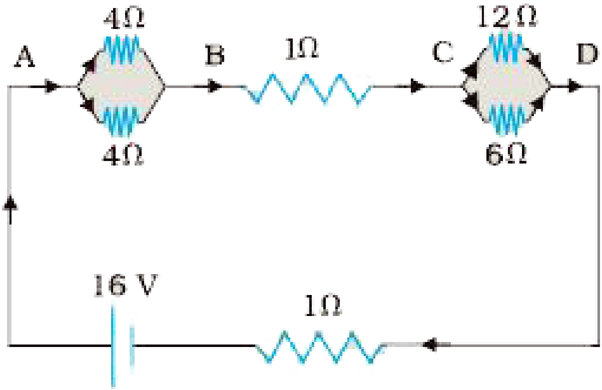
7. An electric toaster uses nichrome for its heating element. When a negligibly small current passes through it, its resistance at room temperature $(27.0^\circ C)$ is found to be 75.3 Ω . When the toaster is connected to a 230 V supply, the current settles, after a few seconds, to a steady value of 2.68 A. What is the steady temperature of the nichrome element ? The temperature coefficient of resistance of nichrome averaged over the temperature range involved , is $1.70 \times 10^{-4 \circ} C^{-1}$.

Watch Video Solution

8. The resistance of the platinum wire of a platinum resistance thermometer at the ice point is 5 Ω and at steam point is 5.39Ω. When the thermometer is inserted in a hot bath, the resistance of the platinum wire is 5.795 Ω. Calculate the temperature of the bath.

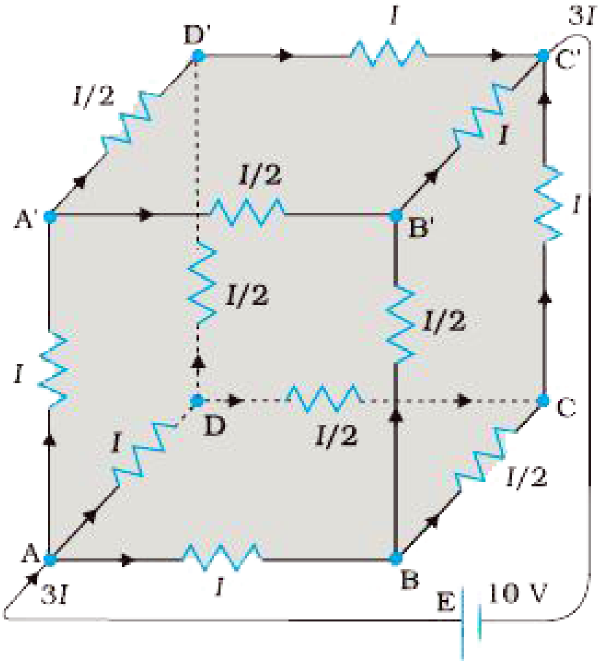
Watch Video Solution

9. A network of resistore is connected to a 16 V battery with internal resistance of 1Ω, as shown in (a) Compute the equivalent resistance of the network. (b) Obtain the current in each resistor. (c) obtain the voltage drops V_{AB}, V_{BC} and V_{CD}



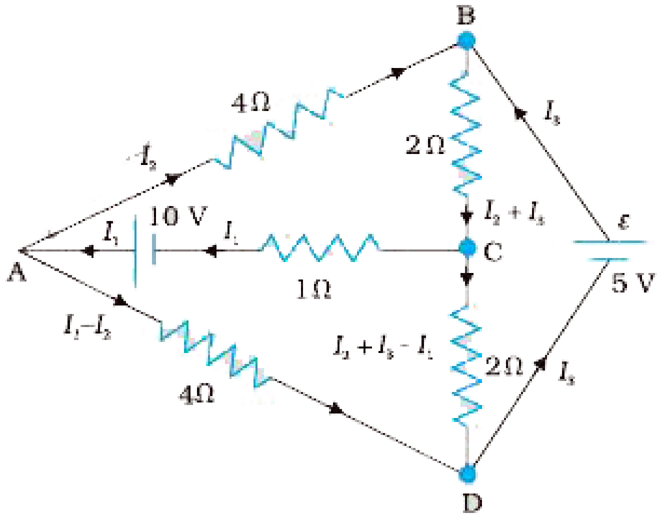
Watch Video Solution

10. A bettery of 10 V and negligible internal resistance is connected across the diagonally opposite corners of a cubical network consisting of 12 resistors each of resistance 1Ω Determine the equivalent resistance of the network and the current along each edge of the cube.



Watch Video Solution

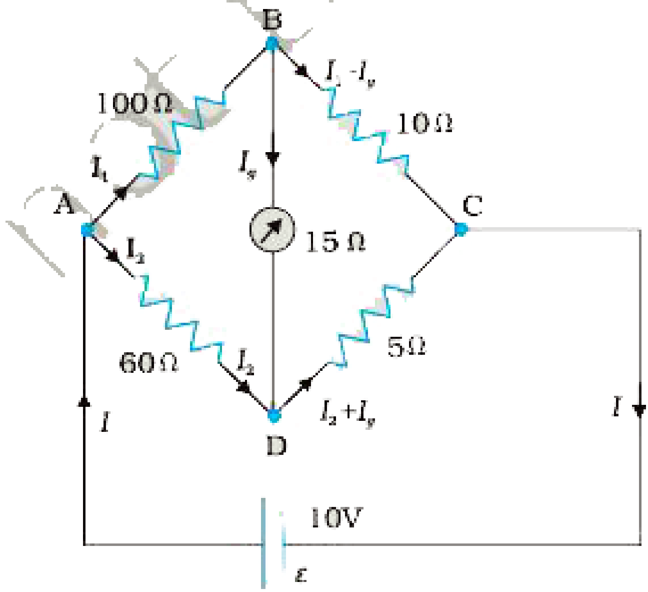
11. Determine the current in each brance of the network showin in



Watch Video Solution

12. The four arma os a Wheatstone bridge have the following resistances:

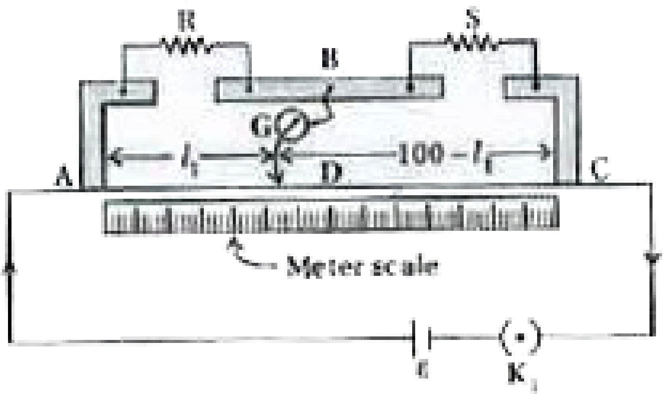
$AB = 100\Omega, BC = 10\Omega, CD = 5\Omega$ and $DA = 60\Omega$



A galvanometer of 15Ω resistacne is connected across BD. Calculate the current through the galvanometer when a potential difference of 10 V is maintained across AC.

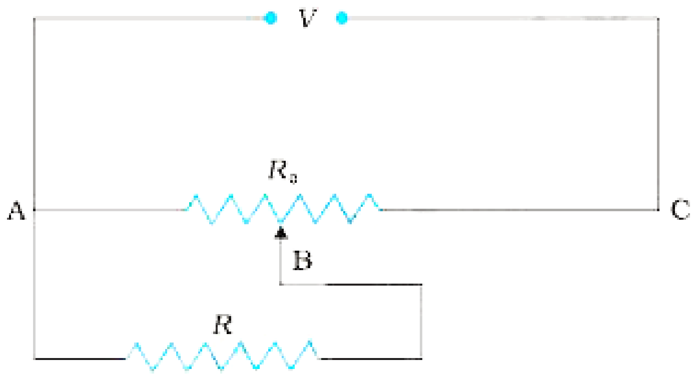
Watch Video Solution

13. In a meterbridge, the null point is found at a distance of 33.7cm from A. If a resistance of 12W is connected in parallel with S, the null points occurs at 51.9cm Determine the values of R and S.



Watch Video Solution

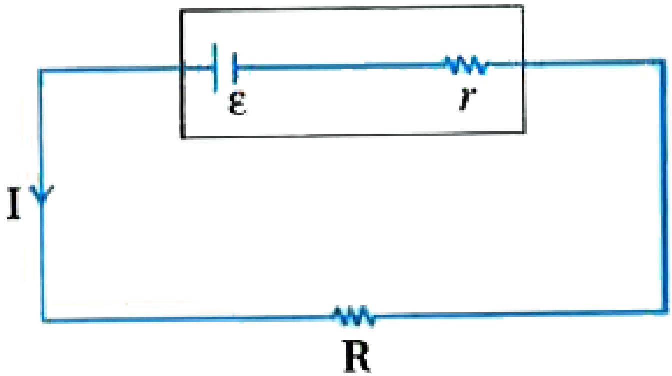
14. A rsisitance of $R\Omega$ draws current from a potentiometer. Te potentiometer has a total resistance $R_0 \Omega$ A voltage V is supplited to the potentiometer. Derive an expression for the voltage across R when the sliding contact is in the middle of the potenttometer.



Watch Video Solution

Section B Numerical From Textual Exercise

1. The storage battery of a car has an emf of 12 V. If the internal resistance of the battery is 0.4 Ω , what is the maximum current that can be drawn from the battery ?



Watch Video Solution

2. A bettery of emf 10 V and internal resistacne 3Ω is connected to a resistor. If the current in the circuit is $0.5A$, what is the resistance of the resistor ? What is the terminal voltage of the bettery when the circuit is closed ?

Watch Video Solution

3. Three resistors $1\Omega, 2\Omega$ and 4Ω are combined in series. What Is the total resistance of the combination ?

Watch Video Solution

4. (a) Three resistor $1\Omega, 2\Omega,$ and 3Ω are combined in series. What is the total resistance of the ombination ?

(b) If the combination is connected to a battery of emf 12 V and negligible internal resistance, obtain the potential drop across each resistor.

Watch Video Solution

5. Three resistor 2 $\Omega, 4\Omega$ and 6Ω are combined In parallel. What is the total resistance of the combination ?

Watch Video Solution

6. (a) Three resistors $2\Omega 4\Omega$ and 5Ω are combined in parallel. What is the total resistance of the combination ?

(b) If the combination is connected to a bettery of emf 20 V and neglibible internal resistance, determine the current through each resistor, and the total current drawn from the battery.

Watch Video Solution

7. At room temperature $(28.0^{\circ} C)$ the resistance of a heating element is 100Ω. What ic. the temperature of the element if the resistance is found to be 117Ω, given that the temperature coefficient of the material of the resistor is $1.70 \times 10^{-4 \circ} C^{-1}$.

Watch Video Solution

8. A negligibly small current is passed through a wire of length 20 m and uniform cross-section $6.0 \times 10^{7} m^{2}$, and its resistance is measured to be 10.0 Ω . What is the resistivity of the material at the temperature of the experiment ?

Watch Video Solution

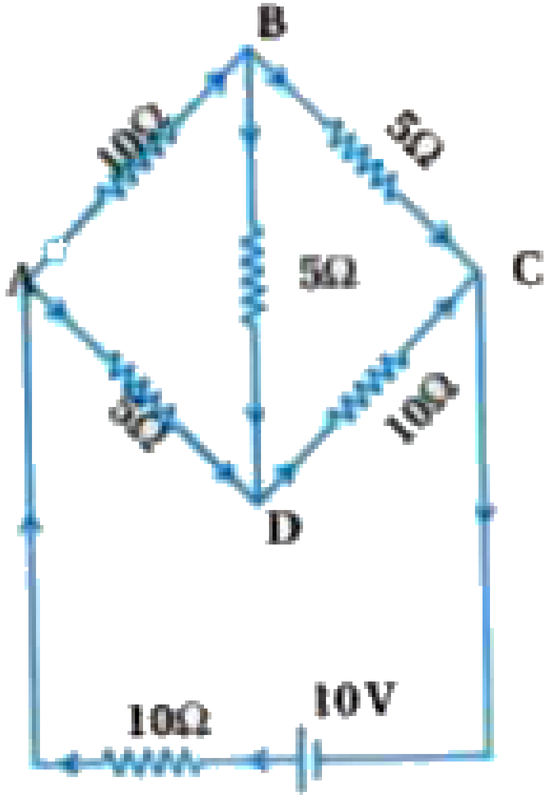
9. A silver wire has a resistance of 2.1 Ω at 27.5° C and a resistance of 2.8 Ω at $100^{\circ} C$. Determine the temperature coefficient of resistivity of silver.

Watch Video Solution

10. An electric toaster uses nichrome for its heating element. When a negllgibly small current pases through it, its resistance at room temperature $(27.0^{\circ} C)$ is found to be 75.3Ω. When the toaster is connected to a 230 V supply, the current settles, after a few seconds, to a steady value of $2.68A$. What is the steady temperature of the nichrome element ? The temperature coefficient of resistance of nichrome averaged over the temperature range involved is $1.70 \times 10^{-4} {}^{\circ}C^{-1}$.

Watch Video Solution

11. Determine the current in each branch of the given network.



Watch Video Solution

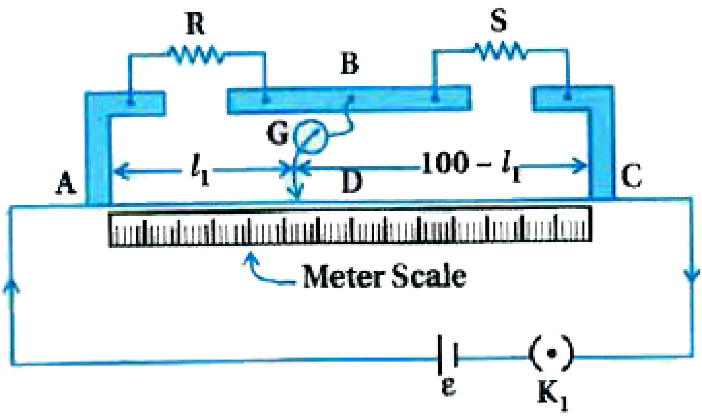
12. In a meter bridge as shown in figure, the balance point is found to be at 39.5 cm from the end A, when

the Y resistor is of 12.5Ω. Determlne the resistance of X. Why are the connections between resistors in a Wheatstone or meter bridge made of thick copper strips ?

Watch Video Solution

13. What happens if the galvanometer and cell are interchanged at the balance point of the bridge ?

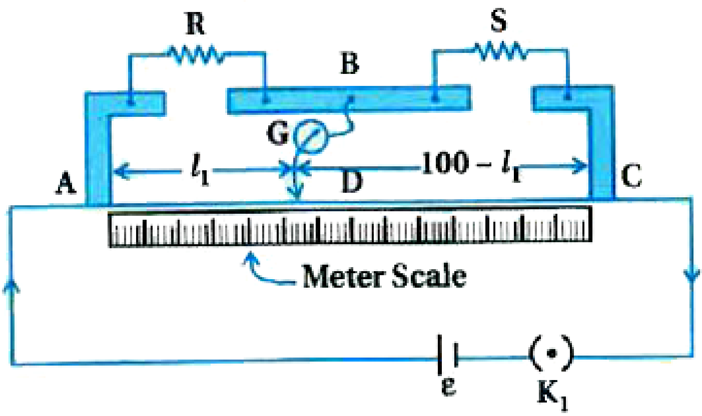
Would the galvanometer show any current ?



Watch Video Solution

14. What happens if the galvanometer and cell are interchanged at the balance point of the bridge ?

Would the galvanometer show any current ?



Watch Video Solution

15. A storage battery of emf 8.0 V and internal resistance 0.5 Ω is being charged by a 120 V de supply using a series resistor of 15.5 Ω . What is the terminal voltage of the battery during charging ?

Watch Video Solution

16. In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 30.0 cm length the wire. If the cell is replaced by another and the balance point shifts to 60.0 cm, what the emf of the second cell ?

Watch Video Solution

17. The number density of free electrons in a copper conductor estimated is $8.5 \times 10^{28} m^{-3}$. How long does an electron take to drift from one end of a wire 3.0 m long to its other end ? The area of cross-section of the wire is 2.0 $\times 10^{-6} m^2$ and it is carrying current of 3.0 A.

Watch Video Solution

18. The earth's surface has a negative surface charge density of $10^{-9} Cm^{-2}$. The potential difference of 400 kV between the top of the atmosphere and the surface results (due to the low conductivity of the lower atmosphere) in a current of only 1800 A over the entire globe. If there were no mechanism of sustaining atmospheric electric field, how much time (roughly) would be required to neutralise the earth's surface? (This never happens in practice because there is a mechanism to replenish electric charges. namely tghe coontainual thunderstorms and lighting in different parts of the globe). (Radius of earth $= 6.37 \times 10^6 m.$)

Watch Video Solution

19. (a) Six lead-acid type of secondary cells each of emf $2.0V$ and internal resistacne 0.015Ω are joined in series to provide a supply to a resistance of 8.5Ω. What are the current drawn from the suply and its terminal voltage ?

(b) A secondary cell after long use has an emf of $1.9V$ and a large internal resistance of 380Ω. What maximum current can be drawn from the cell? Could the cell drive tghe starting motor of a car ?

Watch Video Solution

20. Two wires of equal length, one of aluminium and the other of copper have the same resistance. Which of the two wires is lighter ? Hence explain why aluminium wires are preferred for overhead power cables.

$(\rho_{Al} = 2.63 \times 10^{-8} \Omega m, \rho_{Cu} = 1.72 \times 10^{-8} \Omega$ m, Relative density of Al = 2.7 , of Cu = 8.9)

Watch Video Solution

21. What conclusion can you draw from the follwing observation on a resistor made of alloy manganin ?

Current A	Voltage V	Current A	Voltage V
0.2	3.94	3.0	59.2
0.4	7.87	4.0	78.8
0.6	11.8	5.0	98.6
0.8	15.7	6.0	118.5
1.0	19.7	7.0	138.2
2.0	39.4	8.0	158.0

Watch Video Solution

22. A steady current flows in a metallic conductor of non-uniform cross-section. Which of these quantities is constant along the conductor: current, current density, electric field, drift speed?

Watch Video Solution

23. Is Ohm's law universally applicable for all conducting elements ? If not, give examples of elements which do not obey Ohm's law.

Watch Video Solution

24. A low voltage supply from which one needs high currents must have very low internal resistance. Why ?

Watch Video Solution

25. A high tension (HT) supply of, say, 6 kV must have a very large internal resistance.Why?

Watch Video Solution

26. Choose the correct alternative:

(a) Alloys of metals usually have (greater/less) resistivity than that of their constituent metals.

(b) Alloys usually have much (lower/higher) temperature coefficients of resistance than pure metals.

(c) The resisitivity of the alloy manganin is nearly independent of/increases rapidly with increase of temperature.

(d) The resistivity of a typical insulator (e.g., amber) is greater than that of a metal by a factor of the order of $(10^{22} / 10^{23})$.

Watch Video Solution

27. Choose the correct alternative:

(a) Alloys of metals usually have (greater/less) resistivity than that of their constituent metals.

(b) Alloys usually have much (lower/higher) temperature coefficients of resistance than pure metals.

(c) The resisitivity of the alloy manganin is nearly independent of/increases rapidly with increase of temperature.

(d) The resistivity of a typical insulator (e.g., amber) is greater than that of a metal by a factor of the order of $(10^{22} / 10^{23})$.

Watch Video Solution

28. Choose the correct alternative:

(a) Alloys of metals usually have (greater/less) resistivity than that of their constituent metals.

(b) Alloys usually have much (lower/higher) temperature coefficients of resistance than pure metals.

(c) The resisitivity of the alloy manganin is nearly independent of/increases rapidly with increase of temperature.

(d) The resistivity of a typical insulator (e.g., amber) is greater than that of a metal by a factor of the order of $\left(10^{22} / 10^{23}\right)$.

Watch Video Solution

29. Choose the correct alternative:

(a) Alloys of metals usually have (greater/less) resistivity than that of their constituent metals.

(b) Alloys usually have much (lower/higher) temperature coefficients of resistance than pure metals.

(c) The resisitivity of the alloy manganin is nearly independent of/increases rapidly with increase of temperature.

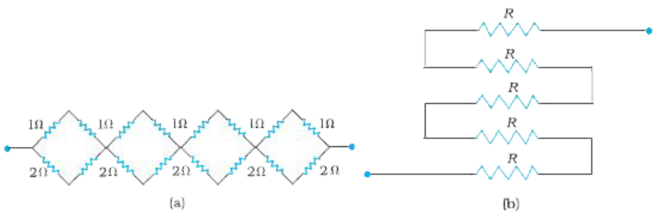
(d) The resistivity of a typical insulator (e.g., amber) is greater than that of a metal by a factor of the order of $(10^{22}/10^{23})$.

Watch Video Solution

30. (a) Given n resistores each of resistance R. how will you combine them to get the (i) maximum (ii) minimum effective resistance?

(b) Given the resistances of 1Ω, 2Ω, 3Ω. how will be combine them to get an equivalent resistance of $(i)(11/3)\Omega(ii)(11/5)\Omega$, $(iii)6\Omega$, $(iv)(6/11)\Omega$?

(c) Determine the equivalent resistance of networks shown in



Watch Video Solution

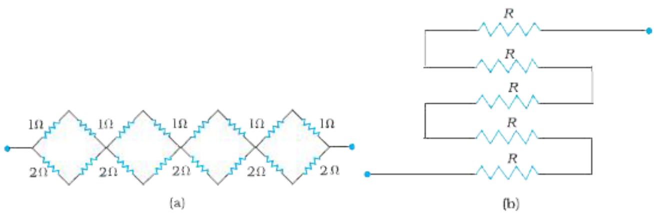
31. (a) Given n resistores each of resistance R. how will you combine them to get the (i) maximum (ii) minimum effective resistance?

(b) Given the resistances of 1Ω, 2Ω, 3Ω. how will be combine them to get an equivalent resistance of

$(i)(11/3)\Omega(ii)(11/5)\Omega$, $(iii)6\Omega$, $(iv)(6/11)\Omega$?

(c) Determine the equivalent resistance of networks

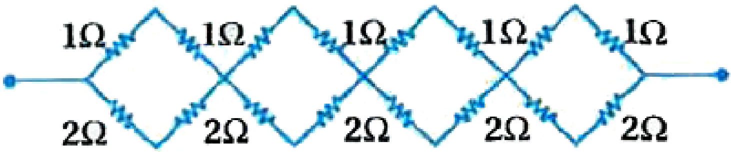
shown in



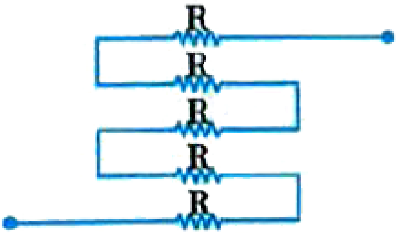
Watch Video Solution

32. Determine the equivalent resistance of networks

shown in figure.

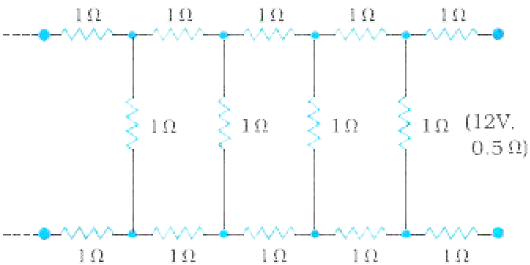


(a)



Watch Video Solution

33. Determine the furrent drawn from a 12 V suly with internal resistacne 0.5Ω by the infinite network shown in Each rsistor has 1Ω resistance.



Watch Video Solution

34. Figure shows a potentiometer with a cell of 2.0 V and internal resistance 0.40 Ω maintaining a potential drop across the resistor wire AB. A standard cell which maintains a constant emfof 1.02 V (for very moderate currents upto a few mA) gives a balance point at 67.3 cmlength of the wire. To ensure very low currents drawn from the standard cell, a very high resistance of 600 $k\Omega$ is put in series with it, which is shorted close to the balance point. The standard cell is then replaced bya cell of unknown emfe and the balance point found similarly, turns out to be at 82.3 cm length of the wire.

(a) What is the value ε ?

(b) What purpose does the high resistance of 600 $K\Omega$ have ?

(c) Is the balance point affected by this high resistance ?

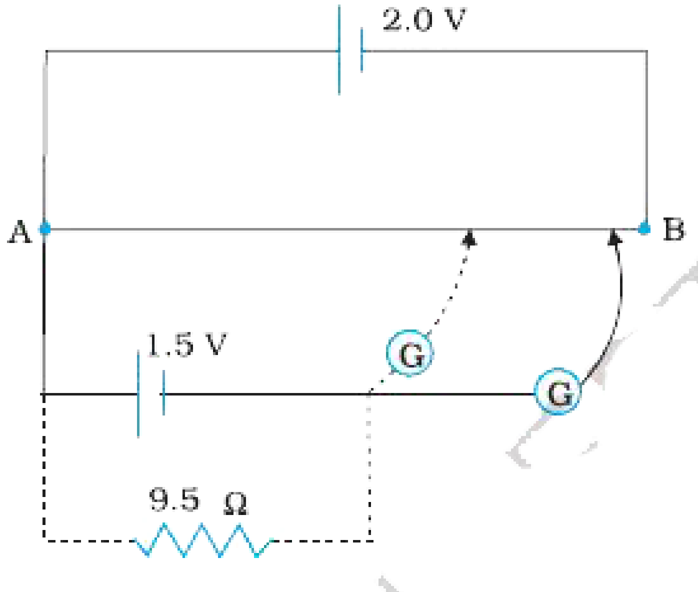
(d) Would the method work in the above situation if the driver cell of the potentiometer had an emf of 1.0V instead of 2.0 V ?

(e) Would the circuit work well for determining an extremely small emf, say of the order of a few mV (such as the typical emf of a thermocouple) ? If not, how will you modify the circuit ?

(f) Can we use above circuit to measure very small emf of the order of mV. (For example, emf obtained in thermocouple) ? If not, then what change would you make ?

View Text Solution

35. show a $2.0V$ potentiometer used for the determination of internal resistance of a $1.5V$ cell. The balance point of the cell in open circuit is 76.3 cm. When a resistor of 9.5Ω is used in the external circuit of the cell, the balance point shifts to $64.8cm$ length of the potentiometer wire. Determine the internal resistance of the cell.



Watch Video Solution

Section B Numerical From Darpan Based On Textbook

1. The current through a wire varies with time as $I = I_0 + \alpha t$, where $I_0 = 10$ A and $\alpha = 4As^{-1}$. The charge that flows across a cross-section of the wire in first 10 seconds is .....

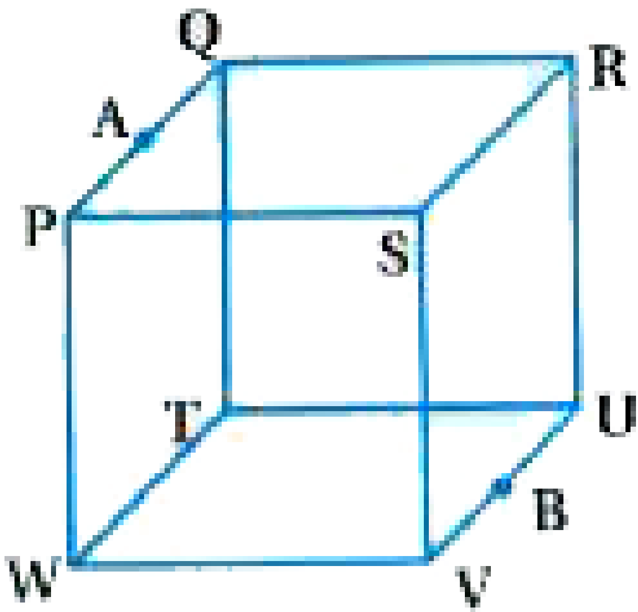
Watch Video Solution

2. Two materials have the value of α_1 and α_2 as $6 \times 10^{-4}(^\circ C)^{-1}$ and $-5 \times 10^{-4}(^\circ C)^{-1}$ respectively. The resistivity of the first material $\rho_{20} = 2 \times 20^{-8}\Omega$. A new material is made by combining the above two materials. the resistivity does not change with temperature . The resistivity

ρ_{20} of the second material is .... Considering the reference temperature as $20^{\circ} C$ assume that the resistivity of the new material is equal to the sum of the resistivity of its component materials.

Watch Video Solution

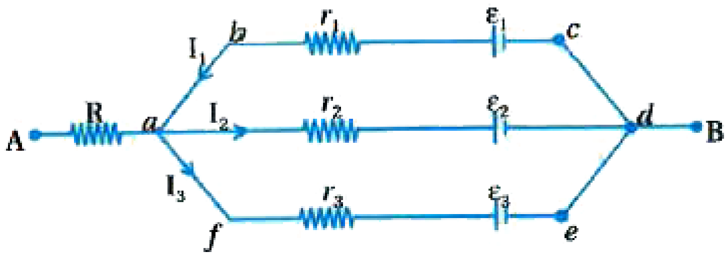
3. A cube is constructed by connecting 12 wires of equal resistance as shown in figure. The equivalent resistance between the points A and B shown in the figure is..... . The resistance of each wire is of r Ω. A and B are the midpoints of the sides PQ and VU respectively.



Watch Video Solution

4. In the circuit shown in figure, $\varepsilon_1 = 3$ V, $\varepsilon_2 = 2V, \varepsilon_3 = IV$ and $R = r_1 = r_2 = r_3 = 1\Omega$.

The current through each branch is...... and potential difference between the points A and B is ....



Watch Video Solution

5. 200 Ω resistor is connected in one of the gaps of the meter bridge. Series combination of X Ω and 50 Ω resistors is connected in the second gap. Here unknown resistance X Ω is kept in a heat bath at a certain temperature. The unknown resistance and its temperature is....... and....... respectively if the balance point is obtained at 50 cm. The total length of the wire of the meter bridge is equal to 1 meter. The resistance of the unknown resistance at $0 \quad ^\circ C$ temperature is equal to 100 Ω. $\alpha = 0.5 \times 10^{-3} {}^\circ C^{-1}$ for the material of the X Ω resistors.

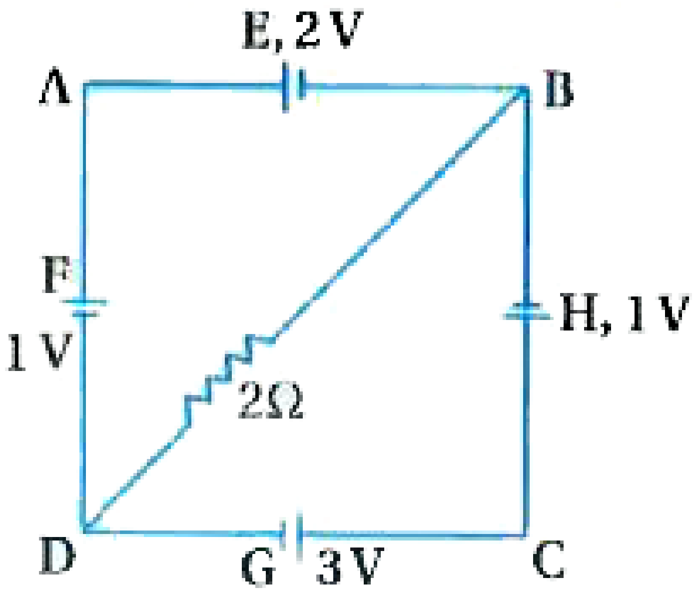
Watch Video Solution

6. An n-type semiconductors has 4×10^{-3} m width, 25×10^{-5} m thickness and 6×10^{-2} m length. 4.8 mA current is flowing through it. Here voltage is applied parallel to the length of the semiconductor. Calculate the current density. The density of the free electron is equal to $10^{22} m^{-3}$ .What will be the time taken by the electron across the length of the semiconductor ?

Watch Video Solution

7. The emf of the batteries E, F, G and H are 2 V, 1 V, 3 V and 1 V respectively. Their internal resistance are respectively $2\Omega, 1\Omega, 3\Omega$ and 1Ω respectively.

Calculate potential difference between B and D.



Watch Video Solution

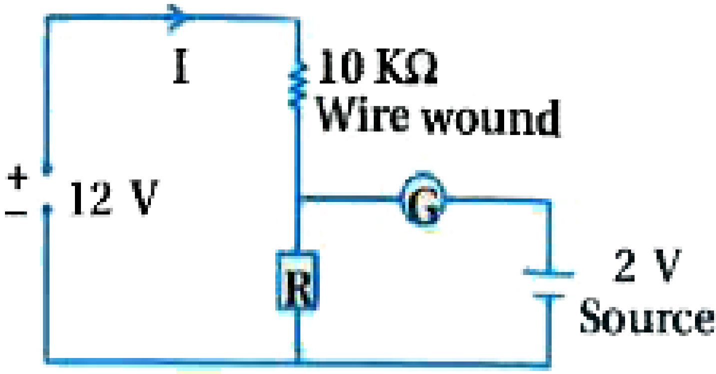
8. A and B are two electric bulbs with their ratings respectively 40 W, 110 V and 100 W and 110 V. Find their respective filament resistances. If the bulbs are connected in series with a supply of 220 V, which bulb will fuse ?

Watch Video Solution

9. At temperature $0^\circ C$ and $100^\circ C$, currents passing through one conductor are resectively 1 A and 0.7 A . Find current through it when its temperature is $1200^\circ C$. (Voltage source is same).

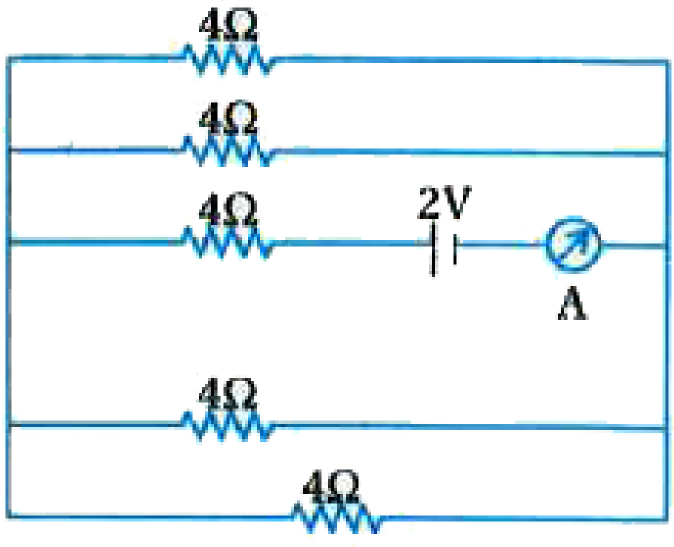
Watch Video Solution

10. If deflection in galvanometer in above circuit is zero then find value of R. Internal resistance of 12 V source is negligible. Will the galvanometer show some deflection if cold air is passed on 10 $k\Omega$ wire wound resistor ?



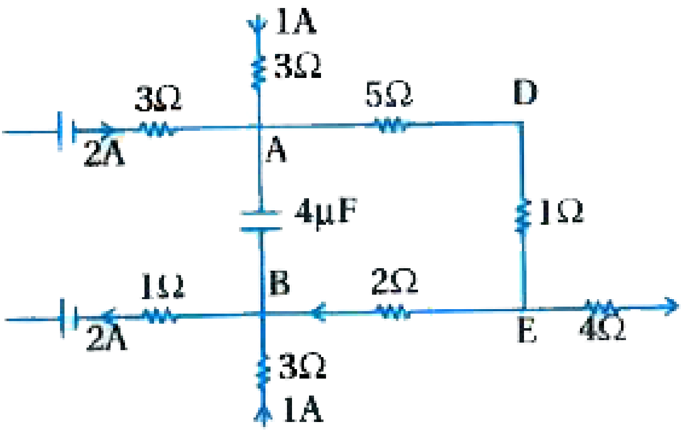
Watch Video Solution

11. Five resistor each having value of 4 Ω are connected with ideal battery and ammeter as shown in figure. Find reading of ammeter.



Watch Video Solution

12. In one part of above network, steady current is flowing. Values of resistances are as shown in the diagram. Find energy stored in capacitor.



Watch Video Solution

13. Resistance of 100 cm long potentiometer wire is 10Ω. It is connected with external resistance R and a

cell with emf 2V and negligible internal resistance. While balancing 10 mV emf in the secondary circuit, null point is obtained at 40 cm. Find this external resistance.

Watch Video Solution

Section B Numerical

1. One copper wire having resistivity 1.7 $\times 10^{-8}\Omega$, density $8.9 \times 10^{3} kgm^{-3}$, atomic weight 63.5 g mol^{-1}, length 0.1 m and cross-sectional area $10^{-6}m^{2}$ carries 1 A electric current. Find (i) potential difference across the wire (ii) drift velocity of free electron. (Avogadro number = 6.02×10^{23} mol^{-1}

and valency of copper - 1

Watch Video Solution

2. One copper wire having resistivity 1.7 $\times 10^{-8} \Omega$, density $8.9 \times 10^3 kgm^{-3}$, atomic weight 63.5 g mol^{-1}, length 0.2 m and cross-sectional area $10^{-6} m^2$ carries 2 A electric current. Find (i) potential difference across the wire. (ii) drift velocity of free electron . (Avogadro number = 6.02×10^{23} mol^{-1}

and valency of copper = 1)

Watch Video Solution

3. Resistance of tungsten filament in one bulb at $20^{\circ}C$ is 18Ω. When this bulb is connected to 60 V source, steady current passing through it is 0.3 A. Find temperature of this filament taking $\alpha = 4.5 \times 10^{-3}K^{-1}$. Assume that Ohm's law is obeyed.

Watch Video Solution

4. Resistance of tungsten filament in one bulb at $20^{\circ}C$ is 18Ω. When this bulb is connected to 60 V source, steady current passing through it is 0.3 A. Find temperature of this filament taking

$\alpha = 4.5 \times 10^{-3} K^{-1}$. Assume that Ohm's law is obeyed.

Watch Video Solution

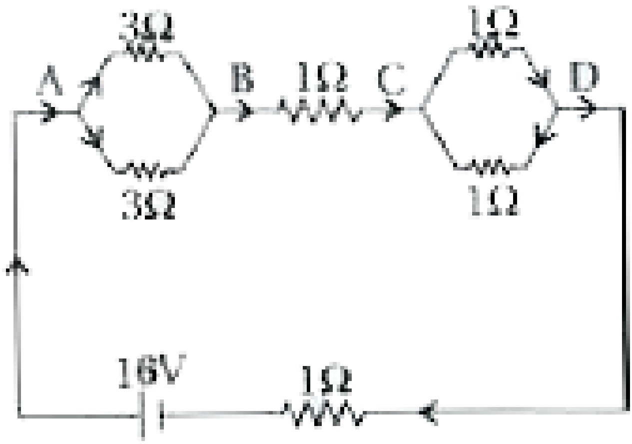
5. Resistance of platinum wire in one platinum resistance thermometer at ice point and at steam point are respectively 10 Ω and 10.78Ω. When this thermometer is kept in one heat bath, its resistance is found to be 10.123 Ω. Find temperature of this heat bath in degree Fahrenheit $\left({}^{\circ}F\right)$.

Watch Video Solution

6. Resistance of platinum wire in one platinum resistance thermometer at ice point and at steam point are respectively 10 Ω and 12.5Ω. When this thermometer is kept in one heat bath, its resistance is found to be 14 Ω. Find temperature of this heat bath.

Watch Video Solution

7. As shown in following figure, one network is connected to a battery of 16 V emf and internal resistance 1 Ω. Find (a) equivalent resistance of network. (b) current through each resistance. (c) voltage drops of V_{AB}, V_{BC}, V_{CD},



Watch Video Solution

8. 12 identical wires, each with resistance 24 Ω are interconnected to form a cube. Find equivalent resistance of this cube across its diagonally opposite points.

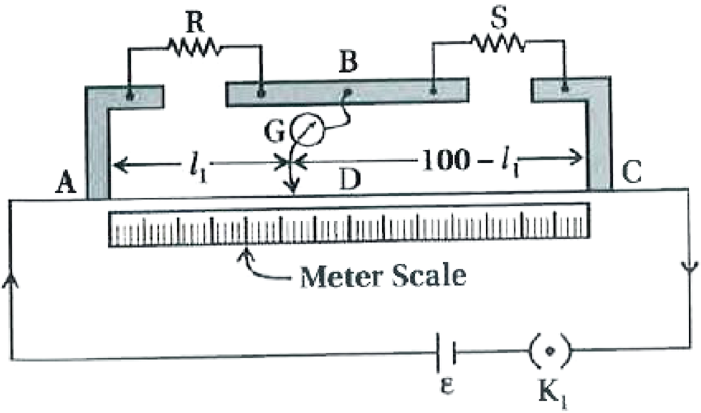
Watch Video Solution

9. 12 identical wires, each with resistance R are interconnected to form a cube. Find equivalent resistance of this cube across its diagonally opposite points.

Watch Video Solution

10. In following meter bridge, when 12 Ω resistance is connected parallel to S null point is obtained at

50 cm from point A. Find value of S.



Watch Video Solution

Section C Ncert Exemplar Solution Multiple Choice Questions Mcqs

1. Consider a current carrying wire (current I) in the shape of a circle. Note that as the current progresses along the wire, the direction of J (current density) changes in an exact manner, while the current I remain unaffected. The agent that is essentially responsible for is

A. source of emf.

B. electric field produced by charges accumulated on the surface of wire.

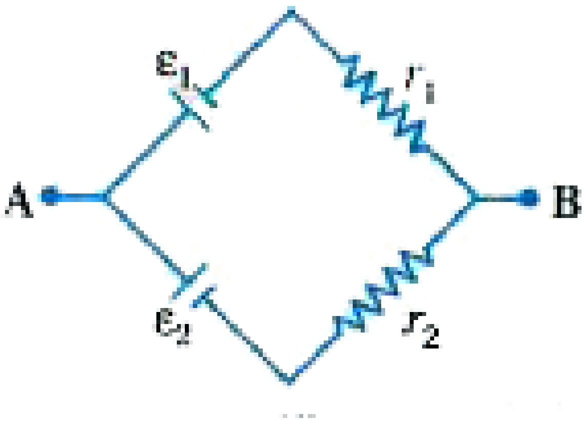
C. the charges just behind a given segment of wire which push them just the right way by repulsion.

D. the charges ahead.

Answer:

Watch Video Solution

2. Two batteries of emf ε_1 and $\varepsilon_2 (\varepsilon_2 > \varepsilon_1)$ and internal resistances r_1 and r_2 respectively are connected in parallel as shown in figure.



A. Two equivalent emf ε_{eq} of the two cells is between ε_1 and ε_2, i.e . $\varepsilon_1 < \varepsilon_{eq} < \varepsilon_2$.

B. The equivalent emf ε_{eq} is smaller then ε_1.

C. The ε_{eq} is given by $\varepsilon_{eq} = \varepsilon_1 + \varepsilon_2$ always.

D. ε_{eq} is independent of internal resistances r_1 and r_2.

Answer:

Watch Video Solution

3. A resistance R is to be measured using a meter bridge. Student chooses the standard resistance to be 100Ω. He finds the null point at $I_1 = 2.9$ cm He is told to attempt to improve the accuracy Which of the following is a useful way ?

A. He should measure I_1 more accurately.

B. He should change S to 1000 Ω and repeat the experiment .

C. He should change S to 3Ω and repeat the experiment .

D. He should give up hope of a more accurate measurement with a meter bridge.

Answer:

Watch Video Solution

4. Two cells of emf's approximately 5V and 10V are to be accurately compared using a potentiometer of length 400 cm.

A. The battery that runs the potentiometer should have voltage of 8V.

B. The battery of potentiometer can have a voltage of 15V and R adjusted so that the potential drop across the wire slightly exceeds 10V.

C. The first portion of 50 cm of wire itself should have a potential drop of 10 V.

D. Potentiometer is usually used for comparing resistances and not voltages.

Answer:

Watch Video Solution

5. A metal rod of length 10 cm and a rectangular cross-section of 1 cm $\times \frac{1}{2}$ cm is connected to a battery across oppostie faces. The resistance will be

A. maximum when the battery is connected across 1 cm $\times \frac{1}{2}$ cm faces.

B. maximum when the battery is connected across IO cm $\times 1$ cm faces.

C. maximum when the battery is connected across 10 cm $\times \frac{1}{2}$ cm faces.

D. same irrespective of the three faces.

Answer:

Watch Video Solution

6. Which of the following characteristics of electrons determines the current in a conductor ?

A. Drift velocity alone.

B. Thermal velocity alone.

C. Both drift velocity and thermal velocity.

D. Neither drift nor thermal velocity.

Answer:

Watch Video Solution

Section C Multiple Choice Questions More Than One Options

1. Kirchhoff''s junction rule is a reflection of

A. conservation of current density vector.

B. conservation of charge.

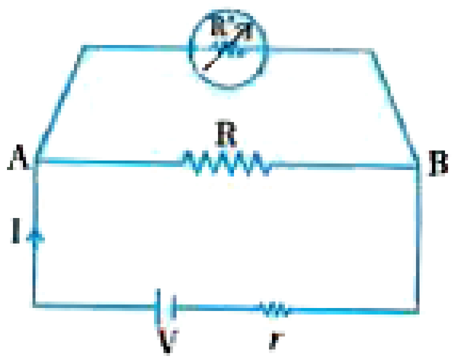
C. the fact that the momentum with which a charged particle approaches a junction is unchanged (as a vector) as the charged particle leaves the junction

D. the fact that there is no accumulation of charges at a junction

Answer:

Watch Video Solution

2. Consider a simple circuit shown in figure stands for a variable resistance R. R can very from R_0 to infinity. r is internal resistance of the battery (r $<< R << R_0$) .



(a) Potential drop across AB is nearly constant as R' is varied.

(b) Current through R' is nearly a constant as R' is varied.

(c) Current I depends sensitively on R'.

(d) $I \geq \frac{V}{r+R}$ always.

A. Potential drop across AB is nearly constant as R' is varied.

B. Current through R' is nearly a constant as R' is varied.

C. Current I depends sensitively on R'.

D. $I \geq \dfrac{V}{r+R}$ always.

Answer:

Watch Video Solution

3. Temperature dependence of resistivity p(T) of semiconductors, insulators and metals is Significantly based on the following factors :

A. number of charge carriers can change with temperature T.

B. time interval between two successive collisions can depend on T.

C. length of material can be a function of T.

D. mass of carriers is a function of T.

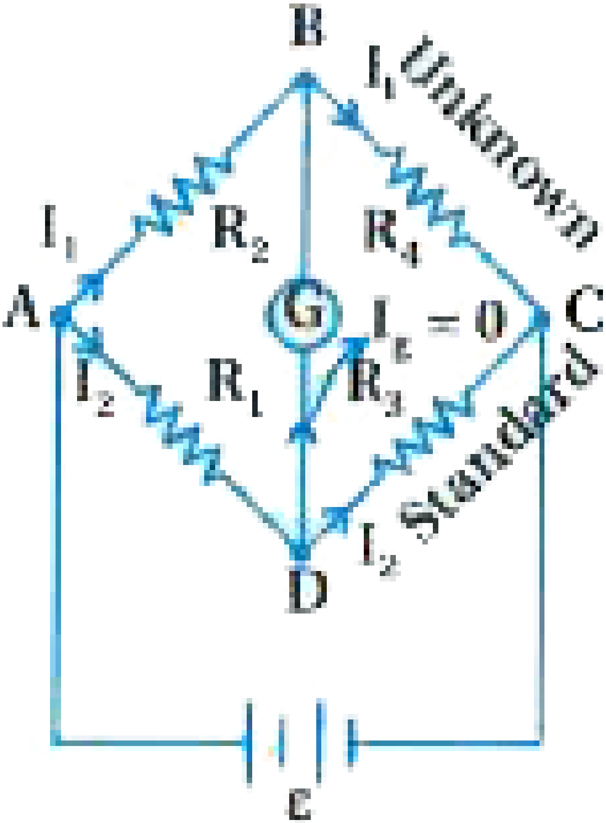
Answer:

Watch Video Solution

Watch Video Solution

4. The measurement of an unknown resistance R is to be carried out using Wheatstone bridge as given in the figure below. Two students perform an experiment in two ways. The first students takes $R_2 = 10\Omega$ and $R_1 = 5\Omega$. The other student takes $R_2 = 1000\Omega$ and $R_1 = 500\Omega$. In the standard arm, both take $R_3 = 5\Omega$. both find R = $\frac{R_2}{R_1}, R_3 = 10\Omega$

within errors.



A. The errors of measurement of the two students are the same.

B. Errors of measurement do depend on the accuracy with which R_2 and R_1 can be measured .

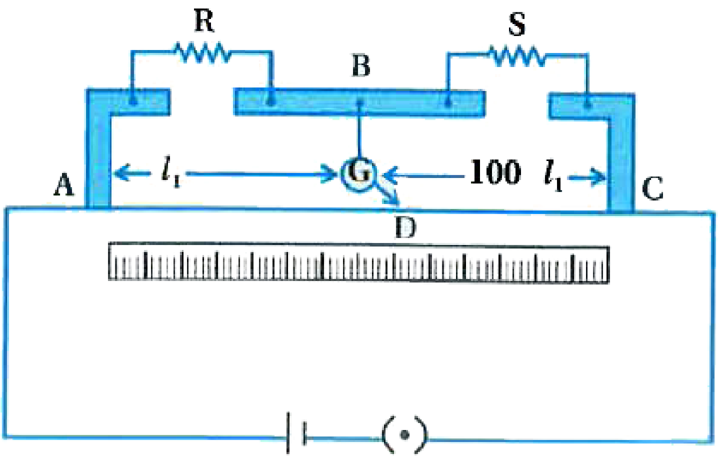
C. If the student uses large values of R_2 and R_1 , the currents through the arms will be feeble. This will make determination of null point accwately more difficult

D. Wheatstone bridge is a very accurate instrument and has no errors of measurement.

Answer:

Watch Video Solution

5. In a meter bridge the point Dis a neutral point as shown in figure.



A. The meter bridge can have no other neutral point for this set of resistances.

B. When the jockey contacts a point on meter wire left of D, current flows to B from the wire.

C. When the jockey contacts a point on the meter wire to the right of D, current flows from B to the wire through galvanometer.

D. When R is increased, the neutral point shifts to left.

Answer:

Watch Video Solution

Section C Very Short Answer Type Questions

1. Is the motion of a charge across junction momentum conserving ? Why or why not ?

Watch Video Solution

2. The relaxation time τ Is nearly independent of applied E field whereas it changes significantly with temperature T. First fact is (in part) responsible for Ohnl's law whereas the second fact leads to variation of p with temperature. Elaborate why ?

Watch Video Solution

3. What are the advantages of the null-point method in a Wheatstone bridge ? What additional measurements would be required to calculte R_{unknown} by any onther method ?

Watch Video Solution

4. What is the advantage of using thick metallic strips to join wires in a potentiometer ?

Watch Video Solution

5. For wiring in the home, one uses Cu wires or Al wires. What considerations are involved in this ?

Watch Video Solution

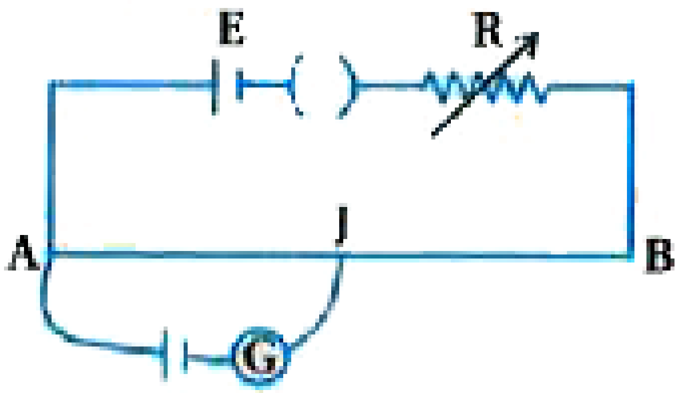
6. Why are alloys used for making standard resistance coils ?

Watch Video Solution

7. Power P is to be delivered to a device via transmission cables having resistance R_C If V is the voltage across R and I the current through it, find the power wasted and how can it be reduced.

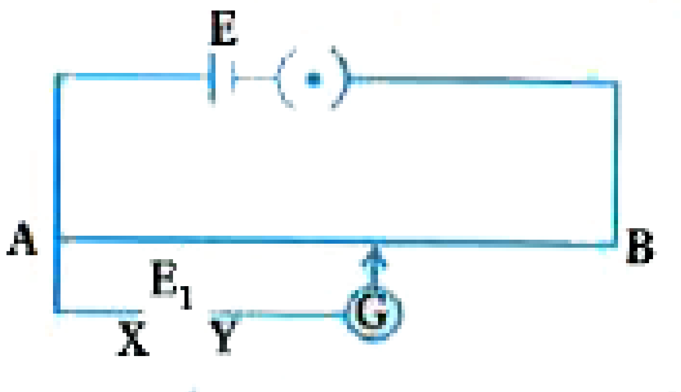
Watch Video Solution

8. AB is a potentiometer wire as in figure. If the value of R is increased, in which direction will the balance point J shift ?



Watch Video Solution

9. While doing an experiment with potcntiometc as shown in figure in was found that th deflection is one sided and (i) the detlectio, decreased while moving from one end A of the wire to the end B, (ii) the deflection increase while the jockey was moved towards the end



(i) Which terminal + or - ve Of the cell E_1 connected at X in case (i) and how is related to E ?

(ii) Which terminal of the cell E_1 is connected at X in case (ii) ?

Watch Video Solution

10. A cell of emf E and internal resistance r is connected across an external resistance R. Plot a graph showing the variation of P.D. across R, verses R.

Watch Video Solution

Section C Short Answer Type Questions

1. First a set of n equal resistors of R each are connected in series to a battery of emf E and internal resistance R. A current I is observed to flow. Then the n resistors are connected in parallel to the same battery. It is observed that the current is increased 10 times. What is 'n'?

Watch Video Solution

2. Let there be n resistors $R_1 \ldots R_n$ with $R_{\max}$ = max $(R_1 \ldots R_n)$ and $R_{\min} = \min\ (R_1 \ldots R_n)$. Show that when they are connected in parallel, the resultant resistance $R_p = R_{\min}$ and when they are connected in series, the resultant resistance $R_s > R_{\max}$. Interpret the result physically.

Watch Video Solution

3. The circuit in figure shows two cells connected in opposition to each other. Cell E_1 is of emf 6 V and nternal resistance 2 Ω the cell E_2 is of emf 4 V and internal resistance 8 Ω. Find the potential difference between the points A and B.

Watch Video Solution

4. Two cells of same emf E but internal resistance r_1 and r_2 are connected in series to an external resistor R (figure). What should be the value of R so that the potential difference across the terminals of the first cell becomes zero ?

Watch Video Solution

5. Two conductors arc made of the same material and have the same length. Conductor A is a solid wire of diameter 1 mm. Conductor B is a holJow tube of outer diameter 2 mm and inner diameter lrrun. Find the ratio of resistance R_A to R_B.

Watch Video Solution

6. Suppose there is a circull consisting of only resistances and batteries. Suppose one is to double (or increase it to n-times) all voltages and all resistances. Show that currents are unaltered.

Watch Video Solution

Section C Long Answer Type Questions

1. Two cells of voltage 10 V and 2 V and internal resistances 10 Ω and 5Ω respectively, are connected

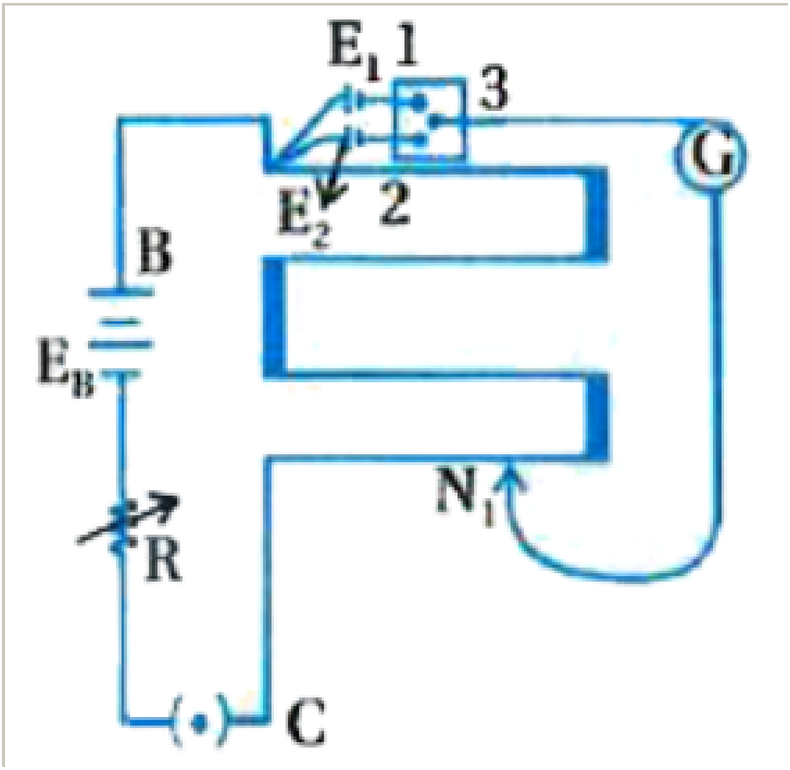
in parallel with the positive end of 10V battery connected to negative pole of 2 V battery (figure). Find the effective voltage and effective resistance of the combination.

Watch Video Solution

2. A room has AC run for 5 hours a day at a voltage of 220V. The wiring of the room consists of Cu of 1mm radius and a length of 10m. Power consumption per day is 10 commerical units. What fraction of its goes in the joule heating in wires? What would happen if the wiring is made of aluminium of the same dimensions.

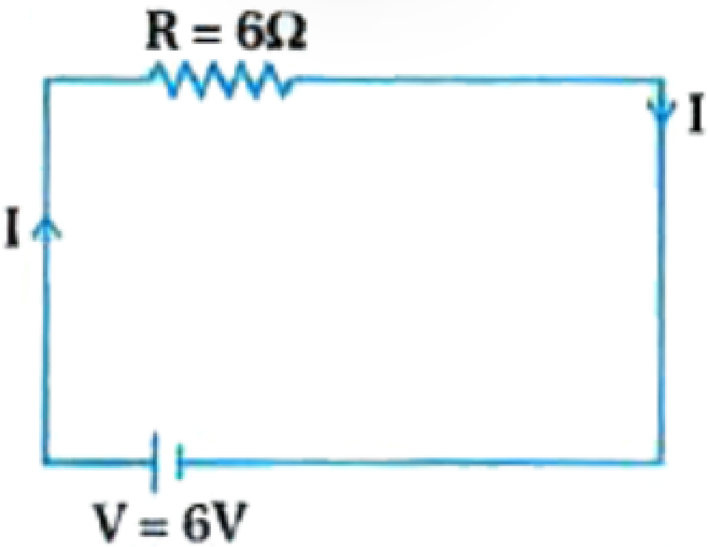
Watch Video Solution

3. In an experiment with a potentiometer, V_B = 10 V. R is adjusted to be 50 Ω (figure). A student wanting to measure voltage E1 of a battery (approx. 8 V) finds no null point possible. He then diminishes R to 10 Ω and is able to locate the null point on the last (4th) segment of the potentiometer. Find the resistance of the potentiometer wire and potential drop per unit length across the wire in the second case.



View Text Solution

4. Consider circuit in figure. How much energy is absorbed by electrons from the initial state of no current (ignore thermal motion) to the of drift velocity ?



Watch Video Solution

5. Electrons give up energy at the rate of Rl^2 per second to the thermal energy. What time scale would number associate with energy in problem (a)

? N = no of electron/ volume = $10^{29} / m^3$, length of circuit = 10 cm , cross-section = A = $(1mm)^2$

Watch Video Solution

Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook

1. Electric current is ..... .

A. scalar quantity

B. vector quantity

C. derived quantity

D. simply a number

Answer: A

Watch Video Solution

2. Electric current density is ..... .

A. vector quantity

B. scalar quantity

C. fundamental quantity

D. having unit Am^{-1}

Answer: A

Watch Video Solution

3. ampere $\times$ second = ...

A. joule

B. volt

C. Ohm

D. Coulomb

Answer: D

Watch Video Solution

4. Unit of electric current density is .... .

A. Am

B. Am^{-1}

C. Am^{-2}

D. AC^{-1}

Answer: C

Watch Video Solution

5. A steady current flows in a metallic conductor of non-uniform cross-section. Which of these quantities is constant along the conductor: current, current density, electric field, drift speed?

A. electric current density

B. electric current

C. drift velocity

D. electric field

Answer: B

Watch Video Solution

6. An electron completes 25 rotations in 1 seconds on circular path, then amount or electric charge passing through any point in circular path in 10 seconds is .... .

A. 4×10^{20} C

B. 4×10^{-19} C

C. $4 \times 10^{-18} C$

D. $4 \times 10^{-17} C$

Answer: D

Watch Video Solution

7. The current through a wire varies with time as $I = I_0 + \alpha t$, where I_0 = 1 A and $\alpha = 4 A s^{-1}$. The charge that flows across a cross-section or the wire In first 10 seconds is ....

A. 210 C

B. 300 C

C. 150 C

D. 250 C

Answer: B

Watch Video Solution

8. Charge passing through a conductor carrying current is given by Q = $5t^2 + 3t + 1$, How much amount of current will pass in t = 5 s ?

A. 9A

B. 49 A

C. 53 A

D. 151 A

Answer: C

Watch Video Solution

9. A charge of 2×10^{-2} C moves at 30 revolutions per second in a circle of diameter 80 cm. The current linked with the circuit is .....

A. 0.02 A

B. 20 A

C. 0.60 A

D. 60 A

Answer: C

Watch Video Solution

10. A charge on electron is 1.6×10^{-19} C. How many electrons will be passing in 2 seconds through a cross-section of a conducting wire carrying 0.7 A electric current ?

A. 4.4×10^{18}

B. 4.4×10^{-18}

C. 8.8×10^{18}

D. 8.8×10^{-18}

Answer: C

Watch Video Solution

11. 30 coulomb electric charge passes through conducting wire in 10 minutes so ...... A electric current will pass through it.

A. 3

B. 0.5

C. 0.05

D. 0.3

Answer: C

Watch Video Solution

12. In a hydrogen atom, the electron is moving in a circular orbit of radius 5.3×10^{-11} m with a constant speed of $2.2 \times 10^{6} ms^{-1}$. The electric current formed due to the motion of electron is ......

A. 1.12 A

B. 1.06 mA

C. 1.06 A

D. 1.12 mA

Answer: B

Watch Video Solution

13. A ring of radius R and linear charge density λ on its surface is performing rotational motion about an axis perpendicular to its plane. If the angular velocity of the ring is ω, how much current is constituted by the ring?

A. $R\omega\lambda$

B. $R^2\omega\lambda$

C. $R\omega^2\lambda$

D. $R\omega\lambda^2$

Answer: A

Watch Video Solution

14. Cross-sectional area of proton beam having electric current 1 μA is 0.5 mm^2 and move with velocity 3×10^4 m/s so current density = ...

A. $6.6 \times 10^{-4} C / m^3$

B. $6.6 \times 10^{-5} C / m^3$

C. $6.6 \times 10^{-6} C / m^3$

D. None of these

Answer: B

Watch Video Solution

15. Current density in a copper wire is $2.5 \times 10^8 Am^{-2}$. If 8A current if flowing through it diameter of the wire is ......

A. 0.2 mm

B. 0.2cm

C. 0.2 m

D. 2 mm

Answer: A

Watch Video Solution

16. Charge passing through the cross-section of a conductor h given by Q = B' + A' t^2 . What will be the current in ampere at lime t = 10 s ?

A. 5 A'

B. 10 A'

C. 20 A'

D. 40 A'

Answer: C

Watch Video Solution

17. The current through a wire varies wilh time as I = $I_0 + \alpha$t where I_0 = 20 A and $\alpha = 3As^{-1}$. Find the charge that flows across a cross - section of the wire in first 10 seconds.

A. 350 C

B. 300 C

C. 200 C

D. 150 C

Answer: A

Watch Video Solution

18. Electric charge passing through a resistor changes with time t as Q = at - bt^2 . Then total heat produce in resistor R = ...

A. $\frac{a}{2b}$

B. $\frac{2b}{a}$

C. $\frac{a^2}{2b^2}$

D. $\frac{R(a^3)}{6(b)}$

Answer: A

Watch Video Solution

19. When an electric cell is in use, ... Relation holds good.

A. $\varepsilon = V - Ir$

B. $\varepsilon = V + Ir$

C. $\varepsilon = V$

D. $\varepsilon = V + IR$

Answer: B

Watch Video Solution

20. Resistivity of material does not depend on ...... of conductor

A. temperature

B. pressure

C. dimensions

D. type of material

Answer: C

Watch Video Solution

21. Lengths and cross-sectional areas of three copper wires are (l, A), $\left(2l, \frac{A}{2}\right), \left(\frac{l}{2}, 2A\right)$. Which of these wires has least (minimum) resistance ?

A. Second wire

B. First wire

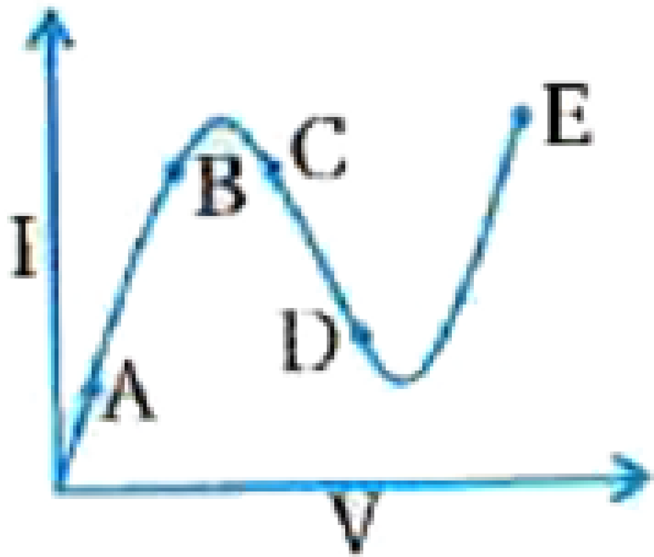
C. Third wire

D. All the wires have same resistance

Answer: C

Watch Video Solution

22. Which of the following curve represents negative resistance ?



A. AB

B. BC

C. CD

D. DE

Answer: C::D

Watch Video Solution

23. ..... is Ohm 's law for good conductor

A. $V \propto R$

B. $V \propto I$

C. $I \propto R$

D. $V \propto \frac{1}{R}$

Answer: B

Watch Video Solution

24. Ohmic resistance of conductor .....

A. Depends on V only.

B. depends on I only.

C. depends on V and I.

D. doesn't depend on V and I.

Answer: D

Watch Video Solution

25. SI unit of electrical conductivity is

A. Ωm

B. Ω

C. J

D. $\mho \, m^{-1}$

Answer: D

Watch Video Solution

26. For a block with dlmensions $1cm \times 1cm \times 100cm$ havng resistivity $3 \times 10^{-7} \Omega$ m, find its resistance between two rectangular sides.

A. $3 \times 10^{-9} \Omega$

B. $3 \times 10^{-7} \Omega$

C. $3 \times 10^{-5} \Omega$

D. $3 \times 10^{-3} \Omega$

Answer: C

Watch Video Solution

27. Specific resistance of material of one wire is ρ. Its volume is 3 m^3 and its resistance is 3Ω. Its length would be ..... .

A. $\sqrt{\frac{1}{\rho}}$

B. $\frac{3}{\sqrt{\rho}}$

C. $\frac{\sqrt{3}}{\rho}$

D. $\frac{\rho}{\sqrt{3}}$

Answer: B

Watch Video Solution

28. Which is the dimensional formula for conductance from the given below ?

A. $M^1L^2T^{-3}A^{-2}$

B. $M^{-1}L^{-2}T^{3}A^{2}$

C. $M^{1}L^{3}T^{-3}A^{-2}$

D. $M^{-1}L^{-3}T^{3}A^{2}$

Answer: B

Watch Video Solution

29. The physical quantity having the dimentiom, $M^{-1}L^{-3}T^{3}A^{2}$ is ....

A. resistance

B. resistivity

C. electrical conductivity

D. electromotive force

Answer: C

Watch Video Solution

30. SI unit of electrical conductivity is

A. Ω

B. Ω

C. Ωm

D. Siemen m^{-1}

Answer: D

Watch Video Solution

31. Resistance of wire having diameter 2 mm and length 100 cm is 0.7 Ω, so resistivity of wire = ...

A. 14.4 $\mu\Omega$ m

B. $22\mu\Omega$m

C. $1.1\mu\Omega$ m

D. $0.22\mu\Omega$ m

Answer: B

32. Resistance of wire having radius r is R. If new wire of radius 2r, is made, then the new resistance of wire = ...

A. $\frac{R}{2}$

B. $\frac{R}{16}$

C. 2R

D. 4R

Answer: B

Watch Video Solution

33. On applying an electric field of $15 \times 10^{-6} vm^{-1}$ across a conductor , current density through it is 3.0 Am^{-2}. The resistivity of the conductor is ....

A. $45 \times 10^{-6} \Omega m$

B. $5 \times 10^{-6} \Omega$m

C. $0.5 \times 10^{-6} \Omega m$

D. $2 \times 10^{5} \Omega$ m

Answer: B

Watch Video Solution

34. The ratio of length of two wires of same mass arc made up of same material is 1 : 2 Therefore ratio of their resistance is ....

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:4$

Answer: D

Watch Video Solution

35. Resistance of a wire is $R\Omega$. It is stretched uniformly till Its length becomes four times. It's resistivity will ....

A. be doubled

B. be four times

C. be half

D. not change

Answer: D

Watch Video Solution

36. $J = \sigma E$ represents ....

A. Coulomb's law

B. Ampere's law

C. Ohm's law

D. Gauss's law

Answer: C

Watch Video Solution

37. On increasing the temperature of a conductor the product of its resistivity (ρ) and conductivity

(σ) will ....

A. increase

B. decrease

C. remain constant

D. may increase or decrease

Answer: C

Watch Video Solution

38. When the temperature of a conductor increase the ratio of its resistivity and conductivity ......

A. Decreases

B. increases

C. remain constant

D. increases or decreases

Answer: B

Watch Video Solution

39. Two wires of equal lengths one of copper and other of manganin have the same resistance which wire is thicker ?

A. copper

B. manganin

C. both have equal thickness

D. none of the above

Answer: B

Watch Video Solution

40. Two wires are made up of same material. Ratio of their masses is 1 : 2 and ratio of their lengths is 2 : 1 . So ratio of their resistances is.... .

A. $1:4$

B. $4:1$

C. $1:8$

D. $8:1$

Answer: D

Watch Video Solution

41. A resistive wire is stretched till its length is increased by 100%. Due to the consequent decrease in diameter, the change in the resistance of a stretched wire will be

A. 3

B. 2

C. 1

D. 0.5

Answer: A

Watch Video Solution

42. A circle of 2.5 meter radius is made using a wire of uniform cross section and resistivity $1m^2$. If resistance of this wire is $10\pi\Omega$ resistivity of the material of the wire is ....

A. $4\pi\Omega$ m

B. $\frac{0.25}{\pi}\Omega$m

C. 2Ω m

D. 1Ω m

Answer: C

Watch Video Solution

43. A solenoid has 50 turns and radius 2 cm, diameter of wire is $2x10^{-4}$ m, current through it when it is joined with battery of 10V is ... Resistivity of material.2*10^-6 Ωm.

Watch Video Solution

44. Resistance or coil at 100°C is 4.2 Ω. If temperature co-efficient of resistance of material is 0.004 $\left(^{\circ}C\right)^{-1}$ so what will be its resistance at $0^{\circ}C$?

A. 5Ω

B. 3Ω

C. 4Ω

D. 3.5Ω

Answer: B

Watch Video Solution

45. Resistance of a wire is $R\Omega$. It is stretched uniformly till Its length becomes four times. It's resistivity will ....

A. be doubled

B. be four times

C. be half

D. not change

Answer: D

Watch Video Solution

46. Resistivity of ideal conductor and ideal insulator are ρ_1 and ρ_2 respectively, then .....

A. $\rho_1 = 0, \rho_2 = 0$

B. $\rho_1 = 0, \rho_2 = \infty$

C. $\rho_1 = \infty, \rho_2 = 0$

D. $\rho_1 = \infty, \rho_2 = \infty$

Answer: B

Watch Video Solution

47. For a conductor, the given Ogure shows the graph of $V \rightarrow$ I for different temperatures then ..... .

A. $T_1 < T_2 < T_3$

B. $T_1 = T_2 = T_3$

C. $T_1 > T_2 > T_3$

D. $T_2 = \frac{T_1 + T_3}{2}$

Answer: A

View Text Solution

48. For a conducting wire V $\rightarrow$ I graph is as shown in figure given below, therefore its resistance will be .....

A. $\sin 50^{\circ}$

B. $\cos 50^{\circ}$

C. $\tan 50^{\circ}$

D. $\cot 50^{\circ}$

Answer: C

View Text Solution

49. Free electron number density in one wire is n, its area of cross-section is A, and drift velocit of electrons is v_d Then electric current forme in this wire is ......

A. nev_d

B. Av_dne

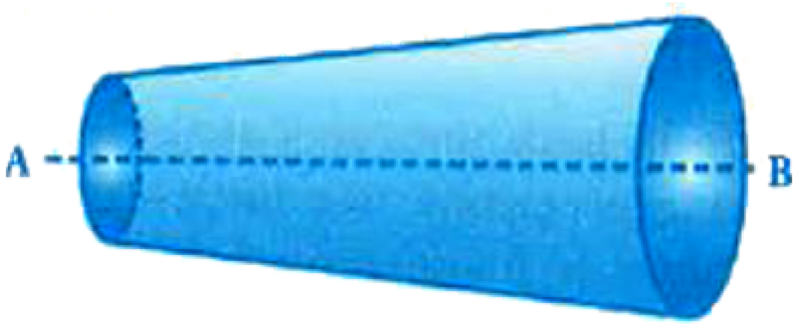
C. Ane

D. $\dfrac{Av_dn}{e}$

Answer: B

Watch Video Solution

50. A wire has a non-uniform cross-section ai shown In figure. A steady current Is tlowint through it. Then the drift speed of tht electrons while going from A and B ....



A. Is constant throughout the wire.

B. decreases

C. increases

D. varies randomly

Answer: B

Watch Video Solution

51. Drift velocity of electrons is ....

A. in the direction of current density

B. in the direction opposite to that of electric field

C. in any random direction

D. not defined.

Answer: B

Watch Video Solution

52. The arc of cross-section of a metallic conductor is halved. The drift vclocity of electron ....

A. is not affected.

B. becomes half.

C. becomes double.

D. none of the above

Answer: A

Watch Video Solution

53. Drift velocity of holes is ......

A. in the direction of current density.

B. in the direction opposite to that of electric field.

C. in any random direction

D. not defined

Answer: A

Watch Video Solution

54. Suppose drift velocity over the entire cross section of a wire is V (r) = $V_0\left[1-\frac{r}{R}\right]$. What is the current density at the surface of the wire ?

A. zero

B. V_0R

C. neV_0

D. ne$\frac{r}{R}$

Answer: A

Watch Video Solution

55. Cross-sectional area of silicon slab at 300 K temperature having length 10 cm is $1 \times 10^{-4} m^2$ Find the current passing through slab if 2 V battery is joined paraUcl to its lengch mobility of electron = 0.14 $m^2 V^{-1} S^{-1}$ and electron density $= 1.5 \times 10^{16} m^{-3}$.

A. 6.72×10^{-4} A

B. 6.72×10^{-5} A

C. 6.72×10^{-6}A

D. 6.72×10^{-7} A

Answer: D

Watch Video Solution

56. Drift velocity of electrons is ....

A. same as velocity of light.

B. larger than the velocity of light

C. negligible compared to velocity of light

D. zero

Answer: C

Watch Video Solution

57. Mobility of electric charge mean., ... per unit electric field.

A. resistance

B. current

C. electric potential

D. drift velocity

Answer: D

Watch Video Solution

58. Resistance of conductor increases with increase in temperature because ....

A. electron density increases

B. electron density decreases

C. relaxation time increases

D. relaxation time decreases.

Answer: D

Watch Video Solution

59. There are three red coloured hands on a carbon resistor. What is its resistance ?

A. $2.2K\Omega$

B. $2200K\Omega$

C. $(2200 \pm 20\%)k\Omega$

D. $1.76k\Omega \text{ to } 2.64k\Omega$

Answer: D

Watch Video Solution

60. On a carbon resistor there are bands of colours of our national flag from upto down, what is resistance of the carbon resistor ?

A. $39 \times 10^{5} \pm 20\,\%\,\Omega$

B. $39 \times 10^{5} \pm 5\,\%\,\Omega$

C. $39 \times 10^{5} \pm 10\,\%\,\Omega$

D. $59 \times 10^{5} \pm 10\,\%\,\Omega$

Answer: A

Watch Video Solution

61. Which of the following is a unit of mobility ?

A. $m^2V^{-1}S^{-1}$

B. $m^2\Omega^{-1}C^{-1}$

C. $CSkg^{-1}$

D. $m^2\Omega C^{-1}$

Answer: D

Watch Video Solution

62. Kirchhoff's first and second law are based ....

A. Conservation of momentum and conservation of electric charge

B. Conservation of electric charge and, conservation of energy

C. Conservation of electric charge anc conservation of momentum.

D. Conservation of electric energy anc conservation of electric charge

Answer: B

Watch Video Solution

63. When a battery is connected across a parallel combination of two unequal resistances.

A. current passing through both the resistances would be equal.

B. p.d. across both the resistances would be equal.

C. current through bigger resistance would be more.

D. p.d. across smaller resistance would be more.

Answer: B

Watch Video Solution

64. When a battery is connected across series connection of two unequal resistances.

A. current passing through both the resistances would be equal.

B. p.ct. across both the resistances would be equal.

C. current through bigger resistance would be less.

D. p.d. across smaller resistance would be more.

Answer: A

Watch Video Solution

65. When 10 resistors, each with resistance $\frac{1}{10}\Omega$ are connected in parallel , equivalent resistance will be ......

A. 1Ω

B. 100Ω

C. $\frac{1}{100}\Omega$

D. 10Ω

Answer: C

Watch Video Solution

66. Resistance P, Q, R, S in the four sides of Whearstone bridge have respective values $10\Omega, 30\Omega, 20\Omega$ and 60Ω. A cell connected across one diagonal has emf 5 V and internal resistance 2 Ω. If resistance of galvanometer is 60Ω then current passing the cell is .....

A. 0.2 A

B. 0.15 A

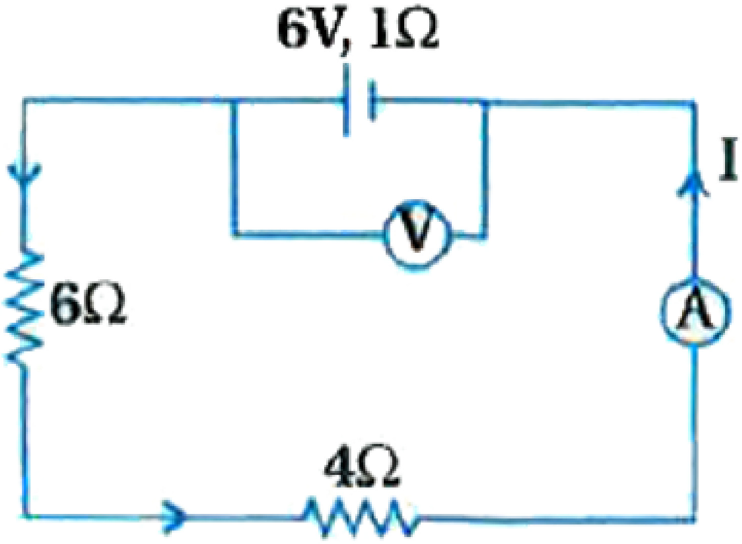
C. 0.17 A

D. 2A

Answer: C

Watch Video Solution

67. Reading obtained in the ammeter and voltmeter would be ....and ..... .



A. 6 A, 60 V

B. 0.6 A, 6 V

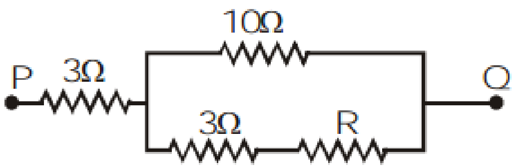
C. $\frac{6}{11}A, \frac{60}{11}V$

D. $\frac{11}{6}A, \frac{11}{60}V$

Answer: C

Watch Video Solution

68. What should be the value of unknown resistance R so that equivalent resistance between P and Q is also R ?



A. 3Ω

B. $\sqrt{39}\Omega$

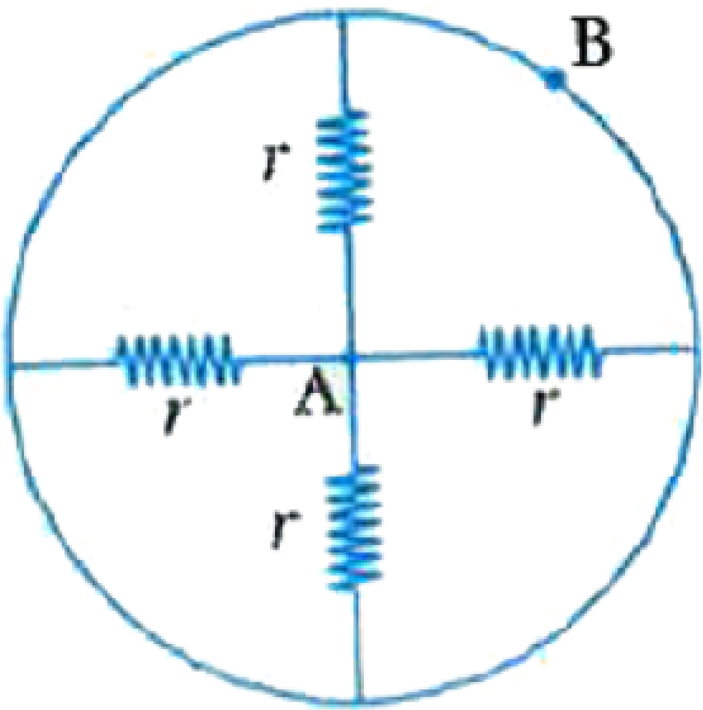
C. $\sqrt{69}\Omega$

D. 10Ω

Answer: C

Watch Video Solution

69. In a given circuit, equivalent resistance between A and B = Ω.



A. r

B. $\frac{4r}{3}$

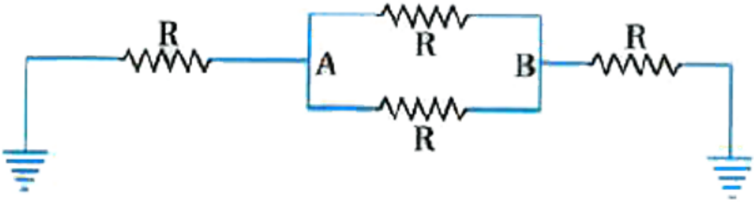
C. 4r

D. $\frac{r}{4}$

Answer: D

Watch Video Solution

70. Equivalent resistance bet ween A and B for shown circuit :



A. $\frac{R}{3}$

B. $\frac{R}{2}$

C. $\frac{2R}{5}$

D. $\frac{3R}{5}$

Answer: C

Watch Video Solution

71. Which unknown quantity is measured with the help of Wheatstone's Bridge ?

A. Electric current

B. Voltage

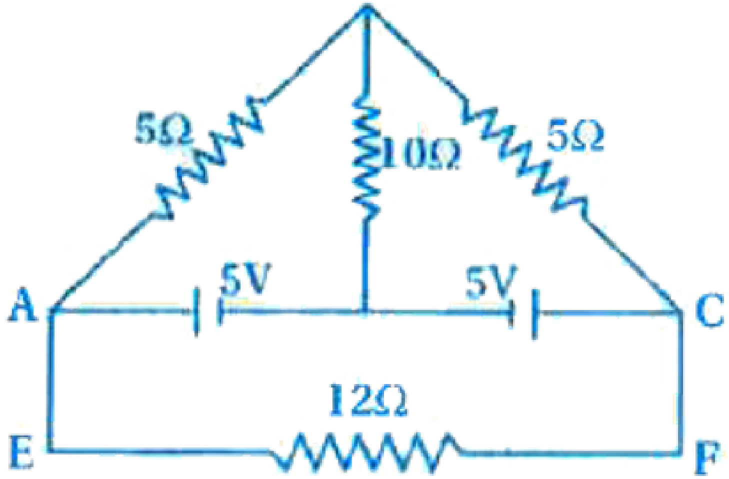
C. Resistance

D. emf

Answer: C

Watch Video Solution

72. In the circuit of adjoining figure the current through 12Ω resistor will be



A. $1A$

B. $\frac{1}{5}$A

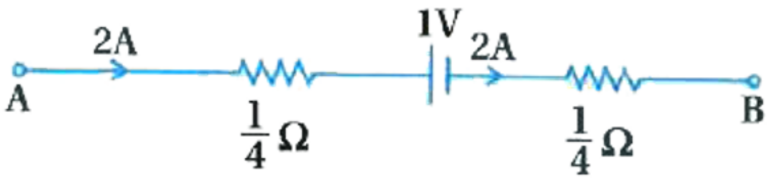
C. $\frac{2}{5}$A

D. $0A$

Answer: D

Watch Video Solution

73. Figure shows a part of a closed circuit. If the current flowing through it is what will b the potential difference be tween point A and R ?



A. $+2V$

B. $+1V$

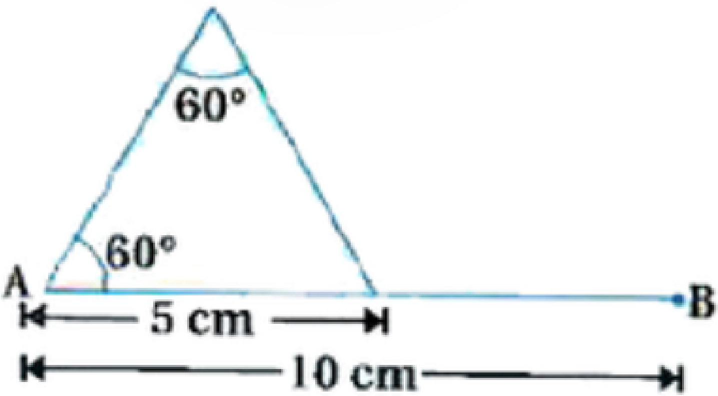
C. $-2V$

D. $-1V$

Answer: A

Watch Video Solution

74. A wire has resistance of 24Ω is bent in the following shape. The effective resistance between A and B is



A. 24Ω

B. 10Ω

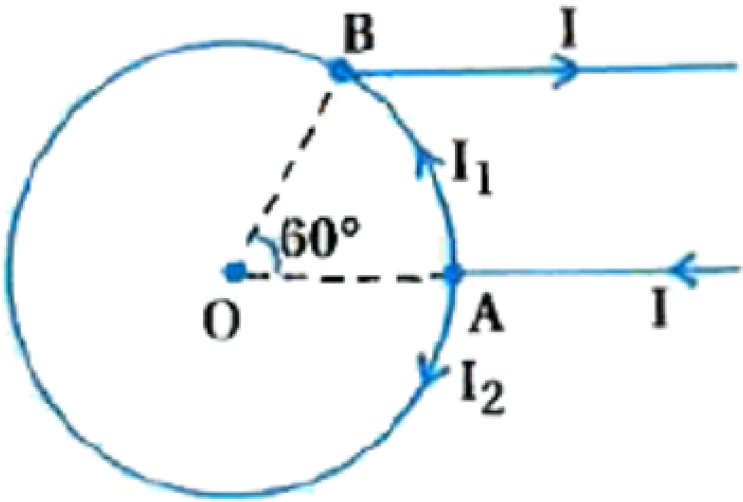
C. $\frac{16}{3}\Omega$

D. None of these

Answer: B

Watch Video Solution

75. A wire of 18Ω resistor is bent in a circle. Find effective resistance between A and B. $\angle AOB = 60^{\circ}$



A. 3Ω

B. 2.5Ω

C. 15Ω

D. 18Ω

Answer: B

Watch Video Solution

76. Resistances of three resistors are in the proportion connected in parallel, their effective resistance is 6Ω. Then connect on if these resistance are connect in series so equivalent resistance will be

....

A. 36Ω

B. 84Ω

C. 66Ω

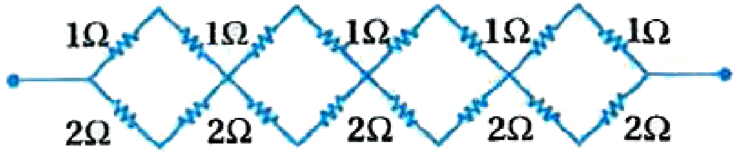
D. 18Ω

Answer: C

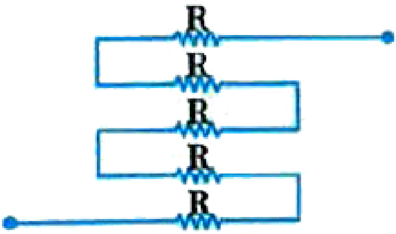
Watch Video Solution

77. Determine the equivalent resistance of networks

shown in figure.



(a)



A. 2Ω

B. 3Ω

C. 6Ω

D. 12Ω

Answer: A

Watch Video Solution

78. The area of the region enclosed between the curves

$y = \sin x + \cos x$ and $y = |\cos x - \sin x|, x \in \left[0, \frac{\pi}{2}\right]$

is ....Sq. units.

A. 4Ω

B. 2Ω

C. 1Ω

D. 3Ω

Answer: A

Watch Video Solution

79. A uniform conductor of resistance R is cut into 20 equal pieces. Half of them are joined in series and the remaining half of them are connected in parallel. If the two combinationi. are joined in series, the effective resistance of all the pieces is ....

A. R

B. $\frac{R}{2}$

C. $\frac{101R}{200}$

D. $\frac{201R}{200}$

Answer: C

Watch Video Solution

80. What maximum power can be obtained from a battery of emf ε and internal resistance r connected with an external resistance R ?

A. $\frac{\varepsilon^2}{4r}$

B. $\frac{\varepsilon^2}{3r}$

C. $\frac{\varepsilon^2}{2r}$

D. $\frac{\varepsilon^2}{r}$

Answer: A

Watch Video Solution

81. Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is 0.5 Ω . The power loss in the wire is .....

A. 19.2 W

B. 19.2 kW

C. 19.2 J

D. 12.2 kW

Answer: B

Watch Video Solution

82. emf of battery is 2.2 V. When 5Ω resisitor i connected across the battery, its termina voltage is 1.8 V. In tern al resistance of battery .... Ω.

A. $\frac{10}{9}$

B. $\frac{9}{10}$

C. $\frac{9}{5}$

D. $\frac{5}{9}$

Answer: A

Watch Video Solution

83. When a voltameter is connected across a battery which is connected with external resistance 280 Ω to measure its emf, it reads 1.4 V. Now when this emf is measured by potentiometer, it is measured as 1.55 V. Now if maximum power is to be spent in the external resistance then its value should be made equal to ....

A. 30 Ω

B. 35 Ω

C. 45Ω

D. 60Ω

Answer: A

Watch Video Solution

84. Rating of 12 V battery is 80 A, this means that if we join any conducting wire between two terminals of battery, we get 80 A electric current and internal resistance of battery = Ω.

A. 0

B. 0.015

C. 0.15

D. none of these

Answer: C

Watch Video Solution

85. Terminal voltage of battery of $1.25V$ and $emf of ba\mathrm{e}ry 1.5V$, so internal resistance of battery is ...... Ω.

A. 2

B. 20

C. 200

D. 2000

Answer: D

Watch Video Solution

86. Internal resistance of cell having emf 24 V is 0.12Ω. If cell is joined with external resistance 3 Ω, so terminal voltage of cell is ....

A. 23.08 V

B. 2V

C. 0.1 V

D. 3.8 V

Answer: A

Watch Video Solution

87. Internal resistance of a battery of 2V terminal voltage is 0.2Ω and currrent flowing through is 0.5 A . So emf of battery will be ..... .

A. 1.9 V

B. 1.0 V

C. 2.1 V

D. 3 V

Answer: C

Watch Video Solution

88. A 10Ω resistance is connected with an electric cell. Now this resistance is replaced by a 20Ω resistance. The potential difference between two poles of the cell

A. will increase

B. will decrease

C. will remain the same

D. will get discharged immediately

Answer: A

Watch Video Solution

89. The potential difference between the terminals or a battery is 10 V and internal resistance 1Ω drops to 8 V when connected across an external resistor . Find the resistance of the external resistor.

A. 40 Ω

B. 0.4 Ω

C. $4M\Omega$

D. 4Ω

Answer: D

Watch Video Solution

90. The cell is said to be in open circuit condition

A. When current passing through it is maximum

B. When $F_n = F_e = 0$

C. When$F_n < F_e$

D. When current passes through it is zero

Answer: D

Watch Video Solution

91. If the current in an electric bulb increases by 1 %, what will be the change in the power of a bulb ?

[Assume that the resistance of the filament of a bulh remains constant]

A. increases by 1%

B. decreases by 1 %

C. increases by 2%

D. decreases by 2%

Answer: C

Watch Video Solution

92. Total power consumed when two resistors of resistance R are connected in series is P. How much power is consumed when they are connected in parallel ?

A. $\frac{P}{4}$

B. P

C. 2P

D. 4P

Answer: D

Watch Video Solution

93. Three equal resistors connected across, a source of emf together dissipate 10 watt of power. What will be the power dissipated in watt if the same resistors are connected in parallel across the same source of emf

A. $\frac{10}{3}$

B. 10

C. 30

D. 90

Answer: D

Watch Video Solution

94. Temperature of a conductor increases by 5°C passing electric current for same time. The increase in its temperature when double current is passed through 1he same conductor the same time is ..... $^{\circ}C$.

A. 10

B. 12

C. 16

D. 20

Answer: D

Watch Video Solution

95. Heat produced in a resistance wire of resistance R on passing current is H cal/sec.Then current through resistor = ... A.

A. $\sqrt{\frac{H}{R}}$

B. $\sqrt{\frac{H}{Rt}}$

C. $\sqrt{\frac{Ht}{R}}$

D. $\frac{HJ}{R}$

Answer: C

Watch Video Solution

96. n identical bulbs operating on same voltage are available. When all such bulbs are connected in series to the same operating voltage source, then power consumed in each bulb = ... W.

A. nP

B. P

C. $\frac{P}{n}$

D. $\frac{P}{n^2}$

Answer: C

Watch Video Solution

97. Maximum power in a 0.5Ω resistance connected with two batteries of 2V emf and 1Ω internal resistance in parallel, is ....

A. $\frac{8}{9}$ W

B. 1.28 W

C. 2.0 W

D. 3.2 W

Answer: C

Watch Video Solution

98. An electric bulb marked 40 W and 200 V is used in a circuit of supply voltage 100 V. Now its power is .... .

A. 10 W

B. 20 W

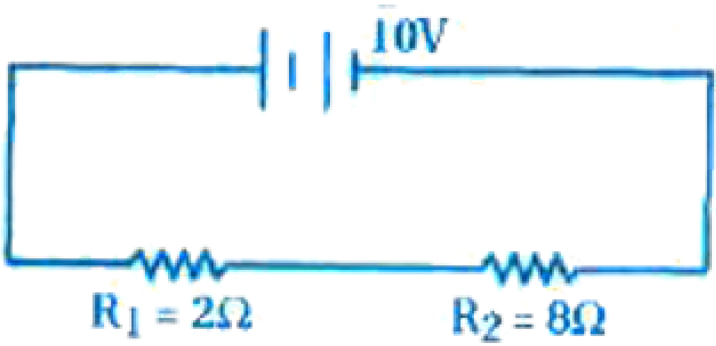
C. 40 W

D. 100 W

Answer: A

Watch Video Solution

99. What is the ratio of power consumed in resistances R_1 and R_2 as shown In figure ?



A. $1:4$

B. $4:1$

C. $1:2$

D. $2:1$

Answer: A

Watch Video Solution

100. Three cells of emf 1.5 V and internal resislance 1Ω are connected in parallel. This combination will have the emf ....

A. 4.5 V

B. 3.0 V

C. 1.5 V

D. 0.5 V

Answer: C

Watch Video Solution

101. n resistors each of resistance r are connected to a battery of emf ε and internal resistance r. Then the ratio of terminal voltage to emf of battery = ...

A. n

B. $\dfrac{n}{n+1}$

C. $\dfrac{1}{n+1}$

D. $\dfrac{n+1}{n}$

Answer: B

Watch Video Solution

102. n identical cells each of emf ε and Internal resistance r are connected in parallel with resistor R. The current nowing through resistor R is ....

A. $\frac{n\varepsilon}{R+nr}$

B. $\frac{n\varepsilon}{nR+r}$

C. $\frac{\varepsilon}{R+r}$

D. $\frac{\varepsilon}{nR+r}$

Answer: B

Watch Video Solution

103. Two bulbs of 220 V and 100 W are firs connected in series and then in parallel with a supply of 220 V. Total power in buth the cases will be ....

A. 50 W, 100 W

B. 100 W, 50 W

C. 200 W, 150 W

D. 50 W, 200 W

Answer: D

Watch Video Solution

104. The resistance of a 10 m long potentiometer wire is 20 Ω . It is connected in series with a 3 V battery and 10 Ω resistor. The potential difference between two points separated by distance 30 cm is equal to ....

A. 0.02 V

B. 0.06 V

C. 0.1 V

D. 1.2 V

Answer: B

Watch Video Solution

105. A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 64 cm and 32 cm from the positive end of the wire in the two cases. the ratio of emf's is

A. $5:4$

B. $3:4$

C. $3:2$

D. $3:1$

Answer: C

Watch Video Solution

106. What is the unit of potential gradient ?

A. Vm

B. V/m

C. Vm^2

D. V/m^2

Answer: B

Watch Video Solution

107. Resistivity of the mateial of potentiometer wire is (ρ) and area of its uniform cross section is A, Hence potential gradient on the wire is = ...

A. $\frac{I}{\rho A}$

B. $\frac{IA}{\rho}$

C. $IA\rho$

D. $\frac{I\rho}{A}$

Answer: D

Watch Video Solution

108. In an experiment to measure emf ε_1 of a battery by a potentionmeter , the main circuit uses a battery of emf ε_2 . Then.

A. $\varepsilon_1 = \varepsilon_2$

B. $\frac{\varepsilon_1}{\varepsilon_2} = \frac{V_1}{V_2}$

C. $\varepsilon_1 > \varepsilon_2$

D. $\varepsilon_2 > \varepsilon_1$

Answer: B

Watch Video Solution

109. The resistance of a 10 m long potentiometer wire is 20 Ω . It is connected in series with a 3 V battery and 10 Ω resistor. The potential difference between two points separated by distance 30 cm is equal to ....

A. 0.02 V

B. 0.06 V

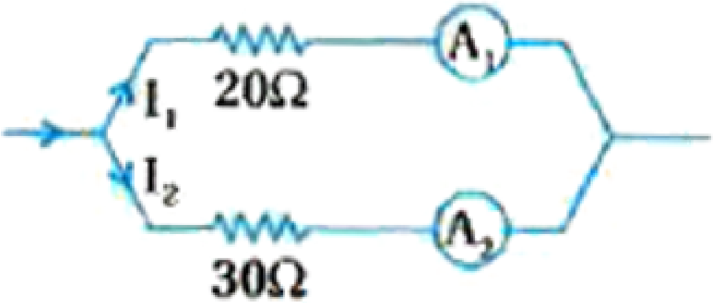
C. 0.1 V

D. 1.2 V

Answer: B

Watch Video Solution

110.



If reading in ammeter A_1 is $3A$ then reading in ammeter A_2 = ...

A. 2A

B. 5A

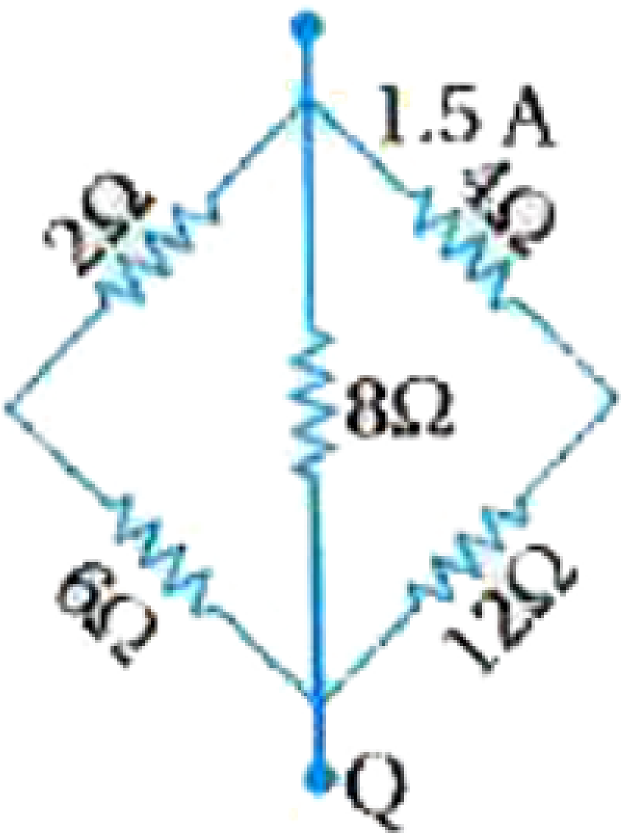
C. $\frac{1}{2}$ A

D. $\frac{1}{5}$ A

Answer: A

Watch Video Solution

111. Potential difference between points P and Q would be ....



A. 24 V

B. 12 V

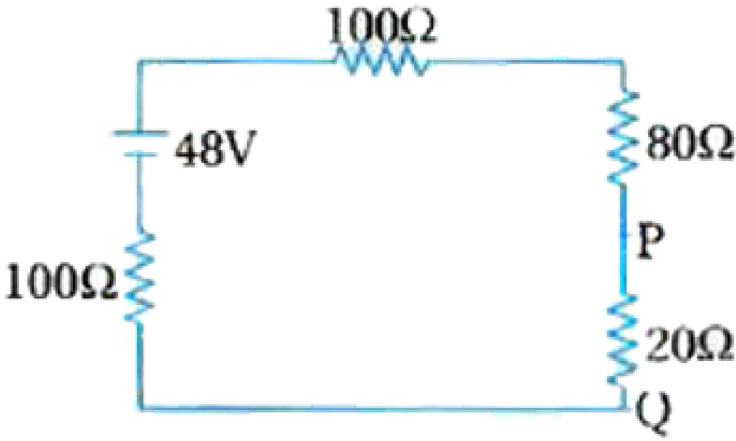
C. 8 V

D. 4.8 V

Answer: A

Watch Video Solution

112. Potential difference between points P and Q would be ......



A. 9.6 V

B. 6.6 V

C. 4.8 V

D. 3.2 V

Answer: D

Watch Video Solution

113. A 100 W bulb B_1 and two 60W bulbs B_2 and B_3 , are connected to a 250 V source as shown in the figure . Now W_1, W_2 and W_3 are the output powers of the bulbs B_1, B_2 and B_3 respectively, then

A. $W_1 > W_2 = W_3$

B. $W_1 > W_2 > W_3$

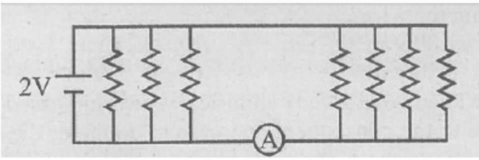
C. $W_1 < W_2 = W_3$

D. $W_1 < W_2 < W_3$

Answer: D

Watch Video Solution

114. Seven resistance each of 20Ω are connected with 2 volt battery, reading of ammeter will be.



(a) $\left(\frac{1}{10}\right)$A

(b) $\left(\frac{3}{10}\right)$ A

(c) $\left(\frac{4}{10}\right)$A

(d) $\left(\frac{7}{10}\right)$A

A. $\left(\frac{1}{10}\right)$A

B. $\left(\frac{3}{10}\right)$ A

C. $\left(\frac{4}{10}\right)$A

D. $\left(\frac{7}{10}\right)$A

Answer: C

Watch Video Solution

115. Given quantity of water is boiled by an electric heater in 5 min. If supply voltage of heater reduces to half then time taken to boil the same quantity or water will be ...... min. (Assume the resistance of the beater remaining constant)

A. 40

B. 20

C. 10

D. 2.5

Answer: B

Watch Video Solution

116. Assertion : In a simple battery circuit the point of lowest potential is positive terminal of the battery. Reason

: The current flows towardi, the point of the higher potential as It nows In such a circuit from the negative to the positive terminal.

A. Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. Both Assertion and Reason are true, but Reason is not correct explanation of the Assertion.

C. Assertion is true, but the Reason is false.

D. Both Assertion and Reason are false.

Answer: D

Watch Video Solution

117. A : The drift velocity of electrons in a metallic wire will decrease, if the temperature of the wire is increased.

R: On increasing temperature, conductivity of metallic wire decreases.

A. Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. Both Assertion and Reason are true, but Reason is not correct explanation of the Assertion.

C. Assertion is true, but the Reason is false.

D. Both Assertion and Reason are false.

Answer: B

Watch Video Solution

118. A : A 60 watt bulh has greater resistance than a 100 watt bulb.

R : P = VI = $I^2R = \frac{V^2}{R}$

A. Both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. Both Assertion and Reason are true, but Reason is not correct explanation of the Assertion.

C. Assertion is true, but the Reason is false.

D. Both Assertion and Reason are false.

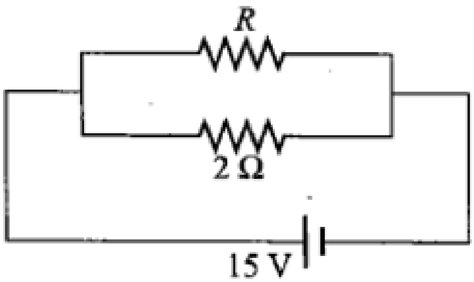
Answer: B

Watch Video Solution

Section D Multiple Choice Questions Mcqs Mcqs Asked In Competitive Exams

1. In given circuit total power consumed is 150 W.

Then value of R = ...



A. 2Ω

B. 6Ω

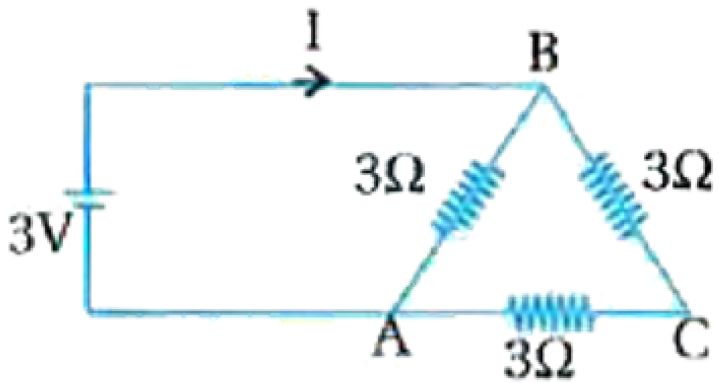
C. 5Ω

D. 4Ω

Answer: B

Watch Video Solution

2. A 3 volt battery with negligible internal resistance is connected in a circuit as shown in the figure. The current I in the circuit will be :



A. 1 Amp

B. 1.5 Amp

C. 2 Amp

D. $\frac{1}{3}$ Amp

Answer: B

Watch Video Solution

3. Power consumed in a bulb of 1000W and 220V when connected to 110 V mains = ...

A. 750 W

B. 500 W

C. 250 W

D. 1000 W

Answer: C

Watch Video Solution

4. Two wires of same material having lengths and radii in lhe ratio of 3 : 4 and 3 : 2 respectively are connected in parallel with a potential source of 6V. The ratio of currents flowing through them $I_1 : I_1$ = ...

A. $1:3$

B. $1:2$

C. $3:1$

D. $2:1$

Answer: C

Watch Video Solution

5. Resistance of a resistor wire is 5 Ω at $50\ {}^{\circ}C$ and 6Ω at $100\ {}^{\circ}C$, then its resistance at $0\ {}^{\circ}C$ will be .... .

A. 2Ω

B. 1Ω

C. 3Ω

D. 4Ω

Answer: D

Watch Video Solution

6. The current in the primary circuit of a potentiometer wire is 0.5 A. Specific resistance of wire is $4 \times 10^{-7} \Omega$ m and area of cross section of wire is $8 \times 10^{-6} m^2$. The potential gradient on the wire would be

A. 2.5 m V/m

B. 25 mV/m

C. 25 V/m

D. 10 V/m

Answer: B

Watch Video Solution

7. A copper wire is stretched to make it 0.1 % longer. The percentage change in its resistance is ...... (Assume that the volume of the wire remains constant.)

A. increase by 0.2 %

B. decrease by 0.2 %

C. decrease by 0.05 %

D. increase by 0.05 %

Answer: A

Watch Video Solution

8. In a large bullding there are 15 bulbs of 40 W, 5 bulbs of 100 W, 5 fans of 80 W and 1 heater of 1 kW. The voltage of the electric mains is 220 V. The minimum capacity of the main fuse of the building will be :

A. 12A

B. $14A$

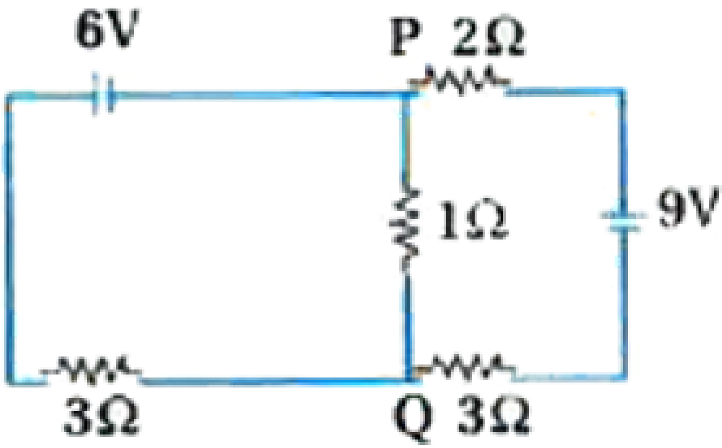
C. $8A$

D. $10A$

Answer: A

Watch Video Solution

9. In the circuit shown, the current in the 1 Ω resistor is ......



A. 1.3 A, from P to Q

B. 0A

C. 0.13 A, from Q to P

D. 0.13 A, from P to Q

Answer: C

Watch Video Solution

10. The temperature dependence of resistances of Cu and undoped Si in the temperature range 300 - 400 K, is best described by :

A. Linear decrease for Cu, linear decrease for Si

B. Linear increase for Cu, linear increase for Si.

C. Linear increase for Cu, exponential increase for Si.

D. Linear increase for Cu, exponential decrease for Si

Answer: D

Watch Video Solution

11. Let R and S be two non-void relations on a set A. Which of the following statement is false?

A. A rheostat can be used as a potential divider.

B. Kirchhoff's second law represents energy conservation

C. Wheatstone bridge is the most sensitive when all the four resistance are of the same order of magnitude.

D. In a balanced Wheatstone bridge if the cell and the galvanometer are exchanged the null point is disturbed.

Answer: D

Watch Video Solution

12.

In the above circuit the current in each resistance is ......

A. 0.5 A

B. $0A$

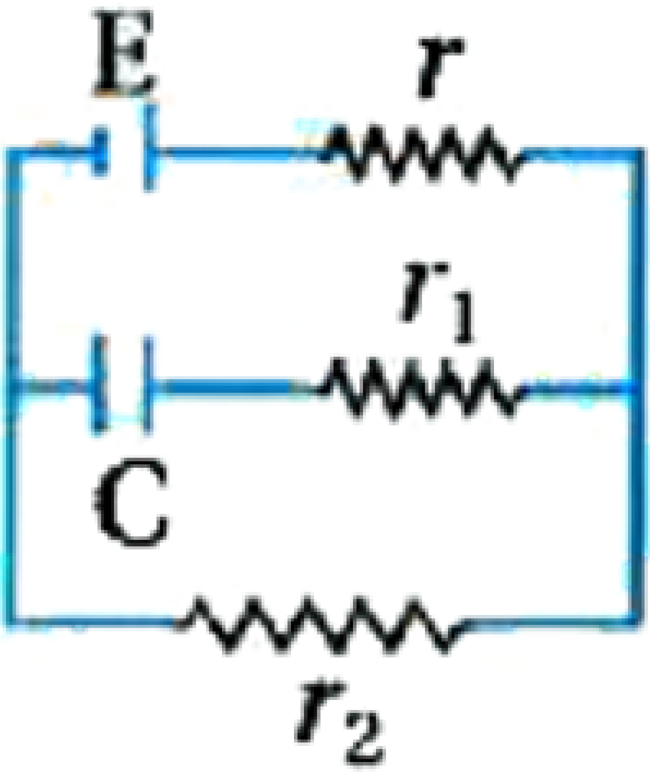
C. $1A$

D. 0.25A

Answer: B

View Text Solution

13. In the given circuit diagram when the current reaches steady state in the circuit, the charge on the capacitor of capacitance C will be .....



A. $CE\frac{r_2}{(r+r_2)}$

B. $CE\frac{r_2}{(r+r_2)}$

C. CE

D. $CE\frac{r_1}{(r_2+r)}$

Answer: A

Watch Video Solution

14. Two batteries with e.m.f. 12 V and 13 V are connected in parallel across a load resistor ol 10 Ω . The internal resistances of the two batteries are 1 Ω and 2Ω respectively. Tine voltage across the load lies between

A. $11.6V$ and $11.7V$

B. $11.5V$ and $11.6V$

C. 11.4 V and 11.5 V

D. 11.7 V and 11.8 V

Answer: B

Watch Video Solution

15. In a potenliomcter experiment, it is found that no current passes through the galvanometer when the terminals of the cell are connected across 52 cm of the potentiometer wire. If the cells is shunted by a resistance of 5 Ω, a balance is found when the cells is connected across 40 cm of the wire. Find the internal resistance of the cell.

A. 1Ω

B. 1.5Ω

C. 2Ω

D. 2.5Ω

Answer: B

Watch Video Solution

16. On interchanging the resistance the balance point of a meter bridge shifts to the left by 10 cm. The resistance of their seris combination is 1 $k\Omega$.

How much was the resistance on the left slot before the interchange ?

A. 990 Ω

B. 505 Ω

C. 550 Ω

D. 910 Ω

Answer: C

Watch Video Solution

17. The current (i_1) (in A) flowing through 1Ω resistor in the following circuit is:

(a) 0.50

(b) 0.30

(c) 0.25

(d) 0.20

A. 0.50

B. 0.30

C. 0.25

D. 0.20

Answer: D

View Text Solution

18. In a building there are 15 bulbs of 45 W, 15 bulbs of 100 W, 15 bulbs of 10 W and 2 heaters of 1 kW. The voltage of electric main is 220 V. The minimum fuse capacity (rated value) of the building will be approximately .

A. $5A$

B. 20 A

C. 25 A

D. 15 A

Answer: B

Watch Video Solution

19. The balancing length for a cell is 560 cm in a potentiometer experiment. When an external resistance of 10 Ω is connected in parallel to the cell , the balancing length changes by 60 cm. If the internal resistance of the cell is $\frac{n}{10}\Omega$ the value of n is ....

A. 10

B. 11

C. 12

D. 14

Answer: C

Watch Video Solution

20. There is a potentiometer wire of length 1200 cm and a 60 mA curreut is flowing in it. A battery of emf 5 V and internal resistance of 20 Ω is balanced on this potentiometer wfre with a balancing length 1000 cm. The resistance of the potentiometer wire is

A. 60Ω

B. 80Ω

C. 1000Ω

D. 120Ω

Answer: C

Watch Video Solution

21. Four resistors of resistance $15\Omega, 12\Omega, 4\Omega$ and 10Ω arc connected in cyclic order to form a Wheatstone bridge. The resistance (in Q) that should be connected in parallel across the 10Ω resistor to balance the Wheatstone bridge is

A. 10Ω

B. 5Ω

C. 15Ω

D. 20Ω

Answer: A

Watch Video Solution

Section D Multiple Choice Questions Mcqs Mcqs Asked In Cbse Pmt Aipmt Neet

1. A potentiometer wire has length 4 m and resistance 8Ω. The resistance that must be connected in series with the wire and an accumulator of e.m.f. 2V, so as to get a potential gradient 1 mV per cm on the wire is :

A. 32Ω

B. 40Ω

C. 44Ω

D. 48Ω

Answer: A

Watch Video Solution

2. A, B and C arc voltmeters of resistance R, 1.5R and 3R respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A, V_B and V_C repsectively. Then :

A. $V_A = V_B = V_C$

B. $V_A \neq V_B = V_C$

C. $V_A = V_B \neq V_C$

D. $V_A \neq V_B \neq V_C$

Answer: A

Watch Video Solution

3. Across a metallic conductor of non-uniform cross section a constant potential difference is applied. The quantity which remains constant along the conductor is :

A. electric current density

B. electric current

C. drift velocity

D. electric field

Answer: B

Watch Video Solution

4. A potentiometer wire of length L and a resistance r are connected in series with a battery of e.m.f. E_0 and a resistance r_1. An unknown e.m.f E is balaned at a length l of the potentiometer wire. The e.m.f E will be given by :

A. $\dfrac{LE_0r}{(r+r_1)l}$

B. $\dfrac{LE_0r}{lr_1}$

C. $\dfrac{E_0rl}{(r+r_1)L}$

D. $\dfrac{E_0l}{L}$

Answer: C

Watch Video Solution

5. Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 are the conductivities of the metal wires respectively, the effective conductivity of the combination is

A. $\frac{\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$

B. $\frac{2\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$

C. $\frac{\sigma_1 + \sigma_2}{2\sigma_1 \sigma_2}$

D. $\frac{\sigma_1 + \sigma_2}{\sigma_1 \sigma_2}$

Answer: B

Watch Video Solution

6. A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 64 cm and 32 cm from the positive end of the wire in the two cases. the ratio of emf's is

A. $5 : 4$

B. $3 : 4$

C. $3 : 2$

D. $5:1$

Answer: C

Watch Video Solution

7. Electric charge passing through a resistor changes with time t as Q = at - bt^2 . Then total heat produce in resistor R = ...

A. $\frac{a^3 R}{3b}$

B. $\frac{a^3 R}{2b}$

C. $\frac{a^3 R}{b}$

D. $\frac{a^3 R}{6b}$

Answer: D

Watch Video Solution

8. The potential difference $(V_A - V_B)$ between the points A and B in the given figure is

A. $+6V$

B. $+9V$

C. $-3V$

D. $+3V$

Answer: B

Watch Video Solution

9. A filament bulb (500W, 100V) is to he used in a 230 V main supply. When a resistance R connected in series, it works perfectly and the bulb consumes 500W. The value of R is

A. 26Ω

B. 13Ω

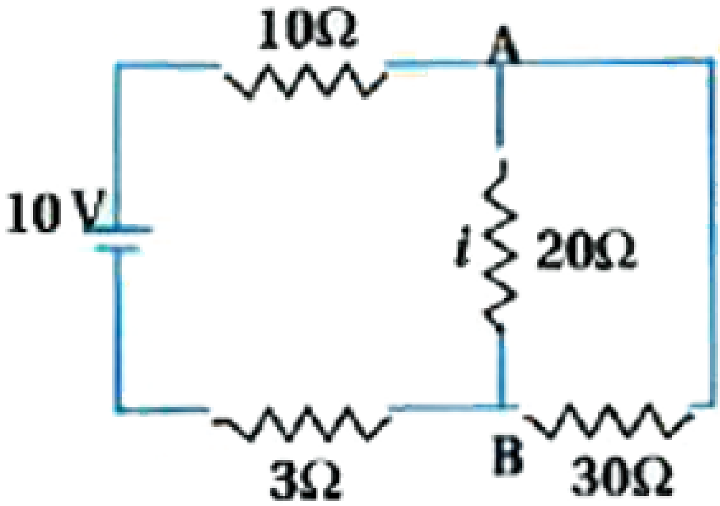
C. 230Ω

D. 46Ω

Answer: A

Watch Video Solution

10. In the electrical circuit shown in the figure, the current i through the side AB is .....



A. $\frac{6}{25}$A

B. $\frac{10}{33}$A

C. $\frac{1}{5}$ A

D. $\frac{10}{63}$A

Answer: A

Watch Video Solution

11. A cell of emf E and internal resistance r is connected across an external resistance R. Plot a graph showing the variation of P.D. across R, verses R.

A.

B.

C.

D.

Answer: B

Watch Video Solution

12. A carbon resistor of $(47 \pm 4.7)k\Omega$ is to be marked with rings of different colours for its marked with rings of different colours for its identification. The colour code sequence will be

A. Green - Orange - Violet - Gold

B. Violet - Yellow - Orange - Silver

C. Yellow - Green - Violet - Gold

D. Yellow - Violet - Orange - Silver

Answer: D

Watch Video Solution

13. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' ,and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors arc connected in parallel to the same battery. Then the current drqwn from battery becomes 10 I. The value of 'n' is

A. 9

B. 10

C. 20

D. 11

Answer: B

Watch Video Solution

14. A battery consist of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The tem1inals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n ?

A.

B.

C.

D.

Answer: B

Watch Video Solution

15. Which of the following acts as a circuit protection device ?

A. fuse

B. conductor

C. inductor

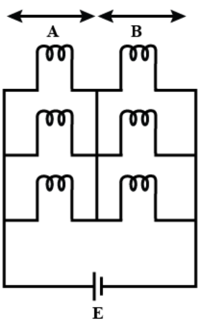
D. seitch

Answer: A

Watch Video Solution

16. Six similar bulbs are connected as shown in the figure with a DC source of emf E, and zero internal resistance.

The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be :



(a) $2:1$

(b) $4:9$

(c) $9:4$

(d) $1:2$

A. $2:1$

B. $4:9$

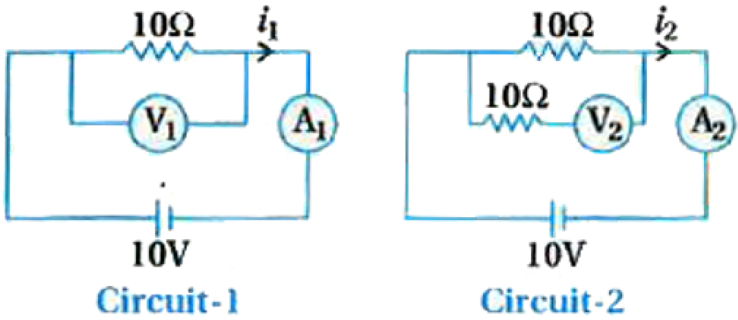
C. $9:4$

D. $1:2$

Answer: C

Watch Video Solution

17. In the circuits shown below, the readings or the voltmeters and the ammeters will be :



A. $V_2 > V_1$ and $i_1 > i_2$

B. $V_2 > V_1$ and $i_1 = i_2$

C. $V_1 = V_2 i_1 > i_2$

D. $V_1 = V_2$ and $i_1 = i_2$

Answer: D

Watch Video Solution

Section D Multiple Choice Questions Mcqs Mcqs Asked In Aiims

1. Which of the following relation shows current density ?

A. $\frac{I^2}{A}$

B. $\frac{A}{I}$

C. $\frac{I^3}{A^2}$

D. $\frac{I}{A}$

Answer: D

Watch Video Solution

2. A battery or emf 10 V and internal resistance 3Ω is connected to a resistot. If the current in the circuit is 0.5 A, what is the resistance of the resistor ?

A. 13Ω

B. 15Ω

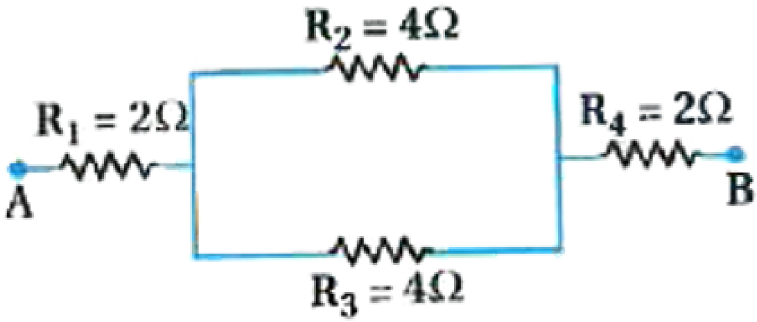
C. 17Ω

D. 19Ω

Answer: C

Watch Video Solution

3. Equivalent resistance between A and B for shown circuit is ..... .



A. 8Ω

B. 6Ω

C. 2Ω

D. 4Ω

Answer: B

Watch Video Solution

4. A wire of length L is strech such that its diameter is reduced to half of its original diameter. If the initial resistance of the wire were 10 Ω, its new resistanc would be

A. 40Ω

B. 80Ω

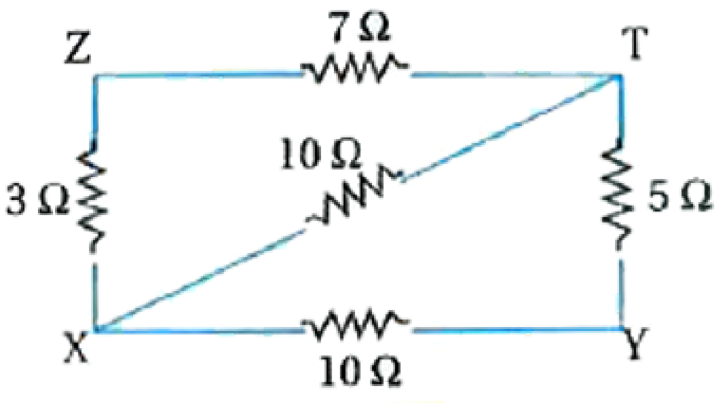
C. 120Ω

D. 160Ω

Answer: D

Watch Video Solution

5. Equivalent resicitance for circuit shown below will be ..... .



A. 10Ω

B. 5Ω

C. 7Ω

D. 3Ω

Answer: B

Watch Video Solution

Section D Multiple Choice Questions Mcqs Mcqs Asked In Board Exam And Gujcet

1. A wire is bent in the form of circle of radius 2m. Resistance per unit length of wire is $\frac{1}{\pi}\frac{\Omega}{m}$. Battery of 6 V is connected between A and B $\angle AOB = 90^{\circ}$.

Find the current through the battery.

A. $8A$

B. $3A$

C. $4A$

D. $9A$

Answer: A

Watch Video Solution

2. The carbon resistor has three orange bands. The maximum value of resistance offered by the resistor will be ..... .

A. 49.6 $k\Omega$

B. $39.6k\Omega$

C. $33k\Omega$

D. $26.4k\Omega$

Answer: B

Watch Video Solution

3. Two wires of same material having lengths and radii in the ratio of 3 : 4 and 3 : 2 respectively are connected in parallel with a potential source of 6V.

the ratio of currents flowing through them $I_1 : I_2$ =

..... .

A. $1:3$

B. $1:2$

C. $3:1$

D. $2:1$

Answer: C

Watch Video Solution

4. Match the following two columns.

Column-I		Column-II	
(a)	Electrical resistance	(p)	$ML^3T^{-3}A^{-2}$
(b)	Electrical potential	(q)	$ML^2T^{-3}A^{-2}$
(c)	Specific resistance	(r)	$ML^2T^{-3}A^{-1}$
(d)	Specific conductivity	(s)	None of these

A. (a) - (q) , (b) - (s), (c) - (r), (d) - (p)

B. (a) - (p) , (b) - (q) , (c) - (s) , (d) - (r)

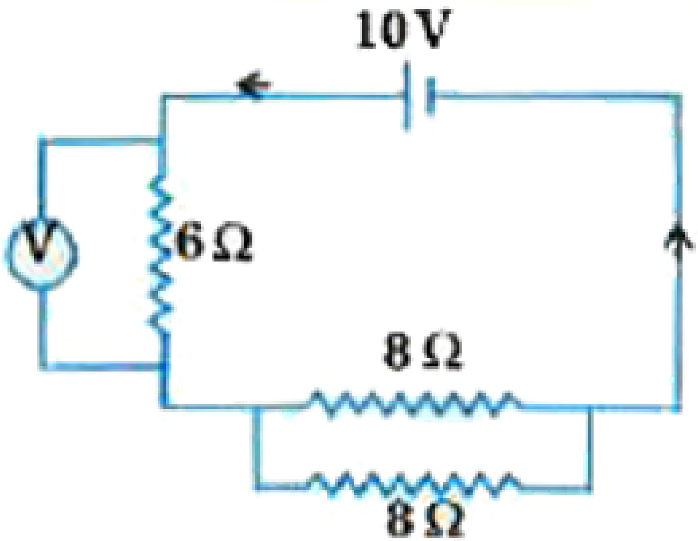
C. (a) - (q), (b) - (r) , (c) - (p) , (d) - (s)

D. (a) - (p) , (b) - (r), (c) - (q) , (d) - (s)

Answer: C

Watch Video Solution

5. A voltmeter of a very high resistance is joined in the circuit as shown in figure. The voltage shown by this voltmeter will be ....



A. 6 V

B. 2.5 V

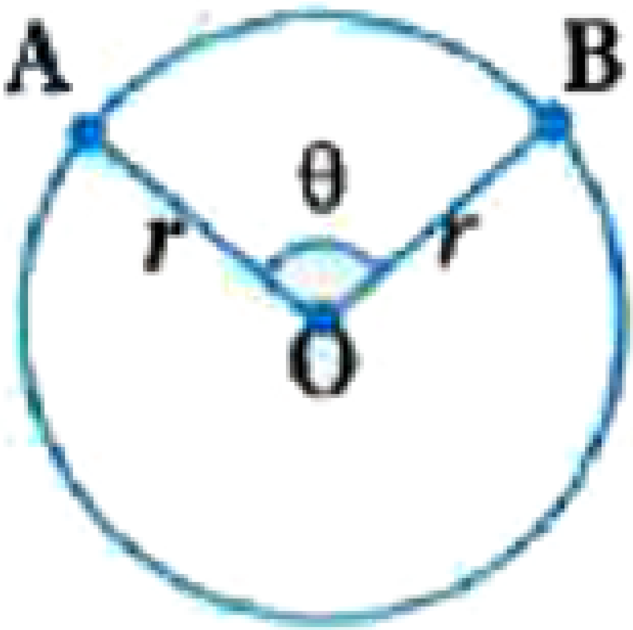
C. 5 V

D. 3V

Answer: A

Watch Video Solution

6. A and B are two points on a uniform ring of radius r. The resistance of the ring is R.$\angle AOB = \theta$ as shown in the figure. The equivalent resistance between points A and B is ....



A. $\dfrac{R\theta}{2\pi}$

B. $R\left(1-\dfrac{\theta}{2\pi}\right)$

C. $\dfrac{R(2\pi-\theta)}{4\pi}$

D. $\dfrac{R}{4\pi^2}(2\pi-\theta)\theta$

Answer: D

Watch Video Solution

7. Two wires of equal length and equal diameter and having resisticities ρ_1 and ρ_2 are connected in series. The equivalent resistivity of the combination is .... .

A. $(\rho_1 + \rho_2)$

B. $\dfrac{\rho_1 \rho_2}{\rho_1 + \rho_2}$

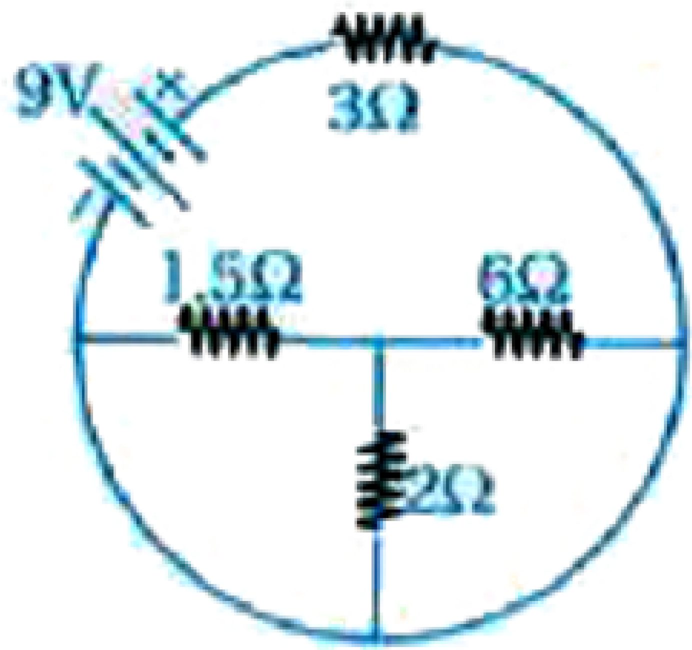
C. $\dfrac{\rho_1 + \rho_2}{2}$

D. $\sqrt{\rho_1 \rho_2}$

Answer: C

Watch Video Solution

8. What is the total current supplied by the battery to the circuit shown ?



A. $6A$

B. $4A$

C. $2A$

D. $1.5A$

Answer: A

Watch Video Solution

9. A student is given 4 identical batteries having emf 1.5 Veach and internal resistance of 0.1Ω each. The student is asked to connect them in assisting manner. By mistake he connects one battery in reverse way. The resultant emf and resultant internal resistance offered by the combination is ....

A. 3V, 0.2 Ω

B. $4.5V, 0.3\Omega$

C. $3V, 0.4\Omega$

D. $6.0V, 0.4\Omega$

Answer: C

Watch Video Solution

10. Given quantity of water is boiled by an electric heater in 5 min. If supply voltage of heater reduces to half then time taken to boil the same quantity of water will be .... min. (Assume the resistance of the heater remaining constant)

A. 40

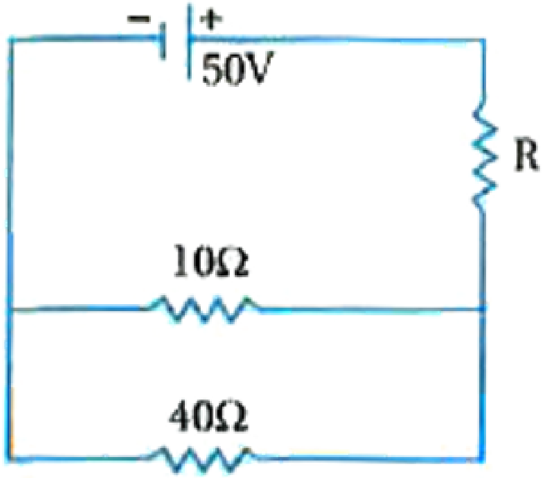
B. 20

C. 10

D. 2.5

Answer: B

Watch Video Solution

11. 

In above circuit if current through 10 Ω resistor is 2.5 A, value of R is .... .

A. 40Ω

B. 10Ω

C. 8Ω

D. 50Ω

Answer: C

Watch Video Solution

12. Brown, Red and Orange coloured bands on carbon resistor are followed by silver band. The value of resistor is ..... .

A. 12 K$\Omega \pm 5\%$

B. $12k\Omega \pm 10\%$

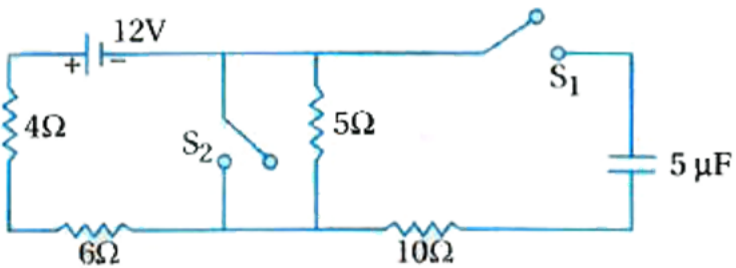
C. $320\Omega \pm 10\%$

D. $320\Omega \pm 5\%$

Answer: B

Watch Video Solution

13. What is the current in the 40 resistor when switch S_1 is open and switch S_2 is closed in the given circuit ?



A. $0.8A$

B. 1.2 A

C. 1.5 A

D. 3.0 A

Answer: B

Watch Video Solution

14. When the temperature of a conductor increase the ratio of its resistivity and conductivity ......

A. remain constant

B. increase

C. decrease

D. increase or decrease

Answer: C

Watch Video Solution

15. You are given 10 resistors each of resistance 2Ω. First they are connected to obtain possible minimum resistance. Then they are connected to obtain possible maximum resistance. The ratio of maximum and minimum resistance is .... .

A. 100

B. 10

C. 2.5

D. 25

Answer: A

Watch Video Solution

16. The dimensional formula of mobility is ... .

A. $M^{-1}L^{1}T^{2}A^{1}$

B. $M^{1}L^{0}T^{-2}A^{-1}$

C. $M^{1}L^{-1}T^{-2}A^{-1}$

D. $M^{-1}L^{0}T^{2}A^{1}$

Answer: D

Watch Video Solution

17. The heat produced per unit time, on passing electric current through a conductor at a given temperature is directly proportional to the .....

A. Electric current

B. Reciprocal of electric current

C. Square of electric current

D. Reciprocal of square of electric current

Answer: C

Watch Video Solution

18. A carbon resistor has three bands as Brown Black and Green in order. What will be that range of resistance it offers.

A. $7 \times 10^5 \Omega - 13 \times 10^5 \Omega$

B. $9 \times 10^5 \Omega - 11 \times 10^5 \Omega$

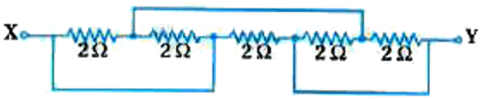
C. $8 \times 10^5 \Omega - 12 \times 10^5 \Omega$

D. None of these

Answer: C

Watch Video Solution

19. In the network shown in the figure the equivalent resistance between points X anx Y will be ..... Ω. Value of each resistance is 2Ω.



A. 2

B. 4

C. 1

D. $\frac{2}{3}$

Answer: C

Watch Video Solution

20. Shunt wire should be ....

A. Thichk and long

B. Thick and short

C. Thin and long

D. Thin and short

Answer: B

Watch Video Solution

21. According to Ohm's law $\left(R=\frac{V}{I}\right)$, as current flowing through a conductor increases, resistance of conductor .....

A. Decreases

B. increases

C. remain constant

D. nothing cab be said

Answer: C

Watch Video Solution

22. Kichhoff's junction role represents.......

A. conservation of linear momentum.

B. conservation of energy.

C. conservation of angular momentum

D. conservation of charge.

Answer: D

Watch Video Solution

23. Two resistors when connected in series net resistance is 5 Ω and when they are connected in parallel net resistance is 1.2 Ω. What are these resistors ?

A. $2\Omega, 3\Omega$

B. $1\Omega, 4\Omega$

C. $0.6\Omega 0.6\Omega$

D. $1\Omega, 0.2\Omega$

Answer: A

Watch Video Solution